

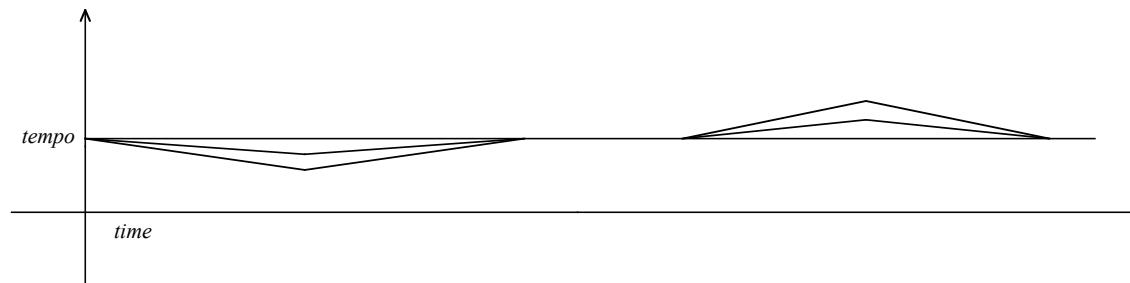
Metamorphoses

Canon a 3 for solo cello and real-time computer delay
or cello trio

2007

Clifton Callender

Metamorphoses is a three-part canon for solo cello and real-time computer-assisted delay that explores the simultaneous presentation of multiple independent accelerandos and ritardandos. (This is accomplished with variable tap delays in Max/MSP.) The solo cello and two “virtual” cellos begin at the same time and in the same tempo, M.M. = 120. The virtual cellos gradually slow to tempos of M.M. = $114\frac{2}{3}$ and M.M. = $109\frac{1}{3}$ over the course of the first 90 seconds. Reversing this process, the virtual cellos return to their original tempos three minutes into the piece, but lagging behind the solo cello by four and eight beats. The second half of the piece inverts this process with the virtual cellos accelerating to tempos of M.M. = $126\frac{2}{5}$ and M.M. = $132\frac{4}{5}$ before returning to M.M. = 120. The piece concludes with all three voices converging on melodic and rhythmic unisons. The following figure graphs the tempo design of the work:



While the sound is entirely acoustic, the computer is absolutely essential to the composition, generation, and realization of the work.

Metamorphoses may also be performed by solo cello with prerecorded virtual cellos or as a canon for three live cellist, each listening to a separate click track. (A non-canonic version for solo cello is also available by contacting the composer at clifton.callender@fsu.edu.) However, the work is ideally performed with solo cello and real-time computer so that the performance of the canon line is “echoed” in every detail.

Metamorphoses was premiered by Evan Jones. My thanks to both Evan Jones and Craig Hultgren for their expert cello advice.

Tempo indications

While the starting tempo is indicated as 120 beats per minute, a range of initial tempos is possible from 96 to 120. All other tempo indications are relative to a starting tempo of 120; a slower initial tempo would necessitate proportionally slower subsequent tempos.

Tempos in the “second” and “third” cellos are often accompanied by variables that modify the tempo of the solo cello part. These variables are defined as below (with t measured in minutes):

$$a_1(t) = \frac{-3\frac{5}{9}t + 120}{120},$$

$$a_2(t) = \frac{-7\frac{1}{9}t + 120}{120},$$

$$b_1(t) = \frac{3\frac{5}{9}(t - \frac{3}{2}) + 114\frac{2}{3}}{120},$$

$$b_2(t) = \frac{7\frac{1}{9}(t - \frac{3}{2}) + 109\frac{1}{3}}{120},$$

$$c_1(t) = \frac{\frac{v_1}{l}|t - t_0| + v_1 + 120}{120}, \text{ and}$$

$$c_2(t) = \frac{\frac{v_2}{l}|t - t_0| + v_2 + 120}{120},$$

where $t_0 = \frac{321211}{60000}$, $l = \frac{321211 - 245000}{60000}$, $v_1 = 8/l$, and $v_2 = 16/l$.

All indicated accelerandos and ritardandos, such as those on pages 14 and following, are *linear*.

Click tracks are available upon request.

Metamorphoses
Canon a 3 for cello(s)

Clifton Callender

legatissimo (change bow as necessary)
motto sul tasto

$\text{♩} = 120$

vc 1:

$\text{♩} = 120 \text{ qd}$ *
vc 2:

$\text{♩} = 120 \text{ qd}$ *
vc 3:

ppp cresc.

al p cresc.

al p cresc.

al p cresc.

* See notes regarding tempos with variables.
Click tracks are available from the composer.

Handwritten musical score for two staves, measures 18-25. The score consists of two staves, each with five systems of music. The key signature varies between measures, including F major, G major, A major, B major, C major, D major, E major, F# major, G# major, A# major, B# major, C# major, D# major, E# major, F major, G major, A major, B major, and C major. Measure 18 starts with a dynamic of *f* and a crescendo of *sub. mp cresc.*. Measures 19-20 start with *al mf*, measure 21 with *f* and *sub. mp cresc.*, and measure 22 with *al mf*. Measures 23-24 start with *f* and *sub. mp cresc.*, and measure 25 with *al mf*.

Measure 18: *f* *sub. mp cresc.*

Measure 19: *al mf*

Measure 20: *al mf*

Measure 21: *f* *sub. mp cresc.*

Measure 22: *al mf*

Measure 23: *f* *sub. mp cresc.*

Measure 24: *al mf*

Measure 25: *f* *sub. mp cresc.*

poco a poco norm.

norm.

a)f

poco a poco norm.

norm.

a)f

poco a poco norm.

norm.

a)f

slow → fast

5

slow → fast

fp

A handwritten musical score consisting of three staves. The top staff uses a bass clef, the middle staff an alto clef, and the bottom staff a treble clef. The music is written in common time. Various dynamics and performance instructions are included, such as 'tr' (trill), 'fast', 'fp' (fortissimo), 'f' (forte), 'mf' (mezzo-forte), 'pp' (pianissimo), 's' (sforzando), '3' (three-note chords), '8:7' (a 7-note chord over 8 notes), and 'tr slow' (trill slowly). The score includes several measures of sixteenth-note patterns, eighth-note chords, and sixteenth-note chords.

A handwritten musical score for two staves, likely for a woodwind instrument like oboe or bassoon. The score consists of five measures.

Measure 1: The first staff starts with a dynamic **d**. The second staff begins with a dynamic **ff**, followed by **PPP**. Measures 1 and 2 end with a repeat sign.

Measure 3: The first staff begins with **mf**. The second staff starts with **ff**, followed by **d**, **dd**, **ff**, and **PPP**.

Measure 4: Both staves begin with **ff**. The first staff has a dynamic marking **simile**. The second staff also has a dynamic marking **simile**.

Measure 5: Both staves begin with **ff**. The first staff has a dynamic marking **simile**. The second staff also has a dynamic marking **simile**.

$J = 120$

$J = 120b$

$J = 120b_2$

f

$b \simile$

f

$b \simile$

f

$b \simile$

f

$b \simile$

A handwritten musical score consisting of two staves. The top staff uses a soprano C-clef and the bottom staff uses an alto F-clef. Both staves begin in B-flat major (two flats) and transition through various keys including E major (no sharps or flats), A major (one sharp), D major (two sharps), G major (one sharp), and C major (no sharps or flats). Measure 1 starts with a half note followed by eighth-note pairs. Measures 2-3 show eighth-note patterns. Measures 4-5 feature sixteenth-note patterns. Measures 6-7 continue with sixteenth-note patterns, with measure 7 concluding with a dynamic ff (fortissimo).

A handwritten musical score consisting of two staves, each with five lines. The music is in common time. Measure 7 starts with a forte dynamic (ff) and includes slurs and grace notes. Measures 8 and 9 show eighth-note patterns with dynamics ff, mf, and ff. Measure 10 contains sixteenth-note patterns with dynamics f, ff, ff, and ff. Measures 11 and 12 feature eighth-note patterns with dynamics ff, ff, ff, ff, ff, and ff. Measure 13 includes eighth-note patterns with dynamics ff, ff, ff, ff, ff, ff, ff, and ff. Measure 14 concludes with eighth-note patterns and dynamics ff, ff, ff, ff, ff, ff, ff, ff.

Handwritten musical score consisting of two staves, 7: and 11:, written on five-line staff paper.

Staff 7:

- Measure 1: $m\int$, dynamic p , dynamic mp , dynamic pp , dynamic p .
- Measure 2: dynamic f , dynamic ff , dynamic mf , dynamic f , dynamic mp , dynamic mf , dynamic p , dynamic mp .
- Measure 3: dynamic $m\int$, dynamic fff , dynamic f , dynamic ff , dynamic mf .
- Measure 4: dynamic f , dynamic p .
- Measure 5: dynamic pp , dynamic p , dynamic pp , dynamic p .
- Measure 6: dynamic f , dynamic mp , dynamic mf , dynamic p , dynamic mp , dynamic pp , dynamic p .
- Measure 7: dynamic mf , dynamic f , dynamic ff , dynamic f , dynamic 6 , dynamic 6 .
- Measure 8: dynamic f , dynamic p .
- Measure 9: dynamic ppp , dynamic f .

Staff 11:

- Measure 1: dynamic p , dynamic b , dynamic $\#$.
- Measure 2: dynamic f , dynamic p .
- Measure 3: dynamic ppp , dynamic b , dynamic $\#$.
- Measure 4: dynamic f , dynamic p .
- Measure 5: dynamic ppp , dynamic b , dynamic $\#$.
- Measure 6: dynamic f , dynamic p .
- Measure 7: dynamic ppp , dynamic b , dynamic $\#$.
- Measure 8: dynamic f , dynamic p .
- Measure 9: dynamic ppp , dynamic b , dynamic $\#$.

L. = $\text{d} = 80$ accel.

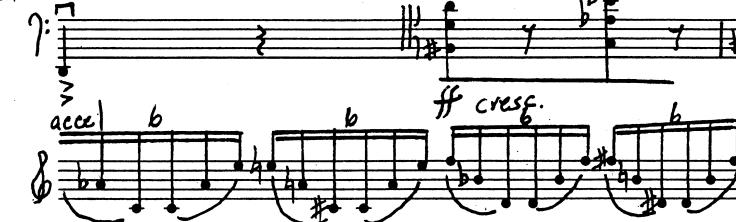
$\text{a1 } d = \text{d} = 80$ accel.

 $\text{d. } d = \text{d} = 80b_1$ accel.
 $\text{d. } d = \text{d} = 80b_2$
 $\text{d. } d = \text{d} = 80b_3$
 mf
 $\text{a1 } d = \text{d} = 80$ accel.
 accel.
 $\text{a1 } d = \text{d} = 80b_1$ accel.
 $\text{a1 } d = \text{d} = 80b_2$ accel.
 $\text{a1 } d = \text{d} = 80b_3$ accel.
 $\text{a1 } d = \text{d} = 80$ accel.
 ff cresc.
 $\text{a1 } d = \text{d} = 80b_1$ accel.
 $\text{a1 } d = \text{d} = 80b_2$ accel.
 $\text{a1 } d = \text{d} = 80b_3$

a1 $\text{d} = \text{b} = 80$ accel.



a1 $\text{d} = \text{b} = 80b$, accel.



very slow, continuous glissando

a1 $\text{d} = \text{b} = 80$ accel.



ffff decrease.

a1 $\text{d} = \text{b} = 80b$, accel.



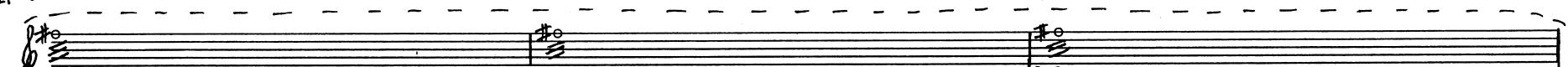
a1 $\text{d} = \text{b} = 80$ accel.

a1 $\text{d} = \text{b} = 80b$, accel.

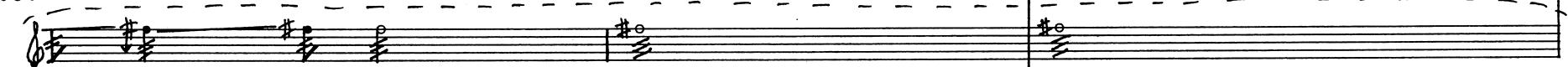


ff cresc

3:2
a1 $\text{d} = \text{b} = 120$

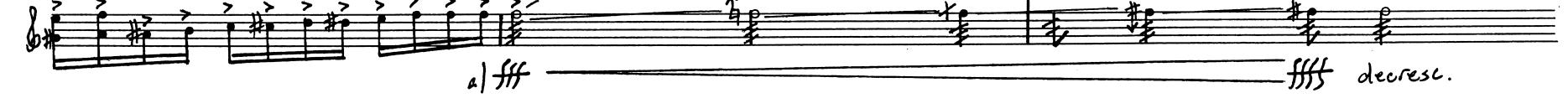


a1 $\text{d} = \text{b} = 80$ accel.



ffff decrease.

a1 $\text{d} = \text{b} = 80$ accel.



a1 $\text{d} = \text{b} = 80$ accel.

ffff decrease.

A handwritten musical score for three staves, likely for a woodwind ensemble. The score consists of three systems of music, each with a key signature of one sharp (F#). The first system starts with dynamics p and includes a tempo marking $a) d = \text{♩} = 120$. The second system begins with mf dynamics. The third system begins with p dynamics. Each system features melodic lines with various note heads (circles, dots, crosses) and rests, separated by vertical dashed lines. The score concludes with a final dynamic marking p .

simile *jeté* *f* *p*

mf *p* *simile*

mp *mf* *p*

I II *molto sul tasto*

poco a poco dim.

f *p* *f* *p*

mf *p*

simile

I II *molto sul tasto*

poco a poco dim.

f *p* *f* *p* *I II*

al ppp $\text{II } \text{d} = 68$ III esp.
 $\text{I } \text{o}$
 al ppp
 poco a poco dim.
 $\text{II } \text{d} = 76$ III esp.
 $\text{I } \text{o}$
 $\text{II } \text{d} = 68$ poco
 $\text{II } \text{d} = 68$ III esp.
 $\text{I } \text{o}$
 $\text{II } \text{d} = 76\text{c}$
 $\text{I } \text{o}$
 $\text{II } \text{d} = 68\text{c}$
 $\text{I } \text{o}$
 $\text{II } \text{d} = 76\text{c}$
 $\text{I } \text{o}$
 $\text{II } \text{d} = 84$
 $\text{II } \text{o}$
 $\text{II } \text{o}$
 $\text{II } \text{o}$
 III esp.
 $\text{I } \text{o}$
 $\text{II } \text{d} = 68\text{c}$
 $\text{I } \text{o}$
 $\text{II } \text{d} = 68$
 $\text{I } \text{o}$
 $\text{II } \text{d} = 84\text{c}$
 $\text{II } \text{o}$
 $\text{II } \text{o}$
 $\text{II } \text{o}$
 III esp.
 $\text{I } \text{o}$
 $\text{II } \text{d} = 68\text{c}$
 $\text{II } \text{o}$
 $\text{II } \text{d} = 76\text{c}$
 III esp.
 $\text{I } \text{o}$
 $\text{II } \text{d} = 76\text{c}$
 $\text{I } \text{o}$
 $\text{II } \text{d} = 68\text{c}$
 $\text{I } \text{o}$

II^o o o
 mp p

→ $\text{♩} = 68$ → $\text{♩} = 108$
 III^o o o #^o I^o
 p mp mf

II^o, → $\text{♩} = 68\text{c}_1$, → $\text{♩} = 108\text{c}_1$, → $\text{♩} = 68\text{c}_1$,
 p mp p

→ $\text{♩} = 84\text{ca}$, II^o o o → $\text{♩} = 68\text{c}_2$,
 p mp p

→ $\text{♩} = 68$ → $\text{♩} = 116$
 mp

→ $\text{♩} = 108\text{c}_1$, → $\text{♩} = 68\text{c}_1$,
 p mp

→ $\text{♩} = 100\text{c}_2$, → $\text{♩} = 68\text{c}_2$,
 mp p

→ $\text{♩} = 68$
 mp

I^{#o} o o #^o
 mf mp

→ $\text{♩} = 116\text{c}_1$, → $\text{♩} = 68\text{c}_2$,
 p mp

→ $\text{♩} = 108\text{c}_2$, → $\text{♩} = 68\text{c}_2$,
 mp p

A handwritten musical score consisting of ten staves of music. The music is written on a single staff system, with each staff starting with a clef (F, C, or G) and a key signature. The tempo is indicated by a 'd' over a number (e.g., d=132, d=68, d=136c1, d=136c2, d=116c2). Dynamics include 'mf', 'mp', 'f', 'p', and 'hp'. Performance instructions like 'P' (pizzicato) and 'I', 'II', 'III', 'IV' (likely referring to fingerings) are also present. The score includes several tempo changes and dynamic markings throughout the ten staves.

A handwritten musical score for a string instrument, likely violin or cello, featuring six staves of music. The music is divided into sections by vertical bar lines. Each section includes tempo markings (e.g., $\text{d}=152$, $\text{d}=112$, $\text{d}=160$, $\text{d}=144\text{c}_1$, $\text{d}=90\text{c}_1$, $\text{d}=152\text{c}_1$, $\text{d}=68\text{c}_2$, $\text{d}=144\text{c}_2$, $\text{d}=90\text{c}_2$, $\text{d}=124$, $\text{d}=160$, $\text{d}=136$, $\text{d}=112\text{c}_1$, $\text{d}=160\text{c}_1$, $\text{d}=124\text{c}_1$, $\text{d}=160\text{c}_1$, $\text{d}=112\text{c}_2$, $\text{d}=152\text{c}_2$, $\text{d}=113\text{c}_2$, $\text{d}=160\text{c}_2$, $\text{d}=148$, $\text{d}=160$, $\text{d}=136\text{c}_1$, $\text{d}=160\text{c}_1$, $\text{d}=124\text{c}_2$, $\text{d}=160\text{c}_2$, $\text{d}=136\text{c}_2$, $\text{d}=160\text{c}_2$, $\text{d}=160$) and dynamic markings (e.g., f , mp , p , ff , $pi\text{if}$, $pi\text{idf}$). The score also includes performance instructions like "poco a poco accelerando*" and "d=1". Measure numbers 17 and 18 are indicated at the bottom.

* As tempo increases descending scales morph into glissandos and détaché bowing morphs into (very dense) tremolos with much bowing noise!

glissando

*very dense tremolos with much bowing noise
(pitches are only approximated)*

f possible

f possible

f possible

A handwritten musical score consisting of two staves. The top staff uses a bass clef and has a key signature of one sharp. It contains six measures of music, each ending with a fermata. The bottom staff uses a treble clef and has a key signature of one sharp. It also contains six measures of music, each ending with a fermata. Measures 1-3 of both staves begin with a single note followed by a sixteenth-note pattern. Measures 4-6 of both staves begin with a sixteenth-note pattern followed by a single note. Measure 4 of the bottom staff includes a dynamic marking "ff". Measures 5-6 of the bottom staff include dynamic markings "ff" and "b". Measures 1-3 of the bottom staff end with fermatas. Measures 4-6 of the bottom staff end with fermatas.

*legatissima
molto sul tasto*

fff f

fff f

fff f

mp mp

mp mp

mp mp

A handwritten musical score for six staves. The key signature is A major (no sharps or flats). The tempo is indicated as $\text{♩} = 120$. The dynamics are varied, including *tutti*, *mf*, *pp*, and dynamic markings like *decresc.* and *noise...*. The score includes sections labeled *simile al fine* and *decresc.* The manuscript is written in black ink on white paper.

