Breana Figueroa

MUSC 100-50

Swanson

November 15, 2015

Iannis Xenakis and How He Redefined Music

Music has continued to be redefined throughout the ages. With each new generation, it seems that the ways in which music can be manipulated continues to expand in possibilities. Music in its general sense is so vaguely defined and broad that it can be interpreted by many different people, and yet it still holds something new to discover. One day, a young composer decided that it was his turn to steer music into a new direction—and his name was Iannis Xenakis. Iannis Xenakis redefined the boundaries of music by establishing a connection between mathematics and music not known before. His first published work, *Metastaseis*, was the beginning of this unique style of music, which even after his death would continue to inspire future generations of composers.

In order to fully understand how Xenakis achieves his distinct style, first one must learn a little bit about his background. Xenakis was a Romanian-born French composer. By the age of twelve, he was regularly practicing piano and fascinated by music. Music was his escape that carried him away from the realities of life. His interests in science and mathematics did not happen separately; instead, he wanted to do everything at the same time. To earn his living, he worked in Le Corbusier’s studio until 1959. At first he worked as an engineer, but gradually took a greater part in architectural design (which would prove to be useful skill for him to have learned in the future). While trying to earn his living, Xenakis studied math and physics, and at the same time he also was involved in music, archaeology, and law. Xenakis was truly a man of many talents.

Xenakis had a childhood that was filled with music; his mother, who was a musician herself, tragically died when he was only five years old, but his interest in music never ceased. His father was a Greek businessman. His family moved to Greece in 1932. At the age of ten, he was sent to a boarding school on the Greek island of Spetsai. He was treated as an outsider there, so he instead chose to immerse himself in science and Greek literature, both of which were to become lifelong interests. He also got early musical experiences on Spetsai, where he encountered Byzantine liturgical music and Greek folk music. In addition, he sang in the school choir and absorbed classical music from the radio. When he was seventeen years old, he realized that he wanted to compose his own music (the decision to be a musician exclusively though occurred later on). At age twenty-five, things took a negative turn in Iannis Xenakis’s life. Around this time, the Communist Party has begun pushing its way through Europe. At the end of 1941, he joined the Resistance of the Communist-led National Liberation Front (EAM) against the German occupation. He took an active part in mass demonstrations against, among other things, the German confiscation of food supplies and attempts to deport Greeks to carry out forced labor in Germany in February 1943. He also took part in street fighting against British tanks. His active role in the Resistance eventually resulted in a serious injury when a shell hit him in the face. While recovering, EAM lost most of its power and ‘White Terror’ was unleashed on former Resistance members. When Xenakis heard that former Resistance members were being sent to concentration camps, he went into hiding. He was sentenced to death (which was later commuted to ten years’ imprisonment in 1951) but managed to illegally cross into France where he had the intention of making it to the United States, but instead was forced to remain where he was as an illegal immigrant. He hit a low point in his life where he felt he only had two options: commit suicide or try to start his life over. Xenakis chose the latter and decided to put everything he had into music.

In Paris, he decided to make up for the musical education he missed during the war. After rediscovering himself, Xenakis began searching for composers to teach him the essentials of composition. He originally wanted to work with Nadia Boulanger, but she turned him down saying that she was too old to take on a beginner like him. He then wanted to work in the electronic studio of Pierre Schaeffer, a French composer most know for his innovative electronic music. They ended up not agreeing about the parallel fifths Xenakis had in the score that he showed him, and so he left. He was troubled by how the man he thought was so free thinking could be caught up on parallel fifths and parallel octaves. In many ways, it was in his favor that he left, for it was him leaving that helped inspire him to pursue his own interest and create his well known works. He finally decided that he would no longer look to someone else for guidance and decided to pursue on his own.

Xenakis was convinced that he could invent another way of writing music. He set himself to imagining sound phenomena, using drawings to help him: such as spirals and intersecting planes. Even though technology had grown exponentially over the past couple decades, it still had some limitations that can only be overcome by a human being, not a machine. This was Xenakis’s challenge. He struggled to figure out how to transmit musical notations to a machine. The solution was the hand: the musician can give his commands to the computer through drawings; thus, the UPIC (Unité Polyagogique Informatique du CEMAMu) was born. The UPIC system is made up of a graphic drawing table equipped with a special pen in which the musician can trace lines on the table. The computer then interprets these signs and reconstructs them in the form of isolated sounds or music, with the X-axis representing time, and the Y-axis representing pitch. The waves can either be done by hand, or sampled from complex sound-sources. Dozens of pitch curves are defined by means of a battery of oscillators in order to turn these waves into simultaneous sounds. This algorithm covers and entire range of musical notes, from simple to complex. This machine takes composing music to the next level, bringing man one step closer to integrating technology into people’s everyday lives.

With the invention of the UPIC came many benefits. With this system, a composer could write a score and have the result immediately, without having to wait for it to be copied and executed. No longer is there any time lapse between what a composer writes and what it sounds likes. The UPIC eliminates a lot of complexities with composing. There is nothing but lines having a certain relationship with the sounds. This machine also broadens the possibilities of music education. The child is no longer forced to begin a relationship with music by becoming introduced to an instrument— now he can just imagine the timbres, write and listen.

The UPIC wasn’t Xenakis’s only major contribution to music. With the development of his first published work, *Metastaseis*, we see a shift into stochastic music, a term introduced by Xenakis himself. His interest in composition by calculation and the mathematics of probability led him to develop this style of music. Stochastic music refers to composition by the the use of the laws of probability. In simpler terms, stochastic music relies on a random pattern to distribute the notes. Stochastic techniques, which often depend on the use of a computer to calculate distributions, can be useful in the creation process where details in sound are less important the the large-scale effect of the sounds as a whole. In *Achorripsis* (1956–7) Xenakis formalized his stochastic method to a point where it could be automated by means of a computer program. It is fitting that the term originated from the mathematical term, a ‘stochastic process’, seeing as how mathematics plays a big role in this style of music. Many later composers have integrated this style of music into their compositions, as inspired by Xenakis.

The piece *Metastaseis* itself is achieved through a projection of geometrical notions, achieved by glissandos, which is a continuous slide upward or downward between two notes, played by a large body of strings. It seems unusual that Xenakis’s first compositions were for orchestra, but he initially preferred writing for string because of their abundance of sound colors and ability to move seamlessly between various pitches. Xenakis also achieves extraordinary new effects, that were soon taken up by other composers, by treating each player as a soloist. In an essay be Xenakis, entitled ‘Les Métastassis’, he describes how ‘the subtle structures of orchestral sound masses represent a reality that promises much’. Like most works of art, this piece was not composed without inspiration. He was inspired by his impressions gained during the Nazi occupation of Greece. Although his experiences were traumatic, he spoke of acoustic mass phenomena in these events, such as the way rhythmically regular shouts turned into chaotic screams of fear when the Nazis opened fire. Many of these experiences he had growing up led him to create the masterpiece *Metastaseis.*

*Metastaseis* is an extremely atonal piece, one which can only be described as dissonant. When first listening to this unique type of music, it can be difficult to take in all that is happening at once. It begins with the glissandos in the strings, continuously raising the pitch higher while at the same increasing in volume, thereby building up anticipation for the climax. An irregular clicking sound, similar to a clave, can be heard as well during this building in the opening. Then once it finally hits the climax, with the strings sawing away at their instruments with their bows, reaching its loudest volume, suddenly, there is silence, and the only sound that is heard is the calming ring of a triangle. In fact, most of *Metastaseis* is a roller-coaster of dynamic changes, with no real pattern presenting itself. At times, a single instrument can be heard shining in between the chaos. Interestingly, the piece ends opposite to how it began. Instead of raising in pitch, the glissandos lower in pitch. Also, instead of a crescendo, the piece ends with a decrescendo. As the violins grows dimmer, the piece almost feels incomplete as their sounds trail off, but the effect created from it is well worth noting.

When one goes to concerts or performances to listen to music, rarely does one take into consideration the venue at which they are located as part of the musical experience. As previously stated, Xenakis has dived into many different aspects of music: from creating new composing technology to a new style of music entirely. Xenakis decided to take yet another step outside of a typical composers range by designing an entire new listening experience. His past experience as working as an engineer helped translate into the development of the architectural design of Le Diatope, located in a pavilion in Paris. Le Diatope is one of Xenakis’s largest polytopes, where he brought together many different types of media into a one of a kind experience. Instead of composing operas, he developed his own vision of a ‘synthesis of the arts’. Le Diatope is a response to a question that had been on Xenakis’s mind for more than twenty years: what architectural form is to be given to musical or visual performances? A great deal of thought went into the construction of this multimedia platform. He wanted to have a maximum of free volume for a minimum of enclosing surface area. His first thought was a sphere, but a sphere is bad shape for acoustics. Eventually, he came up with the final design for Le Diatope, which was a tent-like construction that was erected outside the Centre Pompidou in Paris in 1977. The music that was played inside, *La Légende d’Er,* is made up of various sounds: including Tzuzumis (small Japanese hourglass drums), scraping against cardboard, clapping special blocks, and much more. Xenakis inducted a new approach to the productions of sounds by using probability functions to generate pressure-time curves. It is a generally complex formula, hard for most people to understand, but with this new method he strays away from the traditional approach to create another unique listening experience. It isn’t just the music itself that makes the experience unique, but the visuals as well. Le Diatope was comprised of 1,680 flashbulbs and four lasers guided by 400 mirrors. Symbolically, Le Diatope is a representation of our universe. In it, Xenakis has found a way to unite music with light.

Xenakis is by far one of the most underrated avant-garde composers. He dived into areas of music far beyond many composers’ range. From 1967 to 1972, Xenakis taught at Indiana University in Bloomington, where he also directed a Center for Mathematical and Automated Music. His career finally ended in 2001, when he died in Paris, France. He was not satisfied with merely composing sheet music, but always searched for a way to take music to another level and provide a different experience. Not only that, but he found a way to combine mathematics, computers, and music together in new ways. He may have passed away, but his music will continue to enlighten and inspire future generations to come.

Bibliography

An, Song, Mary Margaret Capraro, and Daniel A. Tillman. "Elementary Teachers Integrate Music Activities Into Regular Mathematics Lessons: Effects On Students' Mathematical Abilities." *Journal For Learning Through The Arts* 9.1 (2013): *ERIC*. Web. 3 Nov. 2015.

Boyd, Joshua Robert. "The Relationship between Music Participation and Mathematics Achievement in Middle School Students." *ProQuest LLC* (2013). *ERIC*. Web. 3 Nov. 2015.

Deppe, Scott. "An Investigation of the Relationships between Mathematics and Music Skills of Students Participating in Successful High School Instrumental Music Programs." *ProQuest LLC* (2012). *ERIC*. Web. 3 Nov. 2015.

Van der Vossen, Maria R. "Mathematics Achievement among Secondary Students in Relation to Enrollment/Nonenrollment in Music Programs of Differing Content or Quality." *ProQuest LLC* (2012). *ERIC*. Web. 3 Nov. 2015.

Albright, Ruth E. "The Impact of Music on Student Achievement in the Third and Fifth Grade Math Curriculum." *ProQuest LLC* (2012). *ERIC*. Web. 3 Nov. 2015.