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All in the Family

A Transformational-Genealogical Theory of Musical Contour Relations

Robert D. Schultz

Although the relatively recent proliferation of research into musical contour theory has indeed yielded a plethora of vital analytical and methodological insights, a crucial phenomenological problem therein remains to be fully addressed: its implicit reliance upon what Michael Friedmann (*A Methodology for the Discussion of Contour*, 1985) has described as a »nonsynchronous« analytical perspective, whereby a contour's constituent elements, though ordered in time, are in fact interpreted as fully and simultaneously present entities. The musical processes that these contours describe (melodies, rhythms, etc.), however, obviously do not present themselves in this manner – their constituent elements occur in direct succession, not simultaneously. Such contours, therefore, cannot be regarded as truly autonomous musical objects; rather, they represent but a single link – albeit, the crucial, culminating link – in a cumulative transformational chain of contours. The contour ⟨1023⟩, for instance, begins as the singleton ⟨0⟩ and evolves successively into ⟨10⟩ (its first two elements) and ⟨102⟩ (its first three elements) before coming to exist as such.
This article develops a system of contour relations that is fully contingent upon this implicit transformational process. First, a sexually »reproductive« model for contour generation is employed to construct a universal contour »family tree«, which provides the foundation for relating contours based on their common »ancestry«. After briefly outlining the fundamental mechanics involved in these kinds of relations, this transformational-genealogical methodology is implemented in order to shed some light on a crucial motivic passage in the first of Alban Berg's *Altenberg Lieder* op. 4, thereby illustrating both the efficacy and utility of the approach.

Although the relatively recent proliferation of research into musical contour theory has yielded a plethora of vital analytical and methodological insights, the approach remains beset by a crucial phenomenological problem, one that has yet to be fully addressed in the literature: it implicitly relies upon what Michael Friedmann has described as a »nonsynchronous« analytical perspective, whereby a contour's constituent elements, though ordered in time, are in fact construed as fully and simultaneously present entities.[1] Take, for instance, the pair of four-note motifs displayed in Figure 1, which are drawn from the first of Alban Berg's *Fünf Orchesterlieder nach Ansichtskarten-Texten von Peter Altenberg* op. 4. Indicated beneath the staff is each motif's customary representation in contour space (c-space) as a set of contour pitches (c-pitches), which are numbered in ascending order from 0 to n–1, where n represents the cardinality of the set, ordered in time.[2] Hence, the intervallic distances

1 Friedmann, *A Methodology for the Discussion of Contour*, p. 238.

2 C-space was first defined by Robert Morris as »a pitch-space consisting of elements arranged from low to high disregarding the exact intervals between the elements«. C-pitches are simply »the (pitch) elements of c-space«. See Morris, *Composition with Pitch Classes*, p. 340.

between each contour's constituent members are by definition left undefined, and the identities of the c-pitches are determined solely by their relative positions within the contour. Disregarding interval- and pitch-specific information in this way allows for a more generalized study of melodic gestures and shapes and can thereby reveal significant relationships that might be obscured by a more traditional pitch- or pitch class-based analysis, as has been amply demonstrated in previous studies by Friedmann, Robert Morris, Elizabeth West Marvin and Ian Quinn, among others.[3]

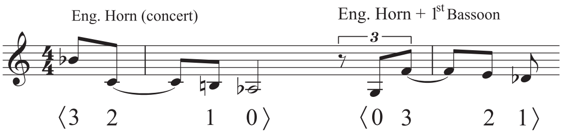

Figure 1: Two adjacent motif forms from Alban Berg, *Altenberg-Lieder*, op. 4, No. 1, m. 25f.

Yet identifying the opening $B^{b}4$ in Figure 1's initial motif, for instance, as c-pitch 3 actually makes sense only in the presence of the following three notes. What, then, are we to make of this B^{b} before these latter three notes have materialized? This line of inquiry gives rise to the realisation that any temporally ordered contour only comes to exist as such via the retrospective, cumulative cognition of all of its constituent c-pitches. Such contours are thus not in actuality autonomous entities in themselves, but rather represent only a single link, so to speak – albeit, the crucial culminating link – in a cumulative transformational contour chain, which is comprised of all contour subsets that begin with a contour's initial c-pitch and consist exclusively of adjacent c-pitches. More formally, given a contour $\langle C_1 C_2 \ldots C_n \rangle$, its transformational chain of ancestors consists of the ordered set $\langle \langle C_1 \rangle \langle C_1 C_2 \rangle \ldots \langle C_1 C_2 \ldots C_{n-1} \rangle \langle C_1 C_2 \ldots C_n \rangle \rangle$.[4] Figure 2 renders more explicit the phenomenological origins of the initial contour from Figure 1 as a model.

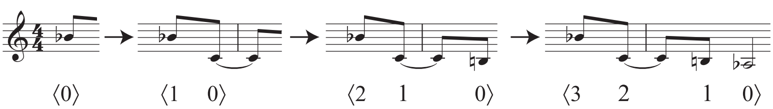

Figure 2: The transformational chain of contour ⟨3210⟩, as realized in the opening motif from Figure 1.

Excluded from the chain are all subsets formed by non-adjacent c-pitches, and all subsets consisting of c-pitch adjacencies that do not include the initial c-pitch. This latter collection, however, is particularly crucial to any phenomenologically or perceptually driven theory of contour, for it includes the subsets that occur in the most recent past at any given point in the transformation process. The collection is easily accounted for, however, by introducing a »sexually reproductive« model of contour generation, whereby a »mating« of two equal-cardinality contours occurs in

3 See, for instance, Adams, *Melodic Contour Typology*, Friedmann, *A Methodology for the Discussion of Contour*, Marvin/Laprade, *Relating Musical Contours*, Marvin, *The Perception of Rhythm* and *A Generalization of Contour Theory*, Morris, *New Directions in the Theory and Analysis of Musical Contour* and Quinn, *Fuzzy Extensions to the Theory of Contour*.

4 Lewin, *Generalized Musical Intervals*, pp. 37–44 applies similar analytical tactics to duration and intervals, but not contour.

the manner shown in Figure 3: a »mother« contour $\langle C_1C_2\ldots C_n\rangle$ mates with a compatible »father« $\langle C_2C_3\ldots C_{n+1}\rangle$, by definition, to produce the »child« $\langle C_1C_2\ldots C_nC_{n+1}\rangle$, i.e. the union of the two parents. Figure 4 illustrates the process using the second contour from Figure 1 ⟨0321⟩.[5]

$$\langle C_1C_2\ldots C_n\rangle \cup \langle C_2C_3\ldots C_{n+1}\rangle = \langle C_1C_2\ldots C_nC_{n+1}\rangle$$

♀ ♂

Figure 3: Formal definition of contour mating.

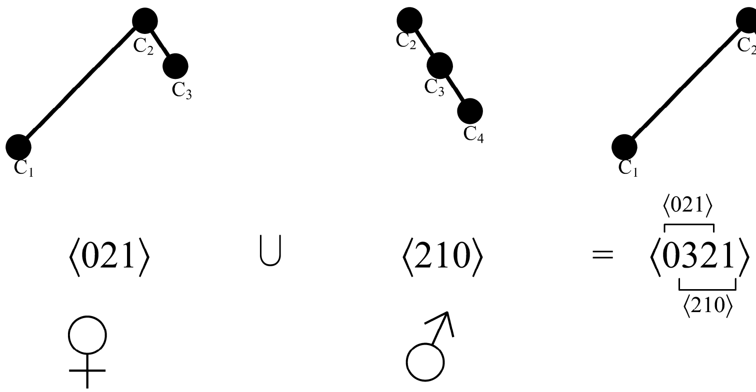

Figure 4: Mating of the female ⟨021⟩ and male ⟨210⟩ to produce the child ⟨0321⟩.

Under this principle of contour generation, the transformational process is thus no longer modelled by the single chain of contours described above, and portrayed in Figure 2, but instead takes the form displayed in Figure 5. Here the timepoints t_0 through t_3 represent the onsets of c-pitches C_1 through C_4, with each contour subset presented at the moment of its initial appearance. All rows of ancestors represent mother-child relationships, all columns father-child relationships, and southwest-northeast diagonals mating partners.[6]

5 David Lewin's RICH (Retrograde Inversion-CHaining) function operates in a similar manner and in fact provided direct inspiration for this sexual model of contour generation. See Lewin, *Generalized Musical Intervals*, pp. 180f.

6 Note that in order to maintain this structural consistency, the male and female manifestations of $\langle C_2\rangle$, $\langle C_3\rangle$ and $\langle C_2C_3\rangle$ have been amalgamated such that both occupy only one position in the figure. This move, however, creates a minor phenomenological distortion, for the three female counterparts of these contours in fact appear one timepoint later than indicated – $\langle C_2\rangle$, for instance, first appears at t_1 as the father of $\langle C_1C_2\rangle$, but $\langle C_2\rangle$-as-mother-of-$\langle C_2C_3\rangle$ actually appears at t_2, not t_1. As will be seen shortly, this slight anomaly has no direct bearing on the implementation of these ancestral profiles in the construction of the transformational-genealogical system, nor on its application in musical analysis.

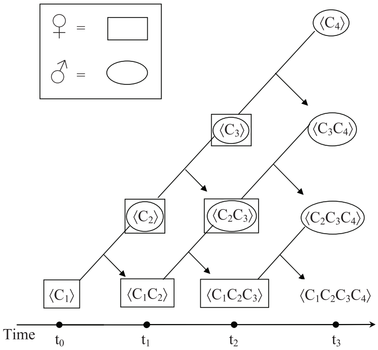

Figure 5: Ancestral profile of the contour ⟨$C_1C_2C_3C_4$⟩.

Applying this principle of sexual contour reproduction to the universal set of all contours produces an infinite open-ended tree structure, the roots of which are displayed in Figure 6. There, each father is attached to an arrow or set of arrows, symbolizing its mating with the mother at the arrow's base to produce the child, toward which the arrow is directed. Generations of contours are labelled according to standard practice in Mendelian genetic analysis, where »P« stands for »parental generation« while »F_1« and »F_2« stand for the first and second filial generations, and so forth for all future generations.[7] In this way, »siblings« or contours with the same parents (e.g. ⟨021⟩, ⟨010⟩ and ⟨120⟩) are the most closely related contours, while »half siblings«, that is, contours with the same mothers but different fathers (e.g. ⟨012⟩ and ⟨011⟩), or vice versa (e.g. ⟨021⟩ and ⟨110⟩), are less closely related, followed by »cousins« or contours with different parents but common »grandparents« (e.g. ⟨021⟩ and ⟨201⟩), and, in subsequent generations, second cousins, third cousins etc.

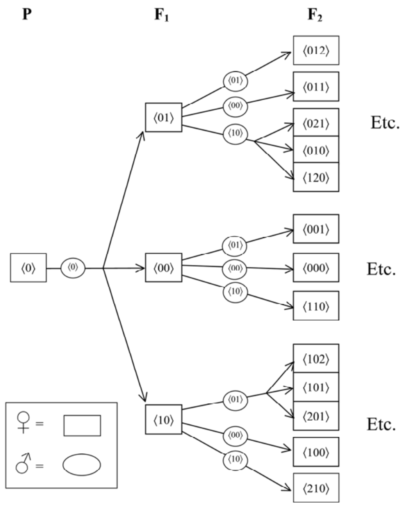

Figure 6: Roots of the universal contour family tree.

7 See Griffiths et al., *An Introduction to Genetic Analysis*, p. 22.

To illustrate the departure this system represents from more standard contour similarity measurements, Figure 7 displays the calculations and resultant values for Elizabeth West Marvin's and Paul Laprade's Contour Similarity (CSIM) and Adjusted Contour Mutually Embedding (ACMEMB) functions as applied to the two contours from Figure 1. CSIM measures the similarity of two equal-cardinality contours using Robert Morris's Comparison Matrix (COM-Matrix),

> a two-dimensional array which displays the results of the comparison function, COM(a,b), for any two c-pitches in c-space. If b is higher than a, the function returns ›+1‹; if b is the same as a, the function returns ›0‹; and if b is lower than a, COM(a,b) returns ›–1.‹ The repeated instances of the integer ›1‹ are omitted.[8]

For instance, the top row of values in the COM-Matrix for ⟨3210⟩ displayed in Figure 1a results from applying the comparison function such that c-pitch »3« equals a and each of the other c-pitches in the contour (including c-pitch »3« itself) equals b; thus, COM(3,3) = »0«; COM(3,2) = »–« ; COM(3,1) = »–«; and COM(3,0) = »–«. The CSIM function itself then tallies the number of equivalent entries in the upper right triangles of the respective COM-Matrices of the two contours, and divides the result into the total number of entries. This produces an output that lies on a continuum between 0 and 1 inclusive, 0 representing oppositeness, 1 equivalence.[9] ⟨3210⟩ and ⟨0321⟩ share three out of a possible six common COM-Matrix values (the three »–« in the lower right hand corner of their respective triangles), yielding a CSIM value of .50.

a.

⟨3210⟩

	3	2	1	0
3	0	–	–	–
2		0	–	–
1			0	–
0				0

⟨0321⟩

	0	3	2	1
0	0	+	+	+
3		0	–	–
2			0	–
1				0

CSIM (⟨3210⟩, ⟨0321⟩) = 3/6 = .50

b.

⟨3210⟩

⟨321⟩ = ⟨210⟩	⟨32⟩ = ⟨10⟩
⟨320⟩ = ⟨210⟩	⟨31⟩ = ⟨10⟩
⟨310⟩ = ⟨210⟩	⟨30⟩ = ⟨10⟩
⟨210⟩	⟨21⟩ = ⟨10⟩
	⟨20⟩ = ⟨10⟩
	⟨10⟩

⟨0321⟩

⟨032⟩ = ⟨021⟩	⟨03⟩ = ⟨01⟩
⟨031⟩ = ⟨021⟩	⟨02⟩ = ⟨01⟩
⟨021⟩	⟨01⟩
⟨321⟩ = ⟨210⟩	⟨32⟩ = ⟨10⟩
	⟨31⟩ = ⟨10⟩
	⟨21⟩ = ⟨10⟩

ACMEMB (⟨3210⟩, ⟨0321⟩) = 14/22 = .64

Figure 7: a. CSIM, and b. ACMEMB values for the contours ⟨3210⟩ and ⟨0321⟩.

8 Marvin/Laprade, *Relating Musical Contours*, p. 228. For more on the COM function and COM-Matrix, see Morris, *Composition with Pitch Classes*, p. 28.

9 Only the upper right hand triangle is needed because the lower left hand triangle is always by definition its inverse, and thus structurally redundant.

The ACMEMB function operates in a similar manner, but instead tallies the number of subsets shared between any two contours and divides that value into the total number of possible common subsets.[10] With respect to the contours ⟨3210⟩ and ⟨0321⟩, the 22 possible shared subsets (including the two four-note contours themselves) are listed in Figure 7b, where the 14 underlined subsets indicate those that are common to both contours. The ACMEMB function thus divides 14 into 22, returning a value of .64.

Both CSIM and ACMEMB thus indicate a fairly significant degree of similarity, which may be attributed chiefly to the common ⟨210⟩ subset that constitutes the final three c-pitches of each contour. For the sake of comparison, however, Figure 8 presents a hypothetical recomposition of the excerpt, in which the original ⟨0321⟩ is transformed into the contour ⟨2103⟩, courtesy of a simple octave displacement of its two outer notes. As Figure 9 indicates, this new contour is equally similar to ⟨3210⟩ as is the original ⟨0321⟩ with respect to both CSIM and ACMEMB value, again due principally to a common ⟨210⟩ subset. Note that here, however, it involves the *initial* three c-pitches of each contour. As it turns out, this seemingly minute disparity in ordinal position actually has a profound effect on the way each contour is experienced in relation to the preceding ⟨3210⟩, despite their doubly identical degrees of structural similarity.

To illustrate, Figure 10 juxtaposes the ancestral backgrounds of the contours ⟨3210⟩ and ⟨0321⟩ at (a) and ⟨3210⟩ with the hypothetical ⟨2103⟩ at (b). In each of these diagrams, the horizontal rows indicate maternal relationships (corresponding to both the left-to-right passage of time and generational succession depicted in Figure 6), while the vertical columns indicate paternal ones.[11] The bottommost row of entries represents the matrilineal, or purely female line of descent, and the farthest-right column the patrilineal line. Thus, for the contour ⟨0321⟩ shown in Figure 10a, its matrilineal descent consists of the lineage ⟨01⟩ (its maternal grandmother) – ⟨021⟩ (its mother) – ⟨0321⟩. This contour's patrilineal descent, on the other hand, is found by reading the farthest-right column from top to bottom: ⟨10⟩ (its paternal grandfather) – ⟨210⟩ (its father) – ⟨0321⟩. As for the lone remaining ancestor ⟨10⟩, found atop the middle column of the diagram, it functions dually as ⟨0321⟩'s maternal grandfather ((⟨10⟩ – ⟨021⟩ – ⟨0321⟩) and its paternal grandmother ((10⟩ – ⟨210⟩ – ⟨0321⟩).

All common ancestors within these two pairs of contours appear in boldface type in the figure. Note that although both pairs have the same number of common ancestors, in (a) none of these ancestors appear in their matrilineal descents, while those at (b) exhibit full common matrilineal ancestry, but no common ancestors in their patrilineal descents. This crucial observation indicates that the paths of descent traversed by the former pair of contours on the universal family tree originate with the lone P-generation contour ⟨0⟩, as indeed do all contours, but split immediately in the F_1 generation, never to meet again. The respective paths of the latter pair, on the other hand, split only in the final F_3 generation. The hypothetical ⟨2103⟩ is thus

10 See Marvin / Laprade, *Relating Musical Contours*, pp. 234–245.

11 Unlike Figure 6, these diagrams place all fathers at the moment of their initial appearance. Their arrangement into vertical columns at each timepoint is merely a visual convenience.

experienced as identical to the initial ⟨3210⟩ until the onset of its final c-pitch at t_3, while ⟨0321⟩ is *never* experienced as such at any nontrivial point in its temporal unfolding. The starkly contrasting experiences of these two contours, as articulated by our transformational-genealogical methodology, thus remain entirely unaccounted for in both CSIM and ACMEMB values.

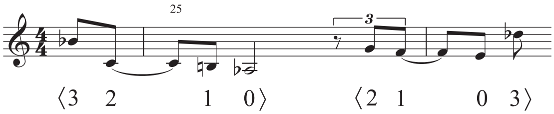

Figure 8: Recomposition of Berg excerpt from Figure 1, with registral displacement in second motif form.

a.

⟨3210⟩

	3	2	1	0
3	0	(–)	(–)	–
2		0	(–)	–
1			0	–
0				0

⟨2103⟩

	2	1	0	3
2	0	(–)	(–)	+
1		0	(–)	+
0			0	+
3				0

CSIM (⟨3210⟩, ⟨2103⟩) = 3/6 = .50

b.

⟨3210⟩

⟨321⟩ = ⟨210⟩
⟨320⟩ = ⟨210⟩
⟨310⟩ = ⟨210⟩
⟨210⟩

⟨32⟩ = ⟨10⟩
⟨31⟩ = ⟨10⟩
⟨30⟩ = ⟨10⟩
⟨21⟩ = ⟨10⟩
⟨20⟩ = ⟨10⟩
⟨10⟩

⟨2103⟩

⟨210⟩
⟨213⟩ = ⟨102⟩
⟨203⟩ = ⟨102⟩
⟨103⟩ = ⟨102⟩

⟨21⟩ = ⟨10⟩
⟨20⟩ = ⟨10⟩
⟨23⟩ = ⟨01⟩
⟨10⟩
⟨13⟩ = ⟨01⟩
⟨03⟩ = ⟨01⟩

ACMEMB (⟨3210⟩, ⟨2103⟩) = 14/22 = .64

Figure 9: a. CSIM, and b. ACMEMB values for the contours ⟨3210⟩ and ⟨2103⟩.

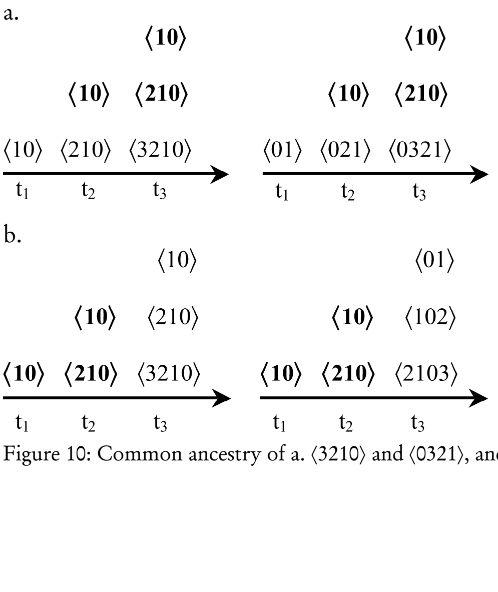

Figure 10: Common ancestry of a. ⟨3210⟩ and ⟨0321⟩, and b. ⟨3210⟩ and ⟨2103⟩.

It is not just the number and placement of common ancestors, however, which determine contour relations in the transformational-genealogical system. To illustrate this point, Figure 11a displays the ancestral profiles of two maternal half-siblings, ⟨0213⟩ and ⟨0321⟩. On the basis of their respective maternal lineages alone (which are by definition identical), these contours are siblings:

⟨01⟩	→	⟨021⟩	→	⟨0213⟩
⟨01⟩	→	⟨021⟩	→	⟨0321⟩
Maternal Grandmothers		Mothers		Children

⟨10⟩	→	⟨021⟩	→	⟨0213⟩
⟨10⟩	→	⟨021⟩	→	⟨0321⟩
Maternal Grandfathers		Mothers		Children

Following their paternal lineages, however, reveals these children to also be not only first cousins via their common paternal grandmother ⟨10⟩,

⟨10⟩	→	⟨102⟩	→	⟨0213⟩
⟨10⟩	→	⟨210⟩	→	⟨0321⟩
Paternal Grandmothers		Fathers		Children

but also *second* cousins via their divergent paternal grandfathers, ⟨01⟩ and ⟨10⟩, respectively:

⟨01⟩	→	⟨102⟩	→	⟨0213⟩
⟨10⟩	→	⟨210⟩	→	⟨0321⟩
Paternal Grandfathers		Fathers		Children

A comprehensive description of the relationship between these two contours must therefore incorporate all three of these relationship types. By convention, we will always proceed as above, from the maternal to the paternal sides of the contour ancestries; hence, ⟨0213⟩ and ⟨0321⟩ are »Sibling-First-Second Cousins«.

By the same token, the contours displayed in Figure 11b, ⟨0213⟩ and ⟨3102⟩, are »Second-First Cousin-Siblings«. To summarize:

⟨01⟩	→	⟨021⟩	→	⟨0213⟩
⟨10⟩	→	⟨210⟩	→	⟨3102⟩
Maternal Grandmothers		Mothers		Children

⟨10⟩	→	⟨021⟩	→	⟨0213⟩
⟨10⟩	→	⟨210⟩	→	⟨3102⟩
Maternal Grandfathers		Mothers		Children

⟨10⟩	→	⟨102⟩	→	⟨0213⟩
⟨10⟩	→	⟨102⟩	→	⟨3102⟩
Paternal Grandmothers		Fathers		Children

⟨01⟩	→	⟨102⟩	→	⟨0213⟩
⟨01⟩	→	⟨102⟩	→	⟨3102⟩
Paternal Grandfathers		Fathers		Children

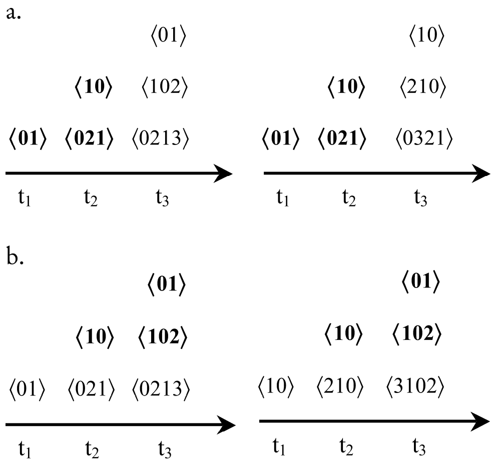

Figure 11: Ancestral backgrounds of a. maternal half siblings, and b. paternal half siblings.

Of course, not all contours have a common parent in their lineage; such contours are capable of possessing up to four separate strands of familial relationships. Those displayed in Figure 12a provide a case in point; they are »First-Second-Second-First Cousins«:

⟨10⟩	→	⟨201⟩	→	⟨3012⟩
⟨10⟩	→	⟨210⟩	→	⟨3102⟩
Maternal Grandmothers		Mothers		Children

⟨01⟩	→	⟨201⟩	→	⟨3012⟩
⟨10⟩	→	⟨210⟩	→	⟨3102⟩
Maternal Grandfathers		Mothers		Children

⟨01⟩	→	⟨012⟩	→	⟨3012⟩
⟨10⟩	→	⟨102⟩	→	⟨3102⟩
Paternal Grandmothers		Fathers		Children

⟨01⟩	→	⟨012⟩	→	⟨3012⟩
⟨01⟩	→	⟨102⟩	→	⟨3102⟩
Paternal Grandfathers		Fathers		Children

Whenever the entire maternal or paternal side of a contour's ancestry is uniform in relationship type, it is included only once in the comprehensive description of the relationship. For instance, with the contours shown in Figure 12b, the lineages through the paternal grandmother and the paternal grandfather are both Second Cousins; therefore, the children are simply called »First-Second-Second Cousins«, and not »First-Second-Second-Second Cousins«:

⟨10⟩	→	⟨201⟩	→	⟨3012⟩
⟨10⟩	→	⟨210⟩	→	⟨3210⟩
Maternal Grandmothers		Mothers		Children

⟨01⟩	→	⟨201⟩	→	⟨3012⟩
⟨10⟩	→	⟨210⟩	→	⟨3210⟩
Maternal Grandfathers		Mothers		Children

⟨01⟩	→	⟨012⟩	→	⟨3012⟩
⟨10⟩	→	⟨102⟩	→	⟨3210⟩
Paternal Grandmothers		Fathers		Children

⟨01⟩	→	⟨012⟩	→	⟨3012⟩
⟨10⟩	→	⟨102⟩	→	⟨3210⟩
Paternal Grandfathers		Fathers		Children

In the same way, the contour children displayed in Figure 12c, which exhibit uniform ancestry throughout, are not »Second-Second-Second-Second Cousins«, but simply »Second Cousins«:

⟨10⟩	→	⟨201⟩	→	⟨3012⟩
⟨01⟩	→	⟨210⟩	→	⟨0321⟩
Maternal Grandmothers		Mothers		Children

⟨01⟩	→	⟨201⟩	→	⟨3012⟩
⟨10⟩	→	⟨021⟩	→	⟨0321⟩
Maternal Grandfathers		Mothers		Children

⟨01⟩	→	⟨012⟩	→	⟨3012⟩
⟨10⟩	→	⟨210⟩	→	⟨0321⟩
Paternal Grandmothers		Fathers		Children

⟨01⟩	→	⟨012⟩	→	⟨3012⟩
⟨10⟩	→	⟨210⟩	→	⟨0321⟩
Paternal Grandfathers		Fathers		Children

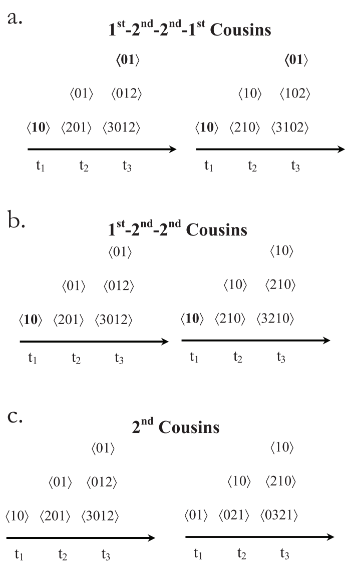

Figure 12: Common ancestry of three different Cousin contour relationships.

Yet another layer of complexity materializes upon recognizing that we have thus far only been considering the relationships involving parents of the same sex, that is, mothers with mothers and fathers with fathers. For present purposes, however, it will suffice to merely point out one particularly significant opposite-sex parental relationship, exemplified by the contours displayed in Figure 13. Here the father of ⟨0321⟩ happens to be the same as the mother of ⟨3102⟩, as indicated. Such structurally identical, but opposite-sex contours will henceforth bear the label »twins«, and children in possession of such twin-related parents are designated by a parenthesized »tw«.[12]

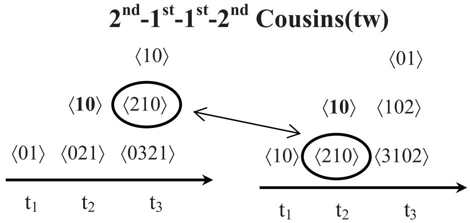

Figure 13: Contours with parental twins ⟨210⟩.

All of the contours displayed in Figures 11–13 were in fact extracted from the same source as those presented in Figure 1: Berg's op. 4,1. Figure 14 displays the entire succession of motif forms, which, as both Mark DeVoto and Dave Headlam have observed, coheres via its nearly exclusive use of the unordered pitch interval series ⟨10,1,3⟩.[13] Each distinct contour form is labelled **u** through **z** in the figure, with the exception of the ⟨210⟩ and ⟨10⟩ forms found in the second system, which are clearly derivatives of the initial contour **u** and thus marked accordingly.

Figure 14: Entire motivic process from Berg's op. 4,1 (mm. 25–36), with distinct contours labelled **u** through **z**.

Besides CSIM and ACMEMB, another fairly immediate place to look for significant contour relations, especially within this particular repertoire, is operational equivalence, that is, the P-, I-, R-, and RI-related forms of a given contour. Indeed, Headlam himself makes special note of the inversional relationship that obtains between con-

12 Contour twins, unlike living, breathing biological twins, are thus by definition always members of the opposite sex.

13 Devoto, *Some Notes on the Unknown Altenberg Lieder*, p. 52; Headlam, *The Music of Alban Berg*, p. 133.

tours **u** and **z**. Contours **v** and **w** in fact also share the same relation, but further scrutiny reveals that **x** and **y** are entirely unrelated in this, or any other such way.

Fortunately, however, our transformational-genealogical approach yields more comprehensive and satisfying results. Figure 15 displays the ancestral backgrounds of contours **u** through **z**, while Figure 16a through 16e displays the succession of relationship networks that obtain as each subsequent motif in the passage occurs.[14] The passage begins with the previously enumerated and rather closely related second-first cousin-siblings (with parental twins) now known as contours **u** and **v**, as seen in Figure 16a. However, as Figure 16b reveals, the subsequent contour **w** is significantly more distantly related to both **u** and **v**. This suggests that the contours in this passage might be grouped in discrete pairs based on the close paternal common ancestry of the initial pair, and also that the ensuing contour **x** will perhaps partner with **w** in precisely this way.

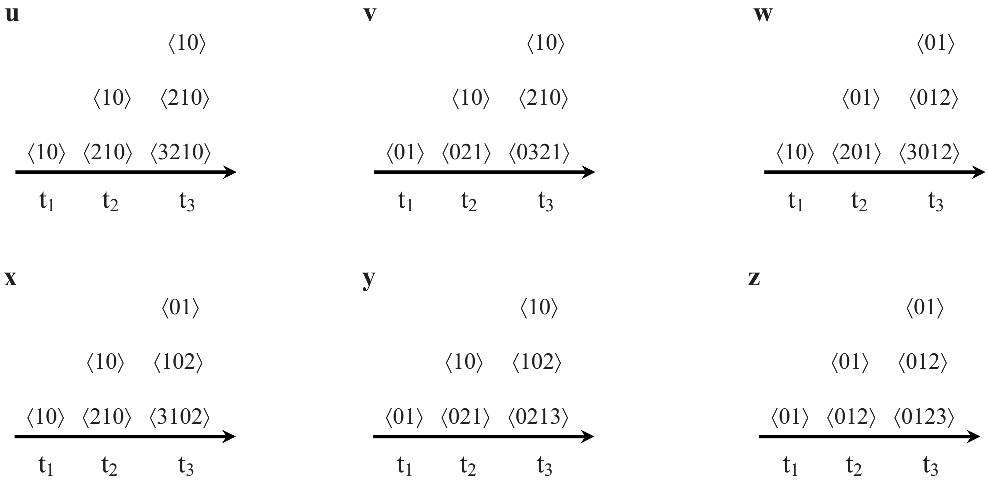

Figure 15: Ancestral profiles of contours **u** through **z** of Figure 14.

Alas, as Figure 16c indicates, this relationship in fact fails to materialize.[15] Indeed, far more conspicuous is **x**'s own close relationship with the initial contour **u**, which turns out to be the maternal counterpart of the relationship held between **u** and **v**, sibling-first-second cousin (tw). Contour **x** thus not only denies **v** the partnership

14 I use the term network here and throughout this article informally, as all such structures lack many of the mathematical properties generally associated with the term, as defined by Lewin, *Generalized Musical Intervals*. Furthermore, since we are describing relationships and not transformations, all connections between nodes are inherently bidirectional – i.e. a given contour A is always related to a given contour B in precisely the same way in which that contour B is related to contour A. For this reason, lines are employed to connect all nodes rather than double-headed arrows, to avoid redundancy and reduce visual clutter. I am grateful to Stephanie Lind for this point of clarification and suggestion as well as her assistance in constructing these figures.

15 The reason for the assymmetrical arrangement of the nodes in this network (i.e. a column of one node and a column of three nodes rather than a 2 X 2 box) will be made clear in the discussion of the following two networks in Examples 16(d) and (e).

previously inferred, but actually calls into question the very idea of discrete contour pairing in this passage, since contour **u** now shares an equally close relationship with this newcomer as it does with the preceding contour **v**.

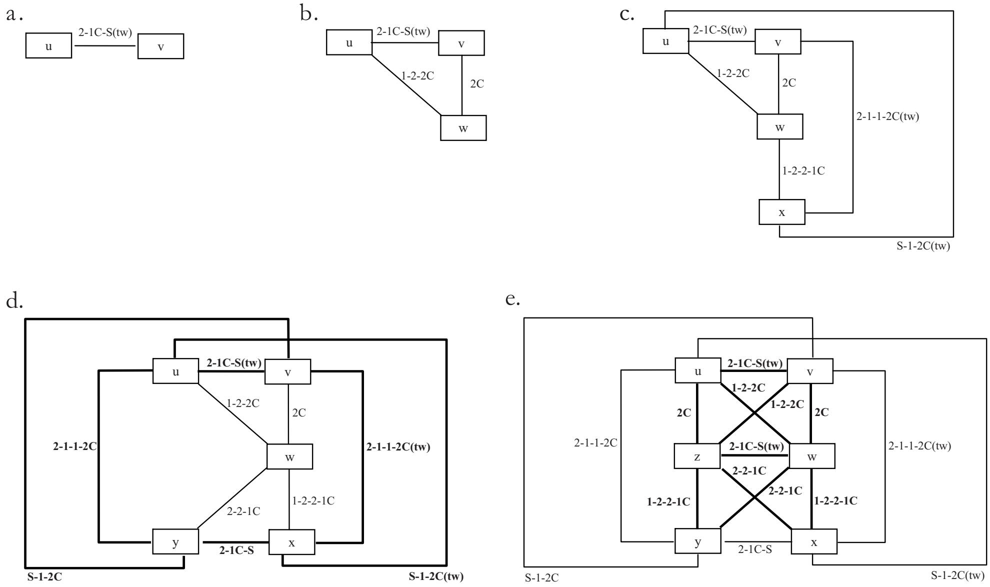

Figure 16: Contour relationship networks that obtain with the successive addition of each new motif form.

The appearance of contour **y**, however, puts any such doubt to rest, as contour **y** is contour **x**'s second-first cousin-sibling, as shown in Figure 16d. In this way, not only does the discrete pairing of contours related as such emphatically re-emerge here, but we also see for the first time a pairing of relationships themselves. That is, as the symmetrically placed bold lines and relationship labels in this network indicate, each relationship that obtains within and between the **u** and **v** as well as **x** and **y** contour pairs itself has an identical partner relationship with the opposite parental twin content.[16]

Yet the absence of a first-second cousin-sibling for contour **w** persists. In fact, it is rendered even more acute by the lack of a matching partner for each relationship in which it is involved – that is, the four non-bold lines and labels in the network. The desire for the ensuing contour to realise that partnership with **w** has thus never been stronger than at this point in the passage.

Mercifully, contour **z** does not disappoint. In fact, as Figure 16e demonstrates, not only does it finally fulfil contour **w**'s by now feverish yearning for companionship, but it does so in decidedly dramatic fashion, for the two not only complete the final pairing of second-first cousin-siblings, but they also represent the first relationship match to also feature identical parental twin content. Furthermore, contour **z**

16 The arrangement of nodes in these graphs is thus ultimately designed to more clearly portray these complimentary relationships.

bestows each of the four aforementioned solitary relationships involving contour **w** with a matching relationship that is also identical in parental twin content. Thus, not only does every contour in the passage now possess a second-first cousin-sibling-related contour partner, but all of the remaining relationships themselves now possess matching partner relationships as well.

This sense of completion engendered by contour **z** is confirmed by the fact that no new contour forms subsequently occur in the score. Instead, Berg presents several reiterations of the initial contour **u**, which is then followed by the motivic liquidation thereof, and finally, a conclusive restatement of the crucial contour **z**. In this way, the composer seems to have been in some way sensitive to, if not fully cognisant of, these types of contour relationships in composing this passage.

The transformational-genealogical system thus yields a fully comprehensive and compelling account of the contour relations at work in this excerpt. Yet the reconciliation of these results with those obtained previously by evaluating inversional equivalence remains an open question, for the fact that this latter grouping is less comprehensive and/or aesthetically satisfying in no way signifies that it is not present or capable of being perceived. In terms of methodology, however, the transformational-genealogical approach is in fact not intrinsically antithetical to such operationally equivalence, but rather informs and enhances its application. Note that all inversional contour relationships actually hold true throughout their respective transformational processes, due to the very nature of the I operation (inversion). This can be witnessed by the fact that not only are all such contours themselves inversionally related, but so are each of their corresponding ancestors; compare contours **u** and **z** or **v** and **w** in Figure 15 for illustration.

In this way, not only do disparate contour pairings emerge under these two separate analytical and perceptual methods, but each one also exhibits an inherently distinctive manner in which the relations purported therein are experienced in real time. The fairy-tale ending of resolution and completion offered earlier with respect to Figure 16 thus fails to tell the whole story, as it were, for it actually generates significant tension and lingering conflict within the context of this broader analytical framework. As it turns out, however, the song's text indicates that this effect may in fact be precisely what Berg had in mind, as its final line speaks of a hint (»Hauch«) of gloom which persists in both the soul and nature, and withdraws not through conquest and resolution, but the dispersion of clouds, an image clearly embodied by the aforementioned liquidation of contour **u**.

Seele, wie bist du schöner, tiefer, nach Schneestürmen.
Auch du hast sie, gleich der Natur.
Und über beiden liegt noch ein trüber Hauch, eh' das Gewölk sich verzog!

Soul, how much lovelier and more profound you are after snowstorms.
You have them also, as Nature does.
And over both a hint of gloom still lies until the clouds disperse!

The transformational-genealogical approach to contour thus not only offers a uniquely comprehensive account of the contour relations in this passage in and of itself, but it also works from a more global analytical perspective to express the work's overall poetic and musical meaning in a significant new way.

In this article, I hope to have not only begun to reshape and enhance our current understanding of musical contour and contour relations, but also to have conveyed the sense in which a transformational and phenomenological orientation can effectively raise consciousness about the music-analytical enterprise and the various perches from which its practitioners observe, collect and interpret their data. Such experiences can not only provide important new paradigms for music theory and analysis, but may also serve to further refine and enrich those already in our possession.

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