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Richardson, John; Pääkkölä, Anna-Elena; Qvick, Sanna

Published in:
The Oxford Handbook of Cinematic Listening

DOI:
10.1093/oxfordhb/9780190853617.013.24

Published: 01/01/2021

Document Version
Proof

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CHAPTER 19

SENSING TIME AND SPACE THROUGH THE SOUNDTRACKS OF *INTERSTELLAR* AND *ARRIVAL*

JOHN RICHARDSON, ANNA-ELENA PÄÄKKÖLÄ, AND SANNA QVICK

C19.P1 In this chapter we consider two recent science-fiction films as benchmarks for new ways of configuring the listening body in time and space. *Interstellar* (2014, dir. Christopher Nolan; music by Hans Zimmer) and *Arrival* (2016, dir. Denis Villeneuve; music by Jóhann Jóhannsson) are both characterized by multisensory involvement and employ extended expressive means which imply a new relationship between the screen, the soundtrack, and audience engagement, in which the immersiveness of new cinema disorientates and re-orientates audioviewers towards visceral experiences.[1] In this sense, *Interstellar* and *Arrival* are emblematic of how, in science fiction cinema, music and sound design play a vital role in *transporting* audioviewers from familiar experiential domains.[2] As Robynn Stilwell has commented, sci-fi "requires the kind of leaps of imagination that sound is particularly adept at suggesting and shaping, not just creatures, objects and ideas, but *space and time*."[3] Our investigation will attempt to unravel how these two films combine existing—even traditional—means with more innovative approaches to sonic and multisensory expression in ways that are redefining what it means to listen cinematically.

C19.P2 A central claim of this chapter will be that the new sci-fi cinema exemplifies an approach that erodes the boundaries between the cinemagoer as a corporeal, experiencing being and the sounds and images this being encounters in films. While we would defend calling this new cinema "immersive," this does not invariably require the sort of

audience involvement that spectatorship theory was concerned with in classic cinema—where the audioviewer was stitched into the film narrative through primary identification with the film's protagonists on the level of plot and projected subjecthood—but rather a mode of attachment through the senses where the very space and time audioviewers occupy is understood as transformed and continuous with the cinematic world. As John Richardson and Claudia Gorbman wrote in the Introduction to *The Oxford Handbook of New Audiovisual Aesthetics*, "[w]e always meet films, or any audiovisual event, halfway as we respond internally with embodied actions and built-in empathetic mechanisms to the sounds and images we encounter."[4] This is, indeed, invariably the case, but the technologies and expressive strategies of the new cinema—especially, we would argue, the sci-fi new cinema—push us to the edge of the sensible and into the realm of the sensory as never before.

C19.P3 Often stigmatized as a pulp genre, sci-fi has long offered a vehicle for addressing far-reaching philosophical and sociocultural questions in the guises of speculative and allegorical story worlds. Arguably, the very difference of these story worlds from everyday experiences makes them more impactful.[5] Nowhere is this more apparent than in the auteurist works of directors like Jean-Luc Godard (*Alphaville*, 1965), Stanley Kubrick (*2001: A Space Odyssey*, 1968), Andrei Tarkovsky (*Solaris*, 1971), and Nicolas Roeg (*The Man Who Fell to Earth*, 1976), which significantly influenced a recent spate of sci-fi movies that resemble both today's mainstream cinema and the arthouse classics mentioned earlier. Farah Mendlesohn proposes that sci-fi's main affective constituent is a sense of wonder and awe towards new possibilities and towards exploring the unknown, futuristic technologies, and scientific breakthroughs; in short, wonder at the universe as both a physical and a technological sphere.[6] This orientation is not, however, without complications. Resembling the concept of "the sublime" in Romantic aesthetics, this awe is closely attached to feelings of melancholy and ennui arising from the fact that the desired goal can never be attained;[7] you cannot reach or pin down the universe.

C19.P4 Unsurprisingly for a genre that draws extensively on tropes of the Kantian and Burkean sublime (the unexplored, the uninhabitable, the unfathomably large), sci-fi music often adopts a Romantic aesthetic, including musical features such as epic scale and volume in arrangements, chromaticism, and uses of unresolved dissonance. Fear, we would argue, is more corporeally present if listeners are made to tremble in their seats; unfathomable scale more easily achieved if sounds encircle listeners. All of which coalesces in the new cinema's allegiance to the corporeal.

C19.P5 Besides Romantic aesthetics, several additional sonic modalities are entangled in the examples discussed here. Experimental and extended compositional techniques have long featured prominently in sci-fi aesthetics, unsurprisingly perhaps given that a goal of directors and their soundtrack collaborators has often been to portray unfamiliar and extreme experiences.[8] The fact that so much of this sonic expression comes close to sound design, Foley work, or even sound art is not exceptional to this genre, since much of the recent cinema works in this way.

C19.P6 As Vivian Sobchack and William Whittington have argued, greater license is given to composers and sound designers in sci-fi than in other expressive domains due to the

apparently limitless potential of the experiences portrayed.[9] In the soundtracks we will discuss, this includes techniques germane to atonal, post-serial, spectral and microtonal, electronic, and postminimalist composition. As David Huckvale has noted, the context of film music permits a comfortable alliance between the avant-garde and the accessibility of popular styles. This is accentuated in soundtracks incorporating postminimalism, which has more successfully traversed cultural divides than most avant-garde styles.[10] We are not concerned merely with the ability of music in film to arouse the body through uses of rhythm and volume, which K. J. Donnelly emphasizes in his discussion of cinematic corporeality.[11] For us, the process bears also on issues of time, space, and multimodal interaction. Namely, techniques of postminimalist music, including additive and other cellular techniques; processual and evolving structures in timbre, pitch, and harmony; stylized counterpoint; and audiovisual anempathy or non-synchronicity, offer unique potential for challenging conventional ideas of time and space. An additional factor in postminimalism is the use of historical reference, including Baroque and Romantic tropes, which run in parallel to the visual narrative of the film, syncing up closely with dramatic actions only occasionally.[12] Whereas the primary modality in the examples discussed in this earlier work could be described as one of "disaffection,"[13] we place more of an emphasis on sonic atmospheres or "sound architectures."[14] These give voice to the experiences of characters (be they human or otherwise) and delineate the mentality of sci-fi as unabashedly "affective," which corresponds with our earlier observation concerning the relevance of Romantic music.[15] The salience of minimalism is most apparent when it comes to configurations of time, where sequential or linear time is replaced by cyclical and non-linear formations that imply both corporeality and technology. It is this combination of the organic and non-organic and the elision of subjective human agency which brings about an uncanny impression of presence in absence, and communicates the films' dominant themes, of extreme experience, non-linguistic encounters with the unknown or alien, spatiotemporal elision, and corporeal involvement.

C19.P7 The changes we are outlining here, comprising minimalism and other experimental and extended techniques, music and sound design, suggest an emerging aesthetic of sci-fi soundtracks that extends earlier theorizations, including that of Philip Hayward.[16] This aesthetic and the various forms it takes revolve around three primary facets: embodied experience; an altered sense of space; and an altered sense of time.

C19.P8 Michel Chion was among the first to contend that the audiovisual is never confined solely to vision and sound, but extends to tactile, kinetic, temporal, dynamic, and other domains of sensory experience.[17] Here we go further by arguing that soundtracks in new science fiction cinema afford a distinct sense of immersion that narrows the gap between cinematic action and audience experiences. This understanding of multisensory film music theory extends Laura Marks's discussions of embodiment; more specifically, her work on "haptic visuality."[18]

C19.P9 Contrary to much of existing theory on multimodality, we take music, sound effects and voices as the starting point of our discussion, building on earlier writing (such as that of Antunes)[19] but arguing for an approach that extends beyond the "five senses" to include also

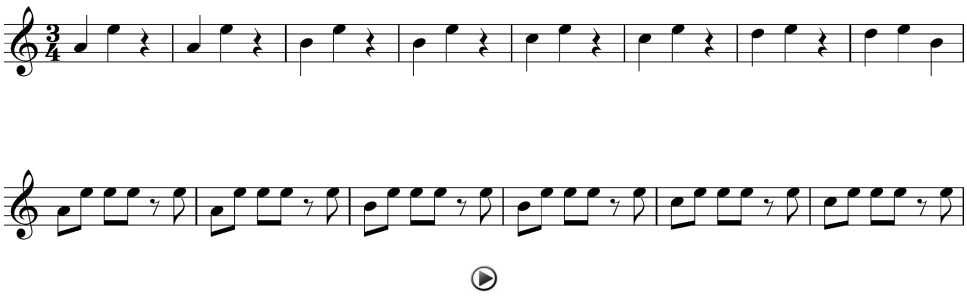
C19.P10 • Balance, gravity, and space (including sensory abilities that have been classed kinesthetic, proprioceptive, and equilibrioceptive)
C19.P11 • Time (including an impression of altered time)
C19.P12 • Embodied immersion (extending to vibration or mechanoreception; temperature or thermoception; pain or nociception; and other domains of human experiences)

C19.P13 Since a priority in sci-fi films is to convince audiences of the existence of credible non-Terran spaces or alternative realities, integrated multisensory music and sounds play a specific role in encouraging immersion. For us, this immersion goes beyond psychological identification to the very situations where films are encountered. In *The Visible and the Invisible*, Maurice Merleau-Ponty has argued that when discussing tactile contact, the act of perception implies an intermingling of subject and object, their mutual enfolding—something that is true not only experientially but on a molecular and "fleshy" level, in terms of how we interact with the physical environment.[20] Touching in this view necessitates also *being touched*, whether the object in question is itself sensate or inanimate, which in turn repositions the experiencing subject as object to another subject. Extending this principle to vision, an element of distance is introduced. Nevertheless, the seer has the potential to become the seen in much the same way; the scene of a painting (for example, a landscape), becomes a vista from which the perceiving subject might equally be observed.[21] This notion challenges the Romantic solitary subject, replacing it with an embodied or "fleshy" subject whose boundaries are continuous with the surrounding environment. This has implications not only in terms of classic cinematic theory, including the positioning of the gaze and its attendant aural and sonic mechanisms, but also gender theory and ecological questions. The implication is that sound permeates not only the cinematic subject but extends the boundaries of that subject into cinematic space and time.

C19.S1 *Interstellar* Overdrive: A Tale of Gravity and Awe

C19.P14 *Interstellar* is one of several films by Christopher Nolan that deal with expanded notions of time (especially *Memento*, 2000; and *Inception* 2010). Its soundtrack, in the words of YouTube's Honest Trailers,[22] features "emotional swells that sound like Hans Zimmer fell asleep at his organ"—one of several factors that led audiences to complain that the music usurps auditive space ordinarily reserved for dialogue.[23] There is undeniably a preponderance of crescendos and pedal tones in the soundtrack, which could create that impression. In fact, the organ swells serve a specific audiovisual purpose, functioning as extending stingers chords, drawing attention to dramatically significant moments, and calling out for affective responses.[24] Furthermore, it could be argued that the purpose

C19.F1 **EXAMPLE 19.1** The Baroque minimalism of Cooper and his daughter Murph's music, reflecting both characters' scientific rationality and their separation in time and space. Hans Zimmer: *Interstellar*, "Day One" (2014).

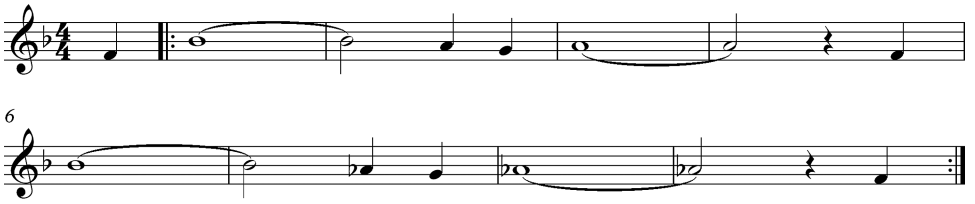


C19.F4 **VIDEO 19.1** *Interstellar*, Launch scene.

of mixing the sound and music differently was, indeed, a push towards a new kind of aestheticism in which sound is purposely prioritized over dialogue.[25] In our view, *Interstellar* and *Arrival* stand out as representing a new approach where musical "meaning" is not the main point, and music becomes a vehicle for conveying visceral intensity facilitated by changes in cinema sound systems and home hi-fi setups. This is not to say, of course, that the films are without precursors. Philip Glass's *Koyaanisqatsi* (1982) is a clear point of reference for *Interstellar*, along with many cap tips in the direction of Stanley Kubrick's *2001: A Space Odyssey* (1968). This is recognizable also in the palette of borrowed music Kubrick used in his soundtrack, including Ligeti's high modernism and Strauss's late Romantic extended tonality, combined in Nolan's film with a distinctly Wagnerian approach to tonal materials and chromaticism, all of which places the score in a powerful affective register. The score of *Interstellar* comprises an ensemble combining thirty-four string instruments, twenty-four woodwinds, four pianos, sixty choir singers, and, additionally, a church organ, which becomes the most persuasive instrument when it comes to the sort of powerful embodied involvement we are discussing here. The expressive range of the organ combined with the rhythmic and dynamic qualities of the music and how it is mixed in the soundtrack make it impossible to ignore.

C19.P15 One of the more prominent musical themes in *Interstellar* appears for the first time in the cornfield chase early on in the film and is reprised in grander forms as it progresses (see 0:05:26-0:09:14).[26] Referred to in the soundtrack album as "Day One," this cue is heard whenever reference is made to the relationship between the films' main protagonist, Cooper (played by an inaudibly mumbling Matthew McConaughey) and his daughter, Murph (three different actors). The chord movement in the initial statement is Fmaj7, Em/G, Am, G6 (see Example 19.1). Its first instance is classically leitmotivic, occurring initially during a conversation between the two where they discuss the origins of Murph's name. Aside from the Morse code-like mechanical quality of the music, perhaps its most recognizable feature is the open fifth sonority between the tones a1 and e2 and stepwise rising and falling movement between these tones. The soundtrack has much of the mood of a baroque chaconne ground à la Glass (e.g., *Satyagraha* 1981; *Akhnaten* 1984).[27]

C19.F2 **EXAMPLE 19.2** Baroque minimalism transformed into the melancholia and sublime thrill of Romanticism as Cooper is separated from humanity. Hans Zimmer: *Interstellar*, "Stay" (2014).



Philip Glass's trademark arpeggiation is there in abundance, as are mechanically repeated polyrhythmic figures, and, importantly, the organ sound. In the case of Glass's minimalist musical output, this is usually electronic; in *Interstellar*, it is played on the 1926 four-manual Harrison & Harrison organ of Temple Church in London, but employing what sounds like mechanically looping, additive, and occasionally polyphonic figures.

C19.P16 A similar Romanticism is found in other sections of the score, not least the culmination of the cue "Stay" (Example 19.2). It is initially heard during Cooper's farewell to Murph, where the combination of a somber drone in low strings and occasional high organ phrases leaves space for the actors' voices, their touching dialogue and eventual bickering (0:36:20). Murph wants her father to stay on Earth and the music provides a suitable combination of melancholia (the low drone entering when Cooper speaks of parents becoming the "ghosts of their children's futures") and excitement, to suggest separation juxtaposed with anticipation of the adventure ahead. Strings introduce the main melody, alternating *Liebestod*-like between minor and major scales.[28] The cue gathers emotional—and visceral—force through an incremental increase in instrumentation, volume, and gradually ascending phrases. As Cooper's rocket launches with Wagnerian excess, the music continues to swell in volume and pitch, rising chromatically towards an ear-piercing pinnacle of strings and trombones, which provide emotive answering phrases. The combination of orchestration, a rising chromaticism sequence, dynamic range (a forceful crescendo), and pitch range (highs and lows), mark this music clearly as Wagnerian.[29] The scene is poignant, indeed, sublime, because of Murph's despair over the loss of her father and Cooper's anguish about his imminent departure. In the final moments of the cue, the count-down to the rocket's take off and the visceral rumbling of the rocket's engines leave little doubt as to the existential affective power of the moment, which becomes loaded with consequence, tear-jerkingly tragic, physically moving, and irreversible. Eventually the ascending rocket drowns out the music and dialogue altogether (0:40:35). (See Video 19.1.)

C19.P17 Concerning the narrative function of "Stay," Nolan describes this theme as portraying the bond between the films' main protagonist Cooper and his daughter, Murph.[30] In the initial stages of composition, Nolan was keen to eschew normative gender coding in Murph's music drawing attention to seriousness of the character as well as the two protagonists' grappling with profound existential questions. While the music depicts the strength and *gravity* of the relationship, it also embodies how it is depicted as transcending

time, moving into a mythical or eternal zone through the use of repetition and looping, which forms the basis of their attempts to save mankind from impending destruction. It is possible, therefore, to understand this timeless or eternal music, which is simultaneously of the present and the past, as referring outwards to a more expansive ecological or universal (in the words' literal sense) frame of reference.

C19.P18 Nolan speaks of technology in his justification of the use of the organ,arguing that it was among the most advanced technologies of its time.[31] Moreover, his use of mechanical looped figures, additive structures, and superimposed Glassian cycles suggests a mechanical sensibility. He similarly refers to the visual appearance of organ pipes, which resemble rocket launchers, while the release of energy from the organ has an *organic* quality that Nolan compares to exhalation of breath (the organ in the biological as well as more prosaic sense). The diatonic rising ground might suggest skyward ascent (rather than lament) while intertextually referencing the Baroque and postminimalist chaconne, which implies transformation and cyclical movement (essential to the film's narrative, coming full circle as father meets daughter in the past).

C19.P19 The dynamic qualities of the organ make it an effective vehicle for conveying rising intensity—as wells as physical and allegorical embodiment communicated by means of the volume and power of sound waves in a contemporary cinematic setting. One account that is heavily cited across the popular media tells of the soundtrack blowing a cinema's IMAX sound system during an early screening in San Francisco.[32] Although this claim has been disputed, the veracity of the anecdote is perhaps secondary to its value in communicating a subjective sense that *Interstellar* was an unusually loud film. While the film is, indeed, characterized by a visceral sound field and by fluid boundaries between the score and sound effects that are typically of new cinema, some of the most striking scenes occur when the music hijacks the action, providing a powerfully "felt" sense of displacement from everyday time, again pushing the film away from ordinary narrative linearity towards an epic and eternal frame of reference. The silence of space, a scientific fact that directors are becoming ever more likely to respect in their cinematic approximations (as in *Gravity*, 2013),[33] could also be interpreted as articulating a more sophisticated environmentally aware sensibility which takes questions of the environmental beyond the global.

C19.S2

Bending Time/Lines and Gentle Singularities: Rethinking the Laws of Physics

C19.P20 The influence of Kubrick's *2001: A Space Odyssey* (1968) on *Interstellar* was mentioned briefly previously. William Whittington notes that Strauss's *Blue Danube* waltz brings order and logic to the perception of space in parts of the film where there is no dialogue:

"In the synchronization of the images to the music, the physics of the universe adhere to an underlined structure of musical mathematics in perfect time."[34] In extended shots where the spaceship seems to float in perfect synchronization with musical time, Whittington argues that the music makes physical laws more apprehensible. The music in *Interstellar*, however, conveys a sense of what it would feel like to *bend or transgress* the known laws of gravity, space, and time. Zimmer achieves this by means of cyclical procedures, also based on waltz time, in which suspensions (note that suspension is also a physical state) and the dissonances they engender resolve only momentarily before a further turn of the wheel leaves them adrift once more, in search of resolution. In a third core theme, the weightless suspension of Zimmer's music coincides with human's scientific manipulation of gravity, although the agency in question has a haunted, uncanny quality resulting from the fact that it is transferred from humans to mechanical *and* natural processes.

C19.P21 The theme is based on an ethereally drifting violin theme that circles around the fifth, the tritone, and the major sixth while lolling atop cyclically undulating chords. This theme, which is reminiscent both of Kubrick's borrowing of Strauss and (again) Wagner's non-resolving melodies, is found in scenes that depict altered gravity: early in the film, where Cooper and Murph discover a gravitational anomaly in Murph's bedroom (0:18:49–0:20:53; see excerpt in Video 19.2); in the first spaceship scene and establishing shots of it in cyclical motion, where Cooper and other crew members are introduced to artificial gravity for the first time, in much the same way as *2001: A Space Odyssey* (0:44:31–0:44:57); again, when discussing "gentle singularities" on an icy planet and juxtaposed with an adult Murph approaching the room in which she was raised, where gravitational anomalies have been witnessed (1:42:20–1:45:17); finally, when Cooper is inside the singularity and figures out how to reconfigure gravity in Murph's bedroom (superimposed here over the *Day One* cue; 2:20:55–2:22:40; see excerpt in Video 19.3). The theme has a quality of optimism, suggested by gradually resolving voice leading, combined with a sense of uncanny displacement and wonder, as both the laws of gravity and of musical resolution are suspended. Since the first instance coincides with shots of falling dust, this music is called *Dust* on the soundtrack album (Zimmer 2014). It is static, only barely suggesting motion: the root of the chord does not change; the melody only implies tonal movement. It is a stationary tonic, lost in its own sound world; an eternity of sound.[35] It is embodied through the presence of gently pulsating cycles and melodic implications, but not forcefully or assertively. Through these gravitational distortions, we learn later in the film that not only space and movement in space are affected, but also time. This impression of infinite openness (also a notable characteristic of Burke's sublime), with fields of presence extending outward from each passing

C19.F5 **VIDEO 19.2** *Interstellar*, Decoding the Message.

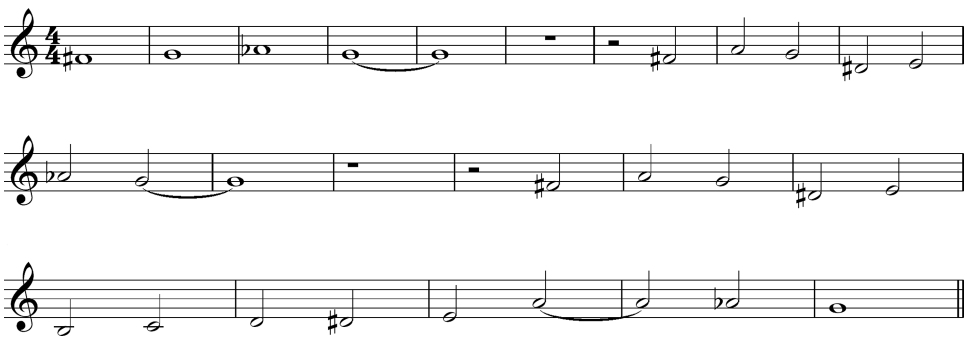
C19.F6 **VIDEO 19.3** *Interstellar*, Bridge.

moment, is brought poignantly home in the scenes where Cooper is caught in a parallel dimension, unable to communicate with his daughter by any means other than gravity itself.

C19.P22 A grandiose reprise of the rocket launch music ("Stay") is heard when Cooper and his budding love interest, the younger Professor Brand (Anne Hathaway), are tragically separated as Cooper selflessly hurls himself into a singularity in order to save humanity (2:14:49–2:25:44). Here Wagnerian suspensions, chromaticism, and blaring trombones pile the pressure up to breaking point. In shots reminiscent of the final scenes of *2001*, Cooper's shuttle disintegrates and the character is ejected into the heart of a black hole. Time-space within the singularity has been manipulated by *them* (who turn out to be *us*: human descendants) into the form of bookshelf, which exists beyond linear time and space: it is everywhere and every-*time*. Cooper's breathing sounds are cut up in a roll effect,[36] while industrial noises and organ chords accentuate his fall (see *Interstellar* 2:11:54–2:15:06).

C19.P23 The singularity is formed musically of themes introduced earlier in the film (*S.T.A.Y.*; Zimmer 2014). The "Day One" organ cue joins images of both the young and the older Murph, as Cooper observes her through the bookshelf (2:18:46–2:20:55). The connection between the two characters is accentuated by the compressed space-time of the singularity, but also though the leitmotivic use of similar musical materials. As TARS contacts Cooper with a reminder of his present time, the "Day One" organ cue is superimposed over the "Dust" (gravity) cue (2:20:56–2:23:48, Example 19.3); a reminder of father and daughter's experiments with gravity. When Cooper decides to send binary information to Murph using gravity and dust as his means of communication, and when Murphy realizes that it is her father who is sending the messages, the music changes to polyrhythmic material; and finally, as Cooper realizes that it is only Murph who can save the world, the "S.T.A.Y." cue points towards her increased significance as an agent of change, bringing hope to an environmentally doomed world, while at the same time implying that father and daughter will eventually be reunited and reconciled (See Video 19.4).

C19.F3 **EXAMPLE 19.3** Weightlessness, uncanny displacement, and wonder coalesce in music depicting gravitational anomalies. Hans Zimmer: *Interstellar*, "Dust" (2014).



C19.F7 **VIDEO 19.4** *Interstellar*, It Was Him.

C19.P24 The past, the present, and a sense of the future are blended together in this extended montage scene comprising snippets of various motives, all of them interconnected in variations that express the changing tone of the narrative. Zimmer here deploys tone color, musical texture, and density in order to suggest a growing sense of momentum, and evolution from a contemplative mood to a more animated, optimistic one. When the cue ends it does so abruptly (2:27:04–2:28:50), with Cooper suspended Major Tom-like in his space suit, floating within a multidimensional singularity—a singular moment, a single variation resolving onto the eternal, in the shape of a gradually transforming organ pedal point. With the realization that *they* are *us*, the virtual world in which Cooper was suspended is disassembled and we are left only with mechanically repeating organ arpeggios in a high register.

C19.S3 *Arrival*: Human and Organic Sounds; Alien Bodies

C19.P25 While the principal means of conveying experiences like kinaesthetic involvement, weightlessness (equilibrioception), rumbling vibration (mechanoreception), and suspended temporality in *Interstellar* are those of Baroque and Romantic postminimalism integrated with visceral sound design, *Arrival's* soundtrack employs similar and yet markedly different means to evoke equally immersive and sensory-rich experiences. The main premise of *Arrival* is familiar in a science fiction context: first contact. The protagonist, linguistics professor Louise Banks (Amy Adams), is lecturing at her university when the class is interrupted by social media news coming from multiple sources. Aliens have arrived and humans around the world are scared and confused. Instead of conforming to the familiar plotline of hostile invasion à la *War of the Worlds* (1953), the aliens do not attack but hover above the ground in oval shaped vessels. Louise is asked to join a team of scientists and soldiers whose goal is to communicate with visitors, and she embarks upon the time-consuming task not only of teaching the aliens to read English, but also of learning their unfamiliar form of communication, which happens principally through the medium of circular ink blotches. It soon becomes apparent (through the work of physicist, and Banks's eventual love interest, Ian Donnelly [Jeremy Renner]), that the aliens' laws of physics work differently to those known to humans. They understanding of gravity, mass, and especially time also diverges dramatically from what has previously been known on Earth.

C19.P26 The Icelandic composer and sound designer Jóhann Jóhannsson (1969–2018) approached the film's music by combining classical techniques with more avant-garde ones and composing music that, in sections of the film, borders on sound design. More generally, the integrated approach to the soundtrack makes it difficult to tell where music ends and sound effects begin. An especially striking feature is the intricate work that was put into producing the aliens' sounds,[37] which are derived entirely from organic

sources. In the film's opening scenes electronic diegetic sounds are mixed so high in the soundtrack as to be intrusive; indeed, these sounds seem to pose an existential threat to characters' due to their omnipresence. The impression of a panic-stricken world is conveyed with diegetic sounds like sirens, military aircraft, helicopters, and the fragmentary and piercing electronically mediated sounds of communication media (news broadcasts, "stock footage" of panicked, violent people on the streets, and Skype calls). Overall, the sound design communicates a central message of the film: the soundscape of humanity is one of confusion, intrusion, and disarray; alien sounds interrupt this human noise with something more primal, while offering glimpses of calm and repose in terms of the visions they offer the protagonist of her future life.

C19.P27 Both films present audioviewers with beings that do not qualify as human. In *Interstellar*, the lively and quick-witted robots have human voices, although obvious markers of corporeality, such as breathing, glottal noises, and the like are absent,[38] and their physical form is not anthropomorphic. The robot TARS does not become a dystopic agent, but instead is a helpful and competent adjunct to the human crew, and occasionally provides comic relief as if to prove its fundamentally benign character. *Arrival*'s aliens are similarly well-meaning; they possess crucial information which they wish to share with the humanity. These creatures differ from standard sci-fi monsters in so far as they are characters who actively, yet benignly, drive the plot forwards.[39] According to Vivian Sobchack, more traditional hostile sci-fi monsters "lack a psyche"; moreover, "[o]ur sympathy is never evoked by a [sci-fi] creature; it remains, always, a thing."[40] Even when alien beings are apparently anthropomorphic in form, conspicuous differences dehumanize them, and these have a tendency to block audience identification. The sound designers Olivier Calbert, Michelle Child, and Dave Whitehead deliberately sought to *envoice* the aliens as living, agentic creatures by creating their sound effects from natural materials. In some ways they are the complete opposite of the talking robots of *Interstellar*, as their sounds are little more than breathing and guttural noises.[41] In a sense, their voices are reduced to nothing but "grain." This brings to the fore commonalties between the aliens and humans, instead of creating an uncanny, phenomenological rift between the two, as Sobchack's argued is the case in conventional imaginings of aliens. Whereas in a film like *Blade Runner* (1982) the mechanized music and ambiguity of music and sound effects conveys a pervasive atmosphere of tension between humans and replicants,[42] in *Arrival* no sonic tension is implied between aliens and humans; at least this can be said of the film's two scientist protagonists. Instead, dissonance is created between the (mechanized and mediatized) outside world and the interior of the alien vessel, where scientific investigation happens, and which is a relative sanctuary from the chaos and diegetic disorder that exists outside.

C19.P28 A cross (perhaps) between elephants and squids, the heptapods loom imperiously over their human counterparts. Initially they are depicted as awe inspiring and physically threatening, due to their sheer size and alien-ness. Gradually, however, they reveal themselves to be intellectual beings with a wisdom exceeding that of humans, and a willingness to share knowledge in order to save their own species in the future. What is remarkable about the initial sequences of the aliens is how seamlessly their bodily

sounds seem to overlap with the music that immediately preceded this their onscreen appearance. The heptapods emit low-frequency sounds produced mostly by slowing down or stretching recorded animal vocalizations (including birdsong and camel snorts) and various other sounds produced by means of breathing (including a didgeridoo and glued, wet rice paper).[43] But the aliens are also depicted through more traditional musical means. Mostly, a sound resembling the manipulated animal sounds is created in the cue named "Arrival" using looped low piano drones (constructed by omitting the onset and looping only the long tail-off signal). These sounds are juxtaposed with the voice of Robert Aiki Aubrey Lowe, who adopts extended vocal techniques treated with an expansive reverb effect. These sounds coincide with the first image of the spaceship (0:17:44–0:20:12). Other significant sounds associated with the aliens include their movements, which are emphasized with gurgling noises, suggesting the aliens exist in a non-Terran environment (made up of gas or liquid), as well as the general ambience inside their ship.

C19.P29 The first instance of sound generated inside the alien ship is found when Louise and Ian, along with the rest of the crew, make their initial approach to the alien vessel (00:25:58–00:31:43.) An intricate relationship between auditive, kinaesthetic, and proprioceptive senses is imparted in this scene to suggest a multisensory experience of "alien" space. The scene begins with the intrusive industrial sounds of a lift, which propels the characters skywards into the corridor that traverses the ship, while the unstable, wavering notes of the looped piano follow their actions. The sounds of the ship, like those of aliens themselves, were created by natural means: the sounds of moving ice and wind which were used in the construction of the sound design identify the alien ship as an ecological, perhaps even an organic, more than a technological space.[44] Meanwhile, Louise's subjective sounds, mainly her heavy breathing, heard through (the filter of) her radiation suit's microphone, create an intimate point of audition.[45] As this character struggles to hold her breathing in check, tension is created through the medium of the sounding body onscreen: we perceive her nervousness. In what follows, kinaesthetic and proprioceptive senses[46] are toyed with as the crew embarks and are required to take an embodied "leap of faith" inside the vessel, where gravity changes from Earth's vertical orientation to the vessel's horizontal one (see Video 19.5). As other crew members leap forwards, we hear throat-singing and bowed double-bass glissandos which "modulate" slowly upwards, together with low strings treated with reverb. In this way, the floating sensation of changing gravitational planes is rendered musically. An embodied, multisensory version of this ensues as Louise herself is helped aboard: Louise's frightened gasp is accentuated by a similar disorientating glissando as her perception of gravity changes. As she floats across the screen, the sound of her oxygen ventilator is panned along with movement from left to right; the audience can experience both a sense of her body in motion and also what it might feel like inside her radiation suit. The audience is thereby elevated with Louise to a new sensory level, her reactions affording empathic responses.

C19.F8 **VIDEO 19.5** *Arrival*, Leap of Faith.

C19.P30 A general impression of suspense is then evoked through the presence of a non-diegetic pizzicato string pulse, which asserts the tonic twice, before descending by an octave. This is paired up with a number of Hitchcock dolly zooms where the subjectivity of the crew is heightened and the magnitude of the alien corridor is brought home. This technique is an iconic example of cinematography prioritizing experience over literal reality, as what was initially distant in the shot is suddenly made to appear close, but with perceptible distortion in the visual frame. Here, though, the zoom might do more than this; in conjunction with the music, it can convey a sudden transition through weightlessness to a different kind of gravity—being swept off your feet and then back onto them, in an Escherian impossible world of coexisting divergent gravitational fields.

C19.P31 The crew moves forwards hesitantly inside the ship, pizzicato strings conveying a sense of their restlessness as well as evoking heartbeats; a subtle embodied link is thus created.[47] The slow pulse of the ostinato is interrupted by shots of the window dividing human and non-human environments, emphasized in each case by a strident orchestral signal that includes brazen brass instruments (probably a Nepalese karnal horn), reed, and electronic instruments. This is sonically shocking because of the dynamic contrast, but also because the low rumblings reach our bodies: we are literally shaken by the signal. This loud instrumental signal, a type of reveille, functions in a similar way to stinger chords in horror films, communicating an embodied sensation that approximates the crew's nervousness.[48] It might also be a sonic allusion to the 2005 remake of *War of the Worlds*, where a similar sound warns of the threatening presence of alien tripods. Since the ostinato establishes a tonic of sorts, the orchestral signal destabilizes it by moving to the flat second and flat seventh, again resulting in an atmosphere of uncertainty and dread, especially when it is combined with Louise's microphone, which picks up her unsettled breathing patterns. Here we might also think of the ambient music and sounds of the alien vessel as disorientating; as William Whittington argues, the sense of hesitation and questioning in sci-fi ambient sound design can encourage both ontological and metaphorical questioning, making the auditive more central than is usual in the hierarchy of the audio-visual contract: "Sounds and sounds in the surrounds offer access into areas the image is not willing or is unable to go. In these instances, the sound design has not just achieved an equal status with the image. It has in fact surpassed it."[49] In *Arrival*, however, it is the seamless combination of sounds in the alien environment and avant-garde music that contributes to creating rich and complex "sonic geographies"[50] that surpass the visuals in their order of sensory prominence (see Video 19.6).

C19.P32 Prior to the first appearance of the aliens, their nature as either hostile or benign has not been established. Whittington's sense of hesitation still pertains.[51] As the crew awaits the aliens, the string ostinato continues, and suddenly low frequency alien noises are audible which match the tonic of the string ostinato, before overriding it with growling, acoustically stretched animal noises that seem somehow to settle on the tonic of the orchestral pizzicato cue. In effect, the alien sounds are musicalized: before we even see

C19.F9 **VIDEO 19.6** *Arrival*, Inside the Spaceship.

the aliens, they are made awe inspiring or—in the words of sound designer David Whitehead—"sacred" by means of some subtle sound design work.[52] An additional clamorous instrumental signal leads directly to the first visual contact with the creatures, again bringing to mind *War of the Worlds*, but the auditive musicalization of the aliens has already achieved its effect. The sounds and music that are associated with the aliens may on first hearing seem odd and disconcerting, but the gradual move towards tonality, combined with the use of organic materials that are reminiscent of breathing sounds, all strive towards a single goal: to familiarize the audioviewer with this new life form, and to do so in an embodied way. As our bodies start to resonate with the sounds of the aliens, we understand them viscerally. This in turn contributes to an audiovisual argument for peaceful interactions, implying readiness to communicate with the aliens through embodied understanding.

C19.S4

Non-linear Time, Non-spatial Space

C19.P33 Both *Arrival* and *Interstellar* raise questions about the laws of physics, including theories of time as a flexible, even malleable entity which can be made to benefit humanity (and extra-terrestrials). Not only is this an optimistic—even quasi-religious—view of the natural sciences, where the technological sublime and the seemingly boundless power of the universe and infinity coalesce;[53] it can additionally be understood as tacit commentary on the "post-truth society," where the laws of physics and expert knowledge about issues like climate change are with growing frequency questioned by politicians and the popular press.[54] Both films take a stand for science, nature, and environmental issues, particularly *Interstellar*. Time is running out in both films, until scientific breakthroughs connected to apparently non-human knowledge create new spaces where these very human problems (war, famine, and ecological disasters) can be eradicated. Although seriously tested, sci-fi optimism ultimately wins the day and humanity is saved.

C19.P34 The notion of linear time in *Arrival* is toyed with in the timeline of the film itself. While the main plot of Louise meeting the alien heptapods and learning their language is told in a conventional linear way, Louise's own story is related in a non-linear way. Of course, the audience initially assumes that the scenes involving Louise's daughter, either growing up or dying in early adulthood, are flashbacks, but it is eventually revealed that they are, indeed, flashes *forwards*, or examples of non-linear thinking, towards the later stages of Louise's life-cycle. Cyclical time is represented in the heptapods' written language (comprising ink circles featuring assorted blotches around their circumferences), but also in Jóhann Jóhannsson's postminimalist music and Max Richter's composition, *On the Nature of Daylight* (2004). Cyclical time is present also in the film's narrative construction, as it begins with the birth of Louise's child, Hannah, and ends with Louise and her future husband deciding to have a baby.

C19.P35 Minimalist music has often been described as altering our subjective sense of time due the various ways in which composers extend musical materials over long periods of

time, or play with listeners' expectations by expanding, compressing, or juxtaposing materials using techniques of repetition and gradual transformation.[55] Because of Jóhannsson's use of repeated musical cells in *Arrival*, which shift subtly from one moment to the next, an altered sense of time is implied in contrast to mathematical or clock-time. This is time without the usual hierarchy of expectations and fulfilment of desires, forward or backward motion; a spatial notion of time where repeated musical passages become a state of mind that is exists beyond rationalization. *Arrival* begins with the slow pulse of Richter's "On the Nature of Daylight," which accompanies Louise's account of what happened to her daughter (see Video 19.7). The music compromises two slowly alternating chords performed by two cellos and a viola, which make up a lament-like ostinato, a chaconne of sorts, over which a series of variations comprising overlapping melodic figures is played on two violins—Baroque minimalism in the Glassian idiom once again. Each pattern coincides with a different memory of the child. In this way, each variation changes in tone: one is connected to a happy memory, another to images of the daughter dying. Louise's voiceover narration recalls events in tandem with the music; the screen action is audio-visually temporalized[56] as the voiceover and music swim into each other. The emotional impact of Louise's story is heightened as the interweaving melodic lines of the violins interweave with cyclically organized postminimalist refrains—here the everyday temporality of the images is animated by the divergent temporality of the music.[57] To recall past events is arguably to create divergent temporalities, just as the music itself dips into contemporary and historical styles; the twist is that the stories Louise relates to us are not strictly speaking "memories."

C19.P36 Another key moment that features an altered sense of time/space is found in a montage sequence where Louise teaches the heptapods human language, but at the same time she also learns heptapod writing and thinking (see Video 19.8). Jóhannsson recalls one of his influences as being Stockhausen's *Stimmung*, a composition for six voices and microphones, alongside other works based on spectral techniques.[58] *Stimmung* (1968) features long, sustained notes and chords without much harmonic progression, and finds its textural richness in different avant-garde vocal techniques, such as uses of glissandos, spoken word, inward breathing speech, whistling, and syllables derived from the words of different languages (English, German, Arabic, and Latin), transformed vowel sounds (a-e-i-e-a), and the percussive qualities of consonants, such as various L, F, R sounds (rolling and non-rolling) and sibilants (s, sh, z). This music exemplifies the "process of unfolding" that Richard Taruskin perceives more generally in Stockhausen's music: "What is predetermined is not just how things *are*, but what they seem to *do*, and what they will *become*." [59] In this way, the temporal progression of the piece becomes blurred, as attention is directed towards what happens in the voices, not the harmonic

C19.F10 **VIDEO 19.7** *Arrival*, Opening Scene.

C19.F11 **VIDEO 19.8** *Arrival*, Heptapod.

progression. The mood is both static and organic—despite the systemic procedures of gradual addition and subtraction that derive from minimalism—which suggests a mode of subjectivity that seems to transcend willful human agency.

C19.P37 Stockhausen's influence on Jóhannsson is evident in the music written for the montage sequence ("Heptapod B" in the soundtrack album). Short syllables (na-na-nan-nan-na) are repeated with two female voices a fifth apart, articulated in a bright, girlish soprano voice (an extract from a composition by experimental vocalist Joan La Barbara's *Erin*) repeating the first riff (wo-do-no-ta-no), with three repeated notes on the tonic (wo-do-no), a jump upwards by a fifth (ta), and occasional completion of the phrase with a final "no" on the leading note.[60] The rhythms of the looped singing are quick, staccato, and only slightly off-beat in relation to Jóhannsson's music; the phrase repeats itself in dialogue with the other singers. Interestingly, Jóhannsson leaves the spatial design of the *Erin* loop intact, even while tuning it up a few steps, thereby contributing an the effect of "girlishness" in Joan La Barbara's ordinarily deeper, mature-sounding voice.[61] The voice is situated center-right in the mix, with the leading note located more to the right than the other syllables, and the high fifth mostly in the center, slightly to the left. This reflects the spatial design of the original recording, where La Barbara plays with multiple directions in the syllables in order to create a "sound painting" (the album's name). (The spatialization of time in La Barbara's composition can easily be compared to the heptapod's non-linear mode of writing and their broader conception of time.) A constant drone of lower female voices (from the vocal ensemble Theatre of Sounds) is heard throughout the piece, on the tonic and fifth, repeating similar syllables to the high solo looped voice, but rarely stopping. In the background, a female choir sings, repeating nonsense syllables at a slower pace, forming chord sequences in the track's otherwise sparse sonority. The human voices are answered, first, by swells from the brass section, then by means of an increase in volume in the percussion, and finally, the lower strings. All of the orchestral swells start out first as a rhythmic pulse, growing then to suspended chords and forming a crescendo; percussive swells happen sometimes together with brass or strings instruments, but often without the support of a crescendo in these instruments. A brisk cembalo is also heard on each of the quarter-note beats. A gradual accumulation of intensity results. Jóhansson describes the process of composing this piece as follows: "I avoided long notes. I wanted to work with this stuttering, random rhythm pattern of female voices. I wanted something that was a cloud of staccato rhythms, unpredictable and *out of time*."[62] These aims are apt in light of the corresponding imagery and central themes of the film pertaining to altered temporality and the task of discerning order within apparently chaotic communication.

C19.P38 Montage scenes like "Heptapod B" are, of course, a traditional cinematic means of compressing narrative time. In traditional montage sequences, however, time (and Louise's learning process) would progress in a linear way from before to after (00:50:21–00:53:41). This is not the case here. The music here depicts a process of unfolding: of time, musical materials, and, symbolically, also Louise's understanding. It is not, however, entirely a given that time should progress "forwards." Even while Louise begins to react to her new perceptions of time-that-has-yet-to-come (the concept of "future" is

irrelevant if time is circular), or memories she hasn't yet experienced, Ian's voiceover begins to flow into the soundtrack, along with the music representing the heptapods ("Heptapod B"), becoming part of that music while commenting on the process of learning the heptapod language. In this way, it could be said that the narration represents the scientists learning and interiorizing the aliens' concept of time and space:

C19.P39 > First, there is no correlation between what a heptapod says and what a heptapod writes. Unlike all written human languages, their writing is semi-siographic. It conveys meaning; it doesn't represent sound . . . We have our friends in Pakistan to thank for their study of how heptapods write, because unlike speech, a logogram is free of time. Like their ship or their bodies, their written language has no forward or backward direction. Linguists call this "non-linear orthography," which raises the question: is this how they think?[63]

C19.P40 In keeping with this idea of non-linear writing and thinking, combined with the notion of time and space as "non-linear," the cycles of repetitive music do not dispense with the linearity of everyday or clock time but, rather, they play with our "expectations" of time. The music folds into itself and unfolds outwards from itself, creating a sense of non-linearity, circularity, and transformation in stasis (a musical logogram, if you will). In this way, space is also reconstructed as untethered from linear time: as malleable, immaterial in the sense of being liquid more than solid, yet bound to actions and movement, omni-spatial; auditive, and non-linear space-*time*. As the music unfolds in this way, a greater sense of immersion is implied. In a similar way to "losing time" when focusing intently on a task, a kind of flow experience, everyday time disappears and the experiencing sensory body is brought to the fore. This altered notion of time and space is made credible because the music instructs our bodies *to feel* it happening.

C19.S5

Full Circle: Embodying the Monumental, the Melancholic, and the Sublime

C19.P41 In *Arrival* and *Interstellar*, time is spatialized through the use of music and works directly on the body. Taking full advantage of the expressive reach of contemporary surround sound systems,[64] both films utilize low frequencies as pedal points in key cues in soundtracks that resonate with viewer-listeners' bodies, permitting malleable time-space to be experienced not only as an intellectual concept but also physically. In other words, the frequencies that most directly bring the body into play also contribute to an immersive sensibility that makes constructions of altered space-time something that is more felt than understood. Music and sound production combine to make the concept of time futuristic and extra-human, which in turn permits the optimism of films' messages

to be experienced both viscerally and intellectually; as well as the turbulent and (physically) moving paths that are taken in order to make these futures *real*. Both films, however, employ the sheer volume and dynamic intensity of music to these ends, with sub-bass sounds that would ordinarily be carried exclusively by the subwoofer being spread across the primary surround-sound tracks, where dialogue is ordinarily heard. Whether one considers Zimmer's "falling asleep on his organ" sublimity, conveyed through extended stinger chords, or Jóhannsson's loud orchestral reveilles when introducing the aliens, the audience is meant to feel the impact of the sound directly on their bodies.

C19.P42 Both films address issues of yearning for loved ones across space and time, whether it is the past in *Interstellar* or the future in *Arrival*. And by bridging the time-space divide, it is argued, it is possible also to solve some of the burning questions facing humanity. This combination of science with romantic yearning resembles what Farah Mendlesohn calls "cold romanticism."[65] Sci-fi, in her view, often juxtaposes romanticism with alienation.[66] In *Interstellar*, Cooper and his daughter Murph, Cooper and his love interest at the end of the film, Brand, Louise, and her daughter Hannah, are all divided in space and time in a manner that can only be bridged by science. In much the same way, science holds the key to uniting humanity and overcoming environmental catastrophes, whether the catastrophes in question are those of humans or aliens in the distant future. Scientific optimism is tainted, however, with tragedy, since Cooper in reunited with Murph only at her deathbed, and the promise of a romantic attachment with Brand remains only a promise, indicated by a spectral handshake across dimensions inside a wormhole and Cooper's intent to join Brand on her lonely planet at the end of the film. The optimism of *Arrival* is similarly saturated with tragedy, all of which reflected in the soundtrack: Louise comes to realize through information she has gleaned from her close encounter that her as yet unborn daughter will die tragically in childhood, and her marriage is similarly destined to fail, but she embarks upon this course of action regardless of this knowledge (unfortunately, as well, she withholds this information from her partner). Musically, both films rely on the dichotomy of mechanically cool and overwhelmingly romantic forces; *Interstellar* with a mixture of minimalist depersonalization and post-Wagnerian chromaticism; *Arrival* with Jóhannsson's exploration of avant-garde techniques juxtaposed with Richter's more elegiac minimalism in the composition *On the Nature of Daylight*. Melancholia and mechanical coolness are, in both films, a poignant mixture.

C19.P43 In both *Arrival* and *Interstellar*, a quasi-religious sublime is seldom far away: *Interstellar* due to the conspicuous presence of a church organ; *Arrival* through Richter's original music and sound design for the aliens. This extends to the plots as well; while science, natural or linguistic, is elevated as instrumental in solving the apocalyptic problems encountered in the films, a sense of awe is ever-present in the music and corresponding imagery. Thus, while both soundtracks evoke a sense of monumentalism reminiscent of long-stranding tropes of the sublime and the heroic, at the same time they convey sensory glimpses of a future where political conflicts and ecological shortsightedness give way to imaginary solutions that the viewer-listener can only grasp at on an intuitive and visceral level.

Notes

1. For more on these new audiovisual means, see John Richardson and Claudia Gorbman, "Introduction," in *The Oxford Handbook of New Audiovisual Aesthetics*, ed. John Richardson, Claudia Gorbman, and Carol Vernallis (Oxford: Oxford University Press), 1–35.
2. See K. J. Donnelly, *The Spectre of Sound: Music in Film and Television* (London: BFI, 2005), 93–4.
3. Robynn J. Stilwell, "The Sonic Realm in The Quartermass Experiment: Medium and Genre and Sound," in *The Palgrave Handbook of Sound Design and Music in Screen Media: Integrated Soundtracks*, ed. Liz Greene and Danijela Kulezic-Wilson (New York: Palgrave Macmillan, 2016)" 213–28: 227, emphasis added.
4. Richardson and Gorbman, "Introduction," 6.
5. See Vivian Sobchack, *Screening Space: The American Science Fiction Film* (London: Rutgers University Press, 2001 [1980]), 19, 25.
6. Farah Mendlesohn, "Introduction: Reading Science Fiction," in *The Cambridge Companion to Science Fiction*, ed. Edward James and Farah Mendlesohn (Cambridge: Cambridge University Press, 2003), 1–14: 3–4.
7. See Philip Shaw, *The Sublime* (New York: Routledge, 2006), 1.
8. See, for example, Rebecca Leydon, "Forbidden Planet: Effects and Affects in the Electro Avant-garde," in *Off the Planet: Music, Sound and Science Fiction Cinema*, ed. Philip Hayward (Bloomington: Indiana University Press, 2004), 61–76: 64.
9. Sobchack, *Screening Space*, 216; William Whittington, *Sound Design and Science Fiction* (Texas: University of Texas Press, 2007), 5.
10. David Huckvale, *Hammer Film Scores and the Musical Avant-Garde* (London: McFarland & Company, Inc., Publishers, 2008), 3.
11. Donnelly, *The Spectre of Sound*, 95.
12. John Richardson & Susanna Välimäki, "Disaffected Sounds, Temporalized Visions: Philip Glass and the Audiovisual Impulse in Postminimalist Music," in *The Ashgate Research Companion to Minimalist and Postminimalist Music*, ed. Keith Potter, Kyle Gann and Pwyll Ap Siôn (Farnham: Ashgate, 2013), 219–37: 220; see also Tristian Evans, *Shared Meanings in the Film Music of Philip Glass* (New York: Routledge, 2015). On historical reference in postminimalism, see John Richardson, *Singing Archaeology: Philip Glass's* Akhnaten (Hanover, NH: Wesleyan University Press, 1999); and Susan McClary, "Minima Romantica," in *Beyond the Soundtrack: Representing Music in Cinema*, ed. Daniel Goldmark, Lawrence Kramer, and Richard Leppert (Berkeley: University of California Press), 48–65.
13. Richardson and Välimäki, "Disaffected Sounds," 222–23.
14. Donnelly, *The Spectre of Sound*, 93–94.
15. The primary purpose of this chapter is not to theorize the concept of "affect," on which there are several competing definitions. For the present purposes we would simply state that we do not posit affect as essentially separate or somehow superior to discursive experiences. The two in our view are experientially continuous and largely interdependent. In this respect, we consider our work as aligned with that of Eve Kosofsky Sedgwick, *Touching Feeling: Affect, Pedagogy, Performativity* (Durham: Duke University Press, 2003). On the controversy surrounding "affect," see Richardson, *An Eye for Music*, 260.
16. According to Hayward, the five stages of sci-fi film music history are (1) 1902–27, the pre synch-sound period; (2) 1927–45, exploration of various western orchestral styles;

(3) 1945–60, discordant and/or unusual orchestration/instrumentation to convey futuristic themes; (4) 1960–77, the continuation of futuristic styles alongside a variety of musical approaches; (5) 1977 onwards, Classic Hollywood-derived orchestral scores (John Williams and *Star Wars*) together with futuristic styles and rock, disco and techno; rise of integrated music/sound scores. We would like to argue that Hayward's fifth period ends in 2014, and the sixth period, Integrated and multisensory music and sound design with postminimalist allusions, is on the rise from 2014 (and *Interstellar*) onwards. See Philip Hayward, "Sci-Fidelity: Music, Sound and Genre History," in *Off the Planet: Music, Sound and Science Fiction Cinema*, ed. Philip Hayward (Bloomington: Indiana University Press, 2004), 1–29: 2.

17. Michel Chion, *Audio-Vision: Sound on Screen*, translation by Claudia Gorbman (New York: Columbia University Press, 1994), 152.
18. Laura U. Marks, *Touch: Sensuous Theory and Multisensory Media*. (Minneapolis: University of Minnesota Press, 2002), 2. The concept has greatly influenced multisensory audiovisual studies despite its almost exclusive focus on the link between the visual and the haptic; see Michel Chion, "Sensory Aspects of Contemporary Cinema," in *The Oxford Handbook of New Audiovisual Aesthetics*, ed. John Richardson; Claudia Gorbman, and Carol Vernallis (Oxford: Oxford University Press, 2013), 325–30; John Richardson, *An Eye for Music: Popular Music and The Audiovisual Surreal* (Oxford: Oxford University Press, 2012); and Anna-Elena Pääkkölä, *Sound Kinks: Sadomasochistic Erotica in Audiovisual Music Performances*, PhD Thesis (Turku: University of Turku, 2016).
19. Luis Rocha Antunes, *The Multisensory Film Experience: A Cognitive Model of Experiential Film Aesthetics* (Bristol: Intellect, 2016), 3.
20. Maurice Merleau-Ponty, *The Invisible and the Invisible*, trans. Alphonso Lingis (Evanston: Northwestern University Press, 1968).
21. *I*Ibid.
22. *Honest Trailers: Interstellar*, YouTube video, 4:59, 2015. https://www.youtube.com/watch?v=lZMzf-SDWP8, accessed July 28, 2018.
23. See Katie Kilkenny, "Why *Interstellar*'s Organ Needs to Be So Loud," *The Guardian*, November 11, 2014, https://www.theatlantic.com/entertainment/archive/2014/11/why-interstellars-organ-needs-to-be-so-loud/382619/
24. Compare to Donnelly, *The Spectre of Sound*, 97.
25. See Whittington, *Sound Design and Science Fiction*, 7.
26. Most of the cue titles listed here are derived from the DVD soundtrack.
27. See John Richardson, *Singing Archaeology. Philip Glass's Akhnaten* (Hanover: University Press of New England, 1999).
28. For more on configurations of desire and longing in Wagner's music, see Lawrence Kramer, *Opera and Modern Culture: Wagner and Strauss* (Berkeley: University of California Press, 2004), 14 and 101.
29. Zimmer is far from being the first to accomplish this in a film soundtrack. The love scene in Bernard Herrmann's music for *Vertigo* is a well-known example of indebtedness to Wagner's *Liebestod*. Interstellar works in much the same way, only with a contemporary spin brought by influences from contemporary music alongside noisy sound design.
30. *Hans Zimmer—Making of Interstellar Soundtrack*. Featurette on YouTube.com, 4:53, 2014, https://www.youtube.com/watch?v=L_8t2VlwK4w, accessed July 28, 2018.
31. *Hans Zimmer: Making of Interstellar Soundtrack*.

32. Vince Mancini, "The Trouble with 70mm…" *UPPROX*, April 11, 2014. https://uproxx.com/filmdrunk/the-trouble-with-70-mm/
33. See Mera, "Towards 3D Sound."
34. Whittington, *Sound Design and Science Fiction*, 51.
35. On the relationship of eternal time to perceptions of physical presence, see Maurice Merleau-Ponty, *Phenomenology of Perception*, trans. Colin Smith (London: Routledge & Kegan Paul, 1962), 492.
36. "Objective-internal sound"; see Michel Chion, *Kubrick's Cinema Odyssey*, trans. Claudia Gorbman (London: British Film Institute, 2001 [1999]), 99.
37. Alien sound design by David Whitehead and Michelle Child. See also *Acoustic Signatures: The Sound Design of* "Arrival," produced by Keith Clark (Invisible Machine, 2016), video.
38. See, for example Chion, *Kubrick's Cinema Odyssey*, 102.
39. Compare this to Sobchack, *Screening Space*, 32.
40. Sobchack, *Screening Space*, 32.
41. Compare, Chion, *Kubrick's Cinema Odyssey*, 102.
42. See Michael Hannan, and Melissa Carey, "Ambient Soundscapes in Blade Runner," in *Off the Planet: Music, Sound and Science Fiction Cinema*, ed. Philip Hayward (Bloomington: Indiana University Press, 2004), 149–64: 160.
43. See *Acoustic Signatures*.
44. *Acoustic Signatures*.
45. "Objective-internal sounds"; see Chion, *Kubrick's Cinema Odyssey*, 99; see also Mera, "Towards 3D Sound," 96.
46. Marks, *Touch*, 2 and 7.
47. For more on this subject, see Ben Winters, "Corporeality, Musical Heartbeats, and Cinematic Emotion," *Music, Sound, and the Moving Image* 2, no. 1 (2008), 3–26.
48. Donnelly, *Spectre of Sound*, 97.
49. Whittington, *Sound Design and Science Fiction*, 126.
50. Beth Carroll, *Feeling Film: A Spatial Approach* (New York: Palgrave Macmillan, 2016), 49.
51. Whittington, *Sound Design and Science Fiction*, 126.
52. *Acoustic Signatures*.
53. See David E. Nye, *American Technological Sublime* (Cambridge Mass.: MIT Press, 1994).
54. Steve Fuller makes the valuable point that the status of knowledge is largely dependent on corresponding power structures and the exploitation by those who aspire to power of debates about the positionality of science from Plato and Pareto to Kuhn. See Steve Fuller, *Post-Truth: Knowledge as a Power Game* (New York: Oxford University Press, 2018).
55. See Richardson, *Singing Archaeology*, 54–7; Kyle Gann, Keith Potter, and Pwyll ap Siôn, "Introduction: Experimental, Minimalist, Postminimalist? Origins, Definitions, Communities," in *The Ashgate Research Companion to Minimalist and Postminimalist Music*, ed. Keith Potter, Kyle Gann, and Pwyll Ap Siôn (Farnham: Ashgate, 2013), 1–18: 4–5; Richardson and Välimäki, "Disaffected Sounds," 220; see also Pääkkölä, *Sound Kinks*, 170.
56. Chion, *Audio-Vision*, 13–14.
57. See also Richardson and Välimäki, "Disaffected Sounds," 224.
58. See Sharon O'Connell, "Arrival Composer Jóhann Jóhannsson: People are Hungry for New Sounds," *The Guardian*, November 26, 2016, https://www.theguardian.com/music/2016/nov/26/arrival-johann-johannsson-soundtrack-oscar-nominated

59. Richard Taruskin, *Music in the Late Twentieth Century. The Oxford History of Western Music* (Oxford: Oxford University Press, 2010), 45. Emphasis in the original.
60. Hrishikesh Hirway, "Song Exploder: Jóhann Jóhannsson on the Secrets of *Arrival's* Score," *Vulture*, November 17, 2016, http://www.vulture.com/2016/11/arrival-score-johann-johannsson-song-exploder.html
61. A technique also used by The Beatles in "Strawberry Fields Forever" (1967, in the album *Magical Mystery Tour*) and "Lucy in the Sky with Diamonds" (1967, in the album *Sgt. Pepper's Lonely Hearts Club Band*) for the same rejuvenating effect.
62. See Hirway, "Song Exploder;" emphasis ours.
63. *Arrival*, montage scene voiceover.
64. See, e.g. Carroll, *Feeling Film*, 18.
65. Mendlesohn, "Introduction," 10.
66. Ibid.

C19.S6 Select Bibliography

Carroll, Beth. *Feeling Film: A Spatial Approach*. New York: Palgrave Macmillan, 2016.

Chion, Michel. *Kubrick's Cinema Odyssey*, translated by Claudia Gorbman. London: British Film Institute, 2001 [1999].

Chion, Michel. "Sensory Aspects of Contemporary Cinema." In *The Oxford Handbook of New Audiovisual Aesthetics*, edited by John Richardson, Claudia Gorbman, and Carol Vernallis, 325–30. Oxford: Oxford University Press, 2013.

Donnelly, K. J. *The Spectre of Sound: Music in Film and Television*. London: BFI, 2005.

Kassabian, Anahid. "The Sound of a New Film Form." In *Popular Music and Film*, edited by Ian Inglis, 91–101. London: Wallflower, 2003.

Leydon, Rebecca. "Forbidden Planet: Effects and Affects in the Electro Avant-garde." In *Off the Planet: Music, Sound and Science Fiction Cinema*, edited by Philip Hayward, 61–76. Bloomington: Indiana University Press, 2004.

Mera, Miguel. "Towards 3-D Sound: Spatial Presence and the Space Vacuum." In *The Palgrave Handbook of Sound Design and Music in Screen Media: Integrated Soundtracks*, edited by Liz Greene and Danijela Kulezic-Wilson, 91–112. New York: Palgrave Macmillan, 2016.

Richardson, John. *Singing Archaeology: Philip Glass's* Akhnaten. Hanover: University Press of New England, 1999.

Richardson, John. *An Eye for Music: Popular Music and The Audiovisual Surreal*. Oxford: Oxford University Press, 2012.

Richardson, John and Susanna Välimäki. "Disaffected Sounds, Temporalized Visions: Philip Glass and the Audiovisual Impulse in Postminimalist Music." In *The Ashgate Research Companion to Minimalist and Postminimalist Music*, edited by Keith Potter, Kyle Gann, and Pwyll Ap Siôn, 219–37. Farnham: Ashgate, 2013.

Sobchack, Vivian. *Screening Space: The American Science Fiction Film*. London: Rutgers University Press, 2001 [1980].

Stilwell, Robynn J. "The Sonic Realm in The Quartermass Experiment: Medium and Genre and Sound." In *The Palgrave Handbook of Sound Design and Music in Screen Media: Integrated Soundtracks*, edited by Liz Greene and Danijela Kulezic-Wilson, 213–28. New York: Palgrave Macmillan, 2016.

Whittington, William. *Sound Design and Science Fiction*. Texas: University of Texas Press, 2007.