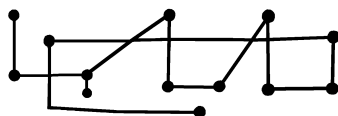


MULTIPLE TIME-SCALES IN ADÈS'S *RINGS*



DANIEL FOX

INTRODUCTION

THOMAS ADÈS OFTEN SPEAKS about his music in scientific or physical terms, be it “the magnetic forces of notes” or the importance of “responding to temperature.”¹ He claims that “Berlioz has brought us into the Modern world of relativity and uncertainty.”² Adès’s music often conveys the sense of a natural process unfolding. Simple, identical processes unfolding at varying rates create expansions and contractions of harmonies in pitch space. Despite a sometimes overwhelming level of detail, one feels the physical causality behind the movement of notes. The aim of this paper is to argue that a scientific understanding of an extended physical metaphor unifies the processes at work in *Rings*, the first movement of Adès’s violin concerto *Concentric Paths* (2005).³ The metaphor of celestial motion is offered to us on the cover of the score and in the composer’s program notes.

COLOR, INSTRUMENT, AND PROCESS

Adès has spoken of Kurtág and Ligeti as “inventors of colour and instruments—not in the sense of actual musical instruments, but an ‘instrument’ being a complex of timbre and interval and harmony and rhythm, which could be an implement that you could use. . . .”⁴ Dominic Wells points us to the “relationship between the opening of *Arcadiana* (Adès’s first string quartet, 1994) and that of Ligeti’s *Violin Concerto*, which also begins with open fifths. . . .”⁵ Adès’s violin concerto also opens with an ostinato of open fifths (see Examples 1A and 1B). However, Ligeti’s piano *Etude No. 6 Automne à Varsovie* offers a more extensive model for the musical processes in *Rings*.

Example 2 shows the opening bars (re-notated for analytical purposes) of *Automne à Varsovie*. The octave Ebs form a perfect crystal. The Fb in m. 2 introduces an impurity into the crystal, and the rest of the piece details the reaction of the crystal to this impurity: the disturbance propagates through the crystal, deforming it into a quasi-crystal.⁶ The final bars of *Automne à Varsovie* present the final collapse of the crystal structure. All that is left is the chromatic descent that was initiated by the impurity. We will find in *Rings* an elaboration on this process.

Rings opens with energetically alternating D6s and G4s in the solo violin, supported thinly in the orchestra (see Example 3).⁷ In the second measure, when Flute 2 tries to leap down a perfect fifth from D6 to G5, instead of a perfect twelfth to G4, there is too much energy in the system, and it overshoots slightly to F#5. Flute 1 leaps from D6

Vivacissimo luminoso (♩ = 60)

Solo violin

pppppp crescendo poco a poco ppppp

EXAMPLE 1A: THE OPENING MEASURES OF LIGETI'S *VIOLIN CONCERTO*

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Fast ♩ = 100 - 108

Solo violin

mf

EXAMPLE 1B: THE OPENING MEASURES OF *RINGS*

$\text{♩} = 144$ Presto cantabile, molto ritmico e flessibile

Piano

sempre legato

p

sempre con ped.

p

EXAMPLE 2: THE OPENING MEASURES OF LIGETI'S *AUTOMNE À VARSOVIE*

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Fast $\text{♩} = 100 - 108$

Flute 1

p

pp

p

Flute 2

pp

sim.

p

Solo violin

mf

EXAMPLE 3: THE OPENING MEASURES OF *RINGS* INTRODUCE THE TETRACHORD [67E2]

to B4 and thus the tetrachord [67E2] 4-20(0158) is introduced. At m. 3 the soloist begins a rapid arpeggiation of this [67E2] chord within the span of G4 to D6 (see Example 4).⁸ This pitch set, a GMaj7 chord, remains stable for mm. 4 and 5.

Similar to the introduction of the $F\flat$ in m. 2 of Ligeti's *Automne à Varsovie*, when Flute 2 introduces the $F\sharp 5$ in m. 2 of *Rings*, it creates instability in the pitch-class G; G develops a tendency to decay to $F\sharp$. In m. 6 the instability in G– $F\sharp$ spreads: the D6 in the solo part slips to $C\sharp 6$ (this is reinforced in the orchestra). None of the pitches in [67E2]

Fast $\text{♩} = 100 - 108$ *accents, non brillante*

Solo violin

4

[67e2]

[1et6]

8

[56t1]

[9t025]

EXAMPLE 4: MM. 4–9 OF *RINGS*. THE PITCH SET [67E2] 4-20(0158) IS TRANSFORMED BY T_{-1} TO THE PITCH SET [56T1] 4-20(0158) THROUGH THE INTERMEDIATE SET [1ET6] 4-14(0237)

remain stable for very long. It is as if each pitch is an atom in a crystal lattice, but there is so much heat that the atoms are jostled out of place. As in *Automne à Varsovie*, a process of chromatic descent is initiated. However, the characters of the two works differ significantly. Ligeti's process feels as if it is describable by laws of physics; Adès's process feels more biological, an association put forth by the composer himself: "The moment I put a note down on paper it starts to slide around the page. And the writhing that I could see when I look at a note under the microscope, you would see with any living thing."⁹ This instability, this tendency for a pitch to decay down a semitone, is played out over the next 85 measures, taking us through about two-thirds of the movement. Fighting against this tendency is the less frequent leap up a major seventh, to which we will return.

The chromatic descents lead to a harmonic progression when applied to the tetrachord [67E2]. The progression filled out by the soloist and reinforced in fragments by the orchestra is diagramed in Example 4. A T_{-1} transformation is applied to [67E2] to produce [56T1] by m. 7, though a transition region mediates, because each pitch loses stability and slides down by a semitone at a different rate. It is as if each pitch is moving at a time-scale that differs slightly from that of its neighbors. This variation in decay rate deforms the set-class but then allows it to regain integrity. The different rates at which pitches descend lead to suspensions reminiscent of common practice counterpoint. In fact the concerto has something of a Baroque feel, due, in part, to the initiation of a "perpetual motion machine."¹⁰ Taruskin observed that Adès possesses an "omnivorous range of reference,"¹¹ and to understand the soloist's material it is useful to turn to the *Presto* from J. S. Bach's *Sonata for Solo Violin* in G minor.

THE *PRESTO* FROM J. S. BACH'S *SONATA* FOR SOLO VIOLIN IN G MINOR

J.S. Bach's *Presto* from the G minor *Sonata for Solo Violin* serves as a model in four ways: 1) It has a near ceaseless perpetual motion texture; 2) It uses arpeggiated seventh chords sliding by (modal) step; 3) It uses sequenced suspensions; and 4) It displays regular interval class motion. The perpetual motion texture of unwavering sixteenth notes in the *Presto* is briefly suspended at the end of each of the two repeated sections. In *Rings* the soloist alternates between the driving sixteenths and melodic lines that unfold on a slower timescale and, largely, in a different register; but there is not a measure of *Rings* in which the sixteenth note tattoo is not carried by some *instrument* (in the literal

sense or in Adès's broader sense of a "complex of timbre and interval and harmony and rhythm").

In comparing *Rings* and the *Presto*, it is clear that the former undergoes chromatic transformations such as T_{-1} , whereas the latter is more rigidly confined to a mode at any given time and undergoes modal transformations. To emphasize the relationship between passages of *Rings* and the *Presto*, it will be useful to regard sections of the *Presto* to be confined to a given minor mode and to measure intervals from *within* that mode, rather than from within the broader chromatic context. When the mode is G natural minor we will use integer notation in which

$$G=0, A=1, B\flat=2, C=3, D=4, E\flat=5, F=6$$

and we will calculate using arithmetic modulo 7. For example, mm. 9–11 of the *Presto* consist of "V" shaped arpeggiations of the chords Cm7, BbMaj7, A⁰7¹ (see Example 5A). Using modal integer notation, the tetrachords can be realized as [3502], [2461], and [1350]. Each is obtained from the last using a T_{-1} transformation, where the step of -1 is regarded *within the mode*.¹² Measures 67–69 have the same sequence but placed in the mode of C natural minor (see Example 5B). Another sequence of seventh chords is found in mm. 17–24 (see Example 5C). There the arpeggiation pattern leads to the (G natural minor pitch-class) sequence [5, 2, 5, 0, 5, 0, 3, 0, 3, 5, 3, 5]. This is projected through a T_1 transformation twice. The third transformation is only approximate, producing an FMaj chord without a seventh in mm. 23–24, as opposed to the seventh chords that have appeared in mm. 17–22. In *Rings* Adès generalizes¹³ these transformations into a chromatic post-tonal context and uses a gradual deformation process to interpolate from one seventh-chord to the next (see Example 4).

The suspensions in *Rings* that result from the uneven rate of decay of each pitch (see mm. 6–7 in Example 4) also have a clear precedent in the *Presto* (see Example 6). Measures 70–73 consist of eleventh chords rooted on a cycle of (rising) fourths. The C in the G dominant seventh chord of m. 70 is a suspension from the ii⁰7¹ (of C minor) from the previous measure and it is resolved to B \sharp (with a bounce!). The F of m. 71 is a suspension from m. 70 (with octave displacement) and is resolved to E \flat (again with a bounce). One can trace a line from B4 in m. 70 to B \flat 4 at the end of m. 71, to A4 in m. 72, and A \flat 4 in m. 73. Measures 70–73 consist of a sequence of 4-3 suspensions of these seventh chords.

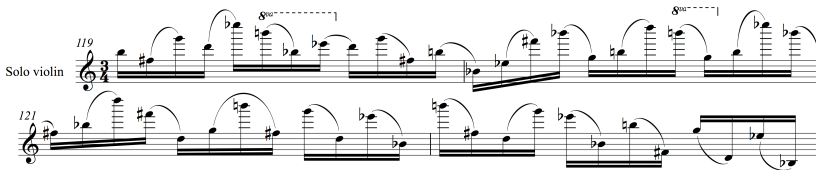
EXAMPLE 5A: BACH *PRESTO* MM. 9–11EXAMPLE 5B: BACH *PRESTO* MM. 67–69EXAMPLE 5C: BACH *PRESTO* MM. 17–23EXAMPLE 6: BACH *PRESTO* MM. 70–73

The *Presto* serves as a model for the initial details of the solo violin material in *Rings*. It also provides a model for the closing material of the soloist. Beginning on the seventh sixteenth-note of m. 121 of *Rings*, the penultimate measure, the soloist fills out Hex_{2,3} with the PC sequence

[E, 6, 7, 2, 3, T; E, 6, 2!, 7!, 3, T; E, 6, 7, 2, 3, T].

If we swap the pitch classes [2] and [7], decorated with exclamation marks, then the whole sequence follows the unordered interval class pattern of 5, 1, 5, 1. . . . Such regularity is obscured by wild octave displacement (see Example 7).

A similarly simple sequence disguised by octave displacement is found in mm. 43–46 of the *Presto* (see Example 8). If we use D natural minor pitch-class space (D=0, E=1, F=2, G=3, A=4, B \flat =5, C=6) then the sequence is [2, 0, 5, 3, 1, 6], [0, 5, 3, 1, 6, 4], [5, 3, 1, 6!, 4, 2]. Within each six-note segment the line moves by the (modal) interval class sequence 5, 5 . . . and between each six-note segment the motion is by a (modal) T₋₂ transform. The one exception is the (modal) PC 6 marked with an exclamation in the third segment. The altered pitch C \sharp endows this third sequence with a dominant function within D minor that ejects the music from the sequence. Both *Rings* and the *Presto*



EXAMPLE 7: THE CLOSING MEASURES IN WHICH
THE SOLOIST MOVES AS IF ON A *STRANGE ATTRACTOR*



explore simple sequences infused with a dizzying energy through octave displacement and tireless rhythmic insistence.

In the last measures of *Rings* the set $\text{Hex}_{2,3}$ functions like a *strange attractor*.¹⁴ In the mathematical subject of dynamical systems theory, a *strange attractor* is a subset of the space of all possible states (known as the *phase space*) to which the system converges, but on which it moves chaotically (but deterministically). Leading up to m. 119 in *Rings*, the soloist saturates the aggregate before it is sucked into the $\text{Hex}_{2,3}$ subset of chromatic space. The passagework gives the impression of chaotic motion, even though it moves with an underlying regularity (or determinism?) in terms of interval class. The analogy is made more congenial by the fact that one of the first chaotic dynamical systems to be studied was the *N*-body system of planetary motion.¹⁵

CONCENTRIC PATHS LEAD TO MULTIPLE TIME-SCALES

In his review of the British premiere of *Concentric Paths*, Paul Griffiths observed that, "People on concentric paths may be going in the same direction, and perhaps can touch each other, but they can never link up—or get away from one another—and they will always come back to the same place."¹⁶ He goes on to quote Adès as depicting the first movement as "fast, with sheets of unstable harmony in different orbits." The imagery of "different orbits" is reinforced by the image of a "Map of the Earth and Planetary Orbits" from *The Celestial Atlas* by Andreas Cellarius (1661), which appears on the cover of the score. Our large-scale sense of time is derived in part from the changing of the seasons, whose rates of change in turn arise from the frequency of the Earth's orbit about the sun. The slowly shifting harmonies in *Rings* come and go like the seasons and, like the seasons, are often muddled up.

The analogy between planetary orbits and the unfolding of the music in *Rings* serves as a conceptual motivic seed that can unify the structure of the music. One of Johannes Kepler's great accomplishments was to formulate the relationship between the period of a planet's orbit and its distance from the sun. Using astronomical units to hide distracting constants, he found that $T^3 = a^3$ where "T" is the period of the planet's elliptical orbit and "a" is the semi-major axis of the ellipse. This law implies that *objects in different orbits move at different speeds* and that *the more distant orbits lead to slower speeds*.¹⁷

In *Rings*, and particularly in the part of the violin solo, we find both the multiple time- scales of different orbits and the tendency of outer orbits to move more slowly if we associate the distant orbits with the

high register. The solo violin spends most of its time swirling around at the rate of sixteenth-notes, but when it launches into an outer orbit of the upper register it slows down dramatically (see Example 9). The soloist looks down from its great height on the voices of the orchestra as they wind through their closer (lower register) and faster orbits.

Different instruments (either in the literal sense, or in Adès's use of the term to describe "a complex of timbre and interval and harmony and rhythm") travel on different orbits, so they move in and out of alignment with one another, as Griffiths emphasized. Example 10 shows an example of this from the opening of the piece. Through m. 12 the soloist and orchestra are aligned. Beginning in m. 13, differing rates of harmonic change begin to be felt, with the orchestra lagging behind the soloist. The re-alignment coincides with the first climax of the piece in m. 20.

The multiple time-scales present in the work operate at two levels. The first is at the microscopic level: Pitches have a tendency to decay down a semitone, but the rate at which this happens varies. This leads to contrapuntal resolutions of suspensions (e.g. $B_4 \rightarrow A\sharp_4 = B\flat_4$ in mm. 6–7, Example 4). The second is at a larger scale: Different instruments orbit at different speeds. This causes the pitch content to spread across the aggregate and then to contract. In mm. 18–20 the harmony is stretched out to fill the aggregate except that it is missing PC 9. In m. 20 the instruments realign on an explosive $\text{Hex}_{2,3}$ chord, and remain aligned in PC space for the next few measures. The missing PC 9 is delivered shortly after as part of a [T]–[9] suspension-resolution as the soloist's melody unfolds more slowly in a distant orbit. Thus the suspensions at the microscopic level are composed out in a suspension of the completion of the aggregate. In fact, there is yet another type of suspension structuring the piece to which we will return when discussing the large-scale structure.

T_E VS. T_{-1} AND THE CHROMATIC SUSPENSION CABLES

The chromatic descent in the upper voices found in Ligeti's *Automne à Varsovie* is a prominent feature of a number of Adès's compositions. For example, multiple chromatic descents weave through *Summa*, the first movement of *Traced Overhead*.¹⁸ The descending chromatic lines function like suspension cables: Rather than building harmonies upon a bass line, the harmonies hang from the cables like a bridge or an alpine cable car as they descend through chromatic space. These chromatic descents are often palpably audible.

20

Solo violin

8va

ff *espress.*

EXAMPLE 9: *RINGS* MM. 20–23: THE SOLOIST IS LAUNCHED INTO AN OUTER ORBIT

MEASURE	SOLOIST PC SET		ORCHESTRA PC SET
1–5	[67E2]	Aligned	[67E2]
6	[6TE1]		[6TE1]
7–8	[56T1], [56T1E]		[56T1], [56T1E]
9–10	[9T025]		[9T025]
10–11	[489E]		[489E]
11–12	[348E]		[348E]
12	[2378T]		[2378T]
13–14	[1269]	Separating	[237T]
15	[1568]		[2679]
16–17	[6801]		[1269]
17	[0158]	Reconnecting	[0158] and [78013]
18	[0357]		[0158], [780], [570], [78T023]
18–20	[E02357]		[E0247], [E0457], [237T]
20	[2367TE]	Aligned	[2367TE]
21–23	[9T123]		[E2367] and [6TE1]
24	[56TE1]		[56TE]
25	[56T]		[56T1]
26	[378]		[03578]

EXAMPLE 10: MULTIPLE TIME-SCALES LEAD TO SEPARATION AND REALIGNMENT BETWEEN THE SOLO VIOLIN AND THE ORCHESTRA, CAUSING THE PITCH CONTENT OF THE HARMONIES TO EXPAND AND CONTRACT

Beginning in m. 6 of *Rings*, the highest sounding pitch is treated to a chromatic descent at the pace of about one semitone every two to three measures (see Example 11). The chromatic suspension cables grow to enormous length, though the continuity is sometimes obscured as they move through inner voices. Example 12 traces one such chromatic descent. It is remarkable that this chromatic line winds continuously through the orchestra over such a long span of time. In fact, one can trace this chromatic suspension cable all the way to m. 113 if one allows for occasional octave leaps, which normally occur at climactic moments, as if high-energy explosions launch the pitches into a higher register. The line descends with hardly a break (though with

Fast $\text{♩} = 100 - 108$

The musical score is written for a full orchestra and solo violin. It features several staves with chromatic descents. The instruments and their parts are: Fl. 1, Fl. 2, Cl. 1, Cl. 2, Vln. 1, Vln. 2, Vla., Vc., and Solo violin. The tempo is marked 'Fast' with a quarter note equal to 100-108 beats per minute. The time signature is 3/4. The score shows a series of chromatic descents in the woodwinds and strings, with the solo violin part providing a large-scale structure. The Solo violin part is marked 'slm.' and features a series of chromatic descents. The woodwinds and strings also have chromatic descents, with some parts marked 'Cl. 1', 'Cl. 2', 'Vln. 1', 'Vln. 2', 'Vla.', and 'Vc.'.

EXAMPLE 11: IN *RINGS* SUSPENSION CABLES OF CHROMATIC DESCENTS
PROVIDE LARGE-SCALE STRUCTURE

Violin Concerto—Concentric Paths by Thomas Adès © Copyright 2010 by Faber Music Ltd., London.

Fl. 2

pp

Ob. b

Vla.

Vln. 1

EXAMPLE 11 (CONT.)

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Fl. 1

Bsn.

Tpt. 1

9

EXAMPLE 11 (CONT.)

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MEAS.	PITCH	INSTRUMENT	MEAS.	PITCH	INSTRUMENT
4	G ⁵ , F [♯] ₅	solo vln.	28	A ₄ –G [♯] ₄	vlms. 1 & 2, clar. 1
7	G ^b ₅ , F ₅	solo vln.	29–31	A ₄ –B ^b ₄	ob. 2, vln. 1
9	F ₅	solo vln.	21–33	A ₄ –G [♯] ₄	vln. 1, clars.
10–11	F ₅ –E ₅ , E ₅ –D [♯] ₅ , E ^b ₅ –D ₅	solo vln.	34–36	A ^b ₄ –G ₄	clars.
12–13	D ₅	solo vln.	37	G ₄ –F [♯] ₄	vln. 1, clars.
14	D ₅ –C [♯] ₅	solo vln.	38	F [♯] ₄ –F ₄	solo vln., clars., ob.
15–17	C [♯] ₅ (D ^b ₅)	solo vln., vlms. 1 & 2	39	F ₄ –E ₄	solo vln.
18–20	C ₅	solo vln., vln. 2	40	E ₄ –D [♯] ₄	solo vln.
21	B ₄	vln. 2, winds	41–42	E ^b ₄ –D ₄	solo vln., vln. 1
23	B ₄ –A [♯] ₄	vln. 2	43	D ₄ –C ₄ , C ₄	solo vln., clar. 1, vln. 2
24–25	B ^b ₄	vlms. 1 & 2, solo vln.	44	C ₄ –B ₃	vlms. 1 & 2, clar. 2
26	B ^b ₄ –A ₄	vlms. 1 & 2	45	B ^b ₅	fl. 1, clar. 1, vln. 2, solo vln.
27	A ₄	vlms. 1 & 2			

EXAMPLE 12: A CHROMATIC DESCENT LISTED ACCORDING
TO MEASURE, PITCH, AND INSTRUMENT

occasional octave leaps) from m. 4 until m. 90 (three measures before Rehearsal 9), where it vanishes for a measure. The chromatic cable breaks off with a B₅ in the viola. In m. 91 the clarinet and solo violin have B^b₄ which initiates a chromatic line that now ascends until m. 110, then descends again briefly until m. 113 (nine measures from the end of the movement), at which point the solo violin begins to rage wildly through Hex_{2,3} (see Example 7). It would appear that during mm. 4–91 *almost* every pitch in the score is succeeded only a short time later by a pitch (not just pitch class) a semitone lower.

Countering the decay of chromatic descent is the tendency to leap by a major seventh. The first important occurrence of this is the soloist's

leap from B \flat 5 to A6 across the seam of mm. 12–13. The highest pitches in the soloist's arpeggios have been sliding down by semitone at the rate of approximately one semitone every two to three measures. But the highest line touches B \flat 5 for only the last sixteenth note of m. 12 before it is catapulted eleven semitones to A6, as if that B \flat 5 was infused with an explosive energy. Building towards this leap the soloist *crescendos* up to *forte* and then to *fortissimo* on the A6, the highest dynamics yet. After the leap, the slurred bowing in groups of two to thirteen notes give way to bowing each sixteenth-note individually. In PC space the harmony continues to sink chromatically from m. 12 to m. 13. But the leap of eleven semitones provokes a pivot in *pitch* space around the D5: the G3 of m. 12 is reflected up to A6 in m. 13, each a perfect twelfth away from D5. This suggests interpreting the transformation from [237T] at the end of m. 12 to [1269] in m.13 as being enacted not by sliding down by T_E but by inverting by T₄I. The existence of two distinct transformations sending [237T] to [1269] is equivalent to the fact that T₅I is a symmetry of [237T]. Throughout *Rings* one finds the contrast of descending chromatic lines and explosive upward leaps.¹⁹ Of course the transition to a higher register also prolongs the chromatic descent which otherwise would be cut off by the lower limits of the violin's register.

CLIMACTIC ALIGNMENTS

Pitch class [T] plays a structural role throughout the work—it is a harbinger of the climactic alignments. In this sense, *Rings* is a [T]-centric work or, using a term introduced by the composer himself, we might call B \flat a “fetish note.” At the end of m. 20 (see Example 9), at the first climactic chord, the soloist launches up to B \flat 7, holding it for seven sixteenth notes and initiating a phrase where each note is held for seven sixteenth notes. The accented notes of this outer orbit melody are B \flat 7 and A7. This pitch pair satisfies three projected expectations: 1) The constant tendency for pitches, or in this case pitch classes, to decay by semitone; 2) In the sequence of highest notes, B \flat was essentially skipped over and now it is filled in, achieving a sort of gap-filling with respect to temporal expectations; 3) The dynamic increases to triple-*forte* with the arrival of B \flat 7, continuing the association of B \flat with high-energies that was initiated in m. 12. (See the discussion in the last section for more detail.)

The PC [T] continues to be pivotal. The pitch classes of the soloist's melody, beginning in m. 20 (see Example 9), are [T, 2, 3, 9, 2, 1]. After this the soloist returns to a faster orbit for mm. 24–25 where it

once again happens upon a B \flat (B \flat 4) that launches it into an outer orbit.²⁰ Although the resolution/decay of B \flat 4 to A4 occurs in m. 26 as part of a chord that stretches from G3 to E \flat 7, what we are more aware of is that the soloist left off with a B \flat 4 in m. 25 and is launched up to E \flat 7 on the climactic alignment on the downbeat of m. 26. Pitch-class [T] has similar functions at m. 30 and m. 45. We will return to the significance of the pair B \flat –E \flat shortly.

When the music resets around m. 92, a B \flat is present at the beginning of the chromatic *ascent* that balances the previous *descent*. At the first big climax after the reset, in m. 110, the soloist lands on B6 but soon arrives on B \flat 6 with a *tenuto* mark, once again adding weight to this pitch class, even though its role is not as central as in earlier climaxes. The piece ends on a Hex_{2,3} chord with the soloist landing on B \flat 3. Thus PC [T] plays a dominant role in the early climaxes and in the final chord, where it also appears in the oboes, clarinets, and trombones—it is the PC most doubled in the final chord.

These instances of B \flat do not exhaust its significance. We will return to its large-scale structural role after a broader discussion of the climaxes.

The alignment of celestial bodies has immediate physical consequences. When the Earth-Moon-Sun system forms a syzygy it causes Moonquakes and leads to the stronger *spring tides*²¹ on Earth. In *Rings*, the alignment of the orbiting instruments also leads to a *spring tide*, manifested in periodic climaxes of explosive power (see Example 13).

In *Rings* the periodic swells to climactic chords release tension. They function not so much like harmonic cadences from tonal music, but like explosive releases of energy resulting from the alignment of the various orbiting *instruments*. Example 13 catalogs the harmonies that occur at these climaxes. While Hex_{2,3} obviously plays an important role, it is more difficult to understand the logic of the harmonies at the other climaxes. One possibility is that we should view these harmonies as snapshots of a pitch process. Sometimes the snapshot captures the pitch structure clearly, but other times a single still frame is misleading, and an analysis tracing the paths of individual voices (moving with their own sense of time) would be necessary to find the *cause* for a harmony to sound at a given climax. What is common to all of these climaxes is that they catapult the soloist, and sometimes other instruments as well, into outer orbits. The slower pace of the outer orbits provides a sense of repose after a climax—the mad rush continues on but we are now observing it from a distant orbit and so are less affected by it.

MEAS.	PITCH-CLASS SET	PRIME FORM	SOLOIST-EJECTION
20	Hex _{2,3}	(014589) 6-20	B \flat 7
26	[9T02357]	(013468T) 7-34	E \flat 7
28	[4568T0]	(012468) 6-22	D7→B \flat 7
34	[35790]	(02469) 5-34	
38	[6T1]	(037) 3-11	B \flat 7→B3
45	[35679T]	(013457) 6-Z10	A \flat 4 . . . G \flat 6
59	[E0134578]	(01245689) 8-19	C6→G6
62	[369TE]	(01258) 5-Z38	E6→B \flat 7
110	[234679TE]	(0124578) 8-20	E \flat 6→B6→G7
114	[13569T]	(014579) 6-31	F6→D \flat 8
115	[7E2]	(037) 3-11	F \sharp 7→B7
116	[T23]	(015) 3-4	B \flat 3→G4
117	[7T2]	(037) 3-11	D7→D \flat 8
118	[T23]	(015) 3-4	D4→E \flat 5
119	[27] and [67E]	(015) 3-4	D6→E \flat 7
120	Hex _{2,3}	(014589) 6-20	D7→B7, B5→E \flat 7
121–22	Hex _{2,3}	(014589) 6-20	G6→B7

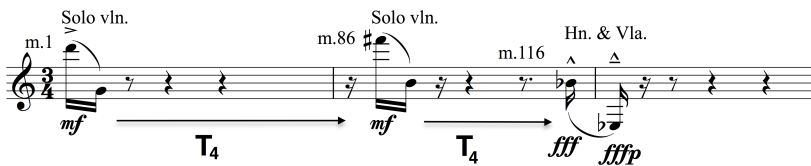
EXAMPLE 13: CLIMACTIC ALIGNMENTS AND THE RESULTING EJECTIONS
OF THE SOLOIST INTO AN OUTER ORBIT

HEXATONIC COMPLETION

Ligeti's *Automne à Varsovie* has a central section of calm involving a slow line with an immense octave-displaced tritone doubling. The octave displacement imparts the sense of a vast space. Beginning with the climax at m. 62 in *Rings*, the soloist climbs (or is flung?) higher and higher (passing through a scintillating violin-piccolo duet) until it comes to rest on an E7 (harmonic). At m. 86 it becomes clear that we have made a return to the opening of the work: the soloist has rapid perfect twelfths in a similar register as the opening measures. However, it is not a circle we have made, but a *spiral*.²² The soloist has F \sharp -B instead of D-G and the low B0 in the double bass creates the sense of having achieved a great height. In m. 93 the winds introduce impurities to the F \sharp -B crystal and the soloist follows, now sweeping out

[237T] (0158) with its racing arpeggios instead of the [67E2] (0158) at the opening of the work. This time the harmonies are transformed by T_1 instead of the T_{-1} process that guided the first two-thirds of the work. The movement has something of a U-shape: harmonies sink by T_{-1} until about m. 60; there is a calm repose from mm. 86–92; and then the harmonies transform by T_1 from m. 92 until close to the end of the work. The spiral nature arises from the T_E catapults: the bottom of the U is perceived from a great height.

The large-scale structure composes out the set $\text{Hex}_{2,3}$ (see Example 14). Recall the opening twelfths D–G and the subsequent $F\sharp$ –B from Flute 2 in m. 3. With hindsight we see that the $B\flat$ – $E\flat$ needed to complete the hexatonic set is withheld. Taking a larger perspective, the opening descending twelfth is D–G and the return to this texture at m. 86 uses $F\sharp$ –B. What is missing, to complete the hexatonic set, is the $B\flat$ – $E\flat$. Of course we hear much of $B\flat$ and $E\flat$ throughout the work, but a decisive statement of these two pitch classes as a descending twelfth is withheld. The finale completes the set $\text{Hex}_{2,3}$ and includes the $B\flat$ – $E\flat$ in a sequence of descending twelfths. Griffiths hears the ending as “a new rotating machine, of loud stuttering chords from the full orchestra” that “cuts the soloist off.”²³ The “rotating machine” he refers to is presumably the repeating sequence of descending perfect twelfths, D–G, $F\sharp$ –B, $B\flat$ – $E\flat$, that fill out $\text{Hex}_{2,3}$ (see Example 15). Parsing the hexatonic scale into a T_4 -cycle of perfect fifths also appears at the opening of *Arcadiana*.²⁴ There the progression is stated completely, as opposed to *Rings*, where a clear statement of the complete cycle of perfect fifths is withheld until the end of the movement. In the last measures of *Rings* the orchestra cycles through this sequence of twelfths as the soloist thrashes wildly through $\text{Hex}_{2,3}$. The completion of the cycle of fifths creates a rounded form, though a spiral one rather than a circular one.



EXAMPLE 14: LARGE SCALE HEXATONIC COMPLETION

EXAMPLE 15: THE HEXATONIC “ROTATING MACHINE”

The $B\flat$ - $E\flat$ has played a less obvious structural role even before the finale. The soloist's outer orbit melody of m. 20 begins on $E\flat$ and the slightly more heliophilic orbit of m. 26 begins on $B\flat$, thus completing the hexatonic sequence of fifths from the opening measures. This type of relation appears in a somewhat diluted form in the pair of m. 30 and 35, and again in m. 62. One sees the gradual alignment of orbits, climaxing in the explosive triple alignment of the hexatonic fifths, first in the initial climax of *Rings* (m. 20) and finally in the terminal chord of the movement.

Although Adès's interest in hexatonic sets has been thoroughly investigated by Roeder,²⁵ I am not aware of an exposition in the literature discussing the sort of movement-length hexatonic completion described above. *Rings* is built around a movement-long composing-out of the T_4 -cycles of perfect fifths that appear in various movements of *Arcadiana*.

CONCLUSION

Adès states that in his work, “The form is a result of the inner music.”²⁶ Though one might also interpret this in a more philosophical light, in *Rings* the microscopic details do shape the form of the music: the initial decay of a note descending a minor second initiates a process which directs the structure of the movement. The existence of multiple time-scales causes the processes to diverge from one another and then realign, like orbiting planets. Adès’s music is filled, sometimes saturated, with the unfolding of simple processes. Roeder analyzes examples of expanding pitch-interval processes, decreasing durational processes, and multi-dimensional pitch transformation processes;²⁷ he also uses physical processes (e.g. “the inexorable trickle of raindrops down a window-pane”) as metaphors for Adès’s music.²⁸ Joshua Banks Mailman claims that “processes in music often depict narratively significant natural forces or physical processes. . . .”²⁹ The association of musical processes with physical processes is, in part, what makes effective the use of physical analogies to characterize aspects of the music of Adès and Ligeti.

The initial decay of a note descending a minor second is pursued over the first two-thirds of *Rings*. The prolongation of such a simple pattern over that time-scale is a procedure more often found in minimalist process music. In particular, the unwinding of the chromatic suspension-cables that underlies the structure of *Rings* is reminiscent of the process used in Alvin Lucier’s *Crossings* (1984). In *Crossings*, a pure sine tone modulates in frequency from the infrasonic to the ultrasonic over sixteen minutes. Using a divided orchestra to hocket, the pitches of a rising chromatic scale are introduced just higher than the sine tone, creating accelerations and de-accelerations of beats. In *Rings* the descending or ascending chromatic cables that thread the orchestra parallel the modulating sine tone in *Crossings*; the oscillations between neighboring chromatic tones in *Rings* are analogous to the orchestral pitches and resulting beats of *Crossings*. Both pieces are concerned with alignments and both acknowledge the significance of the spatial location of the source of music through a pervasive use of hocketing. Furthermore, *Rings* and *Crossings* both probe the extremes of register.³⁰

Adès’s music reflects the current “mental climate”³¹ in that it engages with musical process just as we are all prompted to engage with the notion of physical process through a scientific understanding of the world. Such an association is suggested by the composer’s own common use of scientific analogies, a few of which were quoted at the beginning of this article. The use of the *physical process* of planetary motion as a metaphor for the structure of *Rings* is analogous to but

distinct from the use of a *narrative* as a metaphor for music; it diverts our focus away from a perception of agency within the music and towards a perception of causality within the music. Mailman uses Lucier's *Crossings* to illustrate the narrative possibilities of minimalist process music.³² He suggests that minimalist process music implies a sense of agency outside of the time frame of the music and provides an opportunity for the listener to engage in "ad hoc imaginative play."³³ In *Rings* Adès composes both the "process" of the chromatic suspension cables and the "imaginative play" of arpeggios and melodic lines.

Using the opening of Adès's *Piano Quintet*, Emma Gallon illustrates how a process guided by pitch continuity may override conventional expectations of harmonic material within sonata form.³⁴ She sees the processes within the music as estranging the traditional sense of agency often ascribed to the themes of sonata form. Gallon makes the striking argument that, in the *Piano Quintet*, the agent is "time."³⁵ Both Gallon and Mailman find that processes within music distance the sense of agency from its traditional locus within the music.

A sense of stepping outside of the music has been invoked in other ways with regard to Adès's work. Roeder poetically interprets the end of *Arcadiana* as the transfiguration of "mortal linearity" into "eternal periodicities."³⁶ That moment would also seem to be an example of what Taruskin called "a serene overview of the preceding music, as if from a great height."³⁷ That serene moment arrives in the middle of *Rings* when, once again, there is a sense of looking down from a great height, or of looking inward from a distant orbit. The central placement of this calm moment follows the form Ligeti constructed in *Automne à Varsovie*.³⁸ The explosive end of *Rings* contrasts sharply with the serene ending of *Arcadiana*, but *Rings* also undergoes a convergence to "periodicities." In m. 115 of *Rings* the orchestra initiates the T₄-cycle of descending twelfths that fill out hexatonic space. The soloist saturates the aggregate before the orchestra captures it in a hexatonic trap where the soloist thrashes wildly in pitch space, but with regular periodicity in pitch-class space. Whereas *Automne à Varsovie* terminates with a saturation of chromatic space, *Rings* concludes with the soloist saturating the hexatonic space that is constructed in cadential gestures by the orchestra. Adès has suggested that all of Ligeti's pieces are tending toward "the heat death of the universe." If one is limited to the twelve chromatic tones, then saturating the aggregate reaches towards a type of total disorder. Adès distinguishes himself from Ligeti by claiming that his own pieces escape from the "vanishing point" of "total entropy."³⁹ While *Rings* grapples with dissipative effects that push towards disorder, it is rescued from the disorder of the aggregate by a high-energy hexatonic (strange) attractor.

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NOTES

1. Thomas Adès and Tom Service, *Thomas Adès: Full of Noises, Conversations with Tom Service* (New York: Farrar, Straus and Giroux, 2012), 3, 10.
2. Ibid., 88–89.
3. Thomas Adès, *Concentric Paths* (London: Faber, 2010).
4. Adès and Service, *Thomas Adès: Full of Noises*, 138.
5. Dominic Wells, “Plural Styles, Personal Style: The Music of Thomas Adès,” *Tempo* 66 (2009), 7.
6. This process brings to mind Beethoven’s Opus 111. In m. 11 of the first movement of the sonata the repeated G note is like a crystal, and the introduction of the A \flat is the impurity—it causes a wave of disturbance to propagate downwards. Later this walk down from the b6th degree to the tonic is developed into a theme.
7. Wells says that the F \sharp “infects” the pitch material. See Wells, “Plural Styles,” 12.
8. I will use “T” and “E” for the respective pitch classes B \flat and B.
9. Adès and Service, *Thomas Adès: Full of Noises*, 25.
10. Paul Griffiths observed that Adès “. . . initiates a perpetual motion machine in running semiquavers and at the same time introduces what Mahler might have called a ‘nature sound,’ a raw acoustic fact gleaming from the whole first movement’s horizon.” Paul Griffiths, “Violin Concerto,” *The Times Literary Supplement*, 16 September 2005; p. 20; Issue 5345.
11. Richard Taruskin, “A Surrealist Composer Comes To the Rescue of Modernism,” *The New York Times*, 5 December 1999, <http://www.nytimes.com/1999/12/05/arts/a-surrealist-composer-comes-to-the-rescue-of-modernism.html>.
12. This means that not all steps of “size 1” within the mode contain the same number of equally tempered chromatic semitones.
13. This is an example of *generalization* in the sense defined by Straus in “Remaking the Past,” p. 17.
14. “Strange attractor,” accessed 2 July 2013, http://www.encyclopediaofmath.org/index.php?title=Strange_attractor&oldid=26959.

15. Florin Diacu and Philip Holmes, *Celestial Encounters: The Origins of Chaos and Stability* (Princeton: Princeton University Press, 1996).
16. Griffiths, "Violin Concerto," 20.
17. It requires slight calculation to reach this conclusion. That is because the distance traveled also increases with the size of the orbit so that it might be that the two factors balance out and the average speed is constant for all orbits. That this is not the case can be seen for circular orbits using a bit of algebra: For a circular orbit, a is the radius of the circle. An object traversing the circumference of a circle of radius a travels a distance of $2\pi a$ during the period T . Thus the average speed S (given by the ratio of the distance traveled and the time needed to travel that distance) is $S=2\pi a/T=2\pi a/a^{3/2}=2\pi a^{-1/2}$. The average speed decreases as the inverse square root of the radius of the orbit. Due to the rotational symmetry of the circular orbit, the average speed is also the instantaneous speed.
18. John Roeder, "Co-operating Continuities in the music of Thomas Adès," *Music Analysis* 25/1–2, 135.
19. A "fuzzy" inversion might be taking place in the soloist's material in mm. 41–42. The sc in each measure is (01568). Set [2378T] transforms to [9T235] via T_7 . It is interesting to note that $T_5I[2378T]=[79T23]$, which differs from the desired result only by the presence of [7] in place of [5]. Thus there appears to be an approximate pivot around the [23]-axis, similar to the pivot around [2] found in mm. 12–13. Note that $T_5I[2378]=[239T]$.
20. This Bb4 can be traced back chromatically to the B4–A#4 of the orchestral violins in m. 24, which in turn traces back to the C5 carried by Vln. 2 in mm. 18–20 (before the cataclysmic alignment) and which was also carried by the soloist in m. 18.
21. "Spring" here refers to the "jump" in the size of the tides, not the season. These *spring tides* occur approximately twice per month.
22. The composer has offered, "In my music it's very often spiral rather than circular." Adès and Service, *Full of Noises*, 8.
23. Griffiths, "Violin Concerto," 20.
24. See Examples 3a and 3b in Roeder, "Co-operating Continuities," 128. Dominic Wells characterizes such pitch structures as a "5+2" progression and provides many examples of them in Adès's work. See Wells, "Plural Styles, Personal Style: The Music of Thomas Adès," 12.

25. Roeder, "Co-operating Continuities," 128. Also see John Roeder, "A Transformational Space Structuring the Counterpoint in Adès's 'Auf dem Wasser zu singen,'" *Music Theory Online* 15/1 (2009), 2.3.
26. Adès and Service, *Thomas Adès: Full of Noises*, 131.
27. Roeder, "Co-operating Continuities," 125–27.
28. Roeder, "Co-operating Continuities," 135–37.
29. Joshua Banks Mailman, "Agency, Determinism, Focal Time Frames, and Processive Minimalist Music," in *Music and Narrative Since 1900*, ed. Michael L. Klein and Nicholas Reyland, (Bloomington: Indiana University Press, 2013), 140.
30. Adès is famous for his use of the outer limits of register. For other examples of his use of extreme upper registers, see the music of Ariel in *The Tempest* or the music of the cello in *Lieux Retrouvés*. For low register extremes, see the music of the Duke and Hotel Manager in *Powder Her Face*, or listen to his *basso profundo* voice in an interview.
31. J. W. N. Sullivan, *Beethoven: His Spiritual Development*, (New York: Vintage Books, 1927), 7.
32. Mailman, "Agency, Determinism, Focal Time Frames, and Processive Minimalist Music," 137.
33. Mailman, "Agency, Determinism, Focal Time Frames, and Processive Minimalist Music," 141.
34. Emma Gallon, "Narrativities in the Music of Thomas Adès," in *Music and Narrative Since 1900*, ed. Michael L. Klein and Nicholas Reyland (Bloomington: Indiana University Press, 2013), 216.
35. Emma Gallon, "Narrativities in the Music of Thomas Adès," 223.
36. Roeder, "Co-operating Continuities," 147.
37. Taruskin, "A Surrealist Composer Comes To the Rescue of Modernism."
38. A precursor of this calm center is also found in the aria "Fancy, fancy being rich" from Adès's first opera, *Powder Her Face* (1995).
39. Adès and Service, *Thomas Adès: Full of Noises*, 139.

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