

A Known Unknown

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for grand piano, percussion, and electronics

Val Verde, CA (August 2016)

for Teodora Stepancic, Martin Lorenz, & Assaf Gidron

Duration: 62'

Instrument and Accessory List

1. **Musician 1** plays grand piano. They will also need an EBow and a wedge for the sustain pedal.
2. **Musician 2** plays percussion. They will need the following: crotales, 3 or more additional pitched metal objects (e.g. cymbals, triangles, vibraphone bars, bell etc.) with soft and medium density rubber mallets, 3 or more non-pitched objects (e.g. woodblocks, small/medium/large stones, shaker, etc.), 3 or more resonators of different sizes (e.g. drum heads, buckets, bowls, etc.), 3 or more bowls of grains (e.g. rice, corn, beans, teff, etc.), 1 or more plastic bags, small to large Super Balls, and 1 well-rosined double-bass bow. Additional percussion instruments may be added to this list.
3. **Musician 3** plays electronics. They will need the following: a computer with noise and sine-tone generating capability, a loudspeaker system for playback, and a portable radio. A video projection showing slowed images of space (e.g. Philae lander, Rosetta spacecraft, 67P/Churyumov–Gerasimenko comet, etc.) may also be used during a live performance.
 - I. The performer in charge of electronics is also responsible for the tasteful application of granular synthesis to aspects of the “unknown” sections.
 - (1) In a recording situation: Granular synthesis should be added in post-production and applied to a field recording. The field recording should be created (anywhere in the world) exactly during the time of the studio recording of *A Known Unknown*. It should then be added to the recording session but audible only during the “unknown” sections.
 - (2) In a live performance situation: Granular synthesis should be added and processed in real-time via a live-miking of the room and/or specific instruments and objects. This should be calculated carefully beforehand through the use of digital automation.

Performance Notes

1. *A Known Unknown* attempts to sonically represent celestial events, thus treating all sounds as moments within physical boundaries. Because the subject matter which the sounds represent is always moving, no sound should ever be perceived as stagnated, nor accented, and thus *inevitably* overlapping in a fluid manner. These parameters will result in sounds that react, morph, die, and birth new events.
2. Dynamics:
 - I. The dynamic in the “unknown” sections is relative to the celestial event choice and interactions of that event with other events. In general, each performer should be mindful of one another but play with a sense of independent determination. The added granular synthesis should be folded tastefully into the ensemble’s sound, never overpowering the acoustic nature of the texture as a whole.
 - II. The dynamic in the “known” sections is medium to loud, but—realizing that as the microtonal interactions are the main focus—a balanced sound is needed. For this section it is recommended to place the crotales further away from the audience so the piano’s EBow sustain (which is very quiet) will not be overpowered. An additional set of crotales may be used to ease this transition.
 - III. Sine-tones, or pure-tones, should always be played at a lower volume in comparison to the other performers volume and adequately balanced with their acoustic instruments.
3. Choosing your celestial event(s) during the “unknown” sections:
 - I. For each section the performers may choose any one celestial event or a number of celestial events (e.g. a pianist may choose to delegate their left hand as a star and their right hand as a planet, of course in this scenario the right hand will “orbit” around the left) while making sure each celestial event is acutely aware of its surroundings. Although surroundings in space are often vast expanses of imperceivable “nothingness”, this does not necessarily equate to silence as even the subtle forces of physics apply everywhere in the observable universe.
 - II. Performers should feel comfortable allowing their celestial event to morph into another celestial event if they notice circumstances have altered the fundamental definition of your event (e.g. a stellar nursery may morph into a star, a star may morph into a planet, a planet may morph into a moon, a moon may have an impact event with a planet, etc.).
 - III. During the “unknown” sections, Musicians 1 and/or 3 may choose to play percussion at any time.
4. Performing the “known” sections:
 - I. Each bar represents 1 minute of time. All entrance and exit times are in boxed text.
 - II. Musician 1 (grand piano) is given 2 different performance instructions:
 - (1) Sustain a pitch by placing the EBow on both string edges of a tri-chord note. Once the EBow has been placed and is switched on, press the sustain pedal for the duration of the activity.
 - (2) Pluck the piano string with the sustain pedal wedged down.
 - III. Musician 2 (percussion) is given 2 different performance instructions regarding crotales:
 - (1) Sustain by bowing a selected crotale.
 - (2) Strike a crotale with a medium-density rubber mallet.
 - IV. Musician 3 (electronics) is given 2 different performance instructions:
 - (1) Sustain a sine-tone, which should begin and end with a 6-8 second fade in/fade out.

- (2) Create a sine-tone glissando from one pitch to another. The production of the sine-tone should follow a natural frequency-based linear algorithm (e.g. if you move from 400 Hz to 500 Hz over 100 seconds, 440 Hz should sound at exactly 40 seconds). Glissandi should begin and end with a 6-8 second fade in/fade out.

Form

A Known Unknown is divided into 5 12-minute *sections* with each *section* divided into 2 sub-sections: parts *a* and *b*. In part *a* one finds the “unknowns” and in part *b* one finds the “knowns”. Here, an “unknown” is defined as a section of guided improvisation where players sonify a celestial event’s attributes and thus potential interactions with one another. In contrast, a “known” is defined here as a section of detailed through-composed music where players sonify their instrument’s interaction with space-time.

While the piece begins and ends with silence, the middle form follows a back-and-forth between the “unknowns” and the “knowns”. Transitions between the sections should be minimal and periods of silence before and after the “known” sections are okay.

<u>action/section</u>	<u>enter-exit</u>	<u>duration</u>
syncing of stopwatches, <i>silence</i>	0'-1'	1 minute
Section 1a (<i>Unknown</i>)	1'-5'	4 minutes
Section 1b (<i>Known</i>)	5'-13'	8 minutes
Section 2a (<i>Unknown</i>)	13'-18'	5 minutes
Section 2b (<i>Known</i>)	18'-25'	7 minutes
Section 3a (<i>Unknown</i>)	25'-31'	6 minutes
Section 3b (<i>Known</i>)	31'-37'	6 minutes
Section 4a (<i>Unknown</i>)	37'-44'	7 minutes
Section 4b (<i>Known</i>)	44'-49'	5 minutes
Section 5a (<i>Unknown</i>)	49'-57'	8 minutes
Section 5b (<i>Known</i>)	57'-61'	4 minutes
<i>silence</i>	61'-62'	1 minute

“Unknowns”: Interactions Between Celestial Events

List format:

1. **Event Name** - *formal definition of celestial event.*
 - I. Abstract of main musical idea.
 - (1) Specific musical equivalent and performance *suggestion* #1.
 - (2) Specific musical equivalent and performance *suggestion* #2.
 - (3) Specific musical equivalent and performance *suggestion* #3.

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1. **Gravity** - *the force that attracts a body toward the center of the earth, or toward any other physical body having mass.*
 - I. A subtle growth/decrease in amplitude and/or pitch range.
 - (1) A glissando toward another sounding pitch/texture.
 - (2) A crescendo toward another celestial event, perhaps decrescendo-ing once *contact* has been made.
 - (3) Or something else entirely...
 - II. For percussion, use gravity to produce sounds and textures.
 - (1) Dropping small grains/pebbles onto a resonator from a short distance (a few cm), a medium distance (up to 1/3 of a meter), or a large distance (up to a meter).
 - (2) Pouring water from one vessel into another.
 - (3) Allowing a plastic bag to fall to the ground.
 - (4) Or something else entirely...

2. **Stellar Nursery** - *where stars are born; a type of interstellar cloud, the density and size of which permit the formation of molecules.*
- I. A situation where small-to-large gaps (e.g. intervals) in pitch/rhythm close in on themselves, resulting in a single tone/pattern.
 - (1) Two distinctly different pitches that move inward toward one another, resulting in a single, unwavering pitch (a star).
 - (2) Two distinctly different rhythms that move inward toward one another, resulting in a single, unwavering rhythm (a star).
 - (3) Or something else entirely...
 - II. Very large expanses of star-stuff (pitches) that are unable to sustain and result in very short fragments (or molecules) of micro-tones, many imperceivable.
 - (1) A burst of noise.
 - (2) A single grain thrown against a resonator.
 - (3) Pre-verb added to any sound.
 - (4) Or something else entirely...
 - III. Very infantile rhythm and tones (extremely low, extremely quiet, and/or extremely noisy).
 - (1) Scraping a piano string softly on the lower register.
 - (2) Extremely soft and low register sine-tone pitches with added noise.
 - (3) Softly rubbing a bass-drum head/cymbal/gong with a large Super Ball.
 - (4) Random strikes on a percussion instrument portraying a non-perceivable rhythm.
 - (5) Very quiet and equalized band of radio-waves that borders on the spectrum of pitch/noise.
 - (6) Or something else entirely...

3. **Star** - *a fixed luminous point in the night sky that is a large, remote incandescent body like the sun.*
 - I. A fixed (still and constant) reference point used for the determination and placement of self.
 - (1) A single, unwavering pitch or rhythm with dynamic nuances dictating a movement of proximity (e.g. closer or further away). Keeping in mind that because the hottest stars die young, the higher the pitch the higher of likelihood of a “star death” (e.g. silence or the absence of sound).
 - (2) An EBow drone on a relatively high pitched piano string with added soft plucking of yet even higher pitched strings.
 - (3) Bowing a cymbal or crotales at a steady pace.
 - (4) Or something else entirely...

4. **Planet** - *a celestial body moving in an elliptical orbit around a star (THUS: there cannot be a planet without a star).*
- I. Since planets revolve around stars they may be thought of as having a pitch (melodic or harmonic) or rhythmic relationship to the star they are revolving around.
- (1) If a star is sounding a pitch—and depending upon how far from that star a player perceives their planet to be—their planet could perhaps take the form of a partial of that star's pitch. For instance, if the star is sounding a tone at 1000 Hz, a planet very near in relation to that star may sound the 2nd partial (2000 Hz) or 3rd partial (3000 Hz) while a planet much further away might sound the 293rd partial (293,000 Hz). The harmonic series in reverse, or sub-harmonic series, could also aptly entertain this idea.
 - (2) If a star is sounding a rhythm—and depending upon how far from that star a player perceives their planet to be—their planet could perhaps take the form of an elongation of the original rhythm (stretching time linearly) or perhaps a distant echo of the original rhythm (quieter and delayed).
 - (3) Atmospheric noise.
 - (4) Or something else entirely...

5. **Moon** - *the natural satellite of the earth (or any planet), visible (chiefly at night) by reflected light from the sun (or its nearest star). The moon is always in a phase in relation to its star and to its planet (THUS: there cannot be a moon without a planet).*
- I. The shape of a moon will depend upon its planet's influence and, in addition, its planet's influence will depend upon its star's influence. Another way of putting it: stars influence planets and planets influence moons. Thus, if you take the form of a moon you will be tonally and rhythmically influenced by your planet; the same systematic parameters a star/planet relationship has should be applied to a planet/moon relationship.
- (1) Tonally, if your planet is sounding 100 Hz a moon might sound exponentially lower in frequency, depending upon its perceived location, *perhaps* at 50 Hz.
 - (2) Dynamically, if your planet is sounding 100 dB a moon might sound exponentially quieter, depending upon its perceived location, *perhaps* at 50 dB.
 - (3) Rhythmically, if your planet is sounding at 100 bpm a moon might sound exponentially slower, depending upon its perceived location, *perhaps* at 50 bpm.
 - (4) Or something else entirely...

6. **Pulsar** - *a celestial object, thought to be a rapidly rotating neutron star, that emits regular pulses of radio waves and other electromagnetic radiation at rates of up to one thousand pulses per second.*
 - I. Predetermined: Create a steady and periodic pulse of sound or noise for some time before fading out.
 - (1) A note or plucked string on the piano.
 - (2) Two small/medium/large stones periodically tapped together.
 - (3) A burst of noise.
 - (4) Or something else entirely...

7. **Quasar** - *a massive and extremely remote celestial object, emitting exceptionally large amounts of energy, and typically having a starlike image in a telescope. It has been suggested that quasars contain massive black holes and may represent a stage in the evolution of some galaxies.*
- I. A cluster of soft high-frequency sounds (noise with a low-pass filter and/or high-pitched tones) that spread evenly in all directions from its core (a bit like the opposite of a Stellar Nursery).
- (1) A noise-band filter, spreading from a single band into a large spectrum.
 - (2) A single tone—the fundamental—that grows throughout the harmonic series.
 - (3) A large cymbal or gong placed in the distance, sustained for a very long time.
 - (4) A steady stream of pebbles or grains dropped into a bucket of water.
 - (5) Or something else entirely...

8. **Constellation** - *a group of stars forming a recognizable pattern that is traditionally named after its apparent form or identified with a mythological figure. Modern astronomers divide the sky into eighty-eight constellations with defined boundaries.*
- I. A grouping of stars which are, for our purposes, defined as single unwavering pitches or rhythms with a noticeable form. Subtle dynamics should be applied to inner/outer movement.
- (1) If there are many tonal stars: *perhaps* a chord.
 - (2) If there are many rhythmic stars: *perhaps* a polyrhythm.
 - (3) If there are many noisy stars: *perhaps* a band of noise.
 - (4) Or something else entirely...

9. **Nebula** - *a cloud of gas and dust in outer space, visible in the night sky either as an indistinct bright patch or as a dark silhouette against other luminous matter.*
- I. A cloud of clustered tones or noises.
 - (1) A handful of fine grains dropped onto a resonator.
 - (2) A glissando on the strings inside a piano.
 - (3) A noisy hiss that grows and then dissipates.
 - (4) Or something else entirely...
 - II. An active participant in the change of perception.
 - (1) An influence on sound in terms of a color change from bright-to-dark or dark-to-bright.
 - (2) An influence on sound in terms of a dynamic change from loud-to-soft or soft-to-loud.
 - (3) An influence on sound in terms of a rhythmic change from fast-to-slow or slow-to-fast.
 - (4) Or something else entirely...

10. **Impact Event** -a collision between celestial objects causing measurable effects. Impact events have physical consequences and have been found to regularly occur in planetary systems, though the most frequent involve asteroids, comets, or meteoroids and have minimal impact.
- I. An extremely small to medium sized mass of sound that slightly, yet noticeably, interacts with—and thus affects—the celestial event with which it has *collided*.
 - (1) A band of noise that crescendos toward another celestial event and, upon impact, alters the celestial event's stability (e.g. pitch, dynamic, amplitude). The impact event may not be perceived right way (e.g. a sonic boom) and may possibly take the form of an echo.
 - (2) Or something else entirely...
 - II. A devastatingly large and attention-grabbing sound situation that overwhelms the listener's perception. This sound should grow, peak, and then fade away with the following ratio: grow=3/10th, peak=1/10th, fade-away=6/10th.
 - (1) A tone or rhythm that begins imperceptibly and grows to an overwhelming dynamic.
 - (2) Or something else entirely...
 - III. *Perhaps* this event ends an “unknowable” section of guided improvisations.

“Knowns”: Interactions with Space-time

Section 1b: 5’-13’ (8 minutes)

Crotales: Strike C#4 (sounding C#6) every 15 seconds

Piano: With the sustain pedal pressed down, pluck C6 every 15 seconds

Sine-tones:

5’-6’: Fading in, sustain 1077.16 Hz (C#6 -50c)

6’-7’: Gliss from 1077.16 Hz (C#6 -50c) up to 1108.73 Hz (C#6)

7’-9’: Gliss from 1108.73 Hz (C#6) down to 1046.50 Hz (C6)

9’-11’: Gliss from 1046.50 Hz (C6) up to 1108.73 Hz (C#6)

11’-12’: Gliss from 1108.73 Hz (C#6) down to 1077.16 Hz (C#6 -50c)

12’-13’: Sustain 1077.16 Hz (C#6 -50c) and begin fading out around 12:45

Section 1b (Known)

5 :00 :15 :30 :45 6 etc. 7 8 9 10 11 12 13:00

Cro. strike with mallet

Pno. ^{15^{ma}} :00 :15 :30 :45 etc. 13:00
pluck string
Ped.

S-t. 1077.16 Hz 5:00 6:00 1108.73 Hz 7:00 1046.50 Hz 9:00 1108.73 Hz 11:00 1077.16 Hz 12:00 13:00
gliss. gliss. gliss. gliss.

The musical score consists of three staves. The top staff, labeled 'Cro.', shows a series of notes on a treble clef staff with a key signature of one sharp (F#), representing the crotales. The middle staff, labeled 'Pno.', shows a series of notes on a treble clef staff with a key signature of one sharp, representing the piano plucking. The bottom staff, labeled 'S-t.', shows a series of notes on a treble clef staff with a key signature of one sharp, representing the sine-tones. The sine-tone staff includes frequency labels (1077.16 Hz, 1108.73 Hz, 1046.50 Hz, 1108.73 Hz, 1077.16 Hz) and time markers (5:00, 6:00, 7:00, 9:00, 11:00, 12:00, 13:00) indicating the start of each glissando or sustain period. The word 'gliss.' is written below the sine-tone notes. The piano staff includes a 'Ped.' (pedal) marking and a '15^{ma}' marking above the first few notes. The crotales staff includes a 'strike with mallet' instruction. The score is titled 'Section 1b (Known)' and has a duration of 5' to 13' (8 minutes).

Section 2b: 18'-25' (7 minutes)

Crotales: Sustain by continuously bowing C#4 (sounding C#6)

Piano: With the sustain pedal pressed down, pluck from F#5 up to C6-6 semitones ascending—once a minute, on the minute

Sine-tones: Fading in, gliss from 739.99 Hz (F#5) up to 1108.73 Hz (C#6), begin fading out around 24:45

Section 2b (*Known*)

The musical score consists of three staves. The top staff, labeled 'Cro.', shows a continuous line with a treble clef, a key signature of one sharp (F#), and a common time signature. It starts at 18:00 with a note marked 'with bow' and ends at 25:00 with a final note. The middle staff, labeled 'Pno.', shows a treble clef, a key signature of one sharp, and a common time signature. It features a series of notes at 18:00, 19:00, 20:00, 21:00, 22:00, 23:00, and 24:00, with the instruction 'pluck string' and a sustain pedal symbol 'Ped.' below. The bottom staff, labeled 'S-t.', shows a treble clef, a key signature of one sharp, and a common time signature. It features a glissando line starting at 18:00 (739.99 Hz) and ending at 25:00 (1108.73 Hz), with the instruction 'gliss.' above the line. The score is divided into measures 18 through 24, with time markers in boxes above each staff.

Section 3b: 31'-37' (6 minutes)

Crotales: Strike from D⁴ (sounding D⁶) up to C[#]5 (C[#]7)—11 semitones ascending—once every 30 seconds, on the minute and the 30" mark

Piano: With the sustain pedal pressed down, pluck from D⁶ up to C[#]7—11 semitones ascending—once every 30 seconds, on the minute and the 30" mark

Sine-tones: Fading in, gliss from 1174.66 Hz (D⁶) to 2217.46 Hz (D⁷), begin fading out around 36:45

Section 3b (*Known*)

The score consists of three staves. The top staff is for Crotales (Cro.), the middle for Piano (Pno.), and the bottom for Sine-tones (S-t.).

- Crotales (Cro.):** Shows a sequence of notes from 31:00 to 36:30. The notes are: 31:00 (D⁴), 31:30 (D⁵), 32:00 (D⁶), 32:30 (D⁷), 33:00 (D⁸), 33:30 (D⁹), 34:00 (D¹⁰), 34:30 (D¹¹), 35:00 (D¹²), 35:30 (D¹³), 36:00 (D¹⁴), 36:30 (D¹⁵). The instruction "strike with mallet" is written below the staff.
- Piano (Pno.):** Shows a sequence of notes from 31:00 to 36:30, corresponding to the Crotales. The instruction "pluck string" is written below the staff, and "Ped." is written below a line representing the sustain pedal.
- Sine-tones (S-t.):** Shows a glissando from 1174.66 Hz at 31:00 to 2349.32 Hz at 37:00. The instruction "gliss." is written above the staff.

Time markers are provided for each 30-second interval: 31:00, 31:30, 32:00, 32:30, 33:00, 33:30, 34:00, 34:30, 35:00, 35:30, 36:00, 36:30, and 37:00.

Section 4b: 44'-49' (5 minutes)

Crotales: Sustain by continuously bowing A4 (sounding A6)

Piano: With the sustain pedal pressed down...

44'-45': Pluck from A6 up to B6, 1 semitone per 20"—A6 at 44:00, A#6 at 44:20, B6 at 44:40

45'-46': Pluck from C7 down to A#6, 1 semitone per 20"—C7 at 45:00, B6 45:20, A#6 45:40

46'-47': Pluck from A6 down to G6, 1 semitone per 20"—A6 at 46:00, G#6 at 46:20, G6 at 46:40

47'-48': Pluck from G#6 up to A#6, 1 semitone per 20"—G#6 at 47:00, A6 at 47:20, A#6 at 47:40

48'-49': Pluck A6 3 times, once per 20"—at 48:00, 48:20, 48:40

Sine-tones: Fading in, sustain 1760.00 Hz (A6), begin fading out around 48:45

The image displays a musical score for Section 4b (Known) from 44:00 to 49:00. It consists of three staves:

- Crotales (Cro.):** A single note (A6) is sustained throughout the section, indicated by a long horizontal line with a bowing symbol ($\langle \rangle$) and the instruction "with bow".
- Piano (Pno.):** A sequence of plucked strings is shown. The notes are A6, A#6, B6, C7, B6, A#6, A6, G#6, G6, A6, A#6, and A6. The notes are grouped into triplets (3) and are plucked at intervals of 20 seconds. The plucking times are marked as follows: 44:00, 44:20, 44:40, 45:00, 45:20, 45:40, 46:00, 46:20, 46:40, 47:00, 47:20, 47:40, 48:00, 48:20, and 48:40. The instruction "pluck string" and "Ped." (pedal) are present.
- Sine-tones (S-t.):** A sine tone is sustained at 1760.00 Hz (A6) from 44:00 to 48:45, indicated by a long horizontal line with a fading-in symbol ($\langle \rangle$) at the start and a fading-out symbol ($\rangle \langle \rangle$) at the end. The frequency is labeled as "1760.00 Hz" and "(1760.00 Hz)".

Section 5b: 57'-61' (4 minutes)

Crotales:

57'-58': Strike E4 (sounding E6)—down 3 semitones—to C#4 (sounding C#6) once every 15"

58'-59': Strike C4 (sounding C6)—up 3 semitones—to D#4 (sounding D#6) once every 15"

59'-60': Strike E4 (sounding E6)—up 3 semitones—to G4 (sounding G6) once every 15"

60'-61': Strike G#4 (sounding G#6)—up 3 semitones—to B4 (sounding B6) once every 15"

Piano: With the sustain pedal pressed down...

57'-58': Pluck E6—down 3 semitones—to C#6 once every 15"

58'-59': Pluck C6—up 3 semitones—to D#6 once every 15"

59'-60': Pluck E6—up 3 semitones—to G6 once every 15"

60'-61': Pluck G#6—up 3 semitones—to B6 once every 15"

Sine-tones:

57'-58': Fading in, gliss down 4 semitones from 1318.51 Hz (E6) to 1046.50 Hz (C6)

58'-61': Gliss up 12 semitones from 1046.50 Hz (C6) to 4186.01 Hz (C8), begin fading out around

60:45

Section 5b (Known)

The musical score consists of three staves. The top staff is for Crotales (Cro.), the middle for Piano (Pno.), and the bottom for Sine-tones (S-t.).

- Crotales (Cro.):** Shows a sequence of notes on a treble clef staff. Notes are marked with time stamps: :00, :15, :30, :45, etc., 58, 59, 60. The instruction "strike with mallet" is written below the staff.
- Piano (Pno.):** Shows a sequence of notes on a treble clef staff, mirroring the Crotales. Notes are marked with time stamps: :00, :15, :30, :45, etc. The instruction "pluck string" is written below the staff, and a sustain pedal symbol (ped.) is shown below the notes.
- Sine-tones (S-t.):** Shows a glissando on a treble clef staff. The frequency starts at 1318.51 Hz at 57:00, gliss down to 1046.50 Hz at 58:00, and then gliss up to 4186.01 Hz at 61:00. The instruction "gliss." is written below the staff.