CHAPTER 31

MUSIC AS A SOURCE OF EMOTION IN FILM

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EMOTION characterizes the experience of film as it does the experience of music. Because music almost always accompanies film, we may well ask what contribution music makes to the emotional aspects of film. The present chapter addresses this question.

Despite the integral role of music for film, film music has been largely neglected by the disciplines of both musicology and music psychology until recently (Cohen, 1994; Marks, 1998; Prendergast, 1992). The reasons for the neglect are complex, arising from social, technological, economic, historical, and cultural factors. Some of these factors also account for a parallel neglect by psychology of the study of film perception (Hochberg & Brooks, 1996a, 1996b). Moreover, unlike other types of popular or art music, much music for film has been composed with the understanding that it will not be consciously attended (Gorbman, 1987; Kassabian, 2003). Countering this neglect, the present chapter takes a psychological perspective on the sublime and remarkable emotional phenomena produced by music in the context of film. The chapter has the joint intent of supporting the argument that music is one of the strongest sources of emotion in film and of opening doors to further empirical work that explains why this is so.

The chapter is divided into five sections. Section 31.1 briefly establishes a context for discussing emotion in music and film. Section 31.2 focuses on music in film, first establishing a historical perspective and then examining the role of music at the interface of the fictional and non-fictional elements of film. It continues with empirical studies of music as a source of inference and structure, and it then summarizes functions that music serves for film. Section 31.3 presents a cognitive framework for understanding

musical soundtrack phenomena previously described. Section 31.4 considers the role of the composer as the origin of the source of musical emotion for film. Conclusions are drawn and future directions are suggested in Section 31.5.

31.1 Emotion: definitions in music and film contexts

In the present chapter, the term film refers to the narrative dramas characteristic of movie theatres, television, and video with which most people are familiar as a source of entertainment. Music typically accompanies a considerable proportion of the duration of such films. Because of the relative novelty of the empirical study of film music in general, let alone the study of the emotional contribution of music in film, it would be premature to advocate a particular way of considering emotion in the present chapter. What is more important is to show how various 'music-alone' perspectives on emotion translate in the film context. These perspectives include the contribution of music to recognition of an emotion without necessarily feeling the emotion (e.g. Flores-Gutiérrez et al, 2007; Juslin, 1997; Levi, 1982), the establishment of subjective feeling (e.g. Pignatiello, Camp, & Rasar, 1986), and the experience of intense, affective reactions (Gabrielsson, 1998; Gabrielsson & Lindström; 1993; Sloboda, 1985, 1992).

The film context sometimes permits greater terminological clarity than the music-alone situation. For example, consider the terms *mood* and *emotion*, which are often differentiated with respect to the presence of an object (e.g. Barrett & Russell, 1999; Juslin & Västfjäll, 2008; Tan, 1996). Whereas both moods and emotions may be regarded as dispositions toward appraising emotional meaning structures and a readiness to respond in a certain manner, moods do not have objects; emotions do. For example, experiencing the emotion of relief requires an object of that emotion, such as a safe arrival after a treacherous journey. Experiencing a sad mood does not require an object of the sadness. Objects are not always evident in music-alone contexts, but, as argued by musicologist Nicholas Cook (1998), in a multimedia context, music readily finds an object. The emotional associations generated by music attach themselves automatically to the visual focus of attention or the implied topic of the narrative. Because film content provides the object of emotion generated by music, the film helps to control the definition of the object of the emotion experienced during the presence of music.

Considering music and emotion within the context of film also has the advantage of bringing knowledge from psychological studies of film to bear on questions regarding music and emotion. Based on the emotion theorist Frijda (1986), Tan (1996) for example, who refers to film as an 'emotion machine', addresses the question of the genuine nature of emotions in film, a topic that will be examined later in this chapter. Thus, research on music and emotion in the film context may benefit from research insights derived from studies of film and emotion. Conversely, our understanding of emotion

associated with autonomous music may shed light on emotional processes that occur in the film context. All of this information may contribute to the understanding of both the unique accomplishment of composing music for film and the extent to which music provides an important source of emotion in film.

31.2 Music and cinema

31.2.1 Historical background

Beginnings. From the earliest days of film, music played a part. When silent film was first introduced at the turn of the century, music was enlisted to mask the extraneous noise of the film projector. While serving this function, music was also exploited to illustrate and explain the action (Palmer, 1980, p. 549). Kracauer (1960, p. 133) emphasizes that the noise problem of the film projection was relatively shortlived, and yet the importance of music remained. An entire music-for-the-silent-film industry developed to support this function of music (Limbacher, 1974; Thomas, 1992, pp. 37–40). It included publication of anthologies of music to represent various emotional settings, an increased demand for pianos in the thousands of small movie theatres that sprang up, and architectural plans for movie theatres that included places for pianists and sometimes other musicians.

Hugo Münsterberg. The first psychologist to direct attention to the new phenomenon of film was Hugo Münsterberg, a Harvard University professor (Figure 31.1). Between 1899 and 1916, he wrote 24 books, one of the last of which was *The Photoplay: A psychological study*. In what is regarded as the first book on film theory (Anderson, 1997), Münsterberg's views are enlightening. His experience of film was as fresh as a child's, although acquired as a highly intelligent adult. His understanding of both introspection and scientific method encourage our confidence in his record of and insight into film at that time:

> Yes, it is a new art—and this is why it has such fascination for the psychologist who in a world of ready-made arts, each with a history of many centuries, suddenly finds a new form still undeveloped and hardly understood. For the first time the psychologist can observe the starting of an entirely new esthetic development, a new form of true beauty in the turmoil of a technical age, created by its very technique and yet more than any other art destined to overcome outer nature by the free and joyful play of the mind.
>
> (Münsterberg, 1916/1970, pp. 232–3)

He did not live to experience the talking film, but his experience of film was not lacking in sound. There were sound effects—he describes a machine, the allefex, 'which can produce over fifty distinctive noises, fit for any photoplay emergency' (p. 205)—and there was music. In his view, music relieved tension, maintained interest ('keeps the

Fig. 31.1 Hugo Münsterberg with members of the Vitagraph Co. (courtesy of Harvard University archives).

attention awake'), provided comfort, reinforced emotion, and contributed to the aesthetic experience (pp. 204–5).

Münsterberg also used musical metaphor in describing the film experience (e.g. p. 120, pp. 128–9). For example, he recounts a narrative cliché of the period, a rapid alternation between three scenes: a jovial boss and his secretary enjoying a private after-hours party in the office, the dismal parents of the secretary awaiting their daughter's return, and the lonely wife awaiting her husband's attention. 'It is as if we saw one through another, as if three tones blended into one chord . . . The photoplay alone gives us our chance for such omnipresence' (p. 105). Yet, to extend his metaphor of the musical chord, it is also music that can represent in rapid succession and perhaps simultaneously the emotional polyphony of these multiple messages.

Münsterberg directed attention to the importance of music within the film and to music as a means of understanding the psychological processes underlying film. Musical analogies to film were actually once common among film directors and theorists (e.g. Eisenstein, 1957; Mitry, 1963/1997). Münsterberg suggested that cinema is more similar to music than to photography and drama, which on the surface are arts that bear a more striking resemblance:

> . . . we come nearer to the understanding of its [film's] true position in the aesthetic world, if we think at the same time of . . . the art of the musical tones. They have overcome the outer

world and social world entirely, they unfold our inner life, our mental play, with its feelings and emotions, its memories and fancies, in a material which seems exempt from the laws of the world of substance and material, tones which are fluttering and fleeting like our own mental states.

(p. 168)

Münsterberg's untimely death in 1916 (the year of his publication of *The Photoplay*) and the coincident advent of Behaviourism, focusing as it did on objectively observable behaviour, may in part account for the failure of psychological research in film and music to progress in parallel with the technological developments associated with these media. Instead, technology developed and its psychological study lagged behind in spite of a good start.

The sound film. In 1927, *The Jazz Singer* signalled the advent of the *talkies* and the demise of the film-music industry. With real voices and sound effects, music would no longer be needed to establish mood and emotional context—or would it? To the surprise of many, something was missing without music (Kracauer, 1960, p. 138). The screen had lost part of its vitality. As Kalinak (1992) says, 'when the possibility of synchronized speech and sound effects released sound film from its reliance upon continuous musical accompaniment, it initially rejected music entirely. But the life span of the all-talking picture was brief, the need that music filled quickly reasserting itself' (p. 45).

Several theorists have commented that music adds a third dimension to the two-dimensional film screen (Palmer, 1990; Rosar, 1994). Composers also shared this view. Aaron Copland (1941) stated 'the screen is a pretty cold proposition'. Film composer David Raksin (in Brown, 1994, p. 282) referred to Nietzsche's idea, 'without music, life would not be worth living'. His statement is extreme (deaf persons live worthwhile lives), but paraphrasing the maxim, few hearing people would deny that music contributes to their experience of film.

Since the early days of film, directors have recognized the contribution that film-editing made to the viewer, often referred to as *montage*. Viewers are typically unaware of the rapid changes in camera angle, the move from close-up to long-shot or from one part of the scene to another and back again. Nonetheless, viewers make sense of the world depicted by these juxtaposed shots. Theories of montage concern the audience's synthesis of juxtaposed information in the film. With the advent of the sound film, Russian director Sergei Eisenstein was among the first to extend the notion of visual montage to sound, and suggested that the listener incorporates the same synthetic process in making sense of the entire audiovisual cinematic presentation.

31.2.2 Music and the diegesis and the non-diegesis

Film theory commonly refers to the fictional, imagined, narrative world of the film as the *diegesis*. In contrast, the *non-diegesis* refers to the objective world of the audience, the world of artefact, of film screens, projectors, proficiency of actors, and technical aspects of the film. In terms of physical reality, music as acoustic vibrations belongs to

the non-diegesis. Logically—unless such sound were part of a scene portrayed in a film, as in a film about a musical instrument, or the life of a great composer—these sounds of music should *detract from* rather than *add to* the sense of reality of the film. This point was well made in Mel Brooks's comedy *Blazing Saddles* (1974). A sheriff rides out on the desert—with seemingly appropriate music in the background—and meets face to face with the Count Basie Band performing the now inappropriate music 'April in Paris'. The fictional (diegetic) and the non-fictional (non-diegetic) realities collide and add to the humour of the scene. It is probably not coincidental that Brooks, the director and screenwriter of the film, is also a composer of music including some film scores, and so he would have been particularly sensitive to this film-score convention.

Thus, the audience selectively attends to only the part of the music that makes sense with the narrative. Selective attention is a common perceptual-cognitive operation. The phenomenon of 'inattentional blindness' is an example of it in the visual domain of film. Here it has been shown that people rarely noticed or were seldom distracted by impossible visual aspects represented in either a film or in their real-world experience. For example, viewers did not notice that a woman in a film clip began a short scene with a scarf and ended the scene without it (Levin & Simon, 2000). In another study, an experimenter positioned on a college campus solicited directions from unsuspecting students. Their conversation was interrupted by two confederates carrying a door. One of the confederates changed position with the experimenter who had initially asked for directions. The conversation about directions then continued. The student rarely realized that there were two different people to whom he or she had been conversing. Two facts are important here. First, the visual system is blind to much available information, and this inattentional blindness (cf. Mack & Rock, 1998) is equally characteristic of vision in the real and in the film world. Thus, the fact that audiences extract the emotional information in music and fail to attend to the acoustical aspects might be described as a case of inattentional deafness, a by-product of the fact that awareness depends on attention, and attentional capacity is limited. Indeed, the failure to notice a noxious sound (fingernails down a chalkboard) attests to the generality of the phenomenon to hearing (Wayand, Levin, & Varakin, 2005). A better parallel can be drawn to the role of prosody in speech perception, which shares with music a greater syntactic similarity than the visual or noise examples given. Here patterns of intensity and frequency from intonation systematically provide emotional meaning to a listener, yet the listener focuses on the meaning and is unconscious of this prosodic source of information (e.g. Banse & Scherer, 1996; Murray & Arnott, 1993).

Film-music scholar Claudia Gorbman (1987) has addressed the unconscious perception of film music in her book *Unheard melodies*: *Narrative film music*. Gorbman's perspective is well captured by Jeff Smith (1996): 'By veiling the lacks and deficiencies of other discursive structures, film music, according to Gorbman, lubricates the various cogs and pistons of the cinematic pleasure machine' (p. 234). Film-music theorist Anahid Kassabian (2001) challenges the notion of the either–or dichotomy—diegetic/non-diegetic—and argues that some film music is ambiguous in this regard. She also claims that in the absence of sound effects and dialogue, a music track draws attention to itself (p. 24). We may well ask why a director would choose music over meaningful

dialogue or sound-effects at a critical point in the drama. A case in point is provided by the film *Witness*.

In *Witness*, a young Amish boy is the sole observer of a violent murder in a train station. He is directed to a noisy police station in order to search through a book of photographs of suspects for a match of his memory to the actual perpetrator of the crime. While left unattended momentarily, he wanders toward a display cabinet that holds a photograph of an honoured senior officer in the police force. As he views the photograph, Maurice Jarre's music replaces the background sound effects of the police station. The audience realizes that the boy becomes awestruck with the sudden recognition that the photograph of the police officer depicts the person who he saw commit the crime. The audience would be concerned now about the implications for the safety of the boy. This is one of the most critical points in the film, essential to the plot. Without it, the criminal in the police force would remain unknown and the boy could continue naïvely on his trip. Yet it is this crucial moment, a moment that must be comprehended by the audience, to which the unrealistic music is not merely added but is added at the expense of realistic, diegetic sound effects. But the audience, caught in the drama, is unlikely to note this departure from reality.

To examine whether music alone impacted the involvement in the film, Cohen, MacMillan, and Drew (2006) presented one minute of the *Witness* clip in a between-groups design so that participants saw the clip in only one of five soundtrack conditions: music-only, sound effects only, speech only, a combination of all three, and none. Participants were asked to rate their level of absorption (involvement) in the clip, their judged sense of reality, and the level of professional quality of the clip. The sound effects and speech tracks were composed especially for the experiment, and the music was the original soundtrack. A second set of clips was designed for an excerpt from *The Day of the Jackal*. The positive impact of the music on self-rated absorption in the film was evident for *Witness* but not for *Jackal*. The music-alone track for *Jackal* was perhaps not as effective because the original soundtrack in this case had contained music, dialogue, and sound effects, and the music-alone soundtrack that was developed from music used elsewhere in the film did not reach the same level of professional quality as the *Witness* excerpt. It is clear from this demonstration that music-alone can supersede the sound effects or dialogue in ability to involve the audience in the film. The extent to which an audience is actually aware of the music in a music-only soundtrack remains to be determined.

31.2.3 Music and inference: empirical studies

A number of studies have concerned the role of music in generating inferences, and often those inferences are associated with emotional meaning. Music presumably adds to the involvement in the diegesis while providing non-diegetic, acoustical information that is incompatible with the realism of the diegesis. At the interface of the diegetic and non-diegetic worlds, this typical use of music in film is paradoxical (Cohen, 1990). To escape the paradox, the analysis of the acoustical information can be regarded as

a pre-attentive step that leads the listener to inferences consistent within the diegetic world of the film. From moment to moment, the audience member extracts information from non-diegetic sources to generate the emotional information he or she needs to make a coherent story in the diegesis. The successful director and film-score composer provide just the right cues to guide the attentional and inferences processes.

One attempt at understanding the phenemenon of diegetic inference comes from the context of psychological situation models described as 'vicarious experiences in narrative comprehension' (Zwaan, 1999, p. 15). Zwaan, for example, has focused on how literature enables readers to 'mentally leap into imagined worlds'. The information provided by the text is sufficient to enable a reader to place himself or herself at a spatial, temporal, and psychological vantage point from which events are vicariously experienced. The perspective is termed a deictic center.

Magliano, Dijkstra, and Zwaan (1996) extended the approach to the study of film. In their study, music was indirectly examined as one of six operationally defined film factors (such as montage) that might contribute to the psychological definition of the situation. In two experiments, they investigated visual, auditory, and discourse conditions that enable viewers to predict future events while viewing a James Bond movie, *Moonraker*. In Experiment 1, participants were instructed to generate predictions while watching the movie. In Experiment 2, participants provided 'think-aloud' protocols at different locations in the film. In both experiments, the presence of supporting visual and discourse information led to systematic predictions by the participant. Music significantly co-occurred with other cinematic sources of support such as montage and mise-en-scène, found to influence inference processes.[1]

The study by Magliano et al (1996) was not specifically designed to show the influence of music in the film context. Studies that have been so designed have been successful in showing this influence. Such studies typically require more conditions than do comparable studies in music-alone situations, because it is necessary to determine the effects of music-alone, film-alone, music judged in the context of film, and film judged in the context of music. The studies to be reported have often involved several if not all of these different comparison conditions.

In a study by Bullerjahn and Güldenring (1994), professional composers of film music (including Peer Rabin, composer for all Fassbinder films) created a total of five different backgrounds (e.g. crime, melodrama) for the same ten-minute film segment. Both quantitative and qualitative analysis showed that the different soundtracks led to different judgements of the appropriateness of emotional categories (e.g. sad, thrilling, sentimental, vivid), choice of genre (horror, comedy, thriller, crime, etc.), reasons for the actions of the protagonist, and expectations about the completion of the film. In some cases, these judgements and inferences could be attributed to specific aspects of the film. For example, the authors suggested that the final closure by the major chord of the melodrama music accounted for the presumed reconciliation, though it is preceded by an argument.

In a series of experiments, Thompson, Russo, and Sinclair (1994) specifically examined the effects of musical closure on perceived closure of a film. In their first experiment, a closed soundtrack ended with a traditional 'perfect' cadence (dominant chord

to tonic chord ending). The unclosed soundtrack differed only with respect to the final bar, such that the ending was not on the tonic chord. Subjects viewed a short animation accompanied by one of the soundtracks, and were asked to rate the degree of closure represented by the clip. Judgements of closure were significantly higher for the condition in which the closed ending was presented. In a second experiment, a professional composer produced closed and unclosed soundtracks to accompany a short film clip produced by one of the experimenters. Closed soundtracks ended on the tonic chord, in contrast to the unclosed soundtracks. The effect of soundtrack closure was strong for only one of the film clips, suggesting that visual factors may take precedence over musical structure in some cases. In a final study, 12 separate soundtracks were composed for 12 clips from a commercial film, initially chosen for their assumed range in degree of closure. The soundtracks were also composed to represent a range of closure, and the degree of closure needed not to match that of the clip. Participants in the experiment judged the degree of closure of the soundtracks, the clips alone, and the soundtrack and clips together. The influence of independently judged visual and musical closure on judged closure of the film was shown through regression analysis, with a slightly greater contribution arising from visual than musical information. In addition to demonstrating a robust direct effect of musical structure on the feeling of closure of a film narrative, the authors also reported that the role of music was almost completely implicit. When participants were asked for the basis of their judgements, they almost always attributed their judgements to the visual information.

Boltz, Kantra, and Schulkind (1991) examined the role of music on inferences in a study that compared music that foreshadowed an outcome versus music that accompanied an outcome. Subjects viewed 20 different three- to four-minute clips from feature films and television dramas. Excerpts were selected that ultimately resolved in a happy (positive) or sad (e.g. tragic) way. Music emotionally consistent or inconsistent with these endings (as determined by music-alone ratings) either preceded (foreshadowed) or accompanied the video excerpt. Thus, in some cases the foreshadowing music correctly predicted the mood of the following video event and accompanying music was congruent with the mood of the video event, and in other cases foreshadowing music incorrectly predicted the subsequent event and accompanying music was incongruent with the event. Music accompanying an episode's outcome led to higher recall when the mood of the music and scene were congruent with each other. Conversely, mood-incongruent relations significantly lowered performance to a level comparable to that of the control condition in which no music had occurred. Foreshadowing, however, revealed the opposite pattern. Here, expectancy violations arising from mood-incongruent relations were significantly more memorable than were mood-congruent episodes in which viewers' expectancies were confirmed (pp. 597–8). Boltz et al (1991) concluded that their results supported the notion that viewers rely on the emotional expression of music to either generate expectancies about future scenarios or direct attending toward corresponding aspects of visual activities (p. 602).

In a further study (Boltz, 2004), participants were presented with the same clips accompanied by the congruent or incongruent soundtracks, and were asked to attend to the audio track, the video track, or to both tracks. Subsequently, they were tested

for their memory of the visual film clips and the music. Performance in the mood-congruent condition was superior to that of the incongruent condition. Performance in the incongruent condition was good for the attended audio or visual medium, but did not extend to the unintended medium as it did when the mood of the music and video clip coincided. According to Boltz, congruence in mood of the music and film elicited a search for similar structural properties in the music and film, and the success of the search led to jointly encoding the music and visual material and an integrated music-video memory. Thus, memory for music information would mean memory for the visual information. However, without mood congruencies, attention to the entire music visual complex suffers as the focus is on only one of the modalities (as per instructions in the experiment) and attention directed to the other modality is not sustained due to incongruent meaning.

Marshall and Cohen (1988) also observed the ability of music to alter the interpretation of a simple visual presentation. They studied the effects of two different soundtracks on impressions about three geometric forms, a large and small triangle and a circle, in a short animation developed by Heider and Simmel (1944). In their experiment, subjects viewed the two-minute animation with one of two soundtracks or with no soundtrack (control condition). They then provided 12 ratings for the film overall and for the three figures. Other groups of subjects rated the music on these same scales. Each of the 12 scales represented a bipolar adjective pair (e.g. fast–slow, nice–awful) and specifically tapped one of the three dimensions of emotional meaning—activity, evaluation, and potency—comprising the semantic differential (Osgood, Suci, & Tannenbaum, 1957). The activity and evaluation dimensions are understood to represent the motivation (arousal) and appraisal (valence) dimensions associated with two-dimensional theories of emotion, on which many emotion theorists (Barrett & Russell, 1999; Lang, 1995; Storm & Storm, 1987) and music psychologists (Gregory, 1998; Madsen, 1997; Schubert, 1998) converge.

In Marshall and Cohen's (1988) study, two musical soundtracks were judged to have approximately the same activity level (measured by averaging responses on scales of fast–slow, active–passive, agitated–calm, restless–quiet). The relative activity levels of the three 'characters' in the film, however, differed for the two different musical backgrounds. For example, the large triangle was judged as the most active under one soundtrack, while the small triangle was judged as the most active in the other. Marshall and Cohen (1988) argued post hoc that shared accent patterns in the music and in the motion of the figures operated to focus attention on the temporally congruent part of the visual scene, and subsequently associations of the music were ascribed to this focus (see Figure 31.2). A similar accent-pattern/association breakdown in the processing of film and music was proposed by Lipscomb and Kendall (1994, p. 91).

Cook (1998), in his book *Analysis of musical multimedia*, has suggested the generality of Marshall and Cohen's (1988) theory to other multimedia examples in which musical meaning alters the interpretation of events that are at the focus of visual attention. In advertisements for cars, for example, the car takes on both the vitality and the high-cultural associations of the classical music in the background. Music does more than provide an echo or counterpoint to a concept already present in the film. According to

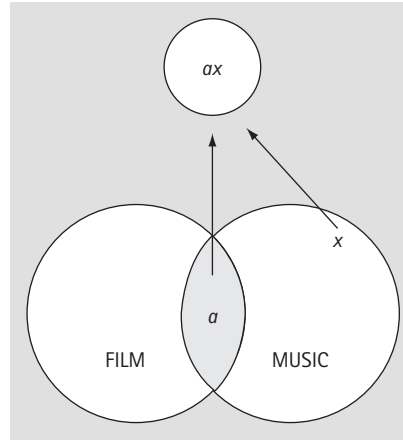

Fig. 31.2 Congruence-Associationist model based on that depicted by Marshall and Cohen (1988). The total meaning and structure of the music and film are presented by their respective circles. The overlap in music and film is depicted by the intersection of the circles (*a*). Attention is directed to this area of visual overlap in the film. Other associations of the music (*x*) are ascribed to this focus of attention (*ax*). Thus, music alters the meaning of a particular aspect of the film.

Cook, music can also direct attention to an object on the screen and establish emotionally laden inferences about that object.

Empirical evidence for the ability of music to focus attention is scant. It has been shown for simple geometric figures, but has not yet been demonstrated with more complex displays (cf. Lipscomb, 1999, 2005). Recent advances in the affordability of non-linear video editing equipment are facilitating the development of computer-generated isomorphic music and visual objects, leading to experiments that are showing that audiences are sensitive to temporal and formal congruencies, yet all experiment-defined congruencies are not necessarily picked up by the audience (Iwamiya, 2008; Kim & Iwamiya, in press; Kendall, 2008).

Regarding the ability of music to focus attention, Bolivar, Cohen, and Fentress (1994), following Boltz et al (1991), noted that attention to a visual object might arise not only from structural congruencies, but also from semantic congruencies. Hypothetically, for example, a soundtrack featuring a lullaby might direct attention to a cradle rather than to a fishbowl when both objects were simultaneously depicted in a scene. Subsequently, additional associations from the lullaby would be ascribed to the cradle.

Shevy (2007) presented happy or ominous rock music or no music background for a video that featured a good (positive) character in a negative environment. Completion of rating scales by participants indicated that happy music had a positive influence on the interpretation of the environment, and that the presence of either kind of music increased the correlation in the judgements of the character and the environment.

This study adds to the literature on the effect of music on interpretation in a film, here distinguishing the protagonist and the setting of the narrative.

Whereas the influences of music on interpretation have been shown for both foreshadowing (Boltz, 2004; Boltz et al, 2001) and accompanying (Marshall & Cohen, 1988; Shevy, 2007; Thompson et al, 1994; Vitouch, 2003; Willis & Simons, 2005), Tan, Spackman, and Bezdek (2008) investigated the role of music on interpretation of an earlier event. Excerpts of 15 seconds of music chosen to represent four emotions were paired with four film clips of a film character carrying out an activity with neutral emotion. Music was presented either before or after the character appeared, and overlapped for only a few seconds. Music in both positions systematically altered the interpretation of the film characters' emotions, as indicated by an analysis of the one-word emotion labels and the rating scales of eight emotions. Following the judgements of emotion, the participants rated the extent to which each of nine film factors (including presence of music) contributed to the depiction of the emotion of the film character. Participants ascribed their own judgements to two factors primarily: music and the facial expression of the film character, even though the facial expressions were neutral and had been presented with all four music emotions. Participants also rated aspects of the character's apparent physiological responses that were felt to portray emotion. These results clustered along two dimensions of action readiness and what the authors term 'valence' for terms 'energized' and 'trembling-shaking'. This two dimensional space led to the orderly placement of each music emotion (both pre- and post-film) in a distinct quadrant.

In another original study, Tan, Spackman, and Wakefield (2008) examined the effects of presenting the same piece of music diegetically or non-diegetically on viewers' interpretations of the film's narrative. They also explored the effects of non-diegetic music matching the mood of the scene (mood-congruent music) and non-diegetic music that was mood incongruent. An action sequence from Spielberg's *Minority Report* (2002) was paired with three soundtracks: (1) the original soundtrack, an orchestral rendition of the song 'Moon River' presented as if originating from within the environment of the characters (diegetic version); (2) the same recording of 'Moon River' presented as if a dramatic score (non-diegetic version), and (3) a third soundtrack, from a dramatic score accompanying a chase scene from *Empire of the Sun* (1987), serving as a mood-congruent condition to be compared with the mood-incongruent 'Moon River' soundtrack. In all versions, speech and sound effects remained intact, so that only the musical soundtrack was varied. Over 200 participants were asked to describe their interpretations of the film scene, and to rate various aspects of the film and music.

The mood of the film excerpt was rated as highest on a 'calm' dimension when accompanied by the original score ('Moon River' diegetic); lowest on the calm dimension and highest on a tense/antagonistic relationship between characters' dimension when accompanied by the 'Moon River' non-diegetic music; and lowest on the tense/antagonistic relationship dimension when accompanied by the non-diegetic congruent music. It was also found that participants' perceptions of the characters' emotions varied with musical soundtrack. For instance, the male character was seen as being less fearful and less excited and more romantically interested in the female character

when the scene was accompanied by the non-diegetic version of 'Moon River' than the diegetic presentation of the same song. The study shows that audience perceptions of the emotions of film characters and overall emotion of the scene can differ significantly—depending on whether the music is presented diegetically or non-diegetically.

31.2.4 Functions of film music

Cohen (1999a) described eight functions of music in a film or multimedia context. First, music masks extraneous noises. Second, it provides continuity between shots, for example, when the camera alternates between close-ups of two people who are presumably looking at each other (cf. Magliano et al, 1996, p. 205). Third, as Marshall and Cohen (1988) and Bolivar et al (1994) had argued, and as noted by Münsterberg (1916) and Cook (1998), it directs attention to important features of the screen through structural or associationist congruence. Fourth, it induces emotion, as often occurs during the opening credits of a film. The ability of music to induce mood has been shown experimentally (Pignatiello et al, 1986) and is used in music therapy (Albersnagel, 1988; see Chapter 29, this volume). Fifth, it communicates meaning and furthers the narrative, especially in ambiguous situations (Bullerjahn & Güldenring, 1994; Cohen, 1993; Kalinak, 1992; Levinson, 1996; Shevy, 2007; Tan, Spackman, & Bezdek, 2007; Vitouch, 2003). Sixth, through association in memory, music becomes integrated with the film (Boltz, 2004; Boltz et al, 1991), and enables the symbolization of past and future events through the technique of *leitmotif*. In leitmotif, a particular musical theme is continuously paired with a character or event so that eventually the theme conjures up the concept of the character or event in its absence (Kassabian, 2001; pp. 50–1; Palmer, 1980, p. 550). The composer Richard Wagner is typically regarded as the first to exploit this principle in opera. In an insightful article by the composer Saint-Saens (1903, p. 259), entitled 'The composer as psychologist', the author remarks that psychological principles must be responsible for the effectiveness of leitmotif. Mood-dependent memories can also be cued with the emotions established by music (Eich, 1995). Seventh, music heightens absorption in film, perhaps by augmenting arousal, and increasing attention to the entire film context and inattention to everything else (Cohen et al, 2008; cf. discussions of reality status by Preston, 1999; Qian, Preston, & House, 1999). Finally, music as an art form adds to the aesthetic effect of the film.

31.3 A COGNITIVE FRAMEWORK FOR UNDERSTANDING MUSICAL SOUNDTRACKS

Many of the functions of film music can be explained via notions of congruence or association, because these represent two primary ways in which the brain

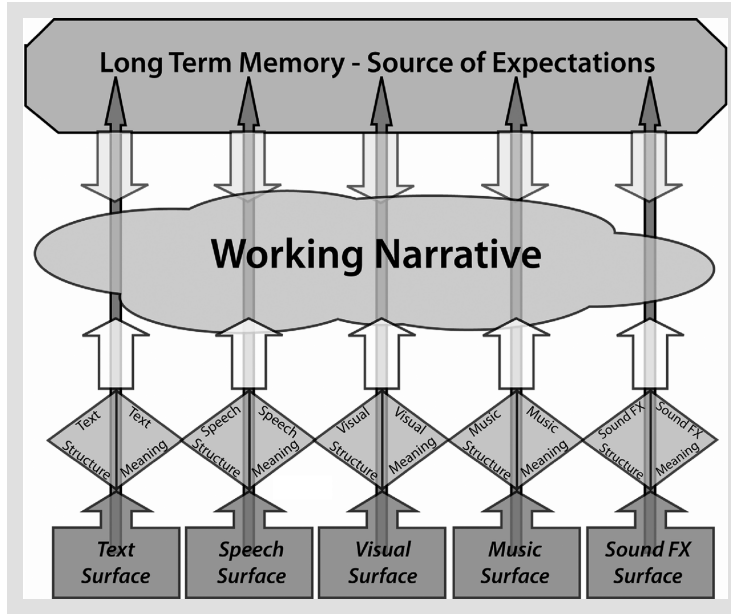

Fig. 31.3 Congruence-Associationist Model (CAM) for understanding film-music communication (see text for explanation).

operates: through innate grouping principles (Bregman, 1990) and by learned connections (Cohen, 1993), respectively. Cohen (2005) presented a capacity-limited information-processing framework, which represented the congruence-associationist concepts in a broad cognitive context. The model, referred to as the *Congruence-Associationist Model* (CAM), extends Marshall and Cohen's (1988) proposal of the importance of the congruence and associationist concepts to account for the influence of music on the interpretation of the Heider and Simmel (1944) film and film characters. The model has undergone several transformations to accommodate the growing empirical evidence specific to film music, as well as current perspectives in cognitive neuroscience.

The framework (see Figure 31.3) consists of five parallel channels along the vertical axis, each devoted to one of the significant domains of film as identified by the French film theorist Metz (described in Stam, 2000, p. 5 and p. 212): visual scenes, visual text, speech, sound effects (noise), and music. Each channel is hierarchically organized into four processing levels, with bottom-up levels (A and B) meeting the top-down level (D) at Level C, the level of conscious attention and working memory.

31.3.1 Bottom-up processes: levels A and B

Processing begins at level A with the analysis of physical features of the two visual and three auditory surfaces into components such as lines, phonemes, and frequencies.

Within each of these domains, at the next level (B), groups of features are subsequently analysed into structural (gestalt-type) and semantic (associationist) information. For music, this means analysis into temporal structures (strong and weak beat patterns, segments, phrases) and categorization of cues of emotional meaning (e.g. pitch height, tempo, direction). For vision, this means motion-pattern analysis, segmentation, and analysis of temporal patterns, as well as assembly into meaningful objects. The outcome of analysis at level B affords the possibility for emergence of cross-modal congruencies, for example, shared accent patterns in audio and visual modalities, to lead pre-attention to only a portion of the visual information, shown here as the material within the oval in the visual channel. Some of the output from level B leaks through to level D, to be discussed in Section 31.3.2.

To further explain the concept of cross-modal congruence, cognitive psychologists have typically applied gestalt principles to visual pattern (Wertheimer, 1939) and later to auditory information (e.g. Bregman, 1990; Narmour, 1991). Rarely are the principles applied to the visual and auditory domains at once. But film music provides the necessity for such application (see Lipscomb, 2005; Kendall, 2008; Iwamiya, 2008). The simultaneous presentation of music and film automatically elicits bottom-up principles that entail perceptual grouping in both auditory and visual domains. When the auditory information and visual information are structurally congruent (e.g. share temporal accent patterns), the visually congruent information becomes the figure, the visual focus of attention (as originally argued by Marshall & Cohen, 1988).

As part of a larger study, Iwamiya (1994, pp. 134–5) showed that judgements of degree of audio-visual matching of four short film clips was lower when the original video and music components were desynchronized by 500 ms (the only delay examined), and more recently, Kim and Iwamiya (in press) have illustrated the impact of structural congruencies between telops (animated typographic letters) and auditory patterns. Thus, gestalt-theoretic ideas that are typically applied to visual or auditory domains independently can be applied to conjoint visual and auditory dynamic information. It follows that through innate or early-learned grouping processes, music can define the visual figure against the audiovisual background. According to CAM, music can sometimes determine the visual focus of attention.

More recently, a notion of temporal congruence, or temporal synchrony, has appeared in a solution to a general problem in cognition, that of consciousness. Cognitive scientists are focusing on the concept of 'binding' to explain how 'the unity of conscious perception is brought about by the distributed activities of the central nervous system' (Revonsuo & Newman, 1999, p. 123). Cognitive neuroscientists are attaching significance to neural synchronization (shared temporal patterning) across neural ensembles (Engel & Singer, 2001; Grossberg, 2007; Herrmann, Munk, & Engel, 2004; Kveraga, Ghuman, & Bar, 2007) following Grossberg (1980). Film music that shares patterns with visual information on the screen may therefore contribute to attention and consciousness by encouraging the elicitation of synchronous firing patterns of neurons that are measurable by EEG (electroencephalograph) or MEG (magnetoencephalograph), a more recent brain imaging technology. Indeed, neural oscillations have been proposed as necessary for information integration and the generation

of the stream of consciousness characterizing working memory. Music is effective in generating synchronous firing patterns in the theta (4–8 Hz, Sammler et al, 2007) and gamma range (>30 Hz, Bhattacharya & Petsche, 2005), the latter particularly for musicians. It is significant that music makes synchronous firing possible across disparate brain regions.

It is interesting to consider notions of congruent patterns in perceptual and cognitive psychology in relation to notions in the film-music literature on sensitivity to and effectiveness of synchronized musical and film structures. Kalinak (1992) suggests that it is this synchronization that contributes to the inaudibility of the music. Synchronization masks the real source of the sound (like ventriloquism):

> The vocal track in classical cinema anchors diegetic sound to the image by synchronizing it, masking the actual source of sonic production, the speakers, and fostering the illusion that the diegesis itself produces the sounds. Mickey Mousing [synchronized music and visual accent] duplicates these conventions in terms of nondiegetic sound. Precisely synchronizing diegetic action to its musical accompaniment masks the actual source of sonic production, the offscreen orchestra, and renders the emanation of music natural and consequently inaudible. Musical accompaniment was thus positioned to effect perception, especially on semiconscious, without disrupting narrative credibility.
>
> (Kalinak, 1992, p. 86)

31.3.2 Top-down processes: level D

We temporarily bypass level C because during bottom-up processing (A and B), some pre-attended information from all five channels leaks through to long-term memory (LTM) at D and begins a top-down inference process with the goal of constructing the narrative of the film—making the best story out of the two available sources of information, the surface information (A and B) and long-term memory (D). Thus, both bottom-up (A and B) and top-down (D) processes simultaneously generate information that meets at level C, which is referred to as the working narrative. In order to achieve consciousness of at least some of the information at A, matching of this information from B by inferences generated from LTM is necessary. The notion of such a matching process is found in theories of conscious attention (Grossberg's Adaptive Resonance Theory, ART; see Grossberg, 1995, 2007), comprehension (Kinstch, 1998, construction-integration), consciousness (Baars, 1997), and prediction of the environment (Kveraga et al, 2007). Each of these theories assumes or proposes that pre-attentive processes are sufficient to initiate the inference processes from LTM.[2]

Kveraga et al (2007, p. 151) locate the source of the top-down predictions in the orbitofrontal cortex (OFC), 'a multimodal association area'. They propose that the brain extracts coarse gist information rapidly and sends it to OFC within 150 ms, time enough for it to establish predictions that can narrow down alternative interpretations of the original stimuli. Of particular interest to the present chapter, they connect the OFC to emotion via the amygdala and the medial prefrontal cortex, known for its involvement in the emotion of fear depicted by music (Gosselin et al, 2005).

Kveraga et al (2007) suggest that this 'network employed in top-down facilitation of object perception may be part of an older system that evolved to quickly detect environmental stimuli with emotional significance' (p. 160). Similar proposals for predictive coding based on fast and slow gamma wave neural synchrony have been offered in Herrmann et al's (2004) match and utilization model (MUM). That model also incorporates the concept of binding of stimulus features through synchronous firing, and the engagement of long-term memory in perception.

From the perspective of film and film music, because everyday emotional experience associated with events is stored in LTM, inferences based on past experience would include emotion (e.g. how a protagonist would feel in a certain situation). These inferences generated by the LTM matching process accommodate the visual and emotional information from a film, but not the acoustical properties of the musical accompaniment that are the source of the emotional information. This explains why the acoustical aspects of the music are not generally attended: in the context of the rest of the narrative, the acoustical aspects of the music do not make sense to LTM (Where is that background music coming from?) and no hypotheses would be generated easily to include it (unless, of course, music were part of the diegesis, e.g. the portrayal in the film of attending a concert, or taking a music lesson). Indeed, Tan, Spaekman, and Wakefield (2008) have shown different responses to the same music used in a film clip when the context of the presentation of the music was either diegetic or non-diegetic.

31.3.3 Working Narrative: level C

Returning to the remainder of the framework in Figure 31.3, information is transferred from level B to level C, the level of the working narrative. Priority of transfer is given to visual information in the grey oval at B, due to its cross-modal audiovisual congruence. Thus, not all of the visual sensory information that is potentially available is transferred. Also, information of musical meaning from B is transferred. The concept is that of constructing a narrative from the information gleaned simultaneously from the two visual and three auditory channels. The term working has a loose connection to Baddeley's notion of working memory, which includes audiovisual sources, capacity limitations, and conscious awareness. The present depiction illustrates how music transports various packages of information, be they structural or semantic, meeting the (diegetic and non-diegetic) goals of a film director and film-music composer for the minds of the audience. The term narrative recognizes the audience aim of making sense of the presentation, using whatever information is at hand. Given the context of entertainment, added to the aim is the desire to make the best (most enjoyable) story possible. It is likely that the focus of attention is on the visual scene, as there is evidence for visual primacy and typical subservience of audio to vision (e.g. ventriloquism, cf. Driver, 1997; see also Bolivar et al, 1994; Thompson et al, 1994). However, conceivably contexts may be established where one of the other sensory channels dominates, and the rest are subservient. Thus, typically, the emotional meaning of the music is directed to this level because it is useful in determining the meaning of the visual scene.

Components of the emotional meaning might fast-track to level D, however, as an aid to predictive coding of the rest of the film information. Consciousness of the musical meaning at level C arises only through correspondence with information from top-down processes based in long-term memory (LTM) arising from D.

An example of this attentional and inference process is provided by consideration of a portion of the film *Apollo 13*, the drama based on the dangerous technical difficulties within the spacecraft, Apollo 13, that prevented the planned landing on the moon and threatened a safe return to earth. Toward the end of the film, Apollo 13 hovers over the moon—so near and yet so far. The film depicts the fantasy of one of the astronauts, Jim Lovell (played by Tom Hanks), imagining his dream of having landed, taking several weightless steps, and slowly brushing his gloved fingers across the moon's surface. The audience has no trouble in inferring the anguish, awe, and exhilaration that he would have felt (in their working narrative at level C). Thanks to the composer, James Horner, the musical basis for such emotional information is carried by the musical soundtrack. On the other hand, the story gives no reason to predict that a full symphony orchestra is performing outside the spacecraft; hence, the acoustical aspect of the music (level A) is not transported to the working narrative. It is encoded by sensory memory, but it is not predicted by inferences derived from LTM (level D), and hence it is unattended.

Thus, the main phenomenal experience at the working narrative is one of a narrative with visual, verbal, and emotional components (but not music qua sound). Once attended in the working narrative, the information about the narrative can itself be stored in LTM and form the basis of new inferences. In parallel, acoustical aspects of the music can be processed at a conscious level (see levels C and D in the music column), as it is known that simultaneous tasks can co-occur (Neisser & Becklin, 1975), and there is evidence that background music is remembered (Boltz, 2004; Cohen, 2000; Smith, 1996). A similar process is envisioned for speech, sound effects, and text as well, but this is not the focus of the present chapter.

31.3.4 Emotion

Emotion cuts through seven of the eight functions of film music described in Section 31.2.4: contributing to the narrative's continuity; emotional meaning of events; inducement of emotion; creation and activation of memory (state dependence, heightening attention to particular events, providing cues in leitmotif); maintenance of arousal, absorption or involvement; and finally, aesthetic experience. Emotion enters at every level of the proposed framework, analysis of structure and meaning, directing emotional meaning to the working narrative, cuing the inference process of LTM, and matching of LTM and stimulus representations in the working narrative.

Juslin and Västfjäll (2008) identify six classes of musical emotion, arising from brain stem reflexes, evaluative conditioning, emotional contagion, visual imagery, episodic memory, and musical expectancy. It seems reasonable to suggest that each of these can be found in the film context, for example, the use of rapidly changing basic acoustic characteristics, covariation between events (leitmotif), musical motion that mirrors

activity of actors, visual imagery that is part of the envisioning of the film, the establishment of emotionally toned memories of the film that connect with its music and the particular events of the theatre visit, and surprise arising from unexpected aspects of the musical syntax.

Tan (1996) has raised the question whether emotion in film is genuine. He set out six criteria based on Frijda's (1986) laws of emotion, and again we can find examples from the situation of film music to establish that film music leads to genuine emotion, according to Tan's definition:[3]

1. *Control precedence*. Music controls emotion response (Thayer & Faith, 2000; Thayer & Levinson, 1983); hence, like other genuine emotions, emotion created by background music exerts control over the audience member. These effects can result simply from bottom-up analysis of the stimuli, although higher-order learned associations may also play a role.
2. *Law of concern*: *Emotion entails identifiable concern*. When music is combined with other media, the music readily finds an object. Cook (1998) provides clear examples of this with respect to advertising. Marshall and Cohen (1988) explained that music directed attention to an object and ascribed its meaning to that object. Attention is required for concern. Music directs such attention (see horizontal arrow from music to vision at level B in Figure 31.3).
3. *Law of situational meaning (or stimulus specificity)*. Each emotion has a particular 'situational meaning structure', a set of critical characteristics of the stimulus. Characteristics of musical stimuli giving rise to particular perceived or evoked emotions have been identified by various researchers (e.g. Juslin, 1997; Juslin & Madison, 1999; Juslin & Västfjäll, 2008; Krumhansl, 1997; Rigg, 1964), and similarities between these characteristics and visually depicted emotions through gait, posture, and speech intonation have also been noted (see Boltz et al, 1991, for a summary). Some aspects of the emotional meaning of music transfer directly to film (Iwamiya, 1994; Sirius & Clarke, 1994; Smith, 1999).
4. *Law of apparent reality*: *the stimulus must represent some reality or other* (see also Tan, 1996, p. 67). Music contributes to the sense of reality of the narrative (first demonstrated in the 'talkies' in Steiner's score for *King Kong*; cf. Palmer, 1990, p. 28). It accentuates important events. The contribution of only the emotional components of the music to the diegesis has been described in Section 31.2 and explained via Figure 31.3 (see, in particular, the diagonal arrow between levels B and C).
5. *Law of change*: *emotion responds to changes in the situation* (see also Tan, 1996, p. 56). Music creates an ever-changing auditory environment that establishes expectations and implications, some of which are realized and some of which are violated. As such, it is a fertile source of emotion (see also Meyer, 1956).
6. *Law of closure*: *an emotion tends toward complete realization of its appraisal and action tendency, and is relatively immune to outside influences such as conscious control*. Music commands interest, especially in a darkened film theatre, as described by Münsterberg (1916). The emotion generated by music is governed

by the tension and resolution established by the music of which the audience is unaware (cf. Thompson et al, 1994) and over which one seems to have little control, although this is a matter for further empirical work. Rehearing music reproduces emotional responses regardless of prior expectations (e.g. Jourdain, 1997).

Thus, having satisfied the six constraints described by Tan (1996), it can be concluded that music contributes genuine emotional experience in a film. Whereas Tan refers to film as an emotion machine, our analysis here suggests that music supplies a considerable portion of the fuel. The origin of the fuel, however, is the composer.

31.4 Emotion and the film-score composer

It is well to say that music is a source of emotion in film, but the ultimate source is the composer. The average theatre-goer appreciates the emotion established by film music, but would be hard pressed to know who composed this music. Whereas many classical composers have created film scores (e.g. Saint-Saens, Satie, Britten, Honegger, Milhaud, Prokofiev, Shostakovitch, Vaughan Williams, Bernstein, Copland, Schuller, and Corigliano), such composition is often regarded as a special talent and preoccupation, exemplified by George Steiner, Miklós Rósza, Erich Korngold, Bernard Hermann, Dimitri Tiomkin, John Williams, and Ennio Morricone among others. Composers known primarily for their film music have also been recognized for classical music composition as well, for example, Rósza and Korngold.

According to film-score composer Victor Young, the film-score composer is characterized by exceptional exactitude, diplomacy, and patience, in addition to music training (in Karlin, 1994, p. 310). Music composition for film differs from music composition for its own aesthetic sake. Typically, film music is music produced for the sake of the story. It is constrained by the intent of the director, narrative, time, and budget. Working within these constraints, the composer may be regarded as exploiting his or her metacognition of the operations described in the framework of Figure 31.3. The composer must know how shared audiovisual accent patterns can focus visual attention, how musical information avoids conscious attention, how mood is established, how musical associations provoke inferences through reinforcement or counterpoint, and how inferences are cued and generated via LTM to further the diegesis.

The composer is usually called upon at the end of the film production (Palmer, 1980; Rózsa, 1982, p. 191; some exceptions being Eisenstein and Hitchcock classics), and may be shown the film for the first time with recorded music already in place, known as temp tracks. The temp tracks indicate the director's wishes for type and placement of music, and therefore can restrict the composer's latitude considerably. In Henry

Mancini's opinion, familiarity with the temp tracks may bias the director against new insights offered by the composer (Brown, 1994, p. 301). The composer's job is to replace the temp tracks with new material that must meet some or all of a number of constraints: time the music cue to a fraction of a second to coincide with the rhythm of the action of a particular frame of the film, match or create the mood or spirit of the film content, use affordable orchestration and rehearsal time, be unheard (unless the music is part of the diegesis) but be memorable, and never drown out the dialogue (cf. Burt, 1994, Ch. 6; Rozsa, 1982, pp. 69, 108, 110). In spite of these constraints, some composers such as classically trained John Barry claim that composing for film can be the ultimate freedom. Within these constraints, the composer can do whatever he or she wants and is assured of exposure.

Composing for film is one way of transmitting musical culture (e.g. Rozsa, 1982, p. 205), because, as shown in Figure 31.3, although the film music serves narrative function, it is also encoded in an information-processing channel devoted solely to music. Exposure to new compositional styles can be an added aspect of the film experience. For example, *The Red Violin* may provide one's first exposure to the work of the contemporary composer John Corigliano. Films provide a major source for transmission of a culture's musical conventions. Thus, composing for film is a two-way street: the composer learns to code music to match the visual and emotional information of a narrative; at the same time, the film provides the composer an opportunity to represent this emotional information in musically novel and creative ways, often to a large audience.

For a feature film, the composer may be given only a month of intensive work to score an hour of music. This pace is faster than that of a composer of 'music alone', but the genre is often, though not necessarily, redundant and characterized by cliché. The music does not have to stand independently, yet the possibility of (recent expectation for) a lucrative soundtrack album may create a challenge to compose music that lives on its own yet hardly reaches consciousness during the film.

Knowledge of the techniques and technology of film scoring can be acquired formally through courses, books, apprenticeships, or trial and error. The art of film music, however, perhaps more than other forms of music, requires 'taking the attitude of the other' (Meyer, 1956, Chapter 1). Specific messages must be communicated in an aesthetic package, but the aesthetic goals may be secondary, unlike composing music alone. Like other skills, such as chess, bridge, music performance, and knowledge of a discipline, expertise in film-music composition may follow the ten-year rule of concentrated practice (Ericsson, 1996). A student composer, Erin Hanson, in scoring an eight-minute film for a friend, spoke of the many hours of experimentation that were entailed until he achieved the effects he wanted. His work several years later went more quickly. Presumably, like learning any language late in life, extensive effort is required to master the syntax and vocabulary. But the film-score language differs from languages learned from scratch, in that the grammar of the film-music language is already known implicitly from exposure to music and film-music conventions. The film score composer must turn that implicit knowledge into explicit knowledge, and in other words must become an expert of the rules.

Research by Lipscomb and Kendall (1994) corroborates the notion that the professional film-score composer has the knowledge to create a score that uniquely matches a portion of the film, and that the explicit knowledge of the composer is implicitly shared by the audience. Lipscomb and Kendall (1994) asked participants to select the best-fitting of five film scores for a feature film, *Star Trek IV*: *the Voyage Home*, with the music composed by Leonard Rosenman. One of the scores had been originally composed for the excerpt, and the remaining selections were by the same composer, but drawn from other excerpts in the film. Confirming the effectiveness of Rosenman's music, the most frequent choice of the subjects was the actual score he had composed for the segment, although not every subject made this choice. Similarly, we recall from research previously reviewed of Bullerjahn and Güldenring (1994) that the professional film-score composer can systematically manipulate the inferences generated by the viewer/listener. Likewise, in the study by Thompson et al (1994), the use of musical closure by the professional composer altered the judged closure in the film.

Some composers may be more suited to film-score composition than others in terms of both personality and motivation (which may play more of a role than talent, as is sometimes the case in regular musical achievement; see Sloboda, 1996). The film composer must have a dramatic sense (Rózsa in Brown, 1994, p. 278), an appreciation of the visual world of film, and a sensitivity to speech nuances. Unlike many other types of composition, the creation of a film score is a collaborative process. Generally, interpersonal intelligence (Gardner, 1993) would be necessary on two fronts: appreciation of the demands of socially shared cognition and the accurate assessment of common ground (Krauss & Fussell, 1991) and the willingness to cooperate with the film production team (although the film composer Bernard Hermann was known to be irascible, according to Karlin, 1994, p. 270). Korngold describes his positive relations with executive producers and others responsible for the film (in Carroll, 1997, pp. 298–9) and claims that his artistry was not compromised in film composition. Similarly, Franz Waxman felt 'there was always room for fresh musical ideas in writing for the screen' (in Karlin, 1994, p. 307).

31.5 Conclusion

Emotion characterizes the primary experience of both music and film. Music typically plays an integral part of film. Kalinak's argument for the importance of music to the emotional experience in classical narrative film finds support in much of the information presented in this chapter:

> Scenes that most typically elicited the accompaniment of music were those that contained emotion. The classical narrative model developed certain conventions to assist expressive acting in portraying the presence of emotion . . . close-up, diffuse lighting and focus, symmetrical mise-en-scène, and heightened vocal intonation. The focal point of this process became the

> music which externalized these codes through the collective resonance of musical associations. *Music is, arguably, the most efficient of these codes* [italics added], providing an audible definition of the emotion which the visual apparatus offers . . . Music's dual function of both articulator of screen expression and initiator of spectator response binds the spectator to the screen by resonating affect between them.
>
> (Kalinak, 1992, p. 87)

Kalinak's is a strong statement regarding the role of music as a source of emotion. She has claimed that music is 'the most efficient code' for emotional expression in film. According to Kalinak (1992, p. 87), 'The lush, stringed passages accompanying a love scene are representations not only of the emotions of the diegetic characters but also of the spectator's own response which music prompts and reflects.' She is arguing that the simultaneity of both the representation and the elicitation of feeling is key. Though her analysis seems correct, more empirical research would be welcomed that compared the relative abilities of music and film to represent and elicit emotion. Recent neurophysiological research has begun to focus on music-visual stimuli. However, the visual material has been still affective pictures rather than moving pictures (EEG: Baumgartner, Esslen, & Jäncke, 2006; fMRI: Baumgartner, Lutz, Schmidt, & Jäncke, 2006; ERP: Spreckelmeyer, Kutas, Urbach, Altenmüller, & Münte, 2005). A study of gamma activation included music and video as two of eight types of stimuli presented, though the video itself had music in its soundtrack (Fitzgibbon, Pope, Mackenzie, Clark, & Willoughby, 2004). These examples provide a most promising foundation for future studies that examine behavioural and physiological responses to the joint presentation of music and video.

That music contributes to the emotional expression and experience of film seems logical, yet surprisingly discussions of emotion in film often ignore music (e.g. Tan, 1996). Experimental evidence has shown that music influences the interpretation of film narrative and that the music becomes integrated in memory with the visual information. Music accomplishes other attentional functions through gestalt-structural and associationist principles. In addition, the fact that music requires cognitive resources probably plays a role in determining absorption, arousal, and general attention. Music also contributes to the aesthetic experience of the film. In conjunction with film, music can also satisfy Frijda's requirements, as identified by Tan (1996), of a stimulus that can support genuine emotion. In the new research framework for music and emotion of Juslin and Västfjäll (2008), the hypotheses that have been proposed for the study of the six mechanisms or types of musical emotion should be equally considered within the context of the moving image (e.g. their ontogenetic development, key brain regions, cultural dependency, induced affect, induction speed, degree of volitional influence).

Film-music composition can be regarded as a type of problem solving that exploits knowledge of the musical rules that express and create emotion through specific musical relations. There are many goals that must be satisfied by the film-score composer: providing continuation, directing attention, inducing mood, communicating meaning, cuing memory, creating a sense of reality, and contributing to the aesthetic experience. The ultimate compositional goal is to produce sound patterns that express the emotion consistent with the narrative, the emotion that is jointly recognized and

experienced by the audience, binding the spectator to the screen (Kalinak, 1992, p. 87). The capacity of music to accomplish the emotional task, arguably far better than the screen itself as Kalinak has suggested, may be based on the ability of music to simultaneously carry many kinds of emotional information in its harmony, rhythm, melody, timbre, and tonality. Real life entails multiple emotions, simultaneously and in succession. Miraculously, yet systematically, these complex relations, this 'emotional polyphony', can be represented by the musical medium. An example is Korngold's music from the classic film *Sea Hawk* that links romantic love and the spirit of childhood adventure: 'The music for the love scenes still makes an indelible impression with its sweeping heroic lyricism, characterized by arching, repeated rising sevenths that dovetail perfectly with a hypnotic and unforgettable horn call that is redolent of every schoolboy's dream of pirate adventure' (Carroll, 1997, p. 254; other examples are provided by Steiner's ability to 'crystallize the essence of a film in a single theme'; Palmer, 1990, p. 29, p. 48).

As depicted by the Congruence-Associationist Model presented here, and as argued by Cook (1998), music is strong in the representation of emotion in the abstract, and the screen is strong in representing the object to which the emotion is directed. While more research is warranted to further examine the simultaneous contribution of music to emotional meaning, feeling, absorption, and memory, there is sufficient data available now to conclude that music, owing in large part to the explicit knowledge and skills of the composer, provides one of the strongest sources of emotion in film. The technical resources available for controlling musical and visual stimuli, and for measuring physiological and brain responses, provide enormous opportunities for empirical and theoretical advances in this area.

Notes

1. When music was entered first into the regression equation, it too was found to be a significant predictor of inference, though accounting for only 6 per cent of the variance (J. P. Magliano, personal communication, June 6, 2000).
2. In Grossberg's (1996) theory, 'when both bottom and top-down signals are simultaneously active, only the bottom-up signals that receive top-down support can remain active . . . Top-down matching hereby generates a focus of attention that can resonate across processing levels, including those that generate the top-down signals. Such a resonance acts as a trigger that activates learning processes within the system. Resonance is also proposed to be a necessary condition for conscious attention'.
3. But see Russell and Barrett's (1999) practical guide to assessment of emotion, in which they claim that films do not induce true emotion, what they refer to as 'emotional episodes'.
4. The Social Sciences and Humanities Research Council is acknowledged for its support of the author's programme of research in the psychology of film music. Appreciation is expressed to four anonymous reviewers and colleague Thomy Nilsson for their comments on an earlier version of this manuscript. The advice of editors Patrik Juslin and John Sloboda is also gratefully acknowledged.

Recommended further reading

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