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## **Astro-music**

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Astro-music, taken to mean astronomy-inspired-music, is a prime example of a synthesis of art and science, or maybe I should even say: synthesis of sciences! Let me remind you that from ancient times (Plato) through the Middle Ages, advanced education within the Quadrivium was composed of geometry, arithmetic, music, and astronomy. Fascination by the Universe started millennia ago, and led for instance Pythagoras and others to propose the theory of *Musica Universalis*, the Harmony of the Spheres. This theory states that the universe exists on the basis of harmonious numerical relations, and that for instance the seven “planets” (Mercury, Venus, Mars, Jupiter, Saturn, Sun, Earth) resonate in numerical harmony, through natural musical intervals. Pythagoreans in fact believed that music purified and nourished our souls, thereby keeping us spiritually healthy, like nutrition and exercise purify and nourish our bodies.

A similar fascination with the sky motivated the writer of the Bible-book Revelation to describe Jesus in chapter 22 verse 16 as the Morning Star (Venus) – which in turn led to a famous Lutheran hymn in 1597. That hymn by Philipp Nicolai, “*Wie schön leuchtet der Morgenstern*”, was very popular in the Baroque era. It was used by many composers, including Bach who used it in his 1725 cantata BWV1 under the same title, but also by contemporary composers.

I will in the following give a number of very diverse examples of astronomy-inspired music. However, to further underline the synthesis, let me remind you that the most famous – Royal – astronomer who ever lived, Sir William Herschel (1738-1822), started his career as celebrated music composer, hobo and violin player, and director of music!

In current times, lots of popular music is produced, inspired by black holes, cosmology, space travel, the search for extraterrestrial intelligence, etcetera. I will here concentrate on the more classical types of astro-music<sup>1</sup>. I will be utterly incomplete, but hope to be able to demonstrate the impressively wide range of compositions inspired by astronomy. In the meantime, it will become clear that astronomy provides considerably more inspiration than mathematics, chemistry, physics, or life sciences....

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<sup>1</sup> The compilation by Andrew Fraknoi specifies lots of popular astro-music (as well as classical); see <http://www.fraknoi.com/wp-content/uploads/2018/06/Fraknoi-Music-and-Astronomy-Article.pdf>

In a sense, all compositions dealing with the seasons are related to astronomy, since the seasons are caused by the geometry of the sun-earth system. Just to name a few: Vivaldi's *Quattro Stagioni*, Tchaikovsky's *Seasons* (actually, the twelve months – but these are related to the moon!), Schumann's first symphony (*Frühlings-symphony*) and Beethoven's *Frühlings sonata* for piano and violin, but also Stravinsky's *Rite of Spring* and Mussorgsky's *Night on Bald Mountain*! Concerning the Mussorgsky: the piece depicts Witches' Sabbath celebrating the summer solstice. And not to forget: the songs by many composers dealing with Spring, Summer, Autumn and Winter. But I admit – the astronomy link is somewhat superficial...

In his *Samson Oratorio* (1743), Händel wrote a tenor aria "Total eclipse" in which Samson laments his loss of sight – "Sun, moon, and stars are dark to me". Three decades later, in 1777, Haydn composed a comic opera "*Il Mondo della Luna*", *World on the Moon*, in which even an Emperor of the Moon features. Talking about the moon, there are many popular and classical songs dealing with it, and Brahms used the evening moon as motto for the slow movement, *Andante espressivo*, of his third piano sonata, opus 5. The subtitle "*Mondschein-sonate*" for Beethoven's 14<sup>th</sup> piano sonata, opus 27 nr.2, was proposed years after the composer's death, by the German music critic Ludwig Rellstab, hence is not original. On the other hand, the piano piece "*Clair de Lune*" by Claude Debussy, third movement of his *Suite Bergamasque*, was inspired by the Paul Verlaine poem of the same name, and got its name from the composer. The same Debussy depicted the moon in prelude nr.7 from his second book of preludes, and in the second Image of the second series of Images. Gabriel Fauré wrote a song, using that same Verlaine poem as inspiration. During 1900-1907, Abel Decaux wrote his piano suite "*Clairs de Lune*", painting four somewhat bizarre moon lit scenes, using the whole tone scale. In its atonality, the Decaux suite predates the 1912 melodrama *Pierrot Lunaire* (*Pierrot in the moonlight*) by Arnold Schönberg. Beautiful *Mondschein Musik* for orchestra was composed by Richard Strauss, for his last (1942) opera *Capriccio*: duchess Madeleine is contemplating her future, in moonlight. Moving from the moon to the sun, there's the 1903 *Helios Overture* by Carl Nielsen (from sunrise to sunset above the Aegean Sea), and also the short piano piece "*Il raggio verde*" by Mario Castelnuovo Tedesco. The latter 1916 piece ends with the last ray of the setting sun, causing a green flash, as seen over the sea from the Tuscan hills. There is also a piece "*Sunspot*" for five percussion instruments by the Japanese composer Masao Endo. An impressive *Sunrise Mass* (2008) was composed by the Norwegian Ola Gjeilo.

As for planets, the (1918) orchestral suite by Gustav Holst comes immediately into mind. The work was initially scored for two pianos, except for Neptune, which was scored for organ, as Holst believed that the sound of the piano was too percussive for a world as mysterious and distant as Neptune. Neptune was the most distant planet in Holst's days. The composer later scored the suite for a large orchestra and chorus, in which form it became very popular. The concept of the magnificent work is however astrological rather than astronomical. Note for instance that our planet Earth is missing in the set.

The planet Venus features in the march "*Transit of Venus*" by the famous American military band composer John Philip Sousa. While the piece was composed at the occasion of the 1882 transit of planet Venus over the sun, there is also an astrological connection. The work was lost for more than a century, and rediscovered in 2003! As such, it was often performed in the following year 2004

when another Venus-transit could be seen (on June 8, the day of the inaugural lecture of the present reviewer...)

Moving further out into the depth of the universe, we reach the stars. Let me begin by Masao Endo, mentioned earlier: he composed a “Binary Star Dialogue” for two mandolins (1992), and a piece “Four Stars of Orion”, for left hand piano (2019). Henri Duparc wrote “Aux étoiles” (To the stars), a beautiful anthem-like nocturnal poem for orchestra (1874), while the “Cant de les Estrelles” (Song of the Stars) by Granados, for piano, organ and triple chorus is also truly heavenly music. The Albeniz composition dates from 1911, but the piece was only rediscovered in 2009! Théodore Akimenko, composition teacher of Stravinsky and pupil of Rimsky-Korsakov and Balakirev, composed “Rêves Etoilés” (Starry Dreams, 1907) for piano, and dedicated the three-part work to the famous French astronomer and popular astronomy writer Camille Flammarion. The same dedication had earlier appeared in his *Uranie* (1904), also for piano solo. Akimenko donated the sales profits of the latter work to the French Astronomical Society.

Worth mentioning is the (1951) *Cantata Sons of Light*, by Ralph Vaughan Williams, on the constellations of the zodiac. The majestic composition *Des Canyons aux Étoiles* by Olivier Messiaen was commissioned for the celebration of America’s bicentennial in 1974. This 12-part composition was inspired by the beauty of the American Southwest, and the stars. For the 2004 Olympic Games in Athens, Philip Glass composed *Orion*. This piece draws inspiration from the myths in different cultures that come from the well-known majestic constellation. The piece involves native instruments from around the world, including an Indian sitar and an Australian didgeridoo.

From Australia comes Ross Edwards’ *Fourth Symphony, “Star Chant”* (2001) – a two-part symphony with chorus, describing well-known stars and constellations in the Northern and Southern sky, respectively. Both European and indigenous Aboriginal legends form the basis for the composition.

A delightful astro-music composition is Aleksander Tansman’s piano suite “*Au telescope*” (“At the telescope”) from 1951. Its six pieces describe astronomical objects, from the moon to Ursa Major and Ursa Minor; the latter is a fugue! The suite is part of a series of four suites for children (“*Les jeunes au piano*”), of which number four, “*Au telescope*”, is the most difficult one.

To commemorate the 500<sup>th</sup> anniversary of the birth of the famous astronomer Nikolaus Copernicus, the Polish composer Henryk Górecki wrote his second *Symphony*, for solo soprano, baritone, choir and orchestra. The 1973 work uses text from Psalms as well as Copernicus’ famous book *De revolutionibus orbium coelestium*. Astronomer/mathematician Johannes Kepler is connected to a (1951) symphony and an (1957) opera, both having the title “*Die Harmonie der Welt*” (The Harmony of the World). Their composer, Paul Hindemith focuses on Kepler’s search for universal harmony. The three movements of the symphony deal with the ways in which humankind can reach universal consonance.

The prolific Armenian-American composer Alan Hovhaness was fascinated with nature and the universe; among his astro-music compositions are Saturn, opus 243, for soprano, clarinet, and piano, the piano sonata “Journey to Arcturus”, opus 354, and his 48<sup>th</sup> symphony “Vision of Andromeda”, opus 355. This four-part symphony is a beautiful representation of our mighty impressive neighbor-galaxy.

Among recent astro-music projects there is a combination of Martian wind data, obtained with a microphone on board of NASA’s Mars Polar Lander in 1997, with Bach pieces. Kelvin Milner designed the project and pianist Roderick Kettlewell played the accompanying Bach music, in this unique production.

There is so much more which I could have described, such as Stockhausen’s (1977) musical mystery play Sirius (and its planets), for electronic music and trumpet, soprano, bass clarinet, and bass. Depending on the season, that composition can be played in different form. Noteworthy are also the two-part symphony Capella (1972) by Dutch pianist/composer Daniel Wayenberg, and the (unsuccessful) 1916 operetta “Der Sterngucker” (Starwatcher) by Franz Léhar. I refer the interested reader to the large 2018 compilation by Andrew Fraknoi mentioned earlier.

I will conclude by highlighting two recent astro-music projects in which I am involved myself: live performances of astronomy-inspired piano music by the Estonian composer and amateur astronomer Urmas Sisask, and by the great Russian composer Alexander Scriabin, in which the piano music is “accompanied” by astronomical video and images on a big screen behind the piano.

Sisask (1960), who is seriously composing since the age of 14, has written many works dealing with stars, constellations, the Milky Way, and galaxies. Since 2008 I collaborate with the professional Grieg piano duo from The Netherlands. The pianists perform 4-hand piano pieces by Sisask, which I illustrate with astronomical video. Sisask was impressed with this type of performance, and wrote a new work for us, his opus 119 “Sombrero Galaxy.” The public is always enthusiastic about these performances: the music enhances the effect of the video, and the video adds to the music – together they make a feast for ear and eye.

In the sense of considering music as a cosmic experience, Sisask follows in the footsteps of Alexander Scriabin (1872-1915), who saw music as communication with the universe. Scriabin was obsessed with light and color, and with flying to the stars. I am involved in a new astro-music project, in which Italian pianist Marco Rapetti performs Scriabin pieces such as his fourth piano sonata, opus 30, which I illustrate with images and video of the universe. Live performances of this are being planned, and a first video performance is nearing completion – stay tuned. Scriabin described art as constructed ecstasy – and ecstasy is surely a feeling that the night sky can bring!

To summarize: astro-music has a long history and a large diversity, and astronomy and music provide a magnificent synthesis. One final example: the immensely popular Star Wars music by John Williams. Let me remind you what Bettina Brentano wrote to Beethoven: “Music indeed translates spiritual feelings into sensory feelings” (“Musik ist so recht die Vermittlung des Geistlichen in das Sinnliche”) – in astronomy it is exactly the other way around!