Marc Sabat
Surface slips away

for bassoon, steel-string guitar and cello

PLAINSOUND MUSIC EDITION
Surface slips away (2013-14)
for bassoon, steel-string guitar and violoncello

commissioned by Pascal Gallois, Magnus Andersson and Rohan de Saram

Time is but the stream I go a-fishing in.
I drink at it; but while I drink I see the sandy bottom and detect how shallow it is.
Its thin current slides away, but eternity remains.
I would drink deeper; fish in the sky, whose bottom is pebbly with stars.
I cannot count one.
I know not the first letter of the alphabet.

- Henry David Thoreau, “Where I Lived, and What I Lived For” from “Walden” (1845-54)

Surface slips away is the echo of an imaginary trio sonata for solo basso continuo ensemble, composed in four episodes. Reflections and refractions of parodic mirror (a)symmetries of musical intervals are observed through the lens of scordature (retunings, indicated by a system of accidentals in Just Intonation as well as by measurement in cent deviations from Equal Temperament).

Music begins as musicians patiently set and adjust each of their 10 open strings into a special constellation by testing and correcting unisons, near-unisons and slow beatings. This process juxtaposes tuneable intervals derived from the first 16 harmonic partials, played and combined in various forms by cello and bassoon, with very close tempered approximations made possible on the fretted equal tempered guitar. Each of the six strings of the guitar is shifted away from Equal Tempered tuning by a different fraction of a semitone divided into 6 parts, together producing a division of the octave in 72 “tempered commas”. The resulting harmonies suggest an enharmonically modulating harmonic space. Fine gradations of melody cast out ever greater harmonic distances and the flowing of musical time is offered as an unfinished space of interruptions, recurrences, eddies and whorls.

The music was composed in Seidmar and Berlin over the course of 2013 and early 2014. The various musical episodes were inspired by the writings of Henry David Thoreau and by reflections on theories about the origins of the minor chord, from, among others, Zarlino, Rameau, Tartini, Hauptmann, Oettingen, Riemann and Partch.

April 2014
for Christian Wolff upon his 80th birthday
in March 2014
An informal introduction to the Helmholtz-Ellis Accidentals
by Marc Sabat

Berlin, April 2009

In learning to read HE accidentals, without having to rely on an electronic tuning device, it is important to be familiar with three things:

First, to keep in mind the natural tuning of intervals in a harmonic series, which deviate from the tempered system.

Second, to get to know how the accidentals refer to these overtone relationships.

Third, to observe that each written pitch may be related to many other pitches by natural intervals, and to tune it accordingly.

In most cases, this approach will allow the player to quickly and intuitively play just intonation (JI) pitches quite accurately. Any remaining adjustments can be made by ear, based on the specific sound of JI intervals.

Just intervals are readily learned because they are built up from simple, tuneable harmonic relationships. These are generally based on eliminating beating between common partials, finding common fundamentals and audible combination tones, and establishing a resonant, stable sonority which maximizes clarity: both of consonance and of dissonance.

A well-focussed JI sound is completely distinct from the irregular, fuzzy beating of tempered sounds. Just consonances, when marginally out of tune, beat slowly and sweetly and may be corrected with the most subtle adjustments of bowing or breath. Just dissonances produce a sharply pulsing regular rhythm and have very clear, distinct colors.

To become familiar with the notation and sounds of JI, the fundamental building blocks are prime number overtones 3, 5, 7, 11 and 13, each of which is associated with a specific pair of accidentals and a basic musical interval.

3 is associated with the signs flat, natural, sharp and refers to the series of untempered perfect fifths (Pythagorean intonation). Generally, A is taken as the tuning reference, and the central pitches C-G-D-A-E can be imagined as the normal tuning of the orchestral string instruments. The just C is rather lower than tempered tuning because of the pure fifths. The further this series is extended, the greater the deviation from tempered tuning: the flats are lower, the sharps higher.

5 is associated with arrows attached to the flat, natural, sharp signs and refers to the pure major third. These arrows correct the Pythagorean intervals by a Syntonic Comma, which is approximately 1/9 of a wholetone or 22 cents. So, for example, the note E-flat arrow-up is a just major third below G, and the note F-sharp arrow-down is a major third above D. In most music, flats are often raised by a comma and sharps are lowered. Because of the open string tuning, it is common to sometimes raise F and C (to match A and E) and to sometimes lower A and E (to match F and C). Corrections by one Syntonic Comma have been used throughout Western music history and are relatively familiar to the ear. However, traditionally these corrections have been hidden by players, for example in Meantone Temperament where fifths are mistuned narrow by 1 comma so that the third C-E ends up sounding pure. More recently, the currently prevailing Equal Temperament has made us accustomed to beating thirds, so at first the pure intervals may seem unfamiliar. To play the arrows accurately, one must carefully learn the sound of the consonant major and minor thirds and sixths, and learn to articulate comma differences clearly.

7 is associated with a Tartini sign resembling the numeral. It corrects the Pythagorean intervals by a Septimal Comma, which is approximately 1/7 of a wholetone or 27 cents. When the Pythagorean minor third is lowered by this amount, it becomes a noticeably low third often heard in Blues music.

11 is associated with the quartetone signs (cross and backwards flat). The accidental is used to raise the perfect fourth by 53 cents, producing the exact tuning of the 11th partial in a harmonic series. The sound is most easily learned by playing one octave plus one fourth and raising it by a quartetone.

13 is associated with the thirdtone signs (cross and backwards flat, each with 2 verticals). The accidental is used to lower the Pythagorean major sixth by 65 cents, producing the exact tuning of the 13th partial in a harmonic series. The sound is most easily learned as a neutral-sounding sixth, one-third of the way between the just minor and just major sixths (closer to minor than to major).

The following table presents the accidentals together with their associated ratios and cents deviations. To calculate the cents deviation from Equal Temperament of a specific written pitch (if desired) the following shortcut may be used:

1.) Find the cents deviation of the Pythagorean pitch, by calculating how many fifths it is away from A, multiplying by 2, and using a plus sign if it is on the sharp side and a minus if it is on the flat side.

2.) For each microtonal accidental, add or subtract its approximate cents value (as given above), keeping in mind whether the accidental is raising or lowering the pitch.

The resulting value should be a cents deviation within 1 or 2 cents accuracy, which is an acceptable starting point for fine-tuning by ear.
ACCIDENTALS
EXTENDED HELMHOLTZ-ELLIS PJ PITCH NOTATION
for Just Intonation
designed by Marc Sabat and Wolfgang von Schweinitz

The exact intonation of each pitch may be written out by means of the following harmonically-defined signs:

\[
\begin{align*}
\begin{array}{cccc}
& \sharp & \# & \#
\end{array}
\end{align*}
\]

Pythagorean series of fifths – the open strings

\[
\begin{align*}
\begin{array}{cccc}
& \flat & b & b
\end{array}
\end{align*}
\]

lowers / raises by a syntonic comma

\[
\begin{align*}
81 \div 80 &= \text{circa} 21.5 \text{ cents}
\end{align*}
\]

\[
\begin{align*}
\begin{array}{cccc}
& \flat & \# & \#
\end{array}
\end{align*}
\]

lowers / raises by two syntonic commas

circa 43 cents

\[
\begin{align*}
\begin{array}{cccc}
& \flat & b & b
\end{array}
\end{align*}
\]

lowers / raises by a septimal comma

\[
\begin{align*}
64 \div 63 &= \text{circa} 27.3 \text{ cents}
\end{align*}
\]

\[
\begin{align*}
\begin{array}{cccc}
& \flat & \# & \#
\end{array}
\end{align*}
\]

lowers / raises by two septimal commas

circa 14.1 cents

\[
\begin{align*}
\begin{array}{cccc}
& \natural & c & c
\end{array}
\end{align*}
\]

raises / lowers by an 11-limit undecimal quarter-tone

\[
\begin{align*}
33 \div 32 &= \text{circa} 33.3 \text{ cents}
\end{align*}
\]

\[
\begin{align*}
\begin{array}{cccc}
& \natural & \# & \#
\end{array}
\end{align*}
\]

lowers / raises by a 13-limit tridecimal third-tone

\[
\begin{align*}
27 \div 26 &= \text{circa} 63.3 \text{ cents}
\end{align*}
\]

\[
\begin{align*}
\begin{array}{cccc}
& \flat & \# & \#
\end{array}
\end{align*}
\]

lowers / raises by a 17-limit schisma

\[
\begin{align*}
256 \div 215 &= \text{circa} 6.8 \text{ cents}
\end{align*}
\]

\[
\begin{align*}
\begin{array}{cccc}
& \flat & b & b
\end{array}
\end{align*}
\]

lowers / raises by a 19-limit schisma

\[
\begin{align*}
113 \div 112 &= \text{circa} 3.4 \text{ cents}
\end{align*}
\]

\[
\begin{align*}
\begin{array}{cccc}
& \natural & c & c
\end{array}
\end{align*}
\]

raises / lowers by a 23-limit comma

\[
\begin{align*}
756 \div 729 &= \text{circa} 16.3 \text{ cents}
\end{align*}
\]

In addition to the harmonic definition of a pitch by means of its accidentals, it is also possible to indicate its absolute pitch-height as a cents-deviation from the respectively indicated chromatic pitch in the 12-tone system of Equal Temperament.

The attached arrows for alteration by a syntonic comma are transcriptions of the notation that Hermann von Helmholtz used in his book “Die Lehre von den Tonempfindungen als physiologische Grundlage für die Theorie der Musik” (1863).

The annotated English translation “On the Sensations of Tone as a Physiological Basis for the Theory of Music” (1875/1885) is by Alexander J. Ellis, who refined the definition of pitch within the 12-tone system of Equal Temperament by introducing a division of the octave into 1200 cents.

The sign for a septimal comma was devised by Giuseppe Tartini (1692-1770) – the composer, violinist and researcher who first studied the production of difference tones by means of double stops.
VORZEICHEN

EXTENDED HELMHOLTZ-ELLIS JI PITCH NOTATION

für die natürliche Stimmung
konzipiert von Marc Sabat und Wolfgang von Schweinitz

Die Stimmung jedes Tons ist mit folgenden harmonisch definierten Vorzeichen ausnotiert:

Pythagoreische Quintenreihe der leeren Streicher-Saiten
(... c g d a e ...)

Erniedrigung / Erhöhung um ein Syntonisches Terzkomma
81 : 80 = circa 21.5 cents

Erniedrigung / Erhöhung um zwei Syntonische Terzkommas
circa 43 cents

Erniedrigung / Erhöhung um ein Septimenkomma
64 : 63 = circa 27.3 cents

Erniedrigung / Erhöhung um zwei Septimenkommas
circa 54.5 cents

Erhöhung / Erniedrigung um den undezimalen Viertelton der 11er-Relation 33 : 32 = circa 33.3 cents

Erhöhung / Erniedrigung um den tridezimalen Drittelton der 11er-Relation 27 : 26 = circa 65.3 cents

Erniedrigung / Erhöhung um ein Selzehner-Schisma
216 : 215 = circa 6.9 cents

Erhöhung / Erniedrigung um ein Neunzehner-Schisma
111 : 112 = circa 3.4 cents

Erhöhung / Erniedrigung um ein Dreundzwanziger-Komma
736 : 729 = circa 16.7 cents

Zusätzlich zu der harmonischen Definition der Tonhöhe durch das Vorzeichen für jeden Ton ist auch der Cents-Wert der Abweichung der gewünschten Stimmung von der Tonhöhe des jeweils bezeichneten chromatischen Tons der gleichmäßig temperierten Zwölfton-Skala angegeben.

Die angesprochenen Pfeile für die Alteration um ein Syntonisches Terzkomma sind eine bleibende Transkription der Notation, die Hermann von Helmholz in seinem Buch "Die Lehre von den Tonempfindungen als physiologische Grundlage für die Theorie der Musik" (1863) verwendet hat. Die kommentierte englische Übersetzung "On the Sensations of Tone as a Physiological Basis for the Theory of Music" (1855) (1885) stammt von Alexander J. Ellis, der auch eine enorme Erweiterung der Tonhöhendefinition innerhalb des Zwölftonsystems der gleichmäßig temperierten Stimmung durch die Unterteilung der Oktave in 1200 Cents eingeführt hat. 

Das Vorzeichen für die Alteration um ein Septimenkomma wurde von Giuseppe Tartini (1692-1770) erfunden, der als Komponist, Geiger und Wissenschaftler die durch Doppelsaiten erzeugten Differenzen in der Musik untersucht hat.
THE HARMONIC SERIES 1 - 64 above “A0” (overtone row)

notated using the Extended Helmholtz-Ellis Pitch Notation
microtonal accidentals designed by Marc Sabat and Wolfgang von Schweinitz, 2004
23-LIMIT TUNEABLE INTERVALS below “A4”

tested and notated in three gradations of difficulty (large open notehead = easiest; small black notehead = most difficult)

by Marc Sabat (violin/viola) with assistance from Wolfgang von Schweinitz (cello), Beltane Ruiz (bass), Anaïs Chen (violin)—Berlin, 2005
23-LIMIT TUNEABLE INTERVALS above “A3”

notated using the Extended Helmholtz-Ellis II Pitch Notation with cents deviations from 12-tone equal temperament based on $A = 0$ cents

microtonal accidentals designed by Marc Sabat and Wolfgang von Schweinitz, 2004
Surface slips away

1: Scordature

Marc Sabat

Begin from "A", playing the indicated material and proceeding freely, but aware of the other players' pitches. Fine-tuning of the open strings is generally of primary importance, alternating with coordinated passages in which players should also focus on carefully adjusting intervals occurring between instruments.

The styles of playing should be chosen to establish with definite clarity the most exact temperament or tuning of the sounds written. Try various dynamics, timbres, means of sound production, seeking to optimize the tuning process for all. For the most part, sustain colors to most easily perceive the effects of intonation.

The music flows freely between measured fragments and material which is chosen, played, and repeated "as needed". The two styles of playing should connect imperceptibly as much as possible without breaks, taking (only) as much time as necessary.

(part is notated at sounding pitch: material on strings III and IV must be fingered higher by a small whole tone 9:10 to sound as written)

Guitar: pluck as often as needed, tune using a clip microphone and an electronic tuning meter with cents readout, also by ear to the other instruments; as in normal tuning, adjust, interrupt, repeat ad lib.; reuse material within repeat marks freely throughout the bar; sempre lü possible.

Cello: please use a tailpiece with fine tuners for all four strings to permit very precise adjustments: tune using a clip microphone and an electronic tuning meter with cents readout, also by ear to the other instruments; as in normal tuning, below with a quiet, clear and focused tone (precise), adjust, interrupt, repeat ad lib.; reuse material within repeat marks freely throughout the bar.

Ban: match Vlc: tuning; wait until adjustments are completed; produce a clear, even tune to maximize clarity of tuned intervals.

Check unisons, intervals; try other combinations ad lib, continue to adjust strings as needed.
Bsn: melody of harmonic multiphonic mixtures over written fundamentals with high "F", overtones may be transposed Pb ad lib.
2: Divided Fifth

Andante, grazioso e scorrevole

Ben. use multiphonics ad lib.; at times produce a soft mixture of natural partials favouring the written harmonics and fundamentals (indicated by diamond notes), or simply play the melody of written microtonal pitches.

allow guitar to emerge

balance and
tune to Celli


harmonies, portamento
press down III and IV II
so only IV II sound together
come prima

allow guitar to emerge
<table>
<thead>
<tr>
<th>Tablature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gtr</td>
<td>Piano solo</td>
</tr>
<tr>
<td>Tab</td>
<td>Guitar solo</td>
</tr>
<tr>
<td>Vlc</td>
<td>Violin solo</td>
</tr>
</tbody>
</table>

**Sheet Music**

- **Bar 21**: 
  - Piano: Piano solo with markings for articulation such as staccato and legato.
  - Guitar: Guitar solo with markings for dynamics and articulation.
  - Violin: Violin solo with markings for dynamics and articulation.

- **Bar 25**: 
  - Piano: Piano solo with markings for articulation such as staccato and legato.
  - Guitar: Guitar solo with markings for dynamics and articulation.
  - Violin: Violin solo with markings for dynamics and articulation.

- **Bar 28**: 
  - Piano: Piano solo with markings for articulation such as staccato and legato.
  - Guitar: Guitar solo with markings for dynamics and articulation.
  - Violin: Violin solo with markings for dynamics and articulation.
3: Helmholtz’s Sirens

**A**

**Scherzo: con moto,**

**ruzzolante**

| ca. 126 |

---

Chords may be played by arpeggiating pitches (in any order) across the bar as a triplet or strummed, dry or ff, vary ad lib.

---

Please note: the open string is already +16 cents! The cent indications show absolute deviation from equal tempered tuning to match the readout of an electronic tuning device (rounded to nearest cent).

---

Wavy line indicates very slight detuning from an octave / unison with cello.

---

Boxed text is used to show the size of melodic steps in cents — rounding may cause slight discrepancies! —

( senza portamento)
sonore possibili