

V ● Y A G E R

for Percussion Octet

6 PM, November 21, 2019 CE at the **Spencer Museum of Art**

Lawrence, Kansas, United States of America, Earth, Sol System, Milky Way, Virgo Supercluster...

Performed by **The University of Kansas Percussion Group**

Composed by **Ben Justis**

⊕ Encounter I: Terra Firma

Inclusion of Voyager's origin point as the first Encounter is significant, as the mission's cultural and humanistic side is every bit as important as the knowledge it unlocked. The mallet players start by drumming the morse code for "hello" as they overlap with echoes from the Golden Record greetings. Later, the vocalist sings into a vocoder, an electronic effect that takes speech and converts it to a synthesized sound. This unification of the human and the technological is fitting given the duality of Voyager's mission.



✧ About the Approach Movements

To illustrate the vast distances and travel times between the planetary encounters, these movements employ slow-moving, ambient backdrops and the performers disperse within the venue. Over time, the degree of musical structure decreases as the precise pitches, rhythms, amount of improvisation, synchronization, and even specificity of the instructions themselves are less and less controlled. This mirrors the drop in transmission strength received from the Voyagers which are so far away (over 13 billion miles) that the signal wattage received here on Earth is less than 20 *billionths* the power of a watch battery.



There are tidy relationships between how often the planets in the solar system go around the sun. Almost exactly eight years pass here on Earth for every 13 Venusian orbits, for instance. The resulting ratios were used to derive the rhythmic material and exact musical intervals used in the Approach movements. Such ratios also factored heavily into Voyager's mission design as its launch was scheduled to take advantage of a near-alignment of the outer planets that only occurs every 176 years. Both spacecraft used the gravitational pull of each celestial body to drastically increase their

speed. In fact, Voyager 2 did not acquire adequate velocity to escape the solar system until its flyby of mighty Jupiter.

✧ Approach I

Time to Jupiter: 2 years. Distance from Earth: 390 million miles.

The opening drone of this movement is derived from the extreme stretching of a synthetic string sound so that its embedded harmonics are brought to the fore. The rhythms played on the timpani relate to the Jupiter – Earth orbital resonance of 1:12. The interval produced from this ratio is a perfect fifth which features prominently in the design of the “Jupiter progression” heard at the end of the first Encounter and halfway through this movement.

ㄨ Encounter II: World of Storms

Jupiter, king of the solar system, is known for the beautiful bands of storms that perpetually swirl in its thick atmosphere. The largest and most prominent one, called “The Great Red Spot” (a maelstrom thought to have been continuously raging for over 350 years), is larger than the diameter of the Earth.



The violence of these storms is depicted with dissonant, aggressive mallet writing in mostly 16th-note rhythms. During a break in the tumult, a very old tune by Spanish composer Thomas Luis de Victoria is presented. *O Magnum Mysterium*, which translates to “O great mystery,” is quoted as a nod to Voyager’s exploratory purpose.

✧ Approach II

Time to Saturn: 2 years. Distance from Jupiter: 400 million miles.

The 2:5 ratio of Saturn and Jupiter’s orbital resonance features prominently in this Approach. The stacking of this interval results in augmented triads, a symmetrical sonority with an endless, otherworldly flavor. The high squealing and whooshing sounds you

hear were interpreted from the plasma wave instrument package aboard Voyager. The low, bass drum-like tones were picked up by the detectors whenever the thrusters of the ship's reaction control system fired for orientation maneuvers. In essence, we are hearing what Voyager heard as it left Jupiter.

‡ Encounter III: World of Rings and Hexes

Due to the particular setup of the instruments, the imitation that makes up the primary material of this movement is continually passed around in a ring shape that both hints at Saturn's iconic adornment and provides a moving point of interest. During the faster middle section, the rigid exchange of upward arpeggios creates a more hexagonal movement than elliptical. Such a shape is clearly seen at Saturn's north pole.



How this regular geometric shape formed within the otherwise turbulent cloud layers eludes scientists to this day. After the return of the ring-like imitation, notes are removed one at a time from the independent lines to let the music evaporate.

✧ Approach III

Time to Uranus: 5 years. Distance from Saturn: 900 million miles.

Uranus's 7:20 orbital resonance with Saturn results in a dissonant musical interval that's used prominently in the long melodies that intertwine with each other in this movement. Each of the drone layers are gradually moved up or down by this interval over the course of several minutes with faster tracks bent upward and slower ones downward. These harmonic strata undergo extreme stretching in multiples of seven to create offset temporal patterns that, if given enough time to play out, would take a very long time to finally align.

The percussionists are asked to listen closely to the audio and, when they hear a specific note they are "responsible" for, activate their instrument in the manner described in the score.

⚡ Encounter IV: World of Ice

Uranus's mysteriously low core temperature makes it the coldest planet in our solar system. Its hydrocarbon-rich atmosphere bestows it with a light green tint that is simultaneously beautiful and bland.

The crackling and buzzing sounds you hear were created using a modeling synthesizer to simulate objects bouncing against a glass resonator. The goal was to mimic the sound of a string ensemble trapped under a thick layer of fracturing ice beneath your feet. The performers are instructed to add and subtract pitches from a large chordal stack in response to the ever-shifting acoustic environment.



✧ Approach IV

Time to Neptune: 3 years. Distance from Uranus: 1 billion miles.

Given that Neptune has strong associations with the ocean (as the Roman God of the sea) a more aquatic sound environment seemed appropriate. The songs of humpbacks you hear were featured on the Golden Record underneath greetings from members of the United Nations. Applying extreme stretching to the whale song resulted in the discovery of a beautiful array of lush timbres. By pitch-shifting the audio tracks, the whales sing as a choir as their squeals and grunts interlock and diverge.

Ψ Encounter V: World of Darkness

By the time Voyager reached Neptune, it took over four hours for signals (traveling at the speed of light) to reach ground stations on Earth. Taking imagery of the planet proved especially difficult as its deep-blue surface and distance from the sun makes it 900 times dimmer there than here on Earth. Like Jupiter, it has distinctive weather patterns including a massive patch called “The Great Dark Spot.”





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IMAGE CREDITS



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