



THE REIF

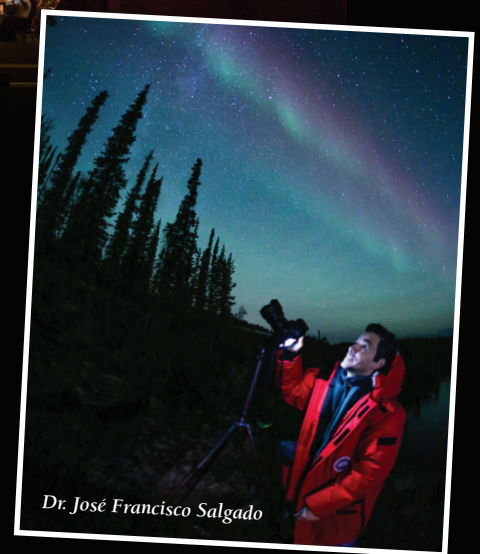
# STUDY GUIDE

The Itasca Symphony Orchestra and The Reif present

# *The* **UNIVERSE** *at the Symphony*



Enjoy a multimedia concert blending **science** and **music**, featuring Gustav Holst's *The Planets* and Christopher Theofanidis's *The Legend of the Northern Lights*. Emmy-nominated astronomer Dr. José Francisco Salgado will elevate the evening with his visual artistry and talks, bridging the gap between science and art.



Dr. José Francisco Salgado



ITASCA ORCHESTRA  
STRINGS PROGRAM



THE REIF

# ABOUT THE REIF

The Reif Center is more than a building.

With two auditoriums, four studio classrooms, an art gallery, and multiple practice rooms, it provides access for people of all ages to explore and exhibit their artistic talents.

The Reif Arts Council proudly produces Reif Education programming including Reif Dance and Theatre Education.

The Reif Center is home to the Grand Rapids Players and the Itasca Orchestra and Strings program. It is the venue for concerts of school bands and choirs.

The lobby gallery is curated by MacRostie Art Center and exhibits professional artists' work as well as multiple student showcases from area schools each year.

In addition to supporting all of these regional programs, the Reif presents a series of events each year, bringing theatre, dance, and music from around the world to our community.



## GOING TO THE THEATER

Please encourage your children to visit the rest rooms before the show begins. It is disruptive to visit the rest rooms during a live performance.

We recommend that you provide your children with some guidelines of things to look at and listen for during the performance.

“Going to the Theatre Watching a live performance is very different than watching television or going to the movies. When you see a live performance you play a part too! Your role is an audience member. As an audience member you should obey the following instructions. . . (You may also want to encourage your children to add to this list.)”

### Children should be encouraged to:

- A. Watch the performers.
- B. Listen to the music.
- C. Look at the costumes and set designs.
- D. Laugh when they see the performers do something funny.
- E. Clap to show the performers that they are enjoying the performance when the performance has finished. It is customary to applaud when the performers take a bow.

### Children should be encouraged NOT to:

- A. Talk or make noise because they might miss something important.
- B. Chew gum or eat because it is disruptive to others and makes a mess at the theater.
- C. Leave their seats before the lights go on because this is very distracting to their neighbors.
- D. Bring phones in the theater because this is disruptive to the dancers and other members of the audience.

## WHOSE PORTRAIT IS HANGING IN THE LOBBY?



### MYLES REIF

Myles Reif, for whom the center is named, was a former president of Blandin Paper Company who believed in investing in the arts and education. Thanks to his contributions, there is a place for generations of artists to develop and share their craft.



### LOIS GILDEMEISTER

The first director of the Reif Center was Lois Gildemeister, who was the greatest champion for the creation of a performing arts center in Grand Rapids. It was Lois' determination and vision that lead the community to come together and realize this dream.



## THE PLANETS

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### HOLST THE PLANETS

- I. Mars, the Bringer of War
- II. Venus, the Bringer of Peace
- III. Mercury, the Winged Messenger
- IV. Jupiter, the Bringer of Jollity
- V. Saturn, the Bringer of Old Age
- VI. Uranus, the Magician
- VII. Neptune, the Mystic

The Student Matinee will feature three iconic movements from Gustav Holst's The Planets

## GUSTAV HOLST

Born in Cheltenham, England 1874

Died in Hammersmith, England 1934

The Planets, op. 32

Composed between 1914-1916



Gustav Holst was born on September 21, 1874 in Cheltenham, England. Gustav was the eldest of two children in his family. His father, Adolph von Holst, was an accomplished pianist from Sweden and taught piano in England. His mother, Clara von Holst studied piano under Adolph when they first met. Clara died after the miscarriage of her third child; Gustav was only eight. Gustav was a very sensitive and fragile child growing up. He had severe asthma and poor eyesight. Gustav was taught the piano and violin at a very early age. He detested practicing the violin, but had a special interest in the piano.

Determined to make his son an outstanding pianist, Gustav's father sent him to Cheltenham Grammar School for composition in 1885 and Gustav also spent two months at Oxford learning counterpoint.

Despite his father's urgings, practicing piano was difficult for young Holst because he suffered from a neuritis condition in his hands.

Holst turned to composition and was highly prolific in his early teenage years. By 1891, at the age of 17, Holst had achieved several local performances of his vocal and instrumental works. In 1892, Gustav composed an operetta, called Lansdown Castle, which was produced at the Cheltenham Corn Exchange the following year. Gustav's father was so impressed by his son's operetta that he provided Gustav with enough money to attend the Royal College of Music.

A year before entering into the Royal College of Music, Holst received his first professional vocation as an organist at Wyck Rissington Church. He was the

later the organist and choirmaster of the choral society at Bourton-on-the-Water. These experiences would remain crucial in Holst's life as a musician. Upon enrollment at the Royal College of Music, Holst studied composition under Charles Stanford who taught Holst the most important aspect of becoming a better musician by showing him how to become his own critic.

In 1895, Holst met a classmate named Ralph Vaughan Williams. Williams and Holst became the best of friends throughout college and shared common interests in folk music, mythology, astrology, and Indian Hinduism. These unique interests of Williams and Holst would later have a great impact on Holst's compositions. Holst's other influences included composers Henry Purcell and Richard Wagner and the philosophies of Walt Whitman and William Morris.

In 1896, Holst pursued his interest in Hindu literature and philosophy and enrolled in Sanskrit lessons at the University College in London. At the same time, he was appointed conductor of the Hammersmith Socialist Choir at William Morris' house in Hammersmith Mall. He fell in love with the youngest soprano named Isobel Harrison, whom he would later marry.

Holst faced further problems with his neuritis condition in college. He could no longer practice the piano because the pain in his hands was too severe. Holst, knowing his career as a pianist was fading, decided to learn the trombone, which also helped his

asthmatic affliction. By being a trombonist, he could be in the orchestra and still have an income and also strengthen his skills as a composer. In 1897, Gustav joined the Queen's Hall Orchestra and played under the baton of composer Richard Strauss. As an enthusiastic trombonist, Holst's performance career was also prominent in the Carl Rosa Opera Company Orchestra, Scottish Orchestra in Glasgow and the freelance world. In addition to being an orchestral performer, Holst worked as a music conductor at numerous schools throughout London. Holst was an encouraging conductor and believed that every student who desires to play in the orchestra should have that chance.

Holst and Isobel Harrison were married in 1901. In 1903, the composer decided to end his orchestral playing career and become a teacher, succeeding Ralph Vaughn Williams at the James Allen's Girls School in Dulwich, and eventually at the St. Paul's Girls School in Hammersmith, where he taught for the rest of his life. In 1907, Gustav and Isobel's daughter Imogen was born. Like her father, Imogen devoted her life to music after attending St. Paul's School. She studied composition at the Royal College of Music, and then became the Artistic Director of the Dartington Hall Arts Centre.

In 1912, Holst and his friend, Clifford Bax, went to Spain for a holiday. While in Spain, Clifford Bax encouraged Holst to study Astrology, which inspired the composer's ideas for *The Planets*. Upon his return to London, Holst

began work on his most famous work, and by the time Holst finished his masterpiece, Europe was deep in the turmoil of World War I.

English conductor, Sir Adrian Boult, was a great admirer of Holst's music. Boult was later the one who conducted the very first public performance of *The Planets* in London in 1918, performed by the New Queen's Hall Orchestra. *The Planets* soon made Holst famous worldwide, and the popularity of the work yielded the performance and publication of several of his earlier works.

Being a passionate educator, Holst accepted the position of theory and composition faculty member at the Royal College of Music in 1919. In 1923, while conducting, Holst fell off the stage and suffered from a concussion, which forced him to retire. However, Gustav kept his teaching position at St. Paul's Girls School and began composing again. In 1927, Holst was honored by his hometown, Cheltenham, when they arranged a Holst Festival.

In 1932, Holst was honored as guest composition lecturer at Harvard University. Poor health cut his United States visit short and he was forced to return in England, but still continued to compose, despite his invalid status. Gustav Holst passed away on May 25, 1934 due to heart failure. His legacy as a prominent 20th Century composer rests on the success and popularity of *The Planets*.

# THE PLANETS, OP. 32

Originally entitled Seven Pieces for Large Orchestra, The Planets, Op.32 is a seven-movement orchestral suite by the English composer, Gustav Holst, written between 1914-1916. Each movement uniquely represents a planet of the solar system, and expresses distinctive characteristics and emotions of the planets based on their appearance and the Roman and Greek mythological tales based on gods and goddesses with the same names. The order of the movements corresponds to the distance of each planet from Earth:

- I. Mars, the Bringer of War
- II. Venus, the Bringer of Peace
- III. Mercury, the Winged Messenger
- IV. Jupiter, the Bringer of Jollity
- V. Saturn, the Bringer of Old Age
- VI. Uranus, the Magician
- VII. Neptune, the Mystic.

At the time, no composer had written a work of The Planets' equal in terms of scale and multi-movements. Especially in terms of orchestra size, The Planets was a rarity among orchestral repertoire of the early 20th Century with its scoring for at least 80 players, including special instrumentation, and 6-voice women's chorus. The instrumentation for the work is as follows:

- 4 Flutes (3rd doubling 1st Piccolo; 4th doubling 2nd Piccolo; Bass Flute in G (or Alto flute))
- 3 Oboes (3rd doubling Bass Oboe)
- 1 English Horn
- 3 Clarinets in Bb
- 1 Bass clarinet in Bb
- 3 Bassoons
- 1 Contrabassoon
- 6 Horns in F
- 4 Trumpets in C
- 3 Trombones (2 Tenor; 1 Bass)
- 1 Euphonium in Bb
- 1 Bass Tuba
- 1 Celesta
- 1 Organ
- 6 Timpani (2 players, 3 drums each)
- 9 Percussion (Bass Drum, Snare Drum, Cymbals, Triangle, Gong, Tambourine, Glockenspiel, Xylophone, Tubular Bells)
- 2 Harps
- 10 Violin I
- 10 Violin II
- 8 Viola
- 8 Violoncellos
- 4 Double basses
- 2 three-part women's choruses (SSA)

The idea for The Planets was conceived in 1913 from Holst's thorough interest in Astrology and Sanskrit literature. The first movement, Mars, the Bringer of War, being completed in 1914 in anticipation of the outbreak of World War I. Venus and Jupiter were also completed in 1914, with Saturn, Uranus and Neptune in 1915, Mercury in 1916, and the entire score in 1917. The first private performance of the work was given in 1918 in London's Royal Albert Hall, its popularity growing with the anticipation of the first public performance in 1920, played by the New Queen's Hall Orchestra under the baton of Holst's close friend, Sir Adrian Boult.

The first complete public performance was finally given in London at the Queen's Hall by the London Symphony Orchestra on November 15, 1920, conducted by Albert Coates. This was the first time that Neptune had been heard in a public performance, as all the other movements had been given earlier public hearings.

Holst later conducted the London Symphony Orchestra to record the work on two occasions, 1922-23 and 1926.

It is often said that Holst incorporated some of his own musical personality traits in each movement, which also correspond to the personalities of the Roman and Greek deities that the planets are named for. Venus's lyricism embodies relaxation, and Jupiter shows a great deal of extroversion in its wide and open melodies, while Saturn's slow processional evokes a melancholy mood. Uranus's mischievous tunes emulate humor and the homogeneity of harmonic language of the other movements serve as different characteristics as well: Mars's harshness, Mercury's ambiguity and Neptune's mystery.

The way that Holst evokes the specific qualities and characteristics of each planet and how he uses movements to contrast one another, the listener is able to experience the effect of travelling through the solar system, pausing to thoroughly observe and appreciate the grandeur and "personality" of each planet. For example, since Neptune was the last planet discovered at the time of The Planets composition, Holst's use of bitonality and dissonance evokes mystery and remoteness. His use of women's voices at the end of the movement in a fading technique ends the work as if it is lingering into infinity. When one listens to the final diminishing chords, the experience had is as if the listener is passing by the last planet, watching it grow smaller behind them, as they move forward into the unknown of the universe.

Holst completed The Planets before the 1930 discovery of the (at the time) ninth planet, Pluto. Since Holst felt that the popularity of The Planets overshadowed other works that he felt deserved more recognition, he had no desire to compose an eighth movement. However, Colin Matthews, an English composer and Holst enthusiast, composed an orchestral work entitled Pluto, the Renewer, in 2000. Commissioned by the Hallé Orchestra, the work was premiered in Manchester in May of 2000, and conducted by Kent Nagano. Having worked with Holst's daughter Imogen at the Aldeburgh Festival 1972-1984, Matthews dedicated the work to her and her father's memory. In order to emulate Holst's style, Matthews incorporated a women's chorus so that the transition from Neptune to Pluto would be smooth. However, with the 2006 discovery of Pluto actually being a dwarf planet, it seems that Holst's orchestral work is entirely complete.

# I. MARS, THE BRINGER OF WAR

## SCIENTIFIC DESCRIPTION

At 4.6 billion years old, Mars is the fourth planet from the sun and emits a bright reddish-orange color, due to the planet's iron-rich soil. Mars has been observed thoroughly by Earth's scientists through telescopes and space probes, but no human has ever set foot on the planet. While Mars has clouds in its atmosphere and ice deposits at its north pole, no liquid water flows on the planet's surface, though scientists have found evidence that there was once water and life dwelling on the planet. This evidence has been discovered in meteorite materials found on Earth. Mars has deep canyons, tall mountains and the largest volcanoes in the solar system. The terrain consists mostly of crater-ridden, low-lying, flat plains which frequently experience intense dust storms. Martian temperatures range from  $-195^{\circ}\text{F}$  to  $70^{\circ}\text{F}$  with an average temperature of  $-80^{\circ}\text{F}$ . At roughly 140,000,000 miles away from the sun, Mars orbits the sun once every 687 Earth days.



## ROMAN GOD

Mars is the ancient Roman god of war, spring, growth in nature, agriculture, terror, anger, revenge, courage and fertility. The son of Jupiter and Juno, and the lover of Venus, he is regarded as the father of the Roman people because he is the father of Romulus and Remus, the legendary founders of Rome. He is the most prominent of the military gods and was frequently worshipped by Roman legions. The month of March is named after him, as wars in ancient Rome were often started or renewed in the spring.



## GREEK EQUIVALENT:

A R E S

## ORIGIN OF NAME

The Romans named the planet Mars after the ancient Roman god of war because of the planet's color association with blood.

## WHAT TO LISTEN FOR

- 5/4 time
- Ostinato- driving and reoccurring rhythm
- Col legno technique in strings
- 3 main melodies
- Tri-tonal harmonies and other dissonances
- 40 measures of continuous crescendo in gong at beginning
- Juxtaposition of trombone and trumpet solo lines

## LISTING MAP

- Section A: 00:05-01:24- Melody 1  
01:24-02:08- Melody 2
- Section B: 02:08  
02:12-03:04- Melody 3  
02:43- Juxtaposition of trombone and trumpet
- Section C: 03:04- Time change from 5/4 to 5/2  
03:12- Melody 2
- Section A: 04:19- Melody 1 and time change back to 5/4  
05:05- Melody 3  
05:21- Melody 2  
06:06- Brief time change back to 5/2
- Coda: 06:15  
06:33- Time change to 3/4

## OTHER

- The first movement to be composed
- Composed just before the outbreak of WWI- in anticipation rather than influenced by "Implacable menace and savage brutality of startling vision"

# II. VENUS, THE BRINGER OF PEACE

## SCIENTIFIC DESCRIPTION

Referred to as Earth's twin because of similarities in size, Venus is the second planet from the sun. After the moon, Venus is the brightest celestial object seen in the evening sky—often the first in the western sky and the last in the eastern sky. At approximately 66 million miles away from the sun, Venus orbits the sun in a nearly circular path making a complete orbit in about 225

Earth days, and rotating once every 243 Earth days. The atmosphere of the planet is constantly engulfed by thick clouds of sulfuric acid, making scientific research about the planet's surface difficult. From exploration by space probes, with Venus being the first planet to be observed by passing space craft, scientists have gathered that the surface of Venus is extremely hot and dry—so much that no liquid water is able to flow without boiling away. 65% of Venus's land consists of flat, smooth plains, while the remainder is mountains, canyons, valleys and volcanoes. Because of its substantial lack of craters, compared to that of other surrounding planets, scientists predict that the planet Venus is less than 1 billion years old. With a heavy, acidic atmosphere and average surface temperature of 870° F, scientists doubt that any life exists on Venus.



## ROMAN GOD

Venus was originally a vegetation goddess and patroness of gardens and vineyards, but under Greek influence and association with the Greek goddess Aphrodite, Venus became the ancient Roman goddess of love, beauty and fertility. The daughter of Jupiter and the lover of Mars and Vulcan, Venus was named the direct ancestor to both Julius Caesar and the emperor Augustus, and played a major role in ancient Roman religious festivals. Venus was also ascribed several epithets to refer to the various roles of the goddess, including grace, purity and motherhood.



## GREEK EQUIVALENT:

APHRODITE

## ORIGIN OF NAME

Venus is named in honor of the ancient Roman goddess of love and beauty, derived from its brightness and beauty in the evening sky.

## WHAT TO LISTEN FOR

- 2 main melodic sections
- Thin texture and high tessitura
- Calm opening with horn and flutes
- Solos
- Use of perfect 4th and 5th intervals for contrast from Mars
- Bitonality, dissonance, key modulations

## LISTING MAP

- Section A:** 00:01-00:36- Calm opening and Melody 1
- Section B:** 01:52- Modulation from Eb major to F# major  
01:55 and 03:04- Violin solo  
02:37 and 03:26- Oboe solo  
03:26- Modulation back to Eb major  
03:33- Clarinet solo  
04:09- Cello solo
- Section A Variations:** 04:16
- Section B:** 05:20
- Section A Restatement:** 06:07  
06:43- Bitonality (Eb and E)
- Coda:** 07:04

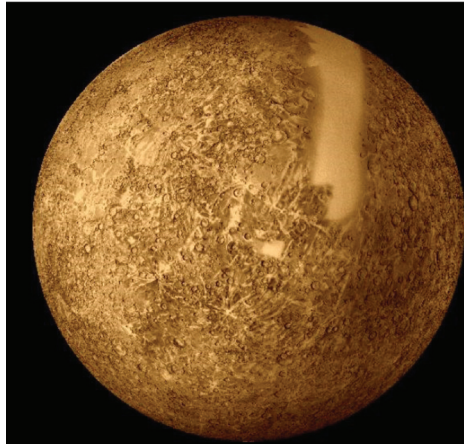
## OTHER

- “Soothes the soul with its heady mix of purity and sensuousness”
- “Conciliatory answer to the brutality of Mars”

# III. MERCURY, THE WINGED MESSENGER

## SCIENTIFIC DESCRIPTION

At 36,000,000 miles away, Mercury is the closest planet of the solar system to the sun. With an elliptical-shaped orbit, Mercury moves faster around the sun than any other planet at 30 miles per second, and makes a complete orbit in only 88 Earth days. However, the planet rotates very slowly—once every 59 Earth days, which is slower than any other planet, besides Venus. As a result of the combination of a quick orbit and a slow rotation, a single day on Mercury lasts 176 Earth days. The surface of the planet is very similar to that of the Earth's moon, as it reflects 6% sunlight and is covered by a thin layer of minerals called silicates. Mercury, like the moon, is comprised of a mixture of flat plains, steep cliffs and deep craters. Mercury is surrounded by a magnetic field, leading scientists to believe that the planet's outer core is made of liquid iron. Because it is so close to the sun, Mercury is very dry, hot and nearly airless, with high temperatures reaching 840°F. However, nighttime temperatures can drop to -275°F with a completely black sky, due to Mercury's lack of atmosphere. Because of its lack of oxygen and high temperatures, scientists believe existence of life is impossible.



## ROMAN GOD

Mercury is the ancient Roman god of trade, profit, merchants and travelers—the circulation of people, goods and words. He is often portrayed wearing winged sandals and a winged hat, like that of his Greek counterpart, Hermes, the messenger of the gods.



## GREEK EQUIVALENT: HERMES

## ORIGIN OF NAME

Ancient Greek astronomers observed Mercury as two separate celestial objects: Apollo, visible only at sunrise and Hermes, visible only at sunset. The ancient Romans named the planet Mercury, the god of trade, whom they associated with the Greek god Hermes.

## WHAT TO LISTEN FOR

- Switch between compound and simple rhythmic feel
- Bitonality- two keys simultaneously- Bb Major and A Major
- Scherzo with hemiola sections throughout
- Restatement of Mars theme
- Passing theme between solos and families of instruments

## LISTING MAP

- Section A:** 00:00-00:34- Melody 1  
Hemiola section example- 00:12  
00:29- Mars ostinato theme in violins  
00:35- Melody 2
- Section B:** 00:58  
01:01- Melody 3 in violin solo
- Section A Variations:** 01:57- Melody 1  
02:20- Melody 4
- Coda:** 03:00  
All 3 melodies combined

## OTHER

- “Flies past with an irrepressible, yet delicate, rhythmic drive”



# IV. JUPITER, THE BRINGER OF JOLLITY

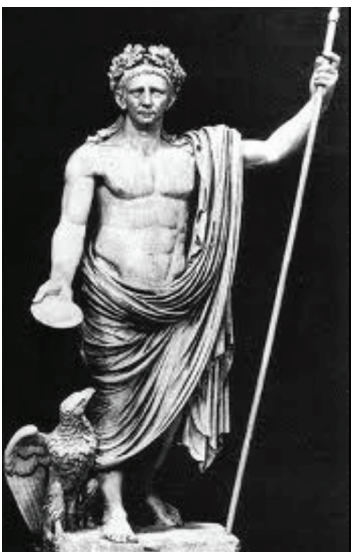
## SCIENTIFIC DESCRIPTION

The largest planet in the solar system, Jupiter is the fifth planet from the sun, approximately 484,000,000 miles away. The planet is so large it would take over 1,000 Earths to fill an equivalent volume. Because of its size, Jupiter is visible from Earth as the second-brightest planet, after Venus. Jupiter has very little solid surface area, and is made up primarily of gas and liquid clouds. These clouds of red, brown, yellow and white coloring comprise light areas, or zones, and darker areas known as belts. Jupiter is distinguished by its Great Red Spot, which scientists believe is an intense atmospheric disturbance due to its similarity to a hurricane. The planet orbits the sun in an elliptical shape, and takes 4,333 Earth days, or nearly 12 Earth years, to make one complete orbit. Jupiter rotates faster than any other planet, taking nearly 10 hours to spin around once. The planet's rotational speed is measured on Earth by radio waves emitted by Jupiter that are so strong that they effortlessly reach Earth's radio telescopes. The core of Jupiter measures about 43,000°F, while the top of the planet's clouds range from -235° to 70°F. Jupiter also has three rings made of fine dust particles that circle around its equator



## ROMAN GOD

Jupiter is the ancient Roman king of the gods, and was the god of sky, lightning and thunder and protector of the state and its laws. The son of Saturn, the brother of Neptune and Pluto, and the husband of Juno, Jupiter is considered the patron god of Rome, whose temple was the official place of state business and sacrifices. The ancient Romans looked to Jupiter as ruler of the universe, god of the state, distributor of laws, and controller of the realm who made his will known through oracles.



## GREEK EQUIVALENT:

Z E U S

## ORIGIN OF NAME

Jupiter earned its name from the ancient Roman king of the gods, derived from the planet's magnitude and the Roman people's perception of it as powerful.

## WHAT TO LISTEN FOR

- Main hymn-like melody orchestrated later by Holst- "I Vow to Thee, My Country"
- Syncopation and hemiola figures in opening melody
- Ostinato patterns

## LISTING MAP

Scherzo:

Section A: 00:00– Ostinato

00:05- Melody 1, syncopation & hemiola

00:27- Melody 2

01:01- Melody 3

01:22- Melody 1

Section B: 01:39- Melody 4

Transition: 02:28

Trio: 03:00- Melody 5, modulation from C Major to c minor

Scherzo: 04:58

Section A: 05:08- Restatement of Melody 1 and modulation back to C Major

Section B: 06:42- Restatement of 2nd theme

07:18- Restatement of Melody 5, modulation to B Major

Coda: 07:36

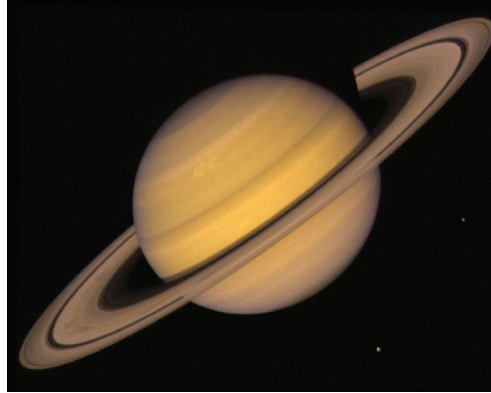
## OTHER

- "Swaggeringly exuberant"

# V. SATURN, THE BRINGER OF OLD AGE

## SCIENTIFIC DESCRIPTION

The second largest planet next to Jupiter is Saturn, which is distinguished by its seven flat rings, encircling its equator. While the planet can be seen from Earth, its rings cannot. At over 940,000,000 miles away from the sun, Saturn orbits in an elliptical shape, taking 10,759 Earth days, or 12.5 Earth years to make one complete orbit. Saturn is the second fastest planet next to Jupiter in rotating, spinning at a rate of nearly 10.5 hours. While the core of Saturn is solid, the majority of the planet, including its surface, is comprised of gas with a dense layer of clouds. Since it is so far from the sun, scientists believe that the planet's outermost temperature of -285°F and much higher inner temperature prevent any life from existing on the surface. While Saturn has the lowest density of any other planet, its mass still makes it 95 times more massive than Earth. Discovered by Galileo in the early 1600's, Saturn's seven rings consist of thousands of smaller rings, all made of ice. The largest and outermost ring measures over 180,000 miles across.



## WHAT TO LISTEN FOR

- Syncopated chords in basses- suggests approaching old age
- Calm ending section- suggest acceptance of old age
- Use of bass flute and bass oboe
- Ambiguity of tonality
- Bitonality and dissonances

## LISTING MAP

- Section A:** 00:14- Melody 1, chords in basses  
02:05- Melody 2  
03:36- Melody 3  
05:24 and 05:39- syncopation with chimes
- Section B:** 06:07- Melody 1  
06:36- Bitonality- Orchestra in a minor, Harps in A major, Harp solo

## ROMAN GOD

Saturn is the ancient Roman god of agriculture and overseer of the sowing of seeds. His introduction of agriculture and viniculture heralded a period of peace, happiness and prosperity, known as the Golden Age. The day Saturday is named after him.



## GREEK EQUIVALENT:

CRONUS

## ORIGIN OF NAME

Saturn earned its name in honor of the ancient Roman god of agriculture. Based on the Greek equivalent's status as the youngest Titan, the name Saturn affiliates the planet as the last, or "youngest," visible planet to ancient astronomers.

## OTHER

- Holst's favorite movement
- "An awesome processional"

# VI. URANUS, THE MAGICIAN

## SCIENTIFIC DESCRIPTION

Uranus is the seventh planet from the sun and the farthest planet that can be seen without a telescope. It is approximately 1,785,000,000 miles away from the sun, a distance that takes light 2.5 hours to travel, and was the first planet to be discovered since ancient times. Uranus orbits the sun in an elliptical shape and takes 30,685 Earth days, or 84 Earth years, to complete one full orbit. In terms of rotation, the planet completes one full rotation in just over 17 hours. Uranus is distinct because of its pale blue-green color from its clouds that are primarily composed of hydrogen gas. Uranus is also severely tilted on its axis, explained by a probable collision with another planet when it was first formed. Therefore, the sun shines more brightly on the planet's poles than its equator. Like Saturn, Uranus has several rings circling it which range from 3 miles to 60 miles wide. Uranus is 14.5 times larger than Earth, but is only 1/20 the size of Jupiter. Uranus was not recognized as a planet by ancient astronomers because of its dimness and slow orbit, and was not discovered until the late 1700's.



## WHAT TO LISTEN FOR

- “Interrupts” Saturn with 4 brass chords that reoccur throughout movement
- 4 reoccurring chords are musical letters of Holst’s name in German: G, Eb, A, B (GuStAv H)
- Dissonance

## LISTING MAP

<b>Introduction:</b>	00:01- Melody 1, brass chords
<b>Section A:</b>	00:20- Melody 2 00:36- Hemiola motif 00:50- Melody 3 01:23- Melody 4 02:39- Melody 5
<b>Section B:</b>	04:12
<b>Coda:</b>	04:43

## ROMAN GOD

Uranus is the ancient Greek god of the sky, known as the embodiment of the heavens, and plays a pivotal role in Greek creation mythology. Together with his wife Gaia, or Mother Earth, he fathered the Titans, the Cyclopes, the Hecatonshires and the Erinyes. According to the Greek poet Hesiod, Uranus was wounded by his son Cronus, the youngest Titan, and the blood spilled on the Earth created the goddess Aphrodite, among other mythological icons.



## GREEK EQUIVALENT: CAELUS

## ORIGIN OF NAME

The only planet named after a Greek mythological icon, Uranus is named in honor of the ancient god of the sky. Uranus is the father of Cronus (Saturn) and the grandfather of Zeus (Jupiter).

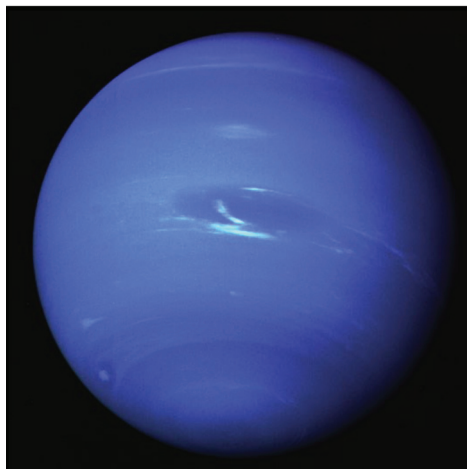
## OTHER

- “Gleefully mischievous”

# VII. NEPTUNE, THE MYSTIC

## SCIENTIFIC DESCRIPTION

Neptune, the eighth planet from the sun, is one of two planets that cannot be seen with a telescope, the other being Pluto. The planet travels around the sun in an elliptical orbit, approximately 2,800,000,000 miles away, and takes 165 Earth years to make one complete orbit, while taking only 16 hours to make one complete rotation. Distinct because of its bright blue color, Neptune's gaseous surface is comprised primarily of hydrogen, helium, water and silicates with an atmosphere of clouds of frozen methane. Neptune has 11 moons and 4 circling rings made of dust particles. The planet was discovered in the mid-1800's, purely by mathematics after scientists noticed that Uranus had unexpectedly changed positions from the unknown planet's force of gravity.



## ROMAN GOD

Neptune is the ancient Roman god of the sea and was the brother of Jupiter, Pluto and Juno. He was held in higher esteem as his epithet Neptune Equester, god and patron of horses and horse-racing.



## GREEK EQUIVALENT:

POSEIDON

## ORIGIN OF NAME

Neptune was named after the ancient Roman god of the sea because its deep blue clouds reminded astronomers of oceans.

## WHAT TO LISTEN FOR

- 5/4 time
- Use of bass flute and women's chorus
- Voices- two chords fading into distance at the end- representing passing the last of the planets
- Bitonality and dissonance
- Soft dynamics throughout

## LISTING MAP

Section A: 00:00-03:30- Melody 1

Section B: 03:30- Melody 2, glissandi in harps

03:59- Melody 3, addition of women's chorus

04:47- Bitonality- Orchestra in a minor, Chorus in E Major

Coda: 05:40

06:25- fading chords

## OTHER

- "Gleefully mischievous"

KV 265  
SCIENCE THROUGH ART

*The Legend of*  
**THE NORTHERN LIGHTS**



## **ABOUT KV 265'S THE LEGEND OF THE NORTHERN LIGHTS**

Music by **Grammy-nominated composer,  
Christopher Theofanidis**

Co-Commissioned by **KV 265 & Grant Park  
Music Festival**

Film by **Emmy-nominated astronomer Dr.  
José Francisco Salgado**

Script by **Kelli Landes and Anne Barlow**

Inspired by a children's story by **Walt Terry**

Premiered by **Grant Park Orchestra in  
association with the Canadian Space Agency**

Taking as inspiration a Canadian children's story, *The Legend of the Northern Lights* is a fusion of science and fantasy that captures the imaginations of all ages, seamlessly combining music, film, narration, and animation. It recognizes both the cultural stories surrounding the aurora and the actual science that causes them.

The film takes the audience on a spectacular voyage from the Earth's upper atmosphere to the Sun, and to the far reaches of subarctic Canada. This multimedia work features NASA images of the Sun, NASA animations of coronal mass ejections (CMEs) interacting with the Earth's magnetic field, and the auroras from space as well as original timelapse photography of this wondrous phenomenon shot on location, from Yellowknife, Northwest Territories, Canada.

## **ABOUT KV 265**

KV 265 is a non-profit organization whose mission is the communication of science through art to communities worldwide. It seeks to heighten appreciation and understanding of art, music, science, and technology, and to inspire further exploration of these disciplines among its audience members through multimedia concerts, lectures, and educational workshops

### **Background**

In 2000 Dr. José Francisco Salgado (then an astronomer at the Adler Planetarium in Chicago and an adjunct professor at Benedictine University) began to apply his skills in scientific illustration and photography to create astronomy-themed artwork that would "provoke curiosity and a sense of wonder about the Earth and the Universe". This evolved into a series of multidisciplinary projects where art is used as a vehicle to communicate science and to inspire people to learn about science on their own. The flagship project of this series has been the *Science & Symphony* films. This project began in 2006 as a collaboration with the Chicago Sinfonietta. It consists of live performances of classical music works accompanied by high-definition science films produced specifically for these works.

### **Formation of KV 265**

Building on the overwhelming success of the first two films, Dr. Salgado, Anne Barlow, and Dr. Geza Gyuk, formed KV 265. This non-profit organization, whose mission is the communication of science through art, has taken up the mantle and continued to expand on these performance and educational experiences. Through partnerships with symphony orchestras, chamber musicians, composers, artists, scientists, and educational institutions, KV 265 presents multidisciplinary works connecting disciplines including astronomy, photography, music, film, and storytelling.

## THE NORTHERN LIGHTS, SCIENTIFIC PERSPECTIVE

These natural displays of light are technically known as auroras. When these occur in the Northern Hemisphere, they are called the aurora borealis or Northern Lights, and when they occur in the Southern Hemisphere, they are called the aurora australis or Southern Lights. Because of the way landmasses (and therefore human populations) are distributed on Earth, auroras are more easily visible in the Northern Hemisphere than in the South, which is why we hear less about the Southern Lights.

Auroras occur high up in the atmosphere where the air is more than a million times thinner than here on the ground. At about 90-160 km up they are far higher than the highest airplanes but below where satellites such as the International Space Station orbit. Their great height allows auroras to be seen from distances of hundreds of kilometers.

Auroras have their origins, not on Earth, but on the Sun, which is the star around which the Earth orbits. The fiercely hot outer layer of the Sun, the corona, emits a steady stream of particles that are high in energy called the solar wind. These particles flow out from the Sun and a small fraction encounter the Earth. Luckily for us, these particles carry an electrical charge and are affected by magnetic fields so they are mostly blocked or trapped by the Earth's magnetic field. The trapped particles form the Van Allen radiation belts that are very dangerous for manned space flight.

However sometimes the Sun ejects a very large number of particles (electrons and protons) at the same time. Such an event is called a coronal mass ejection or CME. Although the ejected particles travel at very high speeds, the distances in the solar system are so vast that it takes two or three days for the "storm" of particles to make the journey from the Sun to the Earth.

On arriving at Earth, the storm of high-energy particles, shake the Earth's magnetic field violently, freeing some of the trapped particles. Because of the way the Earth's magnetic field bends into the Earth's surface at the poles, and because the Sun's particles carry an electrical charge that is affected by magnetism, the swarm of particles is guided by the Earth's magnetic field and directed toward the north and south magnetic poles. This is why we see the auroras most strongly near the poles, although sometimes they can be seen quite a lot farther south.

These "freed" particles smash into atoms and molecules in the Earth's upper atmosphere. Our atmosphere is mostly made up of nitrogen and oxygen gas. When the incoming particles collide with the atmospheric gas particles, the latter emit particles of light called photons. Each type of atom or molecule emits a characteristic set of colors under such circumstances, which is why the auroras have the colors they do. Green, red, and purple are the most common colors. There is a slow "leakage" of energetic particles from the magnetic field that causes auroras on most clear nights. But the CME storms produce magnificent displays that cover the polar skies with light and even produce aurora that can be seen as far south as Texas!

## THE NORTHERN LIGHTS, THE CHILDREN'S STORY

The script for this production of *The Legend of the Northern Lights* was inspired by a story written by Canadian author Walt Terry. During WWII, Mr. Terry was a navigator on Lancaster Bombers for the Canadian Air Force. On one mission, he was badly wounded, and had to have major surgery. Following that, he was shipped to a safe location in Labrador Canada to recover from his wounds and surgery.

It was there that he first got to know Canadian native peoples, and learned from them some of their customs and traditions. Some years later, he wrote a series of short stories and poems for the children of close friends, and *The Legend of the Northern Lights* was among them. He wove some of what he learned about the auroras from the natives into the original story that became the inspiration for this production. Although inspired by the children's story, this version of *The Legend of the Northern Lights* has been altered with the addition of new characters, film, and music and to fit the scientific aspects of the production.

# THE STORY AND MUSIC

The film opens with a splash of musical color as the camera orbits around Earth. We can see the city lights that flow past our point of view and some lightning from storms in the clouds. The music features a pulsing theme. This theme fades, and is replaced by arpeggios – musical chords in which the notes are played in sequence rather than all at the same time. These are played on the strings and harp. We then see the opening credits. During the opening credits, a number of the recurring musical themes are presented, that later are developed into leitmotifs for various aspects of the film. We again see the rotating Earth, and the city lights.

We then see a series of questions flashing on the screen, while the child actor asks these questions. The last question is, “What are the Northern Lights?” This question sets up what is to come next. In the music, we hear the Northern Lights leitmotif. The adult actor then takes up the question, and in dialogue with the child, gives a scientific explanation (while an animation plays), and explores various other cultural explanations with accompanying images. The Northern Lights leitmotif is musically developed, and the adult actor shows the child an old box that has come down to him from his ancestors. It contains a family —that they have their own legend about how the Northern Lights come to be.

To a background of mysterious music, the narrator explains that something happened to his great-great grandparents Archie and Nunataq, and they swore that it was true, and that old, beaten, dark case he shows the child is proof of the story. The scene moves to the far north and a lonely cabin in the woods.

Suddenly, the narrator then shifts our attention to the Sun, and we see visuals of our star with powerful energies being manifested by the roiling surface and loops of mass dancing on the surface. The music changes to powerful chords in the brass, punctuated by the percussion, musically demonstrating the power of the Sun. We see storms flash across the surface and, as the Northern Lights theme returns, an ejection of matter from the Sun’s surface. Other such ejections follow.

The scene then changes to a view of the Earth, far in the distance, and we travel towards it with the coronal mass ejection (CME) particles. We can see the particles hit the Earth’s magnetic field, and the film dissolves into a scene of pine trees in the northern winter.

We travel down to ground level, with musical hints of both the Sun and Northern Lights accompanying us. We pass an alpine stream, see some wildlife and a beautiful, frozen landscape. The music here is mostly strings, harps, and some percussion. A mysterious hooded figure is seen crossing the screen. The narrator resumes his story, and we see a trapper

traveling the landscape via dogsled. This is Archie, returning home from a trip.

To a scampering pizzicato theme in the strings, accompanied by woodwinds and harp, we travel through the snow with the sled. It is moonrise when Archie arrives at his cabin. The dogs settle in for the night, and Archie greets his wife, Nunataq. They settle in for a peaceful night.

We see the interior of the cabin, and the fire on the hearth. Suddenly, there is a knock at the door. A knocking theme is heard in the music. To ominous music, Archie opens the cabin door and looks to see who is there. We hear the mysterious stranger theme, and see, through the cabin window, a hooded figure, dressed all in black. The stranger enters the cabin and joins them by the fire. In the music, we hear echoes of the Northern Lights theme and the mysterious stranger music. The stranger lays a dark case on a table. We see the case open slightly, and both light and music seem to leak out of the case.

Nunatak offers the stranger tea and bannock biscuits. After hungrily eating his biscuits, the stranger thanks them, in a kind of rippling song, accompanied by the orchestra. He offers them a gift in return for the food — a gift of music. The stranger takes a violin from the old case. He goes out into the snowy night, and as he begins to play, the bow begins to emit ribbons of light. Musically, the Northern Lights become a violin solo with orchestra. As the images of the Northern Lights (actual images, not animations) become more complex and glorious, so does the music, mingling the Sun theme, the Northern Lights theme, and the other musical themes presented in the story.

In the film, from this point onward, we leave the family story and see a parade of images of the Northern Lights as they actually appear in Yellowknife, Canada. We see globes and curtains of plasma green, yellows, and purples, dancing and swirling in the atmosphere as pressure changes in the air cause them to move and change.

We have moved from the story now to the science. We see the Northern lights over frozen lakes, mountains, forests, and cabins. Then the Sun theme is heard again and we move to an animation of the Earth’s magnetic lines, and we see the solar particles being funneled around the North Magnetic Pole. We see images from the International Space Station (ISS) showing the Northern Lights with the Canadarm manipulator arm visible. More film follows, showing the flow of the Northern Lights across the top of the Earth. The orchestra joins in with the Northern Lights theme, the Sun theme, and others. The orchestration becomes more complex and reaches a climax as we see the Earth rotating, ablaze with the Northern Lights.

# THE LEGEND OF THE NORTHERN LIGHTS, THE MUSIC

Writing music for a film is very different than writing a song or a work for orchestra. The musical ideas have to relate to what's on screen, and the composer is not in charge of what ideas appear when. This is very different from writing a symphonic composition, where the composer is in complete charge of the musical score.

In this case, composer Christopher Theofanidis had to create musical ideas (themes or leitmotifs) representing the characters and supporting the narrated sections of the story as well as the scientific images. The creative team first worked to develop a storyboard of the various scenes and then adjusted the script, film, and music to create the final project.

## PROGRAM NOTES BY COMPOSER CHRISTOPHER THEOFANIDIS

KV 265's admirable goal of fusing science with the arts appeals to me very deeply, as I have always thought that the deepest aspirations of humanity can be found in both disciplines. In this particular case, the vehicle for bringing these two things together is a simple children's story told with narration, music, and film, and it is one that tries to underscore the idea that the journey of evolving is driven by our basic need to both admire and to technically understand something.

The actual story begins with a child looking into the night sky and asking questions of a grandparent: 'how many stars are there?', 'how old is the moon?', and the like. The final question, 'what are the northern lights,' starts the grandparent ruminating on how since the beginning of time, humankind has tried to answer these kind of questions—to explain what seems inexplicable—and has come up with answers reflecting the values of the time and the individuals searching for explanations. The grandparent explains that even in their own family there was a legend of the Northern Lights, and the rest of the story proceeds narratively from there.

It has been exhilarating to work with both the storytelling and filmic components of this work. The music tries to respond to both of these elements in a synthesized way—allowing moments of one or the other to dominate depending on the arc of the drama, as opera does between language, drama, and music.

### Instrumentation

1 Narrator  
1 Child Actor  
Film  
1 Piccolo  
2 Flutes  
2 Oboes  
1 English horn  
3 B-flat Clarinets (2nd doubles e-flat, 3rd doubles bass)  
2 Bassoons  
1 Contrabassoon  
4 Horns  
3 C-Trumpets  
3 Trombones (3rd is bass)  
1 Tuba  
1 Timpani  
2 Percussion  
1 Harp  
Strings



# SCIENCE GLOSSARY

- atom. . . . . Atoms consist of a nucleus (plural nuclei) containing protons (positively charged particles) and neutrons (neutral particles). Around the nuclei are negatively charged particles called electrons.
- corona . . . . . The corona is the gaseous outer layer of the Sun and other stars.
- coronal mass ejection (CME) . . . . . A coronal mass ejection occurs when particles (mass) are ejected in large quantities from the corona of a star.
- electrons. . . . . A subatomic particle with a negative electrical charge found in all atoms and acting as the primary carrier of electricity.
- element . . . . . An element is the smallest particle of matter that has the characteristic properties of that kind of matter. Atoms of a particular element have a characteristic number of protons in their nuclei.
- matter. . . . . Matter is anything that has mass and occupies space.
- molecule. . . . . A molecule is the smallest particle of an element or compound that has the characteristic properties of that type substance. Usually, molecules have two or more atoms joined together, and are stable, not breaking apart easily.
- particle. . . . . In chemistry, we use the word particle to mean any small bit of matter. We often use particle when we don't want to be specific as to the kind of matter involved.
- photon . . . . . Light can exhibit properties of both a wave and a particle at the same time. When we look at the particle aspect of light, we call these particles photons.
- plasma . . . . . Under some high-energy conditions, the electrons of the atoms are stripped from their nuclei, and the nuclei and electrons exist in a kind gaseous fluid called a plasma. Often under these conditions, the electrons can emit photons (particles) of light.
- magnetism . . . . . Magnetism is produced by moving electrical charges (moving electrons). For this reason, electrically charged particles can affect magnets, and magnets can affect electrically charged particles.

# MUSIC GLOSSARY

- arpeggio . . . . . An arpeggio is a musical chord, but with the notes played in sequence, one after another, instead of together at once, as in a regular chord.
- chord . . . . . In music, a chord is a group of notes of different pitches that are played together at the same time.
- leitmotiv . . . . . A leitmotiv is a theme or melodic fragment that is used by a composer to identify a character or idea in a musical composition. It's a little like tagging an image with a name, but in this case it is a musical tag.
- musical development . . . . . A theme or leitmotiv is musically developed by creating variations of it. These variations can be achieved by changing the instruments playing them, by changing the harmonies, by slightly altering the melody or its rhythm, by inverting the melody (playing it upside down), and by other means.
- pitch . . . . . Musical pitch is what we perceive when we hear a note as high or low.
- pizzicato . . . . . Normal orchestral string instruments (violins, violas, cellos and bass) are played with bows. However they can be plucked with the fingers, and when this is done, it is called pizzicato.
- theme . . . . . In music, a theme is a melody or fragment of melody.
- string section . . . . . In an orchestra, the string section consists of the violins, violas, cellos and double bass instruments. Usually, these instruments are played using a bow.
- harp . . . . . The harp is a musical instrument consisting of a large wood and metal frame, with an array of strings of different lengths strung on it. The harp is played by plucking on the strings.
- percussion instruments . . . . . Percussion instruments are musical instruments played by hitting, shaking or rubbing (friction.) They can be made of wood, metal or other substances (plastic being common in modern times.) Drums, cymbals, gongs, bells and other percussion instruments are common.
- brass instruments . . . . . Brass instruments are musical instruments made of thin, hollow tubes of brass and bent into a shape that makes them convenient to play. They are played by buzzing the lips into a cup-shaped mouthpiece.
- woodwind instruments . . . . . Woodwind instruments are instruments that were traditionally made of wood and played by blowing into them. Some woodwind instruments are played just by blowing (as with the flute), but others have a thin wooden bit of reed attached to the mouthpiece to help make the sound. Today, some woodwind instruments are made of metal, as is the case for the flute.

## FOR FURTHER EXPLORATION

**Canadian Space Agency:** AuroraMAX <http://www.asc-csa.gc.ca/eng/astronomy/auroramax/>

One of the best places in the world to view the Northern Lights is in Canada's Northwest Territories. The Canadian Space Agency has an aurora research program called AuroraMAX. When the Northern Lights are active, the AuroraMax cameras are turned on, and students and teachers can view the Northern Lights live over the internet. Replays of previous Northern Light events are also available on this website.

**NASA Aurora Page** [http://www.nasa.gov/mission\\_pages/sunearth/aurora-news-stories/index.html](http://www.nasa.gov/mission_pages/sunearth/aurora-news-stories/index.html)

**NASA Aurora Poster and PDF Document** [http://pwg.gsfc.nasa.gov/polar/EPO/auroral\\_poster/aurora\\_all.pdf](http://pwg.gsfc.nasa.gov/polar/EPO/auroral_poster/aurora_all.pdf)

**NASA Educational Resources for Teachers** <http://www.nasa.gov/audience/foreducators/index.html>

**NASA Educational Resources for Students:** <http://www.nasa.gov/audience/forstudents/index.html>

**NASA Scientific Visualizations & Animations** <http://svs.gsfc.nasa.gov>

**NASA Solar Dynamics Observatory** <http://sdo.gsfc.nasa.gov>

**DP Review:** Auroral photography Guide <https://www.dpreview.com/articles/8217618174/>

**Exploratorium** aurora web resources: <http://www.exploratorium.edu/auroras/>

**Library of Congress:** Fun Aurora Facts <http://www.loc.gov/rr/scitech/mysteries/northernlights.html>

**National Geographic:** Aurora <http://nationalgeographic.org/encyclopedia/aurora/>

**Salgado, José Francisco:** Aurora Photography <https://www.flickr.com/photos/josefranciscosalgado/albums/72157647463157014>

**Space Weather** Forecast <http://spaceweather.com>

**Stern, David:** Secrets of the Polar Aurora <http://www.phy6.org/Education/wstern.html>