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Dallapiccola's Mirror

I hear the "Fregi" from Luigi Dallapiccola's "Quaderno Musicale di Annalibera" as having mirrored relationships between different musical elements. Some of them are easy to spot, others are more subtle. I will be using a more contemporary work that delves into how Dallapiccola transforms the tone rows within the piece and how each retains a certain relationship with another (Ravensbergen: 13). This essay will discuss how Dallapiccola creates mirroring at the rhythmic and intervallic level. It will also discuss how he utilizes a common TnI operation throughout the piece to mirror pairs of permutations. It will also discuss some instances of hexachordal combinatoriality and the prominence of a common set class.

Upon my initial listen and analysis of this movement, I immediately noticed that there were relationships present. Upon closer investigation, I discovered that there was literal mirroring taking place between the hands of the piano. The initial permutation in the left hand is traded off to the right hand. See Figure 1, which is the original score, attached on the back. See figure 1.1 for an illustration of the mirroring of these ideas on a written level in the score. The rhythms are identical, with the written pitches being one of the only differences between the permutations at the surface level. Beyond that, Dallapiccola mirros the ordered pitch intervals between permutations. See Figure 1.2 for an illustration. The red positive and negative integers represent the ordered pitch intervals. The only anomaly present is the interval between 3 and 6 in P10 and I11 (see the highlighted numbers). There is no change between the ordered pitch intervals, they remain -3, despite the rest of the intervals in the two permutations being mirrored.

I decided to analyze further and discern how exactly the aurally and visually connected permutations were related in terms of set theory.

I first conducted an analysis of the rows as a whole, They appear to be related by inversion of some kind. See Figure 2. This further analysis revealed that the six permutations present all had a common TnI operation. This means that one permutation is a literal mirror of the permutation that it is inverted from. According to Ravensbergen, "Each pair of hexchordally I-combinatorial tone-rows is further paired by sharing the same TnI operation with another set of combinatorial tone-rows (Ravensbergen: 15)." The shared TnI operation is T9I. But what is striking about the relationships between these permutations is that the relationship is identical, thus creating a common mirror between each permutation, despite the rhythmic and intervallic differences between the pairs. The related permutations are as follows: P10 becomes I11 by T9I, and are a related pair. I8 becomes P1 by T9I, and are a related pair. And R5 becomes RI4 by T9I, and are a related pair. See Figure 2 for clarification.

The rows all share a common TnI operation, however the hexachords of each pair of permutations are also related. This "hexchordally I-combinatorial (Ravensbergen: 15)" relationship is touched upon in Ravensbergen's work. Ravensbergen discusses this in her thesis, even though it pertains to a different movement of the Quaderno:

> Dallapiccola constructs the series in such a way that is it hexachordally combinatorial by inversion. The first hexachord of any given tone-row will map onto itself as the second hexachord of another tone-row under an inversional transformation, creating a hexachordally I-combinatorial series. Figure 2.4 shows that the combination of two tone-rows could allow for the full presentation of the series in an aggregate fashion, as opposed to linearly (each hexachord labeled accordingly as H1 and H2). An aggregate presentation does not allow for an official ordering of the series until each element is presented in a linear fashion. (Ravensbergen: 14)

Keeping this in mind, I decided to test this idea, and amazingly, it fit right into two of the permutations of the Fregi. See Figure 3. The two permutations, I8 and P1, are related by TnI operation, but also share the same pitch classes in their respective hexachords. That is to say, the pitch classes in the first hexachord of I8 are scrambled and become the pitch classes present in the second hexachord of P1. The same principle apppies to the second hexachord of I8 and the first hexachord of P1. There is also a relationship on the level of normal and prime form. The first hexachord of I8 (labeled I8H1) shares the same normal and prime form as the second hexachord of P1 (labeled P1H2). The same can be said about the second hexachord of I8 (labeled I8H2) and the first hexachord of P1 (labeled P1H1). Curiously, all four hexachords share the same prime form. The combinatoriality lies in the shared pitch classes and the normal forms. See Figure 3 for further clarification. This is a perfect example of the hexachordal combinatoriality that Ravensbergen discusses in her thesis (Ravensbergen: 14-15).

In addition to this kind of relationship by combinatoriality, all of the permutations have a very interesting hexachordal relationship. The similarities do not lie in the pitch classes themselves or the normal forms, but rather in the prime forms. Every single hexachord in every single permutation belongs to a common set class. The set class in question is (014579). See Figure 4. Another interesting find is the equivalence of normal andprime form in the second hexachord of P10, marked P10H2. The pitch classes contained in this hexachord are identical to the pitch classes found in the normal form, and also match the integers present in the prime form. Thus, the normal and prime forms are identical. This striking relationship could denote some kind of hinting at the commonality of this particular set class throughout the piece, since P10 is the first permutation that the audience (or analyst) encounters. These relationships in the prime form and the common set class do not equal absolute combinatoriality, but rather a kind of hexachordal invariance. I say invariance since the prime form, which is a musical quality, albeit a very subtle one, is preserved during these hexachordal transormations throughout the piece (Ravensbergen: 13).

When looking at the score, one can see just how the material from one section is mirrored in another section. In this case, it is a matter of mirroring the rhythms and the direction the notes travel. There is a clear mirror point in the piece, as is marked in Figure 1. The permutations are also mirrored. Each permutation in this piece is related by an inversion. A common operation is used, in fact. Each permutation is inverted by the operation T9I in order to produce the mirrored permutation later. An inversion is a musical mirror, in a sense. The hexachordal combinatoriality and invariances shown in figures 2, 3, and 4 all have some degree of mirroring between hexachords. Though, the mirroring does not always occur at the surface level, and instead can occur at the prime form level alone, resulting in invariances. This occurs as opposed to the mirroring occurring throughout the written, prime, and normal forms. Figure 3 appears to be the perfect storm, where the hexachords in these two permutations are essentiall identical on the level of written pitch classes, normal form, and prime form whereas the permutations in Figure 4 contain only invariances that preserve the prime form of each hexachord.

This piece is a prime example of how mirroring can be present throughout many levels, besides just on the surface with rhythmic and intervallic mirroring. It also demonstrates how certain elements can be preserved through transformations, in this case the set class was preserved. One other thing that I noticed during my analysis is the prominence of the number 3. There are 6 permutations, and this particular piece is the sixth in the work as a whole. 6 is a multiple of 3. Aurally speaking, the "melodic ideas" sound as though they are put together in groups of three pitches. One can also see the prominent use of the 3/4 time signature, the 7/8 time signature (7 being the sum of 3 and 4), as well as the use of triplets. This abstract relationship as well as the relationships present between the permutations and hexachords in the piece could suggest a deeper level of connections than one would have originally hypothesized.

Works Cited

Ravensbergen, Jacqueline. (2012) *The Twentieth-Century Canon: An Analysis of Luigi Dallapiccola's Canonic Works from his Quaderno Musicale Di Annalibera.* Ottawa, Canada: School of Music, University of Ottawa.

Figure 1: Initial permutational and mirroring analysis

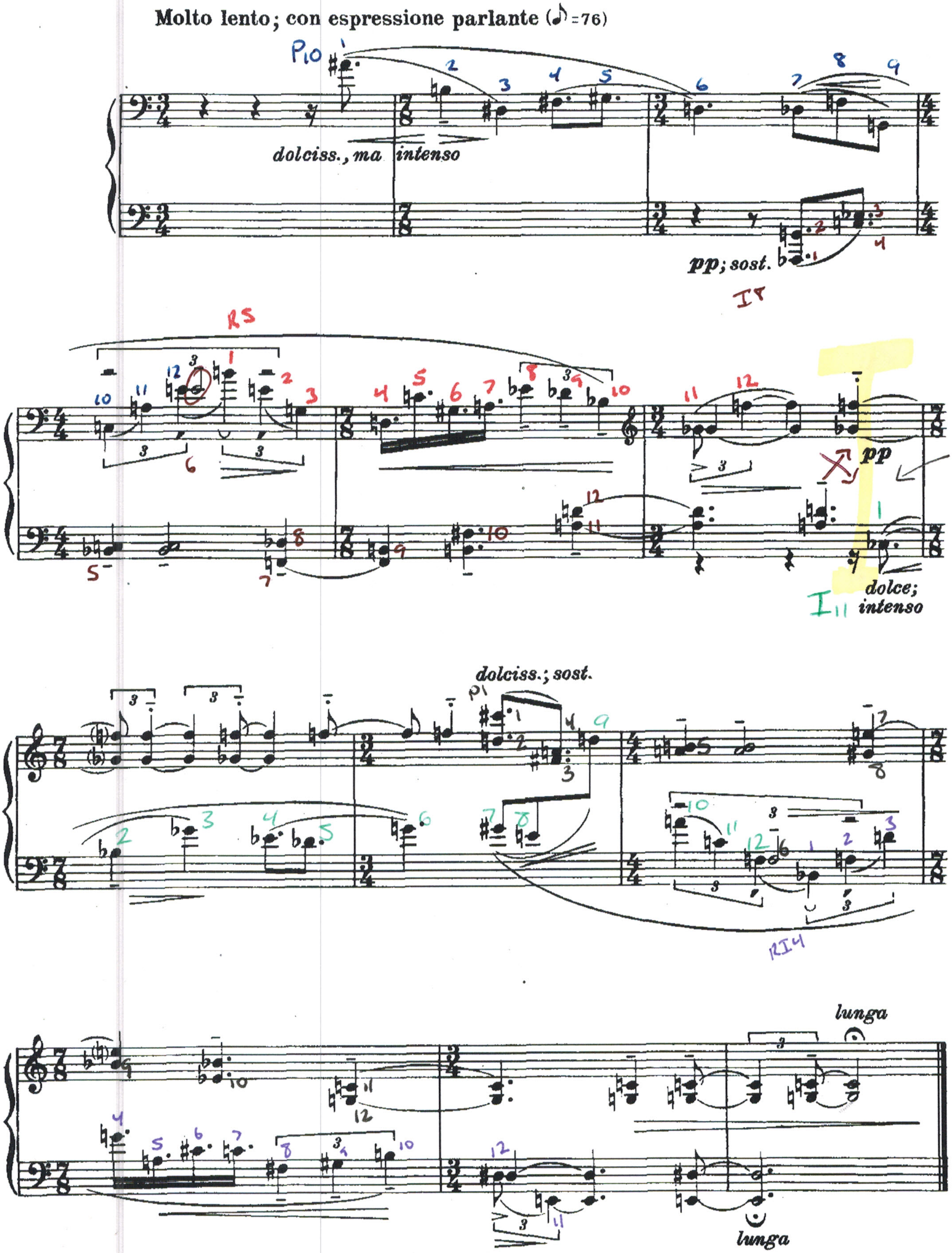

Figure 1.1

Illustration of rhythmic mirroring and mirroring between the hands

Figure 1.2: Illustration of mirroring of ordered pitch intervals

P10	:	10	-11	11	-8	3	-3	6	+2	8	-6	2	-1	1	+4	5	-10	7	+5	0	+9	9	+7	4
I11	:	11	+11	10	+8	6	-3	3	-2	1	+6	7	+1	8	-4	4	+10	2	-5	9	-9	0	-7	5
I8	:	8	+11	7	+8	3	-3	0	-2	10	+18	4	-23	5	+8	1	-2	11	+7	6	+9	9	+5	2
P1	:	1	-11	2	-8	6	+3	9	+2	11	-18	5	+23	4	-8	8	+2	10	-7	3	-9	0	-5	7
R5	:	11	-7	4	-9	7	-5	2	+10	0	-4	8	+1	9	+6	3	-2	1	-3	10	+8	6	+11	5
RI4	:	10	+7	5	+9	2	+5	7	-10	9	+4	1	-1	0	-6	6	+2	8	+3	11	-8	3	-11	4

Figure 2: Analysis of relationships between permutations

P10	:	10	11	3	6	8	2	1	5	7	0	9	4
Inv.	:	2	1	9	6	4	10	11	7	5	0	3	8
+	:	9	9	9	9	9	9	9	9	9	9	9	9
I11	:	11	10	6	3	1	7	8	4	2	9	0	5

T9I

I8	:	8	7	3	0	10	4	5	1	11	6	9	2
Inv.	:	4	5	9	0	2	8	7	11	1	6	3	10
+	:	9	9	9	9	9	9	9	9	9	9	9	9
P1	:	1	2	6	9	11	5	4	8	10	3	0	7

T9I → COMMON OPERATION

T9I

R5	:	11	4	7	2	0	8	9	3	1	10	6	5
Inv.	:	1	8	5	10	0	4	3	9	11	2	6	7
+	:	9	9	9	9	9	9	9	9	9	9	9	9
RI4	:	10	5	2	7	9	1	0	6	8	11	3	4

T9I

Figure 3: Analysis of hexachordal combinatoriality between I8 and P1

I8 H1	:	8	7	3	0	10	4
		[3	4	7	8	10	0]
		(0	1	4	5	7	9)

I8 H2	:	5	1	11	6	9	2
		[9	11	1	2	5	6]
		(0	1	4	5	7	9)

P1 H1	:	1	2	6	9	11	5
		[9	11	1	2	5	6]
		(0	1	4	5	7	9)

P1 H2	:	4	8	10	3	0	7
		[3	4	7	8	10	0]
		(0	1	4	5	7	9)

Figure 4: Illustration of commonality of set class (014579)

$P_{10}H_1$:	[10 11 3 6 8 2]	$P_{10}H_2$:	[1 5 7 0 9 4]
	[6 8 10 11 2 3]		[0 1 4 5 7 9]
	(0 1 4 5 7 9)		(0 1 4 5 7 9)
$I_{11}H_1$:	[11 10 6 3 1 7]	$I_{11}H_2$:	[8 4 2 9 0 5]
	[6 7 10 11 1 3]		[0 2 4 5 8 9]
	(0 1 4 5 7 9)		(0 1 4 5 7 9)
I_8H_1 :	[8 7 3 0 10 4]	I_8H_2 :	[5 1 11 6 9 2]
	[3 4 7 8 10 0]		[9 11 1 2 5 6]
	(0 1 4 5 7 9)		(0 1 4 5 7 9)
P_1H_1 :	[1 2 6 9 11 5]	P_1H_2 :	[4 8 10 3 0 7]
	[9 11 1 2 5 6]		[3 4 7 8 10 0]
	(0 1 4 5 7 9)		(0 1 4 5 7 9)
R_5H_1 :	[11 4 7 2 0 8]	R_5H_2 :	[9 3 1 10 6 5]
	[7 8 11 0 2 4]		[9 10 1 3 5 6]
	(0 1 4 5 7 9)		(0 1 4 5 7 9)
RI_4H_1 :	[10 5 2 7 9 1]	RI_4H_2 :	[0 6 8 11 3 4]
	[9 10 1 2 5 7]		[11 0 3 4 6 8]
	(0 1 4 5 7 9)		(0 1 4 5 7 9)

COMMON SET CLASS THROUGHOUT: (0 1 4 5 7 9)