Transformational Analysis and the Representation of Genius in Film Music

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Neo-Riemannian theory offers an auspicious toolkit for analyzing film music—a repertoire in which dramatic exigency takes precedence over functional tonal logic. The ability of neo-Riemannian theory to model harmonic progressions as dynamic and contextually determined, particularly with association-laden chromatic motions, suits it eminently to Hollywood scoring practice. This transformational approach is tested on James Horner’s music for the film A Beautiful Mind. In this score, Horner illustrates the mental life of the mathematician John Nash with wildly chromatic but firmly triadic music. A group generated by the operators $L$, $R$, and $S$ provides the transformational found for a “Genius complex” that represents intense intellection. Three cues from A Beautiful Mind are analyzed. Collectively, their tonal spaces reveal a distinctly transformational contribution to narrative and characterization. These readings further evince a tension between the logical teleology of sequential patterning with the radically contingent, even game-like quality of Horner’s triadic manipulations.

Keywords: film music, transformation theory, neo-Riemannian analysis, network, James Horner, A Beautiful Mind, narrative, tonal space, breakthrough

A voracious eclecticism of musical styles, evident in Hollywood scoring practice since its inception in the early 1930s, is perhaps the defining feature of contemporary film music. And while not quite ubiquitous, a familiar component of that stylistic diversity has been the employment of triadic chromaticism—the use of $[037]$ in progressions not directed by diatonic intervals or functional routines—to provide reinforcement and commentary for image. This tradition owes much to the strong continuity between film scoring and long nineteenth-century European dramatic and programmatic art music. The hallmarks of the so-called “Second Practice” of Romantic era tonality, which include an arsenal of alternatives to diatonic monotonality and a reliance on absolute progressions as generators of affect, are particularly evident during the Golden Age of Hollywood from the 1930s through 50s. These harmonic mannerisms are on full display in the Wagnerian sound employed by Erich Wolfgang Korngold, Max Steiner, and many others. Although never abandoned, triadic chromaticism made a bold resurgence in the mid-1970s following the revival of symphonic scoring heralded by a later generation of film composers that included John Williams and Jerry Goldsmith. Increasingly infused with elements from other idioms, especially the repetitive textures of minimalism and pared-down sonorities of rock and pop, contemporary Hollywood offers a veritable menagerie of unusual chordal progressions, all ripe for analytic attention. This article proposes one fruitful means of doing this harmonic practice justice: transformational tonal analysis.

Before proceeding further, a caveat: in film music analysis, the danger of over-interpreting pitch relations is more acute than for art music, even opera. This is due chiefly to the repertoire’s subordination to the larger cinematic product which it serves, a relationship that often results in a highly unstable score, subject to the vagaries of spotting, editing, mixing, and systematically redirected viewer attention. However, brute cinematic contingency does not negate the possibility of sophisticated and impactful tonal procedures on the level of the cue, the emblematic unit of musical development in film. Indeed, it is within the cue that a composer may make tonal choices that truly matter, shading and guiding the narrative through moderately sized musical arguments sometimes capable of standing on their own as pieces, even as they operate half-unheard within the larger diegesis.

Accordingly, most analytic approaches to film music have steered clear of overarching tonal design, instead studying phenomena closer to the surface. The impact of, for example, and have left a clear impact on numerous more recent film composers such as Danny Elfman.

1 By “contemporary,” I include film music written since the mid-1970s, particularly following John Williams’ watershed scores for Jaws (1975) and Star Wars (1977) and the new Hollywood landscape they helped usher in. James Wierzbicki notably places the stylistically pluralistic film music from 1978 to 2001 under the descriptive header of “eclecticism” in his Film Music: A History (2009, 209–27).

2 See, for example, Kinderman’s introduction to The Second Practice of Nineteenth Century Tonality (1996, 1–14) for a summary of some of these extended tonal techniques.

3 The scores of Bernard Herrmann for both big and small screen, for instance, are suffused by exotic triadic progressions and juxtapositions, that a composer may make tonal choices that truly matter, shading and guiding the narrative through moderately sized musical arguments sometimes capable of standing on their own as pieces, even as they operate half-unheard within the larger diegesis.

4 Although it does cast serious restrictions on what may be said about tonal relations across a whole score. The problem of tonal analysis for long swaths of film music is raised in Neumeyer and Buhler (2001) and especially Neumeyer (1998), in which the author carefully scrutinizes the possibility of both functional and abstract/associative tonal plans across entire scores.

5 An exception is the work of Ronald Rodman (1998, 2000), who offers intriguing analyses of rare cases in which large-scale tonal design is meaningful in film music.
a surprising modulation will tend to lie in its immediate expressive effect rather than its relation to a putatively prolonged tonic operating somewhere beyond the horizon of filmgoer memory. Given the exigencies of film temporality, this surface-orientation is a prudent approach. And few approaches provide so felicitous a method for analyzing harmonic detail vis-à-vis local change, particularly in chromatically suffused contexts, as the Lewinian transformational attitude applied to triads that is neo-Riemannian theory (NRT). Indeed, contemporary film music offers a confluence of features that NRT is singularly well equipped to tackle: triadic chromaticism (often with smooth voice-leading) redolent of but distinct from nineteenth-century practice; clear associativity of absolute progressions; and a tendency to prioritize expressive local modulation over long-range tonal structure. NRT has already shown promise in laying out the character and usage of a handful of absolute progressions in film. At the current pace, we are fast filling a field guide with its algebraic methodology (1993). Together these scores contribute to a distinctly longer spans of film music quite well. With some ingenuity, a cue-oriented transformational approach may be tailored to be sensitive towards dramatic relevance and cinematic temporality without discounting aspects of form and pitch relationships.

Rather than discussing exhaustively the powers and limitations of transformational analysis of film music here, I will use a single case study as a demonstration of NRT’s cinematic suitability. I have chosen James Horner as a representative composer, and focus on those of his scores that represent the capacity for genius and inspiration in their respective films’ characters. Horner’s Academy Award-nominated work for the biopic A Beautiful Mind (2001), directed by Ron Howard, is the central case, but I will also examine direct precedents in his earlier output from Sneakers (1992) and Searching for Bobby Fisher (1993). Together these scores contribute to a distinctly Hornerian rendering of the mathematical sublime, one that utilizes quick successions of chromatically related triads to suggest infinitude—numerical and psychic. The bulk of my investigation thus centered on aspects of A Beautiful Mind’s pitch construction, I use analytic procedures derived from the work of David Lewin, supplemented with a handful of transformational and graphical tools devised to better facilitate filmic analysis. Following this, I will investigate Horner’s peculiar brand of music-for-genius, situated in a “Horner Space” that results from multiple iterations of the transformational cell LRLS. I then analyze A Beautiful Mind in detail, using three cues—“The Kaleidoscope of Mathematics,” “Playing a Game of Go,” and “Breaking the Russian Codes”—to illustrate how transformational processes actively contribute to the structuring of narrative in this film.

I. Analyzing Chromaticism in Film

Neo-Riemannian theory arose from an urge to explain the roving patches of tonally ambiguous chromaticism characteristic of post-Schubertian nineteenth-century harmonic practice—this holds especially for the employment of disruptive chromatic modulations, enharmonic quirks, and cycles based on third relationships. Its algebraic methodology reflects a desire to demonstrate new varieties of coherence emerging within this style while engaging the dynamic and contextually determined quality of its underlying musical procedures, especially in ways not dependent on traditional conceptions of tonicity. Because contemporary Hollywood scoring practices have continuously drawn from this tonal language and the affective associations embedded within it, many of NRT’s tools can be recruited for analysis of a great deal of film music. As in the nineteenth century, filmic triadic chromaticism is strongly linked with the evocation of a trio of related aesthetic subjects: the supernatural, awe and fear, and unusual psychological states. As we will see, Horner channels these associations in concert in A Beautiful Mind to paint a picture of schizophrenic genius almost magical in its operation.

The connotations associated with particular absolute progressions in nineteenth-century programmatic music operate largely intact in contemporary Hollywood, though a few progressions are employed with more regularity by composers for celluloid than by their Second Practice forebears. This is the case with Lewin’s SLIDE (e.g., C min⇒Cmaj) for example, an absolute progression which is more likely to be heard in a movie theater than concert hall. To capture these progressions and their derivatives, I employ the usual collection of conventionalized transformations for triadic relations, tabulated in Example 1. A few idiosyncrasies of this inventory require explanation. The non-contextual $T_n$ operation is not generally employed in neo-Riemannian analysis due to its disregard for smooth or inversive voice-leading. However, its utility for capturing the film-musically common procedure of parallel voice-leading,
both between individual chords and directly transposed longer passages, makes it quite indispensable. The standard LPR group is supplemented with three less familiar transformations, \( S, N \) and \( M \), each with a special and distinct role to play in *A Beautiful Mind*.\(^{11}\) \( S \), representing the SLIDE transformation, describes the filially widespread if tonally anomalous progression that retains the triadic third while nudging root and fifth by semitone. \( N \), for *Nebenverwandt*,\(^{12}\) captures motions such as C maj \( \rightarrow \) F min while remaining tonally non-committal, while the *Modalverwandt* \( M \) describes in similar fashion the progression C maj \( \rightarrow \) G min emblematic of the Mixolydian and Dorian modes. I treat the extended family of neo-Riemannian operations foremost as agents of pitch displacement (both sounding and idealized), and secondarily as facilitators of absolute root motion between opposite-modeled triads along with the distinctive harmonic qualia that attend them. This formulation downplays their status as more convoluted (and cognitively demanding) dualistic inversions about stable intervals. Such inversionsal properties are of course available to perception, and are of particular salience in looping progressions with clearly projected mirrored and retained pitches. Even so, insisting upon dualistic equivalence constitutes an odd and rather contrived way of accessing film musical harmonic routines. Voice-leading parsimony is also a trait realizable by all the neo-Riemannian transformations, save \( M \) (with a minimum of four displaced semitones), and Horner’s harmonic surfaces tend to bring out this linear smoothness. Nevertheless, I do not render a distinction in my graphic analyses between realized and abstract parsimony, and will locate instances of highly “rough” voice-leading that still instantiate members of our neo-Riemannian inventory.\(^{13}\)

A modest diatonic family of transformations is imported from Lewin (1987) for use in passages with an unproblematic sense of diatonic function and tonicity. Rather than asserting...
Unlike the tonally agnostic $P$ to usher in diatonic functional space after $LS$ and to $DOM$ and $N$, these are labeled with Greek letters. The use of $AS$ I allow dualistic and transpositional transformations to freely intermix, $SUBD$ network modulation $ring$ the ''solid-state'' aspects of $M$ $RL$ $T$ The idea of a network modulation has precedents in several delineations of $DOM$ or $NM$ or $SUBD$ and $RT$ as a property of a fixed point in a predefined space gravitationally warped around a tonic, these transformations treat prototypical diatonic diarthetic relationships as dynamic, mutable properties of a given progression.\textsuperscript{14} Unlike the tonally agnostic neo-Riemannian moves, however, they posit specific and hierarchically differentiated tonal sites. This admixture of functional and non-functional operations is necessitated by the pervasive blending of different harmonic idioms in film music—some tonally secure, some radically untethered, many somewhere between. With any merger of tools devised for different purposes comes potential for confusion and equivocation. This possibility is at its most acute when the progression under investigation harbors transformations for which both functional and non-functional explanations are justifiable. This is particularly true of the fifth-relating moves $DOM$, $N$, $M$, and $RL$. However, limiting ourselves to just one family of operations foists considerably more contrivance onto transformational analysis of this repertoire than a judicious mixture of several. When $LR$ is recruited rather than $DOM$, it means that the progression so described hinges on a concatenation of pitch-displacements and all they entail, rather than an overriding functional impulse and all that entails. These judgments ultimately rest on contextual details of Horner’s music. For example, functional progressions typically occupy chronologically distinct portions of a cue, where they might signify meanings such as closure or attainment. Where multivalent hearings are possible and filmically significant, I indicate multiple, simultaneously hearable transformations (e.g., both $DOM$ and $RL$), but more often I choose a single transformation and justify it in analytical prose.\textsuperscript{15}

Film music analysis accentuates the thoroughly interpretive nature of transformation label selection, which must depend on the reading of ever-shifting musical and dramatic circumstances in addition to pre-analytic transformation inventory choices. The difference between compound and unary transformations is of particular importance. Context alone can determine whether a direct move such as $C$ major to $E$ major is an instantiation of a singular $T_5$, an implicitly blended $PR$ or $LS$, or something as baroque as $T_5S$ $SUBD$ $S$ $NM$ $T_9$. In most situations, mode-switching fifth and third progressions are interpreted as unary operations. This has the upshot of lending the fairly non-parsimonious $M$ relation status as a self-sufficient harmonic move, depending on no reconstruction of multiple component moves (such as $PRL$ or $SUBD$ $P$) for its intelligibility.

In addition to these operations, a handful of further adaptations and expansions to standard transformational graphical methodology are helpful in analyzing film music. First is the template graph, which designates a specific arrangement of two or more different operations to be combined with themselves and other templates to generate larger swaths of explorable pitch-space.\textsuperscript{16} These are labeled with Greek letters. The use of these small graphs is intended to free the analyst from the rigidity of prescribed tonal spaces such as the $Tonnetz$ and to allow complete contextual determination of transformation names, spaces, and implied distances. More than one template graph may be joined either at an edge or by an intervening transformation. When an intervening transformation is contextually novel (e.g., has not been heard before), it is designated a network modulation, indicated graphically by comparatively thick edges. Different species of cellular template graphs can be linked in this manner. In lieu of tonal modulations (which depend on presumption of key stability), network modulations are helpful for capturing the temporal novelty of fresh and digressive triadic moves, and enable passage between different harmonic cycles.\textsuperscript{17} Their essentially contextual determination means that the scope of a network modulation can vary drastically from one harmonic setting to another. One might be as local as a shift between $L$-related pairs, as with an $S$ used to maneuver from $C\#$-$e$ and $E\#$-$g$. Another may be as wide-ranging as a warp across entirely different tonal systems, such as a clean $DOM$ to usher in diatonic functional space after perusal of the hyper-hexatonic system. A distinction should be made between network modulations that are discrete (targeting a single node) and global (moving an entire node-arrow system), as demonstrated with the simple $LS$ pairs of Example 2, although the analyses to come involve only the former. Progressions that assume the status of network modulations are often decisive in structuring the affective flow of film music in situ—akin to a shift to a new, surprising camera angle. Where a network modulation diverts from a sequence or an interval-cyclic process, we may think of it as a harmonic “symmetry break.”

A discrete run through a template graph, or group of templates, is termed a pass after Lewin (1993). My use of passes reconciles formal information (the abstract relations that obtain between potentially non-adjacent triads, and spans of music that execute similar moves in different configurations) and the figurative nature of transformation label selection, which must depend on the reading of ever-shifting musical and dramatic circumstances in addition to pre-analytic transformation inventory choices.}\textsuperscript{17}

\textsuperscript{14} This transformational account does not attempt to capture (indeed, is categorically uninterested in capturing) the “solid-state” aspects of harmonic function as are commonly represented in roman numerals, but in no way precludes the importance of those aspects. It merely draws our attention to the transformational quality of harmonic function that may be brought out or diminished in relation to harmonic-function-as-object relative to musical context and analytic goals.

\textsuperscript{15} As I allow dualistic and transpositional transformations to freely intermix, the path consistency condition (through which networks produce the same result for major and minor inputs) will inevitably, but hopefully not egregiously, be violated in my analyses. As per Hook (2007), path consistency is not a crucial desideratum for transformational analysis, and is better suited to interpretations that place more value on dualistic and inversive network properties than the current study.

\textsuperscript{16} Lewin (1993) provides a similar tool with his “model” networks.

\textsuperscript{17} The idea of a network modulation has precedents in several delineations of tonal space. A variety of methods for embedding motions between distinct cycles (for example, by bridging transformations or intermediate “coupling chords”) are introduced by Douthett and Steinbach (1998), while Lerdahl’s (2001) formulation of region-switching and hypermodulation allows communication between both similar and differing pitch collections. My network modulation pertains less specifically to a pre-ordained tonal space. Therefore, it can take on more diverse forms and do things like “fade” in novelty as a fresh and/or template network-spanning transformation is assimilated through repeated use.
transformation of music in diachronic order away from an initiatory *Klang* (closer to Lewin’s dynamic phenomenology, and highly relevant to film temporality). The networks that comprise passes may have routes suggested or unlocked by group structure but not aurally present. These implied spaces capture implicit connections between non-adjacent *Klangs*, creating a phantom matrix of triadic potential, the better to demonstrate the openness of tonal possibility strongly felt in triadic chromaticism.

II. MUSIC FOR GENIUS

The work of James Horner, composer for almost 150 films including the megahits *Titanic* (1998) and *Avatar* (2009), is familiar to many cinemagoers at the turn of the millennium. He began scoring small pictures while working towards a Ph.D. in theory and composition at the University of California at Los Angeles in the late seventies. Horner eventually dropped out of the program with a terminal M.A. in order to pursue film music exclusively. In the eighties he established himself as a prominent industry composer with scores to science fiction blockbusters such as *Star Trek II* (1982) and *Aliens* (1986). Horner’s style is generally consonant and securely tonal. And while hardly Hollywood’s poster-child for harmonic experimentation, he is fluent in many styles from classical through twentieth-century, and is especially capable of weaving cleverly devised chromatic and atonal threads through essentially diatonic contexts.

Two scores from Horner that deal with characters of preternatural intelligence are *Searching for Bobby Fisher* and *Sneakers*. The problematic notion of “genius,” a familiar target for richly deserved suspicion among musicologists, is on center stage in these films. It is unsurprising that American genre cinema—hardly the first place one expects dismantling of outmoded romantic tropes—tends to participate in the same mythification of exceptional intellect that runs through much discourse on musical culture. Even a film like *Fisher* (directed by Steven Zaillian, 1993), which develops a nuanced and unsentimental picture of the world of child chess prodigies, has moments that make extreme mental exertion seem magically incomprehensible. In one notable scene, Horner’s score bears chief responsibility for this heightening of reality. During the sequence (DVD 1:21:50) in which the child whiz Josh (Max Pomeranc) tests his speed chess skills against the professional Vinnie (Laurence Fishburne) in Washington Square Park, Horner supplies music of restless activity in D minor. The fast harmonic rhythm in “Josh and Vinnie,” coupled with minimal textural figuration, contributes to the representation of faster-than-camera decision making within both characters’ heads. The impatient harmonies race alongside rapid dialogue from Vinnie, who comments incessantly—first critically, then admiringly—on Josh’s choices. No cinematic effort is expended establishing the actual moves and strategy of Josh and Vinnie’s match. Pacing and viewer focus would suffer were the game the object of the camera’s focus, rather than the character dynamics and emotion. The whirlwind editing of fast, disconnected game actions is crucial in maintaining an aura of magic about the workings of the savant’s mind. In a similar manner, Horner’s short chordal attention span suggests spontaneity (a requisite for speed chess), but within the confines of D minor (there are rules, after all!).

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18 The figural-formal distinction is discussed in Lewin (1993) and developed in Rings (2006).
20 Horner’s reliance on the styles of others (not to mention a well-documented penchant for thematic self-borrowings) is a cause for notoriety among critics and film music aficionados. While the case for Horner’s originality will not be strengthened by the following analyses, to the extent that Horner continually alters his recycled material, he serves as a perfect (if unwitting) example of the usefulness of transformation theory. Attention is primarily fixed on the *use* of this material rather than its originality.
Due to the difficulty of accessing printed film scores, this and all other musical examples and their corresponding analyses derive from the author's own by-ear transcriptions. On occasion they might reflect different harmonic spellings than in the notated score, though, from a neo-Riemannian perspective, such discrepancies are often beside the point to begin with.

22 My use of transformational arrows to represent tonicity and function owes to Rings (2006). Following him, I indicate tonic with a doubly encircled node and functional intention with directed edges.
listener with the promise of harmonic infinitude, while simultaneously assuring that at least some great rational minds are capable of handling such an abundance of information.

III. THE LRS GROUP AND HORNER SPACE

The febrile harmonic activity Horner uses to suggest the sublime is all the more conspicuous in the explicitly mathematical *A Beautiful Mind*. Before investigating how he puts similar ingenious procedures to work in that film, it is worth exploring the ramifications of using the characteristic SLIDE progression amidst other transformations. Because in most of the examples (including those from *Sneakers* and *Fischer*) the operation is flanked by *Ls* and/or *Rs*, but not *P*, I consider a group consisting of *L*, *R*, and *S*. This yields an exotic (though no less useful) alternative to the canonical neo-Riemannian family. Of the three involutions, *S* is a transformational black sheep, incapable of diatonic accommodation, chromatically shifting two different triadic pcs rather than the customary one. However, the total semitonal displacement (2) is identical to an application of *R*, and individual voices in closest configuration move only by semitone (such parsimony perhaps offsetting the likely parallel ic5s). Example 4 presents the binary through quaternary cyclic generators of the group (the familiar LR is omitted), along with their associated pitch collections and triadic interval progressions.

**Example 4. LRS group structure.**
A full discussion of these cycles—many behaving like eccentric twins of those from the LRP group—is outside the scope of this article and left to the exploration of the reader. I isolate my attention to one of the quaternary cycles most relevant to Horner’s music-for-genius. Three distinct generators of order 4 are possible from this group of operations, but \( LSLR \) is the only ordering observed reasonably often in film or classical music. It is also the only sequence for which one application moves the starting triad by a major second, while those with double instances of \( R \) or \( S \) behave identically, inching up or downwards by semitone. This is something of an inversion of the behavior of the \( LPR \) group, where the total distance achieved by quaternary generators of form \( abac \) is equal to the number of semitones displaced by the \( a \) operation.\(^{25}\)

Here, when \( a=L \) the cycle has a wider gait than \( a=R \) by a semitone.\(^{26}\)

Example 5 shows the tonal space generated by repeat applications of the linked operations \( L, RL \) and \( S \) (as per the \( F\rightarrow S \rightarrow E \rightarrow L \) progression in the aforementioned cues). The resulting “Horner Space” is a slice of the region generated by the \( LSLR \) quaternary generator. The number of passages in Horner’s scoring oeuvre spawned by this graph, or some modification of it, is prodigious. Of particular frequency is the subdivision into an \( L-S-L-R-L-S \) sequence, henceforth the “SLIDE-line.” In any guise, the \( LSLR \)-sculpted space allows a smooth and quick route downwards by major seconds, while embedding twinned whole-tone scales of alternating mode. Motion by the interval of a second is not usually considered parsimonious, so one auspicious aspect of Horner Space is that, through the use of \( S \), composers can easily navigate progressions that proceed by root intervals of \( ic1 \) and \( 2 \) rather than the commonplace \( ic3, 4 \) and \( 5 \). An additional desirable trait is the space’s symmetrical division of the octave: if iterated six times, the SLIDE-sequence returns to its starting point, yielding one of the two possible 12-triad long cycles. That partial chains, and even complete cycles (as we will see) derived from the \( LSLR \) generator can be observed in concert\(^{27}\) and film music\(^{28}\) stands a counterexample against Cohn’s general dismissal of quaternary operators: “Complete quaternary-generated cycles of [LRP-manipulated] triads are so lengthy as to be of negligible musical value and are impractical to represent in a compact graphic space.” (Cohn 1997, 51). In the case of \( LSLR \), a number of factors—the relatively direct and directionally uniform path through pitch-space by \( ic2 \), the reinterpretation of \( LS \) as \( PR \), and the embedding of the familiar \( ic5 \)-traversing \( LR \)—uniquely commend the generator from its parent \( LRS \) group.

IV. A KALEIDOSCOPE OF TRANSFORMATIONS

Ron Howard’s \textit{A Beautiful Mind} traces the career of mathematician and economic theorist John Forbes Nash as played by Russell Crowe. Inspired by Sylvia Nasar’s biography of the same name, the film paints Nash’s life in broad strokes, depicting his initial breakthroughs as a graduate student, his midlife struggles with mental illness, and his eventual triumph in Stockholm with the 1994 Nobel Prize in Economics. Nash’s intellectual achievements, especially to the then nascent field of game theory, have entered the popular consciousness thanks in large part to the film. On screen, Nash’s gift for numbers is painted with romanticized colors, especially insofar as it is depicted as inextricably linked with his schizophrenia; no surprise, perhaps, given that \textit{A Beautiful Mind} is a Hollywood drama written and directed by non-specialists, not an introductory course in advanced math. Some of Nash’s seminal contributions to game theory (namely the Nash Equilibrium) are nonetheless admiringly, if ham-handedly, illustrated in creatively scripted scenes. Nash’s psychosis is dramatized through paranoid hallucinations and a penchant for maniacal pattern-hunting, an “appetite for patterns” as Crowe confesses in one scene. This results in some of the more chilling depictions of apophenia—the “unmotivated seeing of connections”—set to film.\(^{29}\)

Horner’s score is tasked with externalizing the workings of the film’s titular mind. The Oscar-nominated\(^{30}\) work consists of

\(^{25}\) Observed by Cohn (1997, 47).

\(^{26}\) A quick calculation of sum-directed voice-leading displacement (DVLS, after Cohn) shows why. For \( LSLR \), on a major triad, \( DVLS=1+2+1+2+6 = 10 \) semitones displaced overall. For \( RSRL \), \( DVLS=2+2+2+2 = 8 \) semitones, same for \( SLR \) (the values are opposite but equal for minor triads). Because the \( S \) and \( R \) of \( LSLR \) never follow on the heels of each other, their displacements by \( ic2 \) add up rather than cancelling out, each transformation shifting in one direction and by wider intervals than the other quaternary generators. I am indebted to Drew Nobile for honing this observation.

\(^{27}\) See, for example (from shortest to lengthiest iterations of \( LSLR \)), Glazunov’s \textit{Oriental Rhapsody}, III (mm. 36–38); Prokofiev’s Symphony No. 4, Op. 47 (mm. 1–5); and Fauré’s \textit{Requiem}, “Agnus Dei” (mm. 44–53). At the time of the writing of this article, no complete \( LSLR \) cycle could be located in the classical literature. It seems quite likely that Horner derived some of his harmonic gestures from Fauré and especially Prokofiev. The linear behavior of these passages and their derivation from faubourdon-allusive tonal models is worthy of discussion but outside the scope of this paper.


\(^{30}\) Yet Horner’s music for \textit{A Beautiful Mind} was not unanimously praised—for example, Dennis Lim’s negative review in \textit{The Village Voice} (2001) derides Horner’s “insistent, asphyxiating score.”
around 80 minutes of underscore, replete with wordless voice and an occasional quintet of pianos. And while it accompanies under 15 minutes on film, the complex of thematic material associated with his mental effort, Nash’s “genius music,” is the focus of the rest of this article. Onscreen, the music accompanies sudden breakthroughs and laborious intellectual exertions alike. Example 6 lists its guises and illustrates its distribution across AB e a u t i f u l Mind’s run-time. Most occurrences are clustered during the film’s first reels, before Nash’s major schizophrenic breakdown. A loose association with D minor is preserved in initial appearances, though this points less to a deliberate associative key scheme than to derivation from analogous material in Sneakers and Fischer.

The wellspring for Horner’s musical “genius complex” is the film’s main title cue, “The Kaleidoscope of Mathematics” (DVD: 0:00–1:23). Because the understated opening credits are free of narrative information, little distracts from the musical unfolding during this short span of film. On the cue’s inspiration, Horner remarks:

I had this vision of how numbers work, and, to me, that was always something I wanted to bring across musically…[Ron Howard and I] had this running abstract idea:… music and the whole art of mathematics, when you get above a certain stage, is not literally just numbers and solutions; it’s more like looking through a kaleidoscope you slowly change it.

Horner claims inspiration came from a poetic notion that Nash’s thought processes were akin to the spiraling informational intricacy of a “fast moving weather system” and similar complex systems:

The source for “Kaleidoscope” in turn is from Horner’s main title from Bicentennial Man (1999), “The Machine Age,” which itself draws from Sneakers and Bobby Fischer. This lineage of adaptations (and self-plagiarisms) is one of the more blatant in Horner’s output, although not one to be dwelt upon here.

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32 Transcribed from Horner’s spoken commentary in the A Beautiful Mind DVD supplemental materials (2002).
a kaleidoscope, and you turn the glass and all the little bits fall in
different patterns. [...] That to me was what I wanted to set to
music.\textsuperscript{33}

These remarks evince an impulse to romanticize Nash's
intellect, inspired ostensibly by fuzzy impressions of chaos
theory and dynamical systems.\textsuperscript{34} Nevertheless, the imagery
invoked is relevant to Horner's musical realization of Nash's
inner life. The constellation of traits associated with kaleido-
sopes—their dynamism, symmetry, color, intricacy, patternning,
and unpredictability—are equally musical qualities as they are
geometrical ones. In Horner's score, they are reflected in a
"genius" thematic complex decidedly \textit{transformational} in
conception. The composer's words attest inspiration by visual
metaphors of change over discrete objects, and so fit Lewin's
vision of a transformational stance that models music through
the dynamic processes that steer musical change, rather than
through reified Cartesian points and expanses. As will become
increasingly evident, it is as though Horner analyzes the
shifting particles in a kaleidoscope with the 24 major/minor
triads, with the incrementally applied rotations and mirror
reflections of the whole device corresponding to NRT opera-
tions. Indeed, the graphical networks developed for \textit{A Beautiful
Mind} might come to resemble little neo-Riemannian
ekaleidoscopes.

Like his material for similar scenes in \textit{Bobby Fischer} and
\textit{Sneakers}, Horner's "genius music" in \textit{A Beautiful Mind} bears
a consistently triadic surface with little variation of texture
beyond minimalist chordal figurations. The textural uniformity,
along with a fast harmonic rhythm for long spans of score,
focuses the listener's attention away from the triads themselves,
and squarely onto their interactions. To a certain extent, one
could almost imagine this piece as harboring only one triad: one
characteristic object (or Riemannian \textit{Klang}) on which multi-
various operations swirl around, an object of persistent identity
if not sonic frequency over time. This view posits a sameness for
the D-minor [037] that begins and concludes "Kaleidoscope" of a
different sort than the sameness won by, say, Schenkerian
prolongation. In this case, the traceable line of [037]'s coursing
interrupted across the main title vouches a kind of unity where
the brute pitch identity of D minor$_\text{start}$ and D minor$_\text{end}$ is
of secondary and contingent importance. Such is the nature
of transformational instead of prolongational/function-
coherent.

Adopting this attitude of triadic continuity turns what Daniel
Harrison argues is a shortcoming of neo-Riemannian theory
into an asset. Harrison claims that transformation theories may
verge on emptying out musical objects of their substantive reality
entirely, making vibrant, sensuous chords into little more than
perpetually empty nodes subject to transformation, things "in
such constant becoming that [they] have no being."
\textsuperscript{35} Horner's
"Kaleidoscope" presents an example of music in which such
siphoning of sensuous surface qualia is desirable; after all, little
in the way of melody or sustained counterpart extracts from
pure harmonic activity.\textsuperscript{36} To take this stance is not to endorse
some bizarre harmonic monism. Plenitude still exists, but
resides in chordal transformations rather than chords. Apropos
\textit{A Beautiful Mind}, the first triad within a cue is a single \textit{idea},
morphing through many unpredictable turns of thought.

Horner's "Kaleidoscope" title music rehearses a familiar
narrative archetype as it is accompanied by a parade of studio
logos that culminate with a cut to Princeton's math department.
In tonal terms, it is a tale of an initially asserted order provi-
sionally lost and eventually regained. A doggedly emphasized
D-minor tonic at start is abandoned in the chromatically
digressive inner portion, full of unexpected twists and unusual
sequences. Only with great effort does a breakthrough occur,
using a chromaticized dominant as a sort of harmonic shock-
therapy to jolt the piece back into the stability of D minor. In
her study of the score vis-à-vis minimalism, Rebecca Eaton treats
the cue as a microcosmic representation of the psychological arc
Nash undergoes, to insanity and back.\textsuperscript{37} A focused transforma-
tional analysis nuances Eaton's psychological interpretation,
demonstrating that the cue is less about struggling against the
forces of chromatic disorder than actively incorporating and re-
ocnciling those elements, as during an act of problem-solving.
Indeed, as becomes clear through its development over the course
of the film, this cue represents a session of pure intellection.\textsuperscript{38}

Example 7 offers a Schenkerian shallow-middleground
reduction of "Kaleidoscope." The sketch is unsatisfactory in
several ways. This is unsurprising given the intense and
tangent-prone chromaticism of the piece's central portion (not
to mention the blasé attitude towards parallels and inelegant
voice-leading spawned by Horner's aversion to chordal inver-
sion). Relating the routinely emphasized A5 to the bookending
D-minor tonic is the task that poses the greatest obstacle to
conventional tonal analysis. I treat the pitch as a chromatically
displaced dominant—\textit{V}, and thus A$\flat$—rather than G$. However,

\textsuperscript{33} Transcribed from an interview with Horner on the National Public Radio
program \textit{Performance Today} (2002).

\textsuperscript{34} For an incorporation of dynamic systems—essentially the study of the
effects of change in complex, connected, and adaptable systems—into
music theory, see Douthett (2008).

\textsuperscript{35} See Harrison (2011, 551).

\textsuperscript{36} This radical conception of neo-Riemannian theory works less well for the
still highly constrained repertoire for which it was developed than for some
modern "neo-tonal" music, not just for film but concert hall. Analysis of the
works of neo-tonal composers such as Roy Harris, Jón Leifs, Alan Hovhan-
ness, and Einojuhani Rautavaara, for example, might respond well to this
stance.

\textsuperscript{37} Eaton (2009) offers a thorough and often harmonically minded
investigation of minimalism in film, including its presence in \textit{A Beautiful
Mind}. If anything, the influence of minimalism has allowed Hollywood
composers to be more upfront in their use of surface chromatic
relationships, freeing, as Glassian minimalism does, one from the
strictures of linear counterpoint or sophisticated thematic or motivic
development.

\textsuperscript{38} This is in contradistinction to Eaton's interpretation of the main title as an
encapsulation of Nash's character arc. Her more romantic reading relates
sanity to stable tonics and orderly sequences and schizophrenia to chromatic
"chaos."
the only time it properly functions in this manner is at the end of the fourth of five passes, when it sounds simultaneously with A minor, the proper minor-dominant. Otherwise, the pitch seems to float through passes two through four, “prolonged” (indicated by tenuous dotted slurs with question-marks) by digressive sequences and happenstational returns. The Schenkerian reading forces stabilization of a number of pointedly ambiguous moments, such as the E♭ maj/C243 A♭ min loop at the onset of pass three. Perhaps most dangerously, it commits us to one interpretation of enharmonic spelling (here managed so as to artificially keep the orbit around A♭ as long as possible) when everything in the piece is telling us this employs a different sort of harmonic space (and logic) than functional/prolongational space.

Reexamining the piece through a transformational lens focuses attention on the qualities of individual harmonic motions rather than an overriding sense of hierarchy. Operations of recurrent significance on the kaleidoscope’s surface include L, S and various functionally agnostic fifth-relations (RL, N, and M). The preponderance of these moves generates a chord-to-chord surface that is organized around two template graphs and their offspring as shown in Example 8. The isographic α1 and α2 bear fifth-relations, the former powered by the L progression, the latter by N. Graph β is wholly chromatic, describing motion between two minor-third-removed triads of like mode (reached by SL rather than PR in this S- and L-saturated context). These two shapes in various configurations furnish the cue’s several sequences. When β is augmented by an α-derived LR transformation at its base, it forms the core of Horner Space, and thus the SLIDE-line. Other routes are made possible by various combinations of α and β: a sampling is also shown in Example 8. These simple templates and their plentiful (re)combinations determine the course of most of “Kaleidoscope.” Additionally, a handful of one-off progressions serve as network modulations, including LP, NL and LSLR. The conjunction of α1, α2 and β templates and a handful of network-modulations is sufficient to describe the complete harmonic shape of “Kaleidoscope.” It breaks into five passes of constitutive sub-networks that engage similar moves but execute them differently. Directed arrows indicate chronological progress through pitch space. Network modulations bear thick edges, while faint edges trace the dimensions of formally relevant but indirect or unexplored implied spaces.

Example 9(a) presents my reduced transcription of a portion of the first pass (mm. 1–26). Example 9(b) in turn produces a network representation of this energy-accumulating segment, which is occupied by a single, static progression in obsessive repetition: the minor cell [D min: i→V6→VI→i]. To mitigate the clutter inevitable in two-dimensional representations of busy pitch space, I leave out certain graphical aspects of the sub-networks employed. These omissions mostly comprise unused, un-implied routes and directional arrows—information already encapsulated in the small template graph labels.

Pass two (mm. 27–33) begins with a network modulation as shown in Example 10(b), once again with a reduced transcription...
of the relevant passage (Example 10[a]). Here, the triad-as-idea ventures first to A minor in root position (still within the diatonic/a1 ambitus of D minor) and then to A♭ major with a more significant S. This launches the SLIDE-line, hopping from one a-network into another, escorted by whole tone from B♭ to E and terminating when B maj lands on E♭ maj rather than its expected L-partner, E min.

This novel progression, LP, initiates the next, far-roaming leg through “Kaleidoscope” pitch space. Examples 11(a) and 11(b) depict pass three (mm. 34–50) in reduction along with its respective spatial analysis. This kaleidoscopic twist results in a more tortuous journey through pitch space, characterized by the mixing of a1, a2 and β networks and a more evenly distributed collection of disorienting network modulations (N, M, and LSRL). These network modulations generate three sub-regions. The first (34–40) explores new routes through general a-space; the second (41–45) is an incipient minor-third cycle drawn from a β-backbone (including again an A⇒A′ progression); and the third (46–50) recasts the downward whole-tone sequence of pass two through alternation of a1 and 2 networks. Throughout, evidence for the firmer hierarchical footing for A♭ accumulates. This is especially apparent as Horner redirects the M-R-M cycle back towards A♭ from A min at measure 50.

The space around pass three is adjusted slightly into a vaguely circular shape in Example 11(b) so as to capture the equivalence between the a-network complexes that initiate both passes three and four. Where a Tonnetz-based analysis (or its equivalent) would mask or confuse this connection, the non-prescriptive design opted for here enables such subtle and analytically valuable graphical manipulations without compromising the rigor of the underlying transformational succession. Pass four (mm. 53–65) offers a varied recapitulation of the activity of the previous section. After a deceptive move to A major (captured by the network modulation NL), Horner ushers his floating chord along now familiar tracks, as evident in Examples 12(a) and 12(b). However, as the triad re-approaches the A/A♭ patch at measure 60, the sequential apparatus of “Kaleidoscope” flies out of control. A minor, the minor dominant of starting key D minor, is pitted directly against its nagging SLIDE-partner, first in quick alternation, then as an aggressively dissonant 5-22 simultaneity. The dyadic clash between A♭ and A, implied since the second pass, is here rendered explicit. The transformation, such that it is, is labeled SLIDEJOIN.39 The polychord behaves as an intensified “transformational” dominant, discharging onto D minor at m. 66 and from there into the fifth and final pass (mm. 66–76). This amounts to the cue’s moment of epiphany, an ingenious synthesis wherein the two opposed elements of the piece—A and A♭—are merged and merged and...
progress in a novel way. Such transformational fusion enables the conventional role of cadencing into the home key to take on a fresh cast by blending root progressions of i-5 and 6. Following this ersatz structural dominant, Horner recapitulates in diminution the L-driven progression of network-a, depicted in Examples 13(a) and 13(b). A final network-modulation (the novel RP) shunts C maj to A maj. This opens up a major-hued a1-network nearby and enables the A-maj triad to act as the first straightforward dominant in the “Kaleidoscope.” It progresses, after a cadential pause, neatly to its tonic, and thus garners an unambiguous diatonic-functional transformation. The network ends with the music’s smooth segue into a new cue lit by a sunny, Princetonian D major.

Integrating these diachronic observations into a narratively relevant synchronic account, especially in a piece that places such emphasis on the moment-to-moment flitting of the central triad, poses an analytic challenge. Example 14 presents a transformational background network for the main title cue as an alternative to the Schenkerian reduction of Example 7. It illustrates the essential triadic relationships that underlie the main title’s music and highlights the narratival dimensions that emerge from their interplay. Not all relations are of equal weight (the less important of them are indicated by dotted edges), and some do not arise on the surface of “Kaleidoscope” at all (for instance, the LRL between Eb major and D minor). The structural role of the S is emphasized for its channeling of the central polarity between D, its minor dominant, and that Klang’s SLIDE-partner A♭ major. Occupying a rung slightly lower in the piece’s transformational hierarchy is RL linking E♭ to A♭ major (mirroring the connection of D and A minor), and the set of relations that emerge from the use of the piece’s “tonal” dominant, A major.

Text descriptions provide a tonal-associative reading in the style of Neumeyer (1998), though here it is the dynamic progressions themselves that are primary bearers of associative power while fixed key-areas act as important but secondary vessels of harmonic meaning. Three regions are linked to specific narratival impulses drawing from an epiphanic/problem-solving reading. Those relations around A♭ that present it in variance to

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40 Almén (2008) investigates epiphany as a strategy within a comic narrative structure.
Example 11(a). Pass 3 (mm. 34–50) reduction.

Example 11(b). Pass 3 network.
D minor (T₃P, and the RL that mirrors D’s relation to A minor), are grouped in an area associated with fevered intellect. SLIDE and its cousin T₄P form the crux of the correct formula for an epiphany that leads back to D. And finally, that nominal tonic gains its own nodal point. The association of stability/solutions is uniquely assigned to a chord rather than a relation, as this key area reflects a state of psychic balance, occupying both the initiation of a problem and the arrival at its solution.

The overall transformational trajectory here differs from its linear or prolongational structure. The background path of RL·S·S·P·DOM effects a global move from D min to A♭ maj to D maj. RL·S corresponds with the posing and strenuous working-through of a difficult problem, while the subsequent
S-P-DOM spreads out the “Eureka!” moment that solves it. The double application of S amounts not simply to a liquidation of the chromatic A♭ (which contributes so importantly to the title’s reentry to D minor). Rather, the second S is necessary for the recovery effort of the long-lost A minor, which, after first joining with A♭, transmutes via P into a major version of itself. From there it ventures smoothly into the next cue in D major as a tonal dominant.

V. TONAL LABORS LOST

Two sequences from within the film’s main action feature transformational manipulation of material from “Kaleidoscope” in order to convey failed and successful bouts of intense thought. Horner’s “genius music” occurs as underscore first in the cue “Playing a Game of Go” (DVD: 11:17–12:20) during which John Nash is challenged to an easy-to-learn, ultra-complex game by a colleague. The light scoring only faintly suggests the textures and motoric drive of “Kaleidoscope,” but harmonic derivation is clear. The LRLS SLIDE-line (as a conjunction of graphs α1 and β) furnishes the basis of the cue, as it did for much of the main title. Unlike Kaleidoscope, a handful of moves relate triads a semitone apart that do not share a third; this trek takes the originary triad along the more complex LRL path within α1.

The cue also introduces a new network modulation: the hexatonic pole relation (HEXPOLE, equivalent to LPL or PLP), that most radically disjunct of triadic pairings. At the cue’s conclusion, Nash loses the match, a moment underlined by an unceremonious wrench from G♭ major back to the cue’s initial D minor. The modulation occurs when the colleague lays down the winning game stone. To this indignity, Nash,

41 Cohn, coiner of the transformation’s name and the major-third pitch universe it stems from, considers the Hexatonic Pole progression exhaustively in his 2004 article “Uncanny Resemblances,” exploring its tonally mystifying intrinsic characteristics as well as situating it within turn-of-the-twentieth-century discourses on liminality.
incapable of admitting defeat, protests “the game is flawed. I had the first move, I should have won,” and knocks the game board over.

Tonal coherence in extended harmonic practices such as film music may not be such a zero-sum game—one tonic need not necessarily win out over a competitor for a passage to be organized soundly. Nevertheless, there are ample associative harmonic and textural codes here to suggest that a win/lose narrative is represented in this cue. Example 15 visualizes the underscore as inhabiting Horner Space. The SLIDE-driven sequence (lent an ethereal air by Nash’s vocalizing muse, Charlotte Church) is associated with the Go game as it is being played—regular, logical, and rule-bound. The death-blow harmonic progression to the hexatonic pole is pegged visually to the adversary’s move, and stands in a special relation to the opening and closing region of D minor. Chromatic mediants with ic4 root motions are out of place in Horner Space, and the HEXPOLE brings preloaded connotations of negation and the Unheimlich very much alive in film music practice. Horner’s route across the sequence nearly fulfills its cyclical promise, dutifully checking off five sixths of a directed whole-tone scale D, C, B♭, A♭, and G♭. Winning, one might surmise, would have amounted to either cyclical completion (to E) or return (to E, then D). But presenting G♭ at a vulnerable moment in the cue’s diachronic unfolding (the game onscreen is coming to a close) provides a harmonic opening for Horner to assert a losing operation, just as some imperfect aspect of Nash’s gameplay allowed his colleague to declare victory. HEXPOLE effectively, unceremoniously, cancels out the progress of the SLIDE-line. Returning to D minor in this manner amounts to taking the sequence back to square (node) one. Pure contingency, a condition anathematic to the ultra-rational Nash, has disrupted the expected flow of events here, in both narrative and tonal space. With an abrupt vertical wall barring cyclic completion upon the sounding of the HEX relation, my network in Example 15 represents how the intrusion of an “irrational” transformation throws off overall harmonic progress.

The most sustained development of Horner’s “genius music” occurs one half hour into the film, in the cue “Breaking Russian Codes” (DVD 28:35–29:37). In this fanciful scene, Nash’s apophenic intellect is put into full gear when he is asked to decode a massive set of panels covered in seemingly random numbers. Amid a dazzling show of numerical special effects and a hyperactive audio track, Nash eventually discovers the secret: a single set of integers—missile silo coordinates—that unlocks the underlying pattern. Horner’s “Russian Codes,” an important seed from “Kaleidoscope” is fully developed while others—the D-minor tonicity and the structural importance of SLIDE via the contest between A and A♭—are basically forgotten. Where other cues stop tantalizingly short, “Russian Codes” fully realizes the cyclical tendency of the main SLIDE-sequence. In this way, “Codes” has similar transformational concerns as “Playing a Game of Go.” But where “Go” failed, yanked prematurely back to D minor by a disruptive HEXPOLE, “Codes” succeeds in an epiphanic blaze of transformational completion. The LR/C1L/C1S sequence is consummated, allowed to run its course completely qua cycle, albeit not without surface digressions and changes of transformational profile (although, notably, with no true network modulations). The biggest change is a shift from LR/L'S

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42 Eaton also analyses this sequence, tracking motive, voice-leading, and root-interval progressions rather than transformation and cycle-completion as I do here. She arrives at similar results in demonstrating that harmonic behavior specifies the moment when Nash breaks the code, though leaves open the telos-driven aspect of the cue and its aftermath. (Eaton, 173–77).

43 Casting this passage as a cycle differentiates it from a linear sequence. Cycles imply return with full traversal. Not so with chromatic linear sequences, which, because of the demands of prolongation, enharmonic reinterpretation, and memory, do not necessarily plant the listener in the same place as they began, even if the group structure assures the contrary. Cyclical depiction emphasizes the elegant, singular process underlying this cue. The choice not to return to the D minor starting point—something that could easily have been achieved and is relevant by dint of omission—is
to a compressed form, _LRLS_, midway through the cue. In order to highlight its cyclical trajectory, previously only latent, the sequence is curled into the circular, starfish-shaped network of Example 16 (albeit with a hexagonal orientation, rather than the pentaradial symmetry of true starfish).

Streamlining the SLIDE-line with the compounded _LS_ emphasizes the whole-tone descent that each _LR_ pair undergoes, indicated by the _T_{10-}_ wheel at the heart of starfish space. As a result of this more directed emphasis, a stronger linear drive is palpable in the cue. By continuing beyond the point of triadic abandonment of “Kaleidoscope” and “Codes,” Horner projects a harmonic telos: the full cycling of the _LRLS_ sequence through its twinned whole-tone scales. Doing so represents the completion of an emergent pattern, and concurrently a serial presentation of each of the twelve major triads. Example 17(a) presents “Codes” within the Starfish Network cycle, along with narrative descriptors for each stage of the cue. It is fitting that the acquisition of the final major triad (F major) should match a significant moment on screen, as it not only completes the circle, but also would confirm that all information that came before, despite its chaotic abundance and rapidity, was musically decipherable. Once all pegs of this cycle are visited, the tonal business of this short cue is complete, and anything following is, strictly speaking, cyclical excess.

The code-cracking sequence falls into six chunks: (1) the presentation of the cryptographic problem; (2) the passage of time as Nash approaches and concentrates (3) on the data; (4) the approach and achievement of a crucial breakthrough (5) that solves the cipher; and (6) a short period of afterglow. The musical backdrop follows this segmentation as well: (1) first a buildup consisting of minimalist churning over D minor, then a more harmonically elaborate and timbrally dense leg for Nash’s concentration (2–4), followed by a harmonic breakthrough (5) to underline the moment of epiphany. An additional phase (6) after the acquisition of F major consists of the aforementioned “excess.” The radially symmetrical transformation network of

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EXAMPLE 16. _LRLS_ starfish cycle.

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1. D-minor Circuit: Code
   Introduced

   Harmonic Excess:
   Nash Wraps Up
   (Derived from Kaleidoscope Pass 3)

2. LR·LS Sequence:
   Nash Gets To Work

3. F-minor Circuit:
   Nash Finds Patterns

4. LR·LS Reinterpretation:
   Nash Approaches Solution

Example 17(a) should be read clockwise, starting with D min, to recreate the path Horner’s triad-as-idea undertakes in “Codes.”

Around the point where the cue secures D♭, Horner introduces the female voice, suggesting the arrival of Nash’s mathematical muse, drawing him ever closer to illumination. Indeed, at this point, even fractal imagery—a Sierpinski triangle—magically flashes before Russell Crowe’s eyes. Example 17(b) reproduces this climactic passage. The timbral addition of voice corresponds to the recasting of the discrete SLIDE-sequence into a pure minor-third (LS) driven affair. S, the transformation previously associated with epiphonic tunneling through pitch space, is omitted in favor of a more streamlined maneuver through the same harmonic cycle. After a short detour into an F-minor α-network, the sequence picks up where “Kaleidoscope” left off, shuttling E through B, D to A, and C to G.

With major triad exhaustion near and visual and sound-effect clues indicating Nash is on the verge of that “Eureka” moment, a musical breakthrough is clearly called for. A visit to B♭ and F would nicely reflect the reaching of a harmonic telos of considerable weight. However, given the staleness of a sequence continued beyond three literal repetitions, the continuation of the cycle to that triadic pair through a fourth application LS would not provide revelatory surprise upon reaching the B♭/F goal. Conveniently for Horner, an additional measure is also needed for the score to synchronize with Nash’s visual recognition of the numerical set that unlocks the code. Timing and novelty both call for change. To guarantee the cycle’s culmination “pops” on the soundtrack, Horner calls back a transformational stratagem from the SLIDE-line: instead of venturing directly to B♭ major, G major proceeds to an intermediary, B minor, via L. From there, he takes us directly to B♭, via S, and then to the “last” triad, F major, by LR. Thus, the ultimate chordal pair is prepared by the heavily marked S operation in a structurally crucial position. This flash of transformational recall serves to re-associate the starfish cycle with the more familiar forms of the SLIDE-line (including the one that lost in “Go”). Reinserting LS reveals that throughout this sequence we have been hearing

Example 17(a). “Breaking Russian Codes” network.
the “genius”-associated SLIDE-line sequence, albeit clothed in unfamiliar garb and realized by different tonal means. In effect, the miniscule digression to B minor is the key to the whole pattern, the hint that lays bare the underlying orderliness of seemingly wild chromatic activity. The transformational arc in “Codes” instructs the filmgoer when the cue has “hit the mark,” while other elements of the soundtrack, such as chattering voices in Nash’s head and whirring sound effects, are actually dying down, implying the cessation of mental exertion.

The elegance of the transformational graphs and their attendant hermeneutic analyses for the above cues, especially “Codes,” is difficult to resist. In order to represent a mind preternaturally sensitive to subtle patterns, Horner devises harmonic journeys replete with dazzling, kaleidoscopic symmetries. These tonal pathways and goals are readily audible to the attentive viewer and vital in sculpting the filmgoer’s experience of those stretches of film in which they occur. Neo-Riemannian theory offers vivid elucidation of Horner’s procedures, and emerges enriched by contact with a new repertoire with demands unlike those of absolute art music.

Yet to leave our investigation at that, without heeding the explicit moral of *A Beautiful Mind*—beware the urge to locate underlying order in all things!—is to miss a powerful object lesson for film music analysis, and the practice of transformational analysis at large. Apophenia, after all, is a kind of informal psychological pathology, a cognitive trap. Much of Nash’s pattern hunting in the film is revealed to be the result of mental illness. At times this sprays out of his psyche in the form of sprawling charts that connect random words and symbols from magazines to maps and ripped fragments of paper, all uncomfortably resembling a transformation network of deranged complexity. Doubts over theoretical overreaching, pattern-mania, even relational “promiscuity” seem to quietly echo after viewing the film.

Reaching this region of pitch space means the cue’s transformational business is over. Horner need not navigate back to D minor or A♭ because the narrative context is less about coming full circle than developing a line or reasoning to its completion. However, the cue is not strictly over: following Nash’s discovery, Horner continues ramping up musical energy beyond the point of cyclic breakthrough, even when all other indicators are that the Nash’s genius has completed its job. This is classic cinematic “excess” (cf. Thompson, 2004) that spills over the confines of the scene’s main hermeneutic framework. The effect of this overflow of exuberant but non-critical chromaticism is to lengthen the span of the code-cracking activity as a formal unit in the film; to inject some continued excitement into the scene, as if Nash’s discovery were bathing in its own afterglow; and to further elucidate the derivation of unfamiliar material from the “Codes” from earlier cues (pass three from “Kaleidoscope”).
The same skepticism held towards the romanticized portrayal of Nash’s genius is worth directing at ourselves from time to time, lest we as theorists fall into the trap of treating high-level musical interpretation as an act of pitch-pattern spotting crypt-analysis. Certainly in film music, a buried pattern is only worth the meaning it might lend to the film and to the engaged film-goer’s apprehension thereof. Horner’s work for A Beautiful Mind may be an exceptional case of plot encouraging an unusually pattern-sensitive mode of musical analysis. However, the score serves no less appropriately as an exemplar of the power of assuming a transformational stance in order to perform a rigorous and hermeneutically active interpretation of film music. Transformational analysis need not be limited solely to the location and celebration of recondite symmetries, which are admittedly unlikely to be discovered in this often hurried and contingent musical corpus. The responsible application of neo-Riemannian methods to a repertoire as stylistically rich and methodologically challenging as film music raises our sensitivity to all manner of compositional routines and interpretational avenues only touched on here: harmonic trajectory and tonal style, affectivity and association, local and global change, spatial expansion and contraction, telos and contingency, characterization and critique. With our perspectives thus widened, the phrase “sounds like film music” might stop merely eliciting an analytic shrug; instead it will serve, as it should, as a cause for deep and rewarding investigation of a vast, fascinating repertoire.

works cited


FILMOGRAPHY

