The Dual Nature of Nature:

Analyzing the Seventh Movement of Messiaen's Turangalîla Symphony

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> "Lîla" literally means play – but play in the sense of the divine action upon the cosmos, the play of creation, of destruction, of reconstruction, the play of life and death. "Lîla" is also Love. "Turanga": this is the time that runs, like a galloping horse; this is the time that flows, like sand in an hourglass. "Turanga" is movement and rhythm. "Turangalîla", therefore, means all at once love song, hymn to joy, time, movement, rhythm, life, and death. (Messiaen, Program Notes 1)

So reads Olivier Messiaen's characteristically mystical description of the etymology of the *Turangalila-Symphonie* in his liner notes to the Deutsche-Gramophone recording. One of the remarkable things about this description is its simultaneous holding of disparate, even opposing, meaning. In the same way, Messiaen's singular approach to composition is a kind of unification of opposites. Algorithmic and intuitive, carefully planned and spontaneous, Messiaen always has one foot in the purity of math, and one in the chaos of the natural world.

Nature is actually a good framework from which to understand Messiaen, being for him both a literal and a figurative inspiration. The literal inspiration is of course best exemplified by his lifelong obsession with birdsong. The figurative aspect comes from the fact that nature has, as it were, a dual nature. On the one hand, it is an incredible central planner: looking at a symmetrical Christmas tree, one can't help but feel that, had nature been in charge instead of Stalin, the Soviet Union might well have fared much better. And yet, anyone that has seen a tree on a windy hillside wind its way up at a

strange angle to meet the sun knows that nature is capable of great acts of improvisation, bending to the demands of individual situations. These, too are the dual sides of Messiaen's art.

Taking as a case study the seventh movement of the Turangalîla Symphony, this paper will first explore Messiaen's more algorithmic side – his systems, his patterns, his beloved symmetries – starting with rhythm, and then delving into pitch and into form. Having done that, we will see what can be made of the sections that do not fit so neatly into a box, those seemingly composed more intuitively. But first, let's take an overview of the movement at hand.

Context and Overview of the Form

The seventh movement of the Turangalîla Symphony, entitled *Turangalîla II,* is one of its shortest movements, and yet also one of the most varied and action-packed. This becomes readily apparent when it is considered in the context of the previous movement, *Garden of Love's Sleep*. Messiaen writes of the sixth movement that "a single, expansive phrase on the 'love theme' occupies the whole movement" upon which the piano superimposes birdsong (Messiaen, Liner Notes 5). Thus it is essentially a one-part form. *Turangalîla II* could not be more different, as we can see by the formal diagram in Figure 1:

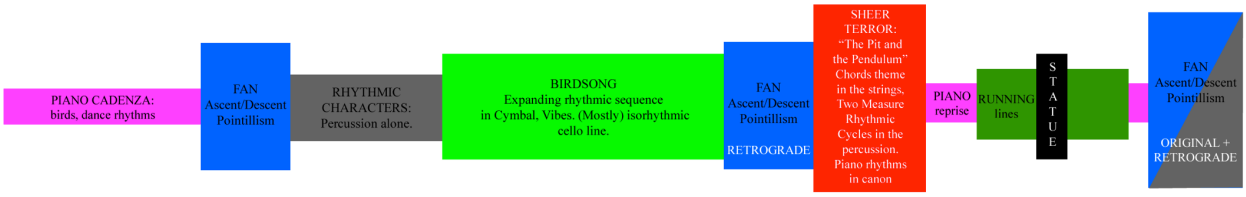

Figure 1: The form of *Turangalîla II*, with width proportional to duration and height proportional to the density of the orchestration.

A few things jump out immediately: the blue sections, which Messiaen describes as a "fan closing in on itself", and the grey section, made up of rhythmic cycles for the percussion ensemble, are engaged in a process that ultimately results in their fusion at the end of the movement. Interspersed between these sections are a number of interjections: solo piano cadenzas, passages of orchestral birdsong, and a terrifying orchestral tutti occurring very nearly at the golden section. Thus, already on the structural level, order and anarchy are dancing with one another.

Messiaen's Approach to Rhythm

Let us begin our exploration of Messiaen's algorithmic side with his approach to rhythm. One of the defining features of Messiaen's rhythmic thinking is an additive, rather than multiplicative approach to duration (Sherlaw-Johnson 121). Traditionally, rhythmic thinking is concerned with the subdivision of pulses into smaller units (meter) or the multiplication of metric units to form higher order structures (hypermeter). Messiaen's characteristic approach, by contrast, is additive. For instance, in his treatise, "The Technique of My Musical Language", Messiaen discusses the process by which an

originally simple rhythm might be varied and extended by the insertion of, or extension of, a note. (See examples in Fig. 2.)

The apparent consensus is that this approach had its genesis in an encyclopedia article on Indian music that Messiaen read as a student at the Paris conservatoire. He also may have found some influence in this regard from rhythmic processes in Stravinsky's *Rite of Spring* (Sherlaw-Johnson 122).

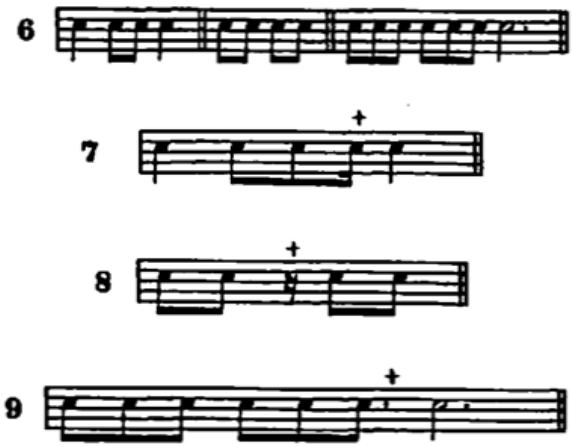

Figure 2: Three rhythms embellished by the technique of "added value", from the musical examples in "The Technique of My Musical Language"

Julian Hook, in his article, "Rhythm in the Music of Messiaen: An Algebraic Study and an Application in the 'Turangalila Symhpony'", breaks this process down particularly methodically, and mathematically. First, he chooses to represent a rhythm as a sequence of integers representing multiples of an underlying rhythmic pulse (in Turangalîla, this is almost always the sixteenth note). Consider the opening rhythm of the piano part, for instance:

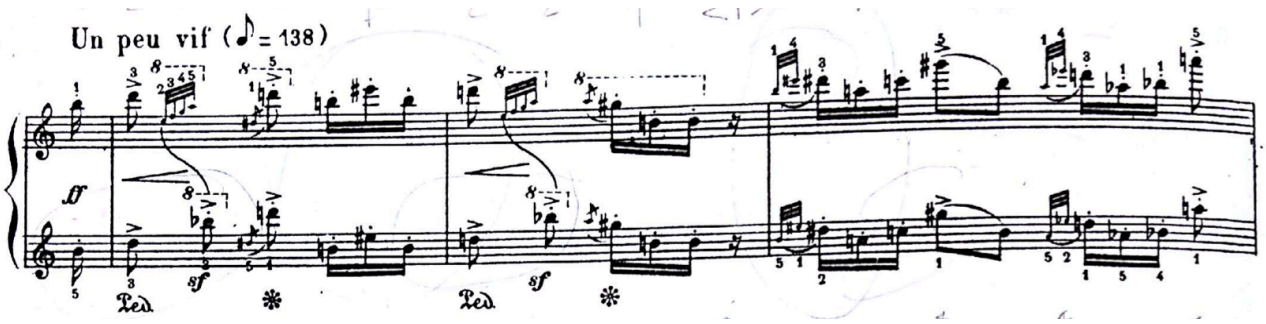

Figure 3: The opening piano solo.

Ignoring grace notes, and including the two further eighth notes that fall at the beginning of the next system, this rhythm would be written:

$$1\ 2\ 2\ 2\ 1\ 1\ 1\ 2\ 2\ 1\ 1\ 1\ <1>\ 1\ 1\ 1\ 2\ 2\ 1\ 1\ 1\ 2\ 2\ 2.$$

Note the chevrons enclosing rest values. Hook might further shorten it to: $1\ 2^3\ 1^3 2^2\ 1^3\ <1>\ 1^3\ 2^2\ 1^3\ 2^3$, which condenses the notation and helps us to better see the rhythm's palindromic structure around the central rest.

With this basic notation in mind, Hook defines several possible algebraic operations. For instance, if $x = 2\ 3\ <1>\ 4$ and $y = 4\ 1\ 5$, we can describe the following operations (Hook 103):

1) Retrograde: $x_R = 4 < 1 > 3\ 2$
2) Augmentation / diminution: $x \times 3 = 6\ 9\ <3>\ 12$
3) Concatenation: $x\ y = 2\ 3\ <1>\ 4\ 4\ 1\ 5$
4) Elision (point of connection not repeated): $x \circ y = 2\ 3\ <1>\ 4\ 1\ 5$
5) Composite Rhythm (the rhythm formed by the attack points from both rhythms): $x * y = 2\ 2\ 1\ 1\ 4$

With this mathematical vocabulary in place, let us consider some of the rhythmic procedures employed in Turangalîla.

Rhythm Symmetry: Non-retrogradability

Non-retrogradable rhythms are, quite simply, palindromic rhythms – thus, they are rhythms whose retrogrades are no different than the original. In his program notes, Messiaen describes the symmetrical structure of these rhythms as being found in "the veins of the leaves and trees, in butterfly wings, in the human face and body" (Messiaen,

Liner Notes 3). Clearly, the centrality of such rhythms to Messiaen's musical language derives from their connection to nature.

We have already seen one non-retrogradable rhythm in the opening piano solo. While the non-retrogradable portion lasts only through the first four measures, after which the rhythm becomes apparently freer, its importance is underscored by its returns at rehearsal 9. Only the initial, non-retrogradable, portion is heard the second time, suggesting that it was the seed from which the rest of the opening was built.

Another important instance of non-retrogradable rhythm in the movement occurs at rehearsal 2, the passage for the percussion ensemble alone. Here, however, the non-retrogradability is in the composite rhythms of pairs of parts, rather than in any of the parts individually. This arises out of a property that Hook describes in his article, namely that a rhythm and its retrograde played simultaneously produce a non-retrogradable composite rhythm: $(x * x_R)_R = x * x_R$ (Hook 105). In this case, three rhythmic cycles – 15 13 3 4, 12 14 1 2 7 8 16, and 5 6 9 11 10 – are combined with their retrogrades, thereby forming three non-retrogradable rhythmic strata.

The Rhythmic Characters

Lest we be tempted to view rhythmic patterns like these as pure mathematical contrivances, Messiaen, in his liner notes, is careful to describe them in a way that imbues them with vitality. Analogizing them to characters in a theatrical scene, he depicts an augmenting pattern as an "attacking character", a diminishing pattern as a "character attacked", and an unchanging ostinato as "the character who stands aside" (3). This description is again revealing of the organicism at the heart of his aesthetic aims.

As a concrete example, consider the vibraphone part at rehearsal 3. Here a cycle of seven values (1 4 7 6 5 3 2) is repeated, but with each repetition the length of each value goes up by 7. Thus, it is an augmenting rhythmic character[1].

Symmetry in Pitch

I would have liked to title this section, "Symmetry and Algorithmic Thinking in Pitch," but try as I laboriously did, I could not find much in the way of algorithmic pitch treatment in *Turangalîla II*. There are, however, instances of repeated pitch sequences – such as in the vibraphone and cello parts at rehearsal 3, and the vibraphone, glockenspiel, celesta, and piano parts at rehearsal 7 – and, of course, one can never say for sure that there is no hidden algorithmic process behind the pitch content of a passage.

Algorithms aside, Messiaen's thinking with respect to pitch certainly shares with his rhythmic thinking a strong concern with symmetry. In "The Technique of My Musical Language", Messiaen acknowledges this connection when discussing the "charm of impossibilities" that he deems essential to music's ability to touch upon deeper truths:

> This charm, at once voluptuous and contemplative, resides particularly in certain mathematical impossibilities of the modal and rhythmic domains. Modes which cannot be transposed beyond a certain number of transpositions, because one always falls again into the same notes; rhythms which cannot be used in retrograde because in such a case one finds the same order of values again.

Here he is of course referring to the modes of limited transposition, modes with repeated interval sequences, such as the whole-tone and octatonic scales. Though his use

[1] It seems to me that Messiaen might have meant to associate the attacking character with diminishing, rather than augmenting patterns, since increasing note lengths tend to correlate with

of these modes is generally improvisatory, their underlying theory exhibits the same kind of mathematical reasoning we see in his use of rhythm.

Finally, while perhaps not strictly algorithmic, there is something about Messiaen's combinatorial process of composition that seems almost architectural. Xenakis, for instance, remarked of Messiaen that, "What captivated me most of all was his pure combinatorial thought" (Harley 1). One senses, for instance that the appearance of the cyclic chords theme in the strings at the moment of climax (rehearsal 7) is a part of a larger, ecstatic tapestry of themes upon which the entire symphony rests.

Symmetry as a Structural Force

Probably the most remarkable example of non-retrogradability in this movement concerns the "fan" sections at rehearsal numbers 1, 6 and 12. At rehearsal 1, the texture consists primarily of three elements: A rising progression of muddy chords in the low brass, a descending chromatic scale in the Ondes Martenot, and a pointillistic line passed around the winds, upper brass, and pizzicato violins. The pitched percussion and piano pick out and sustain certain notes of the pointillistic line, while the bass drum sustains a quiet roll.

The second fan section, at rehearsal 6, is an almost exact retrograde of the first. (The only difference is that the notes picked out and sustained by the pitched percussion sustain in the opposite direction.)

Finally, at rehearsal 12, both forward and retrograde versions appear simultaneously. At each sixteenth note pulse, there is one note from the original pointillistic line, and one from the retrograded line. The high strings enhance the

opposition of the Ondes Martenot and low brass by doubling the former in diminished sevenths, and the pitched percussion and piano pick out and sustain the same notes as before, including both the forward and retrograde versions. This results in a line that is non-retrogradable in both pitch and rhythm.

In fact, not only does the superimposition of forward and retrograde versions of the fan result in an entire passage that is essentially non-retrogradable, but Messiaen chooses to combine it with the reappearance of the percussion cycles from rehearsal 2, which, as discussed above, form non-retrogradable composite rhythms. Thus we can see that the whole movement was building to this point: a cacophony of symmetry.

The Other Stuff

Satisfying though this structural trajectory unquestionably is, it conveniently ignores about half of the movement. What is to be made of the numerous interjections? Of sections like rehearsal 3? Or even of the opening piano solo, which after the fourth measure consists of decidedly retrogradable material?

Music that has been written intuitively is much harder to analyze definitively than music written algorithmically. While rhythmic cycles and large scale retrogrades like those described above are, once discovered, essentially uncontestable, analyses of intuitive compositional work will always remain, to greater and lesser extents, somewhat arguable. What follows is an exploration of some of the materials that Messiaen used when writing intuitively, in the hopes of providing, if not perfect elucidation, at least some glimmer of understanding.

Messiaen and Birdsong

Birdsong was, of course, a deep passion for Messiaen, and he devoted an unprecedented amount of time and energy listening to and transcribing it, as well as incorporating it into his musical vocabulary. Though his most exhaustive explorations of birdsong took place in the 50's and 60's, and thus were still to come when writing Turangalîla, it had already become a frequent guest in his oeuvre. Messiaen clearly also took inspiration from the rhythmic and textural possibilities suggested by choruses of birds, writing: "Through the mixture of their songs, bird make extremely refined jumbles of rhythmic pedals" (Messiaen, "Technique of My Musical Language" 34).

This points to the fact that Messiaen's use of birdsong was more than mere transcription. In fact, Messiaen readily acknowledges a number of issues with transcription:

> A bird being much smaller than we are, with a heart that beats faster and nervous reactions that are much quicker, sings in extremely swift tempos, impossible for our instruments. Birds also sing in extremely high registers that cannot be reproduced; so I write one, two, three octaves lower. (Shenton 60)

He goes on to explain that, since birdsong is often confined to a small pitch range and very microtonal, he is obliged to widen that range – while retaining the contour – so as to make it playable on human instruments[2]. In these ways, the birdsong is translated to a "more human scale".

[2] Not wholly surprisingly, Messiaen's personal version of the "human scale" involves significant use of the modes of limited transposition.

Beyond translating it to the human scale, it seems that Messiaen often presents birdsong in a "stylized, idealized" way (Messiaen, Liner Notes 5). One might therefore describe it as a kind of *style oiseau*, rather than necessarily the transcription of the song of any bird in particular (Shenton 60).

Birdsong in *Turangalîla II*

Though Messiaen never explicitly refers to the use of birdsong in the seventh movement of the *Turangalîla Symphony*, we can infer its use from similarities to the preceding movement, where "the solo piano introduces birdsongs: that of a nightingale, of a blackbird, of a garden warbler" (Messiaen, Liner Notes 5). The most extensive birdsong section in the seventh movement is at rehearsal 3, following the section for percussion alone, though it is also a feature of the passages for solo piano. Consider the following examples:

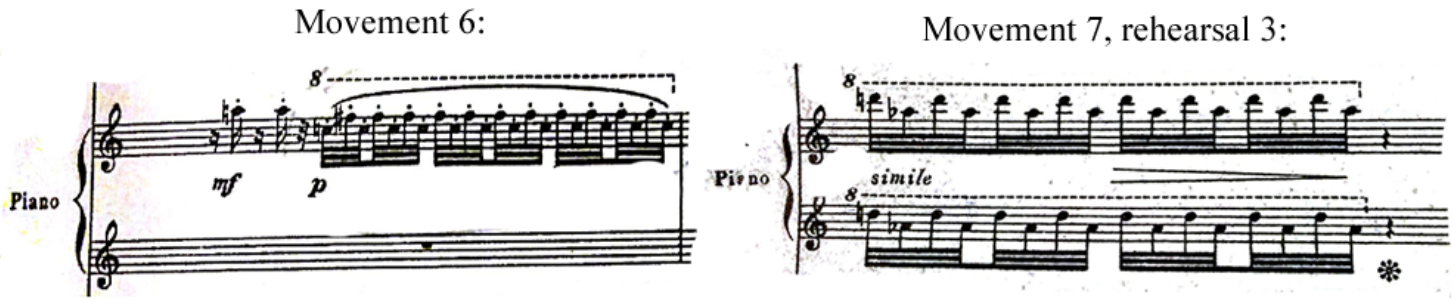

Figure 4: Oscillating Tritone

This oscillating tritone in Figure 4 is perhaps the garden warbler.

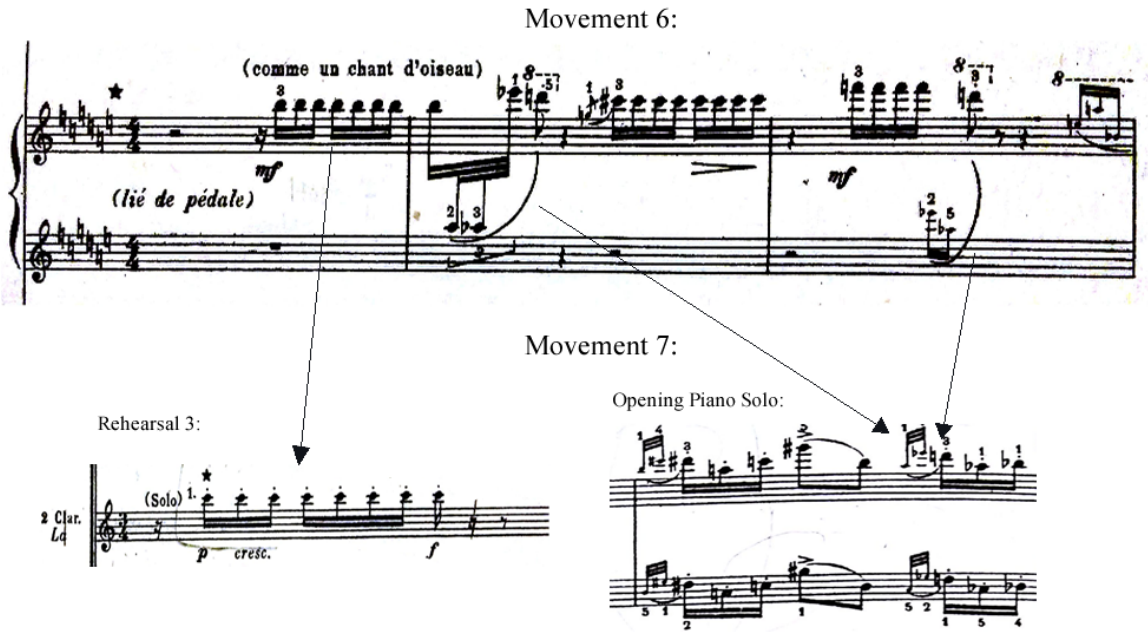

Figure 5: Repeated notes and grace notes.

In Figure 5 we see that the gesture of eight repeated notes, so prominent at rehearsal 3, has its derivation in the birdsong material of the preceding movement. Not only do the winds and piano participate in this motive, but also the cello, as part of its isorhythmic activities. Also note the grace note gestures leading to D in sixth movement, which are echoed in the opening piano solo, as well as at rehearsal 3.

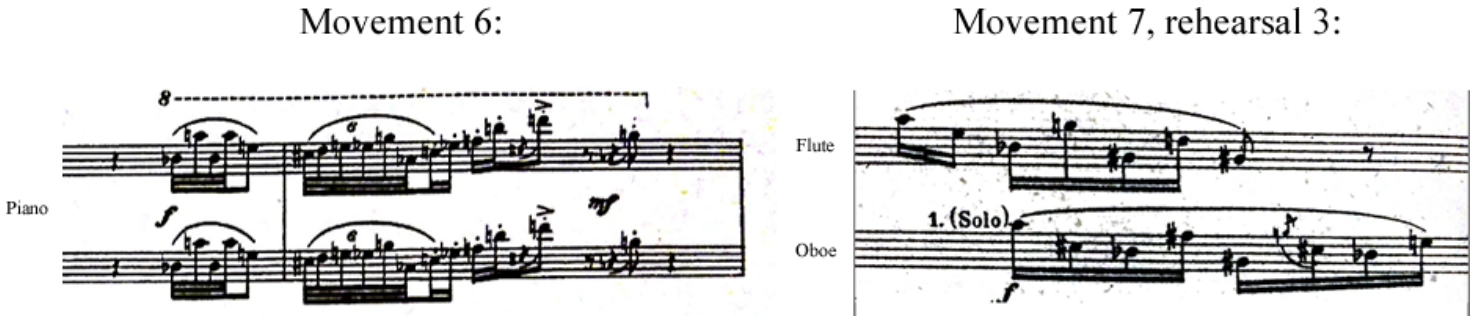

Figure 6: Birdsong based on a particular melodic contour

Figure 6 shows two birdsong passages, one from movement six, the other from movement seven, featuring a common pool of pitches: a central diminished seventh, Bb-C#-E-G, extended at top and bottom by a whole step. This is the most prominent kind of birdsong used at rehearsal 3, and it is presented in a number of variations. These variations exhibit a kind of Wittgensteinian family resemblance, so it is hard to identify one single unifying characteristic. However, it is more than simply a set of pitches: the gesture tends to start on the major seventh Bb-A and then proceed to the Ab-G seventh, with the C# and E acting as filler somewhere in the in the process.

The Role of the Solo Piano

In his program notes, Messiaen has the following to say about the role of the solo piano part in Turangalîla:

> The solo piano is so important…that one can say the Turangalîla-Symphonie is almost a piano concerto. Long, brilliant cadenzas are intercalated into the different movements, tying together the elements of development and becoming part of the form. (3)

Cadenzas are, of course, an improvisatory tradition: on the continuum from central planning to moment-to-moment, intuitive decision-making they are firmly of the latter camp. Also, as Messiaen alludes to, both traditionally and here in Turangalîla they serve a developmental function: an opportunity for free play with the material, for thematic digestion.

Indeed, some digestion is needed at the beginning of the seventh movement: the listener has just been lulled for twelve minutes into a state of trance. To use the kind of cinematic language that Messiaen would likely approve of, we are transitioning from a

love scene to an action scene; long, continuous shots are replaced by fast-paced cutting between different angles. The solo piano helps shift the music into a higher gear through faster, more accented rhythms. The initial non-retrogradable rhythm is spun out in improvisatory fashion into less regular but equally sharp and accented patterns. At the same time, it remains linked to the previous movement by its use of birdsong.

The return of the solo piano at rehearsal 9 comes at another pivotal moment. If rehearsal 7, which Messiaen refers to as a "terrifying rhythm" recalling the situation of the doomed prisoner in the Edgar Allen Poe story, *The Pit and the Pendulum* (Messiaen, "Program Notes", 6), evokes a fight or flight response in the listener, the response at rehearsals 9 and 10 is probably one of flight. After recalling the opening palindrome, running eighth notes, originating in the piano, are passed among the orchestra. In the spirit of intuitive thematic play, this running eighth note pattern seems to have had its genesis (either intentionally or unintentionally) in some of the material from the opening cadenza:

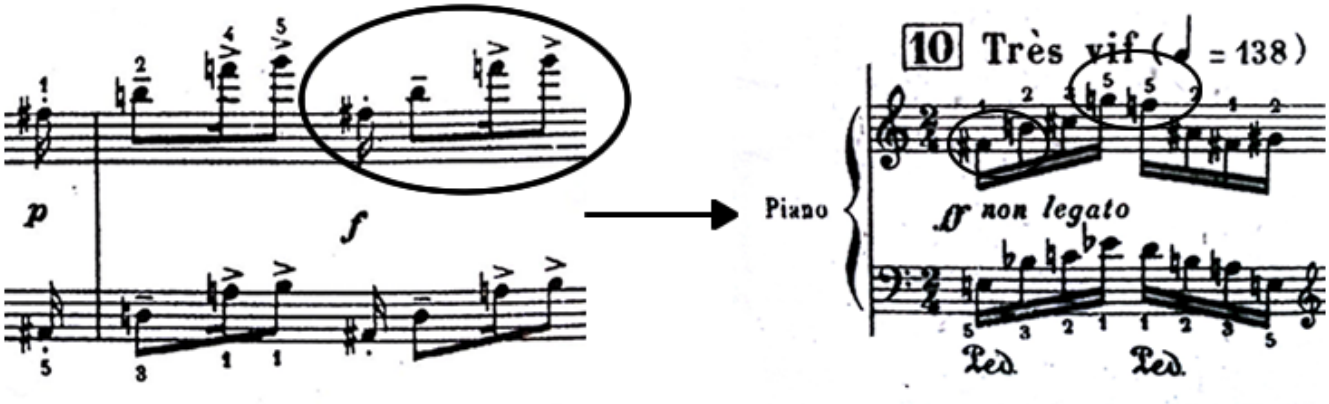

Figure 7: Thematic connection between the opening piano solo and the passage starting at rehearsal 10

Data Driven Analysis

As a kind of postscript, I would like to offer one further approach to the analysis of intuitively created music: data visualization. Though my work here is still in its early stages, I believe it has much potential to shed light on the inner workings of such music. I have chosen to focus here on exploring of the octatonic harmonic landscape so often inhabited by Messiaen, but I think data visualization has a role to play in the analysis of rhythm, timbre, or any other aspect of music for which quantitative data exists.

Consider the diagram in Figure 8. The three corners of an equilateral triangle are used to represent the three different diminished seventh chords. Since each of the three octatonic collections combines two diminished seventh chords, they can be said to lie at the midpoints of the three sides, equidistant from the corners representing their constituent diminished sevenths. Any individual note will lie at one of the three corners, depending on which diminished seventh it belongs to. A chord or passage of several notes could lie anywhere within the area of the triangle, its position being a weighted average of the corners occupied by its constituent notes.

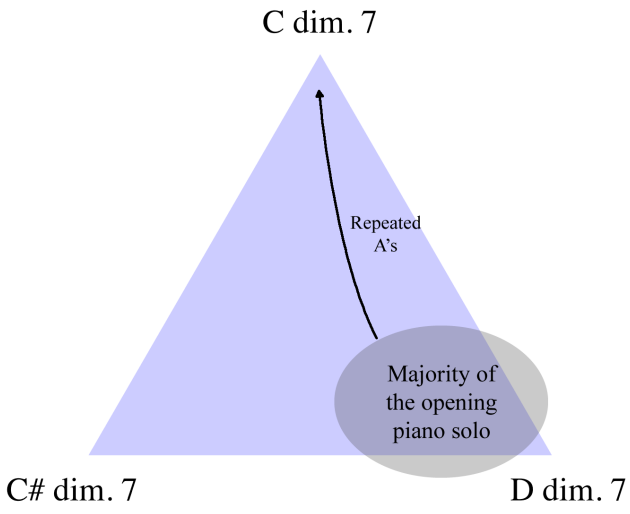

Figure 8: The diminished seventh triangle.

This diagram was prompted by my intuition that the opening piano solo was somehow octatonic in sound, despite the fact that it didn't stick purely to any particular octatonic collection. I was then able to program an animation in Python showing a dot dancing around the interior of the triangle in response to the opening piano solo, its

location determined by a weighted average of the most recently heard pitch classes. (This was done by means of a leaky integrator with a half-life just under a second, which I think offers a decent facsimile of typical harmonic memory.)

The result was a dot that spent almost all of its time hanging around the lower right corner, establishing a harmonic focus not unlike a tonal center with occasional chromatic deviations. Most interestingly, the fifteen repeated A naturals at the end of the solo cause the dot to head sharply toward the top of the triangle; a striking visual change of course entirely congruent with one's aural sensation. This change of course is significant, as it ushers in the entrance of the orchestra.

Thus, by means of visualization, we are able to see Messiaen establish a harmonic center, and see him deviate from it. Perhaps this was a conscious decision, or perhaps it was made entirely unconsciously. Regardless, I think it is in accordance with the aural experience of the music.

Closing Thoughts

Messiaen is not easy to analyze. Beguiling instances of clear algorithmic thinking are tossed together, almost haphazardly, with the instinctively generated music of a master improviser. Searching for an underlying generative process can feel like digging for buried treasure that may lie one foot underground, or twenty, or not be there at all. Moreover, unlike with intuitive music of the common practice period, intuitive passages in Messiaen leave us with no tradition of tonal harmony or sonata form to fall back upon.

And yet that is what makes the music great. The rhythm that starts as a palindrome and then goes its own way, the gesture that may or may not derive from

birdsong, the unexpected interjections in the form: all of these place the music on the edge of understanding – never quite explainable, but not incomprehensible.

The true interest of Messiaen lies in the interplay between that which is definable and that which is hard to fit into a box. After all, it is the same way with nature, and what's more interesting than that?

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