geometria situs

(2009-10)
James Saunders
geometria situs was commissioned by Südwestrundfunk for the Donaueschinger Musiktage 2010

First performed by Sylvain Cambreling and the SWR Sinfonieorchester Baden-Baden, Donaueschingen, 17 October 2010.
programme note

Geometria situs is the Latin term adopted for the study of the geometry of place, a field of mathematics which has become known as topology. Topology deals with the spatial properties of an object which remain constant when undergoing deformations such as compression or stretching, but not by cutting or gluing. Some objects may be deformed into each other; the classic example is a coffee cup and a donut, both of which feature a single hole. Topology is also referred to as flat sheet geometry.

In geometria situs, all players operate independently and have a series of pages, each of which features a sustained sound which undergoes a series of gradual changes of timbre and dynamic. Each change is cued by the conductor who marks them at irregularly spaced time points. The material is therefore stretched and compressed depending on its placement in the piece, such that the same material might be differently structured on each hearing.

doneuaeschingen was commissioned by Südwestrundfunk for the Donaueschingen Musiklajge 2010. It was first performed by Sylvain Cambreling and the SWR Sinfonieorchester Baden-Baden, Donaueschingen, 17 October 2010.

instrumentation

Instrumentation is flexible, but could comprise:

3 (3 d.pic), 3 (2 d.cor), 3 (3. d.bcl).3/4.3.3.2/timp.3perc/14.12.10.8.6

percussion required: bass drum, tam tam, vibraphone, crotales
All players will need at least on auxiliary instrument as determined by their selected pages. See below for information.

number of pages

<table>
<thead>
<tr>
<th>instrument</th>
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<td>coffee cup on surface</td>
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<td>cello</td>
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<td>double bass</td>
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Duration: up to 25 minutes.
**preparation**

*geometria situs* comprises a set of pages for orchestral players and time charts for the conductor. The conductor gives cues at each of the time points, which trigger actions and changes in sound by the players.

Pages should be distributed amongst the orchestral players. Where multiples of a single instrument are present (e.g. violas), split the pages evenly amongst them such that all pages are used before duplicates are included. Where there are insufficient pages to provide enough material, players may be given copies of pages already distributed, such that these are also spread evenly before further duplicates are used.

Each player should be provided with instrumental parts for their specific instrument. Each player should also be given at least one auxiliary part as follows:

- **woodwind**  blown tube; cup on surface
- **brass**  blown tube; cup on surface
- **percussion**  bowed polystyrene; bowed wood; bowed plastic cup; cup on surface
- **strings**  bowed polystyrene; bowed wood; bowed plastic cup

Players should source auxiliary instruments themselves, such that a variety of objects are used in a performance. Where possible, avoid duplicating objects used by other players.

Each player is also given a page which indicates their starting point. These pages should be spread evenly amongst players, such that there is an equal spread of each starting timepoint, and that these are also shared evenly amongst the different instrument types.

The conductor selects one of the time charts. For shorter performances, later time points may be omitted. The conductor needs a stopwatch.
The conductor gives cues at each of the time points on the selected timechart. These should be given with a clear downbeat. In between each downbeat, the approximate time to the next timepoint should be indicated so that players can measure the transition of their sounds. This might be achieved by gradually raising the other hand proportionally over the required duration so that it reaches the top of the downbeat at the correct time.

The players all act individually. Their selected pages should be ordered in advance of the performance without reference to choices made by other players. The ordering should be changed for each performance (and rehearsal as appropriate).

Each page of the instrumental parts comprises a single held sound separated into distinct phases by vertical cue points. Each sound changes one parameter (e.g. dynamic, timbre, playing technique) between or at a cue point. Where a sound changes between cue points, this should be an even and gradual transition. Where there is a sudden change (e.g. moving from normal to tremolo bowing), where possible the change should be gradually introduced in advance of or following the cue (e.g. so the tremolo might gradually accelerate to full speed by the cue). Transitions around cue points should in general be smooth.

Players individually select a cue given by the conductor at which to begin their next page. The first cue is provided by the page supplied in the part (i.e. +6 would mean to start on the sixth cue, and +1 would mean to start on the first cue etc.).

After completing their first page, players determine freely when they begin their next page. There must be at least one inactive period for each player between pages however (i.e. the final cue of the preceding page may not also be the first cue of the next). If all pages are used before the performance is complete, they may be reused.

The first of the selected conductor cues becomes cue 1 on the current page. Players complete the page as determined by the duration of the cues given by the conductor. The choice of starting point will therefore affect the duration of each page, and the changes within it.

When there are 10 cues remaining, the conductor will signal this by counting down on their fingers when giving cues. At this point, players may only begin a new page if there are sufficient cues remaining for it to be completed (i.e. if the conductor has signalled ‘4’ remaining cues, pages with five or more cue points may not be started, and the player remains silent until the end).

In general, there should be a relatively uniform sound and balance between all instruments. The low dynamic range should be adjusted appropriately to allow for the correct sound production on the edge of silence at the low end, through to an audible result with enough presence for the performance space at the higher end.

For sounds which need to be interrupted through breaths or bow changes, try to create as smooth a result as possible, and avoid cue points for changes.
performance techniques

transposing instruments
Parts may be played on any related instrument unless specified (e.g. flute parts can be played on piccolo, alto flute etc.). If a transposing instrument is used, the sounding result will vary depending on the transposition.

general instructions

o-pppp(-----)
The sound should be on the edge of silence, and stop and start irregularly, or have an inconsistent quality due to any associated playing techniques (often used on combination with various tremolo or o-pppp markings).

ppp(<>)
The sound should centre on the indicated dynamic, but allow any micro-variations to emerge naturally (do not try to play them though)

wind and brass

[throat]
A very rapid series of single articulations of the air stream in the throat (not a growl or flutter-tongue). The pace should be as fast as possible, to the point where it is hard to control the regularity of the attack.

[air/pitch]
Breath sound with a clear pitch component. Where this is unspecified (single-line stave), any pitch may be selected. Where two-line staves are used, a lower- and higher-pitched breath sound should be selected. Where trills are marked on breath sounds, find a fingering which allows the articulation to be heard clearly.

[air/noise]
Breath sound with little pitch component. Noise tones should be emphasised.

N
Multiphonic. All multiphonics should be relatively pure, with a tendency towards consonant pitch content. Where more than one multiphonic is indicated on a page, each should be different.

A
An alternate, timbre fingering (small microtonal detunings are acceptable). The numbers are based on Peter Veale’s The Techniques of Oboe Playing (Kassel, 1998) and range from 0 (normal fingering) to 5. The higher the number, the more diffuse the result.

[bleed]
Slightly depress or raise a valve from the normal fingering to destabilise the sound. Where a trill line is also indicated, the position of the valve should be slowly varied.

mutes
Mutes are indicated as boxed text. See auxiliary instrument instructions for related markings

flute
[whistle tones]
Conventional whistle tones. Aim for a relatively stable pitch, but accept any occasional oscillations.

[blocked]
Place mouth completely over mouthpiece and blow into instrument.

diamond noteheads
A hollow pitched tone, pure.

oboe/bassoon
[rolling tone]
The rolling tone is obtained by a stronger lip pressure on the reed.
A double trill using a separate trill key for each hand resulting in a faster oscillation.
horn
hand stopping

Where gradual stopping and glissando are indicated, do not compensate for pitch change (allow gliss to occur as a result of stopping). Where gradual stopping only is indicated, compensate for pitch change in order to maintain pitch (timbral change only).

auxiliary instruments

mutes

Mutes are indicated in boxed text for brass instruments. Where mutes are indicated for auxiliary instruments (e.g., blown tubes), either the hand or another appropriate object may be used.

+ closed
o open
★ blocked – as closed, but with extra pressure to seal the tube as much as possible.

A mute tremolo involving a small uneven shaking movement of the mute centred on the position(s) indicated.

bowed wood

Select any piece of wood (timber, found, objects, instruments), and bow as indicated with a string instrument bow. String players may use the wood of their instrument if preferred. Noise tones are preferred.

bowed polystyrene

Select any piece of polystyrene and bow an edge as indicated. When sourcing polystyrene, experiment with size and density to find a rich sound.

[light pressure]
[very slow bow]

Very slow bow movement, producing a series of unpredictable clicks/noise.

bowed plastic cup

A hard, thin plastic disposable drinking glass, preferable with a well defined (sharp) rim. Any size may be used. Bow one side of the rim at an angle of at least 30°, unless indicated. Up and down bow will produce a different sound.

[fast, light pressure]
[bow flat]

Bow flat across cup such that the bow touches the rim on opposing edges.

blown tube

Select any type of straight, open tube, made from any material (e.g., cardboard tube, drinking straw, copper pipe, waste pipe, hose etc.). Any length capable of producing an audible sound may be used. When blowing, an air sound should result, possibly with a slight pitch content. This may be aided by sounding a ‘f’ phonetic into the tube. Do not blow in the manner of a flute or brass instrument. See above for mute information.

coffee cup on surface

A standard card takeaway coffee cup. Any flat surface may be selected to be sampled by the cup (e.g., a metal sheet, polystyrene block, a brick, a wooden tray, felt etc.) using the techniques indicated

\[ U \]

use base of cup on surface

\[ \hat{U} \]

use rim of cup on surface (upside down)
Pull the cup across the chosen surface. Appropriate pressure for the designated volume will be determined by the surface type.

A rapid back and forth friction action
A friction action with a regular circular motion

**percussion**

See auxiliary instruments for other related instructions

A constant long friction action in one direction with the hand pushing the beater/object across the surface. The pushing action should create greater friction resulting unstable jittering, unevenness etc.

A very rapid roll with one stick/hand only (not a conventional two stick/hand) The pace should be as fast as possible, to the point where it is hard to control the regularity of the attack. All rolls should be of this type, whether marked specifically in contrast to other techniques, or where no indication is made.

Lightly damp crotales with finger tips to reduce upper partials.
Lightly damp timpani with finger tips
A plastic-haired washing-up brush with relatively stiff bristles.

**strings**

diamond noteheads
Diamond noteheads indicate a harmonic pressure left hand fingering. The indicated pitch and roman numeral denote the position of the finger and the string to be used. This will produce a range of results from relatively clear harmonics through to (coloured) noise.

damp
Damp all strings lightly with the fingers of the left hand. A coloured pitch/noise sound will result.

bow tailpiece
Bow the tailpiece using the indicated techniques; the sound will vary depending on their specification

bow spike
Place cello on lap and bow near the end of the spike, producing a low-pitched tremolo

**preparations**

Selection and placement of the exact objects to be used when preparing instruments is at the discretion of the players. Aim for maximum variety between players and avoid duplicating preparations where possible. Objects should be inserted and removed from the instrument as quietly as possible.

metal preparation
A small, light piece of metal (e.g. a large paper clip, cutlery, a skewer, metal ruler, small bolt etc.) should be inserted above I and IV and below II and III. The best position will be determined by the combination of instrument and object.

wood preparation
A small light piece of wood (e.g. a lolly stick, pencil, chopstick, toothpick, coffee stirrer etc.) should be inserted above I and IV and below II and III. The best position will be determined by the combination of instrument and object. The wood should force the non-bowed strings to vibrate sympathetically.

card preparation
A small piece of paper or card should be woven between the strings over the fingerboard. The marking ‘card’ indicates that stings/card should be bowed over the card itself (molto sul tasti).

cloth preparation
A small piece of cloth (any type of fabric may be used) should be woven between the strings over the fingerboard. Bow in the conventional manner.
geometria situs

conductor (1)

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</table>
geometria situs

+ 1

James Saunders
+2
geometria situs

+3

James Saunders
+5
geometria situs

+6

James Saunders
+8
geometria situs

James Saunders

+9
geometria situs
flute (2)

[throt]

o-pppp (-----)  ppp

James Saunders
geometria situs

flute (3)

James Saunders
geometria situs

flute (4)
geometria situs
flute (5)
geometria situs

flute (6)

James Saunders
geometria situs
flute (7)

James Saunders
geometria situs
flute (9)

James Saunders
geometria situs
flute (10)

[Diagram with numbered points and musical notations]

James Saunders
geometria situs
flute (11)

* any audible trill fingering
geometria situs
flute (12)

James Saunders
geometria situs

flute (13)

whistle tones

o-pppp (-----)

ppp (<>)

[throat]

o-pppp (-----)
geometria situs

flute (16)

James Saunders
geometria situs

flute (17)

James Saunders
geometria situs
flute (18)

James Saunders

1 2 3 4 5 6 7

o-pppp (----)  ppp (<>)  [throat]  o-pppp (----)
geometria situs
flute (19)
geometria situs
flute (20)

James Saunders

[air/pitch]
[throat]

1

2

3

4

5

6

7

1

2

3

4

5

6

7

o-pppp(----)

ppp(<>)

o-pppp(----)
geometria situs
flute (21)

James Saunders
geometria situs

oboé (3)

James Saunders
geometria situs

oboé (4)
geometria situs

obo[e] (5)

James Saunders
geometria situs

obo (7)

James Saunders
geometria situs

oboë (9)

James Saunders
geometria situs

oboe (10)

James Saunders
geometria situs

oboé (11)

James Saunders
geometria situs

oboé (12)

---

James Saunders
geometria situs

obo (13)

James Saunders
geometria situs

oboae (14)

James Saunders
geometria situs

oboë (15)

James Saunders
geometria situs

oboء (16)

James Saunders
geometria situs

oboe (17)

James Saunders
geometria situs

obo (18)

James Saunders
geometria situs

oboë (19)
geometria situs

oboe (20)

James Saunders
geometria situs
clarinet (1)

James Saunders
geometria situs
clarinet (2)

James Saunders
geometria situs
clarinet (3)
geometria situs
clarinet (6)
geometria situs
clarinet (7)

James Saunders
geometria situs
clarinet (9)

James Saunders
geometria situs
clarinet (11)

James Saunders
geometria situs
clarinet (12)

James Saunders
geometria situs
clarinet (13)

[Diagram with numbered points and annotations]

James Saunders
geometria situs
clarinet (14)
geometria situs
clarinet (15)

James Saunders

[air/pitch]
[throat]

o-pppp (----)

ppp (<>)

o-pppp (----)
geometria situs
clarinet (16)

James Saunders
geometria situs

bass clarinet (1)
geometria situs

bass clarinet (2)
geometria situs
bass clarinet (3)

James Saunders
geometria situs
bass clarinet (4)

James Saunders
geometria situs
bass clarinet (5)

James Saunders
geometria situs
bass clarinet (6)

[air/pitch]
[throat]

o-pppp (----)  ppp (<>)

o-pppp (----)
geometria situs
bass clarinet (7)

James Saunders
geometria situs
bass clarinet (8)
geometria situs

bass clarinet (9)

[air/pitch]
[throat]

1 2 3 4 5 6 7

d-pppp (----)  ppp (<>)  o-pppp (----)
geometria situs
bass clarinet (10)

James Saunders
geometria situs
bassoon (1)

James Saunders
geometria situs

bassoon (2)
geometria situs
bassoon (4)
geometria situs

bassoon (5)
geometria situs

bassoon (6)

James Saunders
geometria situs

bassoon (7)

James Saunders
geometria situs
bassoon (8)

James Saunders
geometria situs
bassoon (9)

James Saunders
geometria situs
bassoon (10)

James Saunders
geometria situs

James Saunders

bassoon (11)

1

o--pppp (----)

2

ppp (<>)

3

4

5

6

7

o--pppp (----)
geometria situs
bassoon (12)

[Diagram of a bassoon with annotations for air/pitch and throat, and dynamic markings for ppp(<>), pppp(----), and PPP(---)].

James Saunders
geometria situs

James Saunders

bassoon (13)
geometria situs

James Saunders

bassoon (14)
geometria situs
bassoon (16)

James Saunders
geometria situs
bassoon (17)
geometria situs

bassoon (18)

James Saunders
geometria situs

horn (1)

James Saunders
geometria situs

horn (2)

James Saunders
geometria situs

horn (3)

James Saunders
geometria situs

horn (4)

James Saunders
geometria situs

horn (5)

James Saunders
geometria situs

horn (6)

James Saunders
geometria situs

horn (9)

James Saunders

1  2  3  4  5  6

mute

[throat]

o-pppp(----)  ppp  o-pppp(----)
geometria situs

horn (14)

James Saunders
geometria situs
horn (15)

James Saunders
geometria situs

horn (16)

James Saunders
geometria situs

corn (17)

James Saunders
geometria situs

horn (18)

James Saunders
geometria situs

horn (19)

James Saunders

1

2

3

4

5

6

stopping mute
[throat]

ô-pppp (----)

ppp

ô-pppp (----)
geometria situs

horn (20)

stopping mute

[throat]

o-pppp (----)

ppp

o-pppp (----)
geometria situs

James Saunders

horn (21)
geometria situs

horn (22)

James Saunders
geometria situs

horn (24)

James Saunders

\[ \text{Diagram with musical notation} \]
geometria situs

trumpet (1)

James Saunders

1

2

wawa [air/noise]
[throat]

3

ppp (<>)

4

pppp (----)

5

6

7

8

ppp (<>)

(----)
geometria situs

trumpet (2)

James Saunders

1

plunger [air/noise]
throat

PPP (<>)

2

3

4

5

6

7

-pppp (-----)
geometria situs

trumpet (3)

James Saunders
geometria situs

James Saunders

trumpet (6)
geometria situs

James Saunders

trumpet (7)
geometria situs

trumpet (8)

James Saunders
geometria situs

trumpet (11)

James Saunders
geometria situs

James Saunders

trumpet (12)
geometria situs

James Saunders

trumpet (13)
geometria situs

James Saunders

trumpet (14)

1
silent

2

3 [throat]

4

5

6

7

ppp (<>)

pppp (----)
geometria situs

James Saunders

trumpet (15)
geometria situs

trumpet (16)

James Saunders

silent

$\text{ppp (\langle \rangle)}$ $\text{o-ppp (----)}$
geometria situs

trumpet (17)

James Saunders

1

2

3

4

5

6

7

silent

o-pppp (----)

ppp (<>)

[ throat]

o-pppp (----)
geometria situs

James Saunders

trompet (18)

cup
[ throat]

\( \text{o-pppp (- - - -)} \)

\( \text{ppp (< >)} \)

\( \text{o-pppp (- - - -)} \)
geometria situs

trombone (1)

James Saunders
geometria situs

James Saunders

trombone (2)

1
plunger +

2

3

4

5

6

o-pppp (----)  ppp  o-pppp (----)
geometria situs

trombone (4)

James Saunders

plunger
[throat]

\( \circ \text{pppp (----)} \text{ppp o-pppp (----)} \)
geometria situs

James Saunders

trombone (6)

1

wawa
[ throat]

2

3

4

5

6

o-pppp (----) | ppp

o-pppp (----)
geometria situs

trombone (7)

James Saunders
geometria situs

James Saunders

bucket

o-pppp (----)  ppp (<>)

1  2  3  4  5  6  7
geometria situs

trombone (9)

straight

ppp (<>)

pppp (----)
geometria situs

trombone (10)

James Saunders
geometria situs
frombone (11)

James Saunders
geometria situs
frombone (12)

1. plunger [air/noise]
   [throat]

2. +

3. +

4. +

5. +

6. +

7. o-ppp (----)
geometria situs

trombone (13)

James Saunders
geometria situs
frombonge (14)

James Saunders
geometria situs
trombone (15)

James Saunders
geometria situs

trombone (16)

James Saunders
geometria situs

trombone (17)

James Saunders
geometria situs

trombone (18)

James Saunders
geometria situs

James Saunders

trombone (19)

bucket

[ throat]

o---pppp

ppp (<>)

o---pppp
geometria situs

James Saunders
geometria situs

trombone (21)

James Saunders
geometria situs

trombone (22)

James Saunders
geometria situs

trombone (23)

James Saunders
geometria situs

trombone (24)

James Saunders

1
[air/noise]
[throat]

++

++

++

++

++

++

++

++

ppp (<>)

-pppp (----)
geometria situs

tuba (2)

James Saunders
geometria situs

James Saunders

tuba (3)

mute

o-pppp (----)    ppp    o-pppp (----)
geometria situs

tuba (4)

James Saunders
geometria situs

tuba (6)

James Saunders
geometria situs

James Saunders
geometria situs

tuba (9)
geometria situs

percussion (1)

James Saunders
geometria situs
percussion (2)

James Saunders
geometria situs

percussion (3)

James Saunders

1. bass drum
   washing-up brush
   (scratch) edge

2. centre

3. [drag]

4. edge

5. ppp (<>)

6. o-pppp (----)

7. 
geometria situs
percussion (4)

1. bass drum
   polystyrene block
   [circle] centre

2. 

3. edge

4. 

5. 

6. centre

7. o-pppp (-----)

ppp (<>)

James Saunders
geometria situs
percussion (5)

James Saunders

tam tam bow

o-pppp (----)

ppp (<>)

o-pppp (----)
geometria situs
percussion (6)

James Saunders
geometria situs
percussion (7)

James Saunders
geometria situs
percussion (8)

1  tam tam  soft stick
   edge

2  

3  centre

4  ppp (<>)

5  -pppp (-----)

6

7  ppp
geometria situs
percussion (9)

James Saunders
geometria situs
percussion (10)

James Saunders

1. bass drum
2. hard stick
3. edge
4. centre
5. o-pppp (----)
6. ppp
7. o-pppp (----)
8. edge
geometria situs
percussion (11)

1
bass drum
rubber mallet
[push]

2

3

4

5

6

o-pppp (----)

PPP

o-pppp (----)
geometria situs
percussion (12)

1. bass drum
   coffee cup n
   [drag]

2. o-pppp (----)

3. [scratch]

4. ppp

5. [drag]

6. o-pppp (----)

James Saunders
geometria situs
percussion (13)
geometria situs
percussion (14)

James Saunders

tam tam
rubber mallet
[push]

1
2
3
4
5
6
7

ppp (<>)

[roll] minimal movement

o-pppp (-----)

PPP
geometria situs
percussion (15)
geometria situs
percussion (16)

1. tam tam
   coffee cup U
   [drag]

2. o-pppp (----)

3. ppp (<>)

4. [scratch]

5. [drag]

6. o-pppp (----)

James Saunders
geometria situs
percussion (17)

James Saunders
geometria situs
percussion (18)

James Saunders
geometria situs
percussion (19)

James Saunders
geometria situs

percussion (21)

James Saunders
geometria situs

percussion (23)

James Saunders

1. vibraphone
   soft stick
   [motor on]

2. 

3. 

4. [motor off]

5. 

6. 

7. o-pppp (----)

ppp

Ped.
geometria situs

James Saunders
geometria situs

timpani (2)

James Saunders
geometria situs

timpani (3)

James Saunders
geometria situs

timpani (4)

James Saunders
geometria situs

timpani (5)

James Saunders
geometria situs

timpani (6)

James Saunders
geometria situs

timpani (7)

James Saunders

1 2 3 4 5 6 7 8

fingers  centre  edge

o-pppp (----) <ppp (<)
geometria situs

timpani (8)

1. fingers
2. edge
3. centre
4. ppp (<>)

James Saunders
geometria situs
blown tube (1)

James Saunders
geometria situs
blown tube (2)

James Saunders
geometria situs
blown tube (3)
geometria situs
blown tube (4)

James Saunders
geometria situs
blown tube (6)
geometria situs
bowed plastic cup (1)

James Saunders
geometria situs
bowed plastic cup (2)

1. plastic cup
   [bow flat

2. V

3. m
   [ heavy]

4. v
   
5. m
   norm.

6. ppp

ppp

mp

ppp
geometria situs
bowed plastic cup (3)

James Saunders

1
plastic cup
[bow]
[fast, light pressure]*

2

3

4
norm.

5

6

*change bow direction as necessary

o-pppp (-----)
geometria situs
bowed plastic cup (4)

1. plastic cup
   [bow]

2. [light pressure]

3. [light pressure]

4. ppp

5. ppp

6. ppp

7. ppp (---)
geometria situs
bowed plastic cup (5)

1 plastic cup [bow]
2
3
4 heavy pressure
5 norm.
6
7

pp pp
geometria situs
bowed polystyrene (1)

[Diagram with musical notation and instructions]
geometria situs
bowed polystyrene (2)

James Saunders
geometria situs

bowed polystyrene (3)

James Saunders
geometria situs
bowed polystyrene (4)

James Saunders
geometria situs
bowed polystyrene (5)

polystyrene
(bow)
(light pressure)

1

2

3 norm.

4

5

6

ppp (<>)

-pppp (----)
geometria situs
bowed wood (1)
geometria situs
bowed wood (2)

James Saunders
geometria situs
bowed wood (3)

James Saunders
geometria situs
bowed wood (5)

James Saunders
geometria situs
bowed wood (7)

James Saunders
geometria situs
bowed wood (8)

James Saunders
geometria situs
coffee cup on surface (3)

James Saunders
geometria situs
coffee cup on surface

James Saunders

1

2

3

4

5

6

7

8

coffee cup

 draggable
geometria situs
coffee cup on surface (5)

James Saunders
geometria situs

1

bow tailpiece

o-pppp (----)

2

3

4

5

violin (1)

James Saunders
geometria situs

violin (2)

James Saunders
geometria situs

violin (3)

James Saunders
geometria situs

violin (4)

James Saunders
geometria situs

violin (5)

James Saunders
geometria situs

violin (6)

---

James Saunders

---
geometria situs

violin (7)

James Saunders
geometria situs

violin (8)
geometria situs

violin (9)
geometria situs

violin (10)

James Saunders
geometria situs

violin (12)

James Saunders
geometria situs

violin (13)
geometria situs

violin (14)

James Saunders
geometria situs

violin (17)

James Saunders
geometria situs
violin (19)

James Saunders

1 2 3 4 5 6 7 8

o-pppp (----)

{pont}

ppp (<>)

---
geometria situs

violin (20)

James Saunders
geometria situs

violin (21)

James Saunders
geometria situs

violin (22)

James Saunders
geometria situs

James Saunders

violin (23)

mute
pont.

o-pppp (----)
geometria situs

violin (24)
geometria situs

violin (26)

James Saunders
geometria situs

violin (27)

James Saunders
geometria situs

violin (28)

James Saunders

(Staff notation)

-PPP (----)
geometria situs

violin (29)

James Saunders
geometria situs

violin (30)

James Saunders
geometria situs

violin (32)

James Saunders
geometria situs

violin (33)

James Saunders
geometria situs

violin (35)

James Saunders
geometria situs

violin (37)

James Saunders
geometria situs

violin (38)

James Saunders
geometria situs

violent (39)

James Saunders
geometria situs

violin (40)

James Saunders

1 bow tailpiece

2 ppp

3

4

5

6

7

-o-ppp (- - - -)

ppp

--
geometria situs

violin (41)

bow tailpiece

1 2 3 4 5 6 7

o-pppp(----)------PPP------o-pppp(----)------PPP

James Saunders
geometria situs

violin (43)
geometria situs

violin (44)
geometria situs

violin (46)

James Saunders
geometria situs
violin (47)

1. cloth preparation
2. 
3. 
4. pont.
5. norm.
6. 
7. 

PPP (<>)

PPP (----)
geometria situs

violin (48)

James Saunders
geometria situs

violin (49)

cloth preparation

1

2

3

4

5

6

7

o-pppp (- - - -)

pont.

norm.

ppp (<>)

James Saunders
geometria situs

violin (50)

James Saunders
geometria situs

violin (51)
geometria situs

violin (52)

James Saunders

card preparation
pont.

card

 PPP

 o-pppp (----)

 PPP
geometria situs

violin (53)

James Saunders

card preparation → pont. → card

PPP

-PPP (----)

---
geometria situs

James Saunders

violin (54)

metal preparation

PPP ---- pppp (----)
geometria situs

violin (55)

metal preparation

pont.

norm.

o-pppp (----)

ppp
geometria situs

violin (56)
geometria situs

viola (1)

James Saunders
geometria situs
viola (2)

James Saunders
geometria situs
viola (3)

James Saunders
geometria situs
viola (4)

James Saunders
geometria situs

viola (7)

James Saunders
geometria situs

viola (8)
geometria situs

viola (9)

James Saunders
geometria situs

viola (10)

James Saunders

ppp (<>)

-pppp (-----)
geometria situs

viola (11)

James Saunders
geometria situs
viola (12)

James Saunders
geometria situs
viola (13)

James Saunders
geometria situs

viola (14)

James Saunders
geometria situs

viola (16)

James Saunders
geometria situs
viola (17)

James Saunders
geometria situs

viola (19)

James Saunders
geometria situs

viola (20)

James Saunders
geometria situs

viola (21)

James Saunders
geometria situs
viola (22)
geometria situs

viola (23)

James Saunders
geometria situs
viola (25)
geometria situs

viola (26)

James Saunders
geometria situs

viola (27)

James Saunders

PPP (<>)

mute
geometria situs

viola (28)

James Saunders
geometria situs

viola (29)

James Saunders
geometria situs
viola (30)

James Saunders
geometria situs

viola (31)

James Saunders
geometria situs
viola (32)

James Saunders
geometria situs
viola (33)

James Saunders
geometria situs
viola (34)

James Saunders
geometria situs
viola (37)

James Saunders

[Diagram with musical notation and markings]
geometria situs

viola (38)

[ damp ]

1 2 3 4 5 6 7

tasto. pont.

o-pppp (- - - -)

PPP ( <> )
geometria situs

viola (39)

James Saunders
geometria situs
viola (40)

James Saunders

---

wood preparation

o-pppp(---)

ppp(<>)

ppp

---
geometria situs
viola (42)

wood preparation

PPP (<>)

-pppp (----)  ppp (<>)  o-pppp (----)
geometria situs
viola (44)

James Saunders

1
2
3
4
5
6
7

bow tailpiece

o-pppp (----)

PPP

o-pppp (----)

PPP
geometria situs
viola (45)

James Saunders
geometria situs

viola (46)

James Saunders
geometria situs
viola (48)

James Saunders
geometria situs

viola (49)

James Saunders

cloth preparation

1

2

3

4

5

6

7

o-pppp (----) pont.

ppp (<>)

nozr.
geometria situs

viola (51)

James Saunders
geometria situs

viola (52)

James Saunders
geometria situs
viola (54)

James Saunders
geometria situs
viola (55)

metal preparation

pont.

norm.

0-pppp (----)

ppp
geometria situs

viola (56)

James Saunders

1
2
3
4
5
6
7

metal preparation

o-pppp (----)

ppp (<>)

o-pppp (----)
geometria situs

cello (1)

James Saunders

bow tailpiece

PPP
geometria situs

J. Saunders

cello (3)
geometria situs
cello (4)

James Saunders
geometria situs

cello (5)

James Saunders
geometria situs
cello (6)

James Saunders
geometria situs

cello (7)

James Saunders
geometria situs

cello (9)

James Saunders
geomietria situs

cello (12)

James Saunders
geometria situs

cello (13)

James Saunders
geometria situs

cello (14)
geometria situs

cello (15)

James Saunders
geometria situs

James Saunders

cello (16)
geometria situs

cello (17)

James Saunders
geometria situs

cello (18)
geometria situs

cello (19)
geometria situs

cello (20)
geometria situs

James Saunders

cello (22)
geometria situs

cello (23)

James Saunders
geometria situs

cello (24)

James Saunders
geometria situs

cello (25)

James Saunders
geometria situs

cello (26)

James Saunders
geometria situs

cello (28)

James Saunders

\[\text{PPP (<>)}\]
geometria situs

cello (32)

James Saunders

[Diagram with notes and symbols]

-o-pppp (----)

pont.

ppp (<>)

tasto.
geometria situs

James Saunders

cello (33)
geometria situs

James Saunders

cello (34)

1
2
3
4
5
6
7

bow tailpiece

o-pppp(----)

PPP

o-pppp(----)

PPP
geometria situs

cello (35)

wood preparation

o-pppp (----)

PPP (<>)

pont.

tasto.

pont.
geometria situs

cello (36)

James Saunders

wood preparation

PPP (<>)

PPP (----)  PPP (<>)  PPP (----)
geometria situs

cello (37)

wood preparation

o-pppp (----) ppp (<>)

pont.

tasto.
geometria situs

James Saunders

cello (39)
geometria situs

cello (40)

James Saunders

1  cloth preparation
2
3
4  pont.
5
6  norm.
7

PPP (<>)

-PPPP (----)
geometria situs

James Saunders

cello (41)

cloth preparation

ppp (<>)

pppp (-----)

pont.

ppp
geometria situs

cello (42)

James Saunders
geometria situs

cello (43)

1. card preparation
2. pont.
3. card
4. pont.
5. pppp (<>)
6. pont.
7. o-pppp (----)
geometria situs

cello (44)

James Saunders
geometria situs

James Saunders

cello (45)
geometria situs

cello (46)

James Saunders

1. card preparation
2. card
3. norm.
4. PPP
5. PPPP (----)
6. 
7. 
geometria situs

cello (48)

metal preparation

pont.

norm.

o-pppp (-----)

ppp
geometria situs

cello (49)

metal preparation

o-pppp(----)  ppp  o-pppp(----)
geometria situs

James Saunders

cello (50)

metal preparation

\[\text{pppp} (---) \quad \text{PPP} \quad \text{pppp} (---)\]
geometria situs

James Saunders

cello (51)
geometria situs

cello (54)

James Saunders
geometria situs

cello (56)

James Saunders
o-pppp (----)
geometria situs

cello (57)

James Saunders
geometria situs

cello (58)

James Saunders
geometria situs

cello (59)

James Saunders

1
2
3
4
5
6
7

mute

p-pppp (----)
geometria situs

cello (60)

James Saunders
geometria situs

double bass (1)

James Saunders
geometria situs

double bass (2)
geometria situs

double bass (3)

James Saunders

\[ \text{o-ffff (----)} \]
geometria situs

double bass (5)

James Saunders
geometria situs

double bass (6)

James Saunders
geometria situs

double bass (8)

James Saunders
geometria situs

double bass (3)

James Saunders
geometric situs

double bass (10)

James Saunders
geometria situs

double bass (11)
geometria situs

double bass (12)

James Saunders
geometria situs

double bass (13)

James Saunders
geometria situs

double bass (14)
geometria situs

double bass (15)

James Saunders
geometria situs

double bass (16)

James Saunders
geometria situs

double bass (17)

James Saunders
geometria situs

James Saunders
geometria situs

double bass (19)

James Saunders
geometria situs

double bass (22)

James Saunders
geometria situs

double bass (23)

James Saunders
geometria situs

double bass (24)

James Saunders
geometria situs

double bass (25)

James Saunders
geometria situs

double bass (27)

James Saunders
geometria situs

double bass (28)

James Saunders

[Diagram of musical notation with notes and dynamics]
geometria situs

double bass (31)

James Saunders

cloth preparation
pont.

1

2

3

4

5

6

7

o-pppp (----) PPP (<>)

pont.
norm.

pont.
norm.
geometria situs

double bass (32)

1. cloth preparation
2. 
3. 
4. pont.
5. 
6. norm.
7. 

PPP (<>)

-PPPP (-----)
geometria situs

double bass (33)

James Saunders
geometria situs

double bass (35)

1: card preparation
2: pont.
3: norm.
4: pont.
5: pppp (<>)
6: pont.
7: o-pppp (----)
geometria situs

double bass (36)

James Saunders
geometria situs

double bass (37)
geometria situs

double bass (38)
geometria situs

double bass (39)

metal preparation

PPP — pppp (----)

pont. — norm.

James Saunders
geometria situs

double bass (40)

James Saunders

1. metal preparation
2. pont.
3. norm.

o-pppp (----)

ppp
geometria situs

double bass (41)

metal preparation

o-pppp (----)  ppp  o-pppp (----)
geometria situs

double bass (42)
geometria situs

doctor bass (43)

James Saunders
geometria situs

double bass (44)

James Saunders
geometria situs

double bass (46)

James Saunders