



<Photo 1: Immersive sound mixing control room with a NEVE 88D digital console with immersive sound support and an AURO 12.1 (7.1+4H+1Top) monitoring environment. This is also the control room used by Patrick Lemmens, mainly for film scoring and acoustic recording of classical music. >

<Category Title>

PROSOUND Frontiers

<Main Title>

Interview to the Galaxy Studios Tonmeister concerning the forefront of immersive sound recording

<Lead>

We visited Galaxy Studios in Belgium, one of the most immersive sound recording

studio complexes in the world, to talk to Patrick Lemmens, the studio's Tonmeister who has been at the forefront of immersive sound music recording from its birth to the present day, about immersive sound recording.

Galaxy Studios is also the home of AURO-3D, one of the world's most popular immersive sound formats. And since the first commercial immersive cloud format was AURO-3D, Galaxy Studios was one of the earliest places to record commercial music with immersive sound. We asked him how AURO-3D, which has an overwhelming following in the music industry, came to be at Galaxy Studios.



<Photo 2: Patrick Lemmens, the Tonmeister at Galaxy Studios, who spoke with us>

< Sentence>

Mr. Patrick Lemmens

PROSOUND (PS): Please first introduce yourself and tell us how you came to work at Galaxy Studios.

Patrick Lemmens (PL): I am a Tonmeister and studied at the Robert Schumann Hochschule in Düsseldorf, Germany. And I am also a French horn player who plays classical music.

When I was eighteen years old, I thought about what I was going to do in the future, but I didn't want to be a musician. There were very few jobs in Belgium, a small country, where we could play in an orchestra. Then a friend of mine, who was studying to become a Tonmeister at Robert Schumann University in Dusseldorf, invited me to come and visit. I had only studied music before, so I was a novice when it came to technology. So I thought that technical work would be difficult for me. However, when I actually went on the tour, everything was based on music. So I decided to go to that

university, which had a capacity of 30 students and 300 applicants, so I was fortunate enough to be able to pass through the narrow gate.

I graduated from this university in December 2001 at the age of 23, and just one email to get a job was sent to Wilfried Van Baelen of Galaxy Studios.

I studied in Germany, but I wanted to get a job in Belgium. Fortunately, education was not provided in Belgium as it had been in Germany. So I did a Google search for recording studios in Belgium and the first one that came up was Galaxy Studios. Up until then, I didn't know anything about Galaxy Studios at all, but I remember looking at their website and being very interested and excited.

So, I sent an email to Wilfried. As soon as I did so, he replied to me. He said your background of studying classical music is so interesting that I was invited to come to the studio once. Then, in 2002, he decided that I could start working as an assistant engineer at Galaxy Studios.



<Photo 3: Wilfried Van Baelen, founder and CEO of Galaxy Studios, professional organist and music recording producer/engineer who has produced over 20 platinum albums, inventor of AURO-3D and chairman of Auro Technologies. He was also the proponent of the term "immersive sound" in 2010. >

PS: You met with Wilfried Van Baelen and were hired right away.

PL: I worked as an intern for the first few months and then got hired as an assistant engineer, starting with a job as an assistant who musically supported the recordings by Wilfried.

PS: Does the Tonmeister education at the Robert Schumann University in Düsseldorf differ in any way from the Tonmeister education at the universities in Berlin and Detmold?

PL: Detmold and Berlin are more focused on the music. To be admitted there, you have to pass a rigorous music exam. Düsseldorf, on the other hand, is more about technology. Of course, students must be able to play an instrument, but the entrance exam is not as rigorous on music as it is on Detmold or Berlin. The only degree you can get from Düsseldorf is a technical degree. On the other hand, graduating from the Tonmeister courses in Detmold and Berlin will give you a degree in music.

On the job training at Galaxy Studios

PS: What was it like working at Galaxy Studios in your early years, starting with your internship?

PL: It was a very interesting experience, because in 2000-2001 or so, Galaxy Studios was doing a lot more rock and pop recording. I personally felt that such recordings were not my style of music. I was fortunate enough to have followed Wilfried's assistant. He, like me, has a background in classical music. His pop recordings had a classical music influence on them. Symphonic and string orchestras were used, as well as many acoustic instruments. Within the first two years or so, I was able to learn pop recording myself, and I was able to bring my

experience and ideas to bear on acoustic instrument recordings. As a result, I think Wilfried has come to trust me.

From there, I was tasked by Wilfried with arranging the orchestra for his recordings, selecting the microphones, and preparing the console. After the recording was completed, I was asked from Wilfried for my opinion on the recording, and I could repeat the experience on the next recording. I've learned so much by this repetition. Because Wilfried was responsible for the recording and I was able to try different things without that pressure. In addition, his recordings gave me the task of manipulating the ProTools, so I was able to learn more about them during this period. I think Wilfried and I were a very good recording team. By trusting each other, the speed and efficiency of the recording has increased steadily.

PS: How many house recording engineers were there at Galaxy Studios at that time?

PL: There were three house recording engineers. One of them was Wilfried, who recorded a wide range of genres, from pop to classical music. The other, Ronald Prent, did very little recording and mainly specialized in mixing pop, rock and heavy metal. The other was Filip Heurckmans, who was in charge of recording and mixing local projects in Belgium.

PS: Were all recordings made in two-channel stereo at this time?

PL: That's right. However, Wilfried was a pioneer in multichannel surround. The studio I'm interviewing now opened in 1998, but it was already the first music studio in Europe to support surround sound. At the time, an SSL 9000J (96 channel inline

console) was being introduced with 5.1ch surround support.



<Photo 4: I interviewed Patrick Lemmens in the control room, which opened in 1998 as Europe's first 5.1ch surround sound studio for music. Currently, the AURO 9.1 (5.1+4H) monitor environment and the 80-channel API Vision analog mixing console with immersive audio support are mainly used for immersive sound recording and mixing of pop and rock music. >



<Photo 5: The API Vision analog console has two inline surround panners for ear level and height level. >

When I started working at Galaxy Studios three or four years ago, Wilfried and Ronald Prent were already mixing surround sound, and I think Wilfried saw a future in surround sound.

PS: Was Galaxy Studios already finished at that time?

PL: There are three major historical milestones at Galaxy Studios.

First, it opened as Galaxy Studios in 1995. It was equipped with a main hall for recording and two control rooms. One is now used as a pre-dubbing stage for video post-production and the other is a studio with this API Vision console. The studio was originally built on the site of Wilfried's family's chicken-coop.

In 1998, the studio was redesigned to support surround sound.

In 2002, a mastering studio with surround sound support was opened.

Encountering 2+2+2

PL: It was in the year 2005. I was working as Wilfried's assistant at the time, so I saw all the projects he was doing. In the midst of this, Wilfried will encounter the Height (the height channel).

Tom Hapke, a German producer, had heard from a friend of his that there was a "2+2+2" format, the 2+2+2 format, conceived for classical music.

For classical music, a center speaker and a subwoofer for the LFE were not used. Renowned German Tonmeister Werner Dabringhaus wondered if there was a way to make good use of the six channels that could be recorded on SACD or DVD audio in classical music. When he recorded the pipe organ, he wanted to hear it from above because it was mounted high up, so he added two microphones to the high position. In addition to the two front and two rear channels, he added two more channels at the front height that play the sound from that added microphone. He recorded it on six channels of SACD. This was the first "4ch

surround sound + 2ch front height" and was called "2+2+2".

Tom Hapke, a German producer, heard about 2+2+2 invented by Werner Dabringhaus and it was great. He was a producer of pop music, so he asked Wilfried to record the female singer Silvia Dias, whom he was producing. At that time, Tom Hapke suggested to Wilfried that he would like to record the Height at the same time as the CD. In other words, it was a request to Wilfried to record with the intention of 2+2+2.

Neither Wilfried nor I knew about 2+2+2 until then. So Wilfried set up the speakers and listened to 2+2+2 and it was great. However, in Wilfried's opinion, center speakers and subwoofers are inevitably needed for pop surround recordings. The center speaker was essential for the vocals, and the subwoofer was needed to punch in the bass and kick drum. Since Galaxy Studios already supported 5.1, it was easy to test by adding 2 high channel speakers and sending them through an auxiliary send; Tom Hapke was the drummer, so Wilfried recorded his drumming on 5.1ch plus 2 front-height with just two high channel microphones. The sound was very natural and wonderful.

The birth of AURO-3D

PL: Wilfried did some recordings with 5.1ch + 2ch front-height and did some listening tests. As a result, although very good, he realized that there was something missing in the sonic impression that there was a two-dimensional screen of sound in the front, but in the rear we could hear only ear-height reflections from the surround speakers. It turned out to be the lack of rear height - 5.1ch + 2ch front height, which was very good in the front, but lackluster in the

back. So Wilfried decided to add two more microphones and two speakers and listen to them at 5.1ch + 4ch height (2ch height each at the front and rear). The sound of this was truly amazing. Compared to the traditional 5.1ch, the difference was staggering. This was the moment when the AURO 9.1 was born.

PS: When was the first time AURO 9.1 was born?

PL: The first time Wilfried recorded the AURO 9.1 was in 2005. AURO 9.1 in the studio was a really great experience. But at that point, it was just a studio experience, and the question of how to bring it to the home stood in the way.

The technology developed for this purpose is called AURO-Codec. This technology allows native immersive sound recorded in AURO-3D to be encoded in quasi-lossless quality to 5.1 or 7.1 linear PCM. In addition, metadata can be recorded about the height of an immersion sound mix and how much of the top channel signal is downmixed in a 5.1ch or 7.1ch surround heard by a listener without an immersion sound environment. The amount of downmixing can remain the same throughout the song, or it can be changed dynamically within a song, and Blu-ray music albums produced with AURO-3D can be heard in the original immersive sound with an AVR with an AURO-Codec decoder, or listeners without an immersive sound environment can listen in 5.1 or 7.1 surround sound, depending on the amount of downmixing the producer intended.

PS: When did the actual music recording with AURO-3D begin?

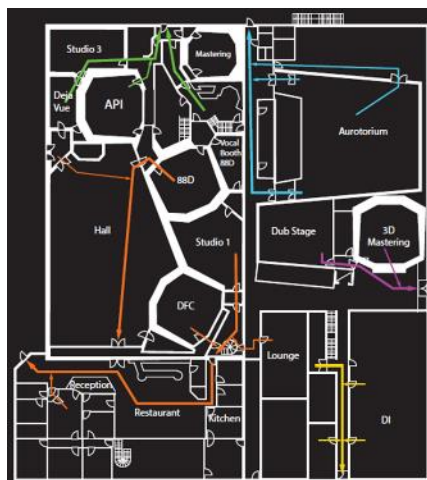
PL: Shortly after the AURO-3D was

conceived in 2005, high microphones began to be used in all recordings. We only need to add four recording tracks, and already ProTools was capable of recording 96 tracks. What's more, the recorded height channel could be used effectively in 5.1ch surround and stereo mixes, as well as immersive sounds.

Microphone Techniques for Immersive Sound Recording

PS: Do you record classical music and film scoring in the main hall?

PL: I've recorded a lot of film music. This hall is perfect for that. Film music recording also requires flexibility. Galaxy Studios has multiple recording areas so you can record simultaneously in up to eight separate areas. (See Fig. 1).



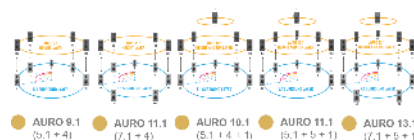
<Fig. 1: Plan view of Galaxy Studios>

If the sound in the main hall does not match the sound in the other booths, we can solve this problem by setting up a 9.0-channel microphone in the main hall, putting the sound from the previous recording out in the hall with a 2-channel speaker, and adding the microphone-recorded sound to the

original recording.



<Photo 6: A sound source already recorded was played back with speakers in the main hall, and then reverberation captured by 9.0 microphones was added to the original recorded sound.>



<Fig. 2: Speaker arrangement for each AURO-3D format>

PS: Which AURO-3D format do you use to record immersive sound music? (See Fig. 2).

PL: AURO 9.1 (5.1ch + 4H) is used in 99% of cases.

PS: Please explain your microphone techniques used in immersive sound recording.

PL: In the orchestra, I always use the "Decca Tree". In chamber music, I use what we call the "mini Decca Tree" method. The L/R microphone spacing on the mini Decca Tree is about 80 cm, and the center microphone is only slightly ahead from the L/R line.

Basically, I like the sound of omnidirectional microphones. Omnidirectional is best, especially in places with great spatial acoustics, such as the main hall here. For my main orchestral recording, I use nine

omnidirectional microphones: three on the Decca Tree, two on its surrounds, two on the Outriggers, and four on the Height.

In film music, the listener's envelopment is more important than the localization of the instrument, so the omni-directional microphone is suitable. The Decca Tree, used in the film music, is a change from the original arrangement: the L/R spacing is about 180 cm, but the center microphone only protrudes 20-30 cm from that line toward the orchestra. This is to leave enough sound space for dialogues near the front center. For non-film music recordings, the center microphone should protrude sufficiently in the orchestral direction, as it did in the original Decca Tree, so that each instrument is located throughout the front.

PS: Are there any omni-directional microphones that you particularly like to use?

PL: Of course, it depends on what we're recording, but I like the omni-directional microphones from Sonodore in the Netherlands. Originally a microphone for measurement, it has been reborn for music recording, and has very linear sound pressure frequency characteristics over the entire frequency range. I like to use this microphone as a mini Decca Tree for chamber music and solos. NEUMANN's M150 and M50 are used for the Decca Tree for orchestral recording. The highs are slightly lifted, so you can get a unique "silky sound" with strings and other instruments.



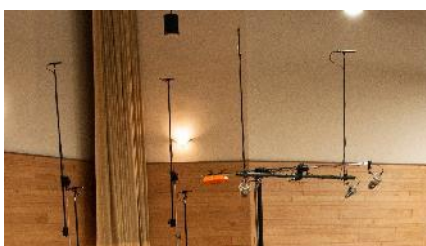
<Photo 7: Patrick Lemmens' film music recording in the main hall with examples of instrument placement and microphone placement. You can see the booths that can be used for separate recording and the control room view window. >



<Photo 8: Patrick Lemmens' main microphone for film music recording. Compared to the original Decca Tree, the center microphone protrudes less in the direction of the orchestra. >



<Photo9: An example of Patrick Lemmens' placement of instruments and microphones for a classical music orchestra recording in the main hall. You can see the booths that can be used for separate recording and the control room view window. >



<Photo10: Patrick Lemmens' main microphone for classical music orchestra recording. As with the original Decca Tree, the center microphone has a large protrusion towards the orchestra. >



<Photo11: Example of the microphone arrangement of Patrick Lemmens' chamber music recording in the main hall - 1. >



<Photo12: An example of Patrick Lemmens' chamber music recording in the main hall. >

Current recording situation

PS: What kind of recordings are doing in Galaxy Studios these days?

PL: In Western Europe, the only studios with such large scale, high quality and high functionality are Galaxy Studio and Abbey Road Studios and AIR Studios in the UK, so film and classical music recording with large orchestral instruments is on the rise.

When recording film music, it's not practical to carry the equipment into a concert hall to record it. Film music recording always uses click tracks, so the amount of equipment used is much larger than for classical music recording. An

orchestral recording of classical music may require 10 to 15 microphones, while a film recording requires at least 60 microphones. And we'll need about 60 headphones for the performer. So, for film music, it's easier to record at Galaxy Studios.

And the fact that the sound of the main hall of the Galaxy Studio is more suited to film music is another reason why producers and engineers prefer this studio. The reverberation is not as long as in a concert hall and is better suited to film music. The acoustics are also easy for musicians to play.

These days, a computer and a few microphones are all it takes to record and mix high quality sound in a small studio or home studio. However, it is because of these excellent acoustic recording halls and immersive sound recording facilities that the orchestra is able to record film music of unparalleled quality. I think that's one of the reasons why this studio has survived.

History and Overview of Galaxy Studios

Here's a key history of Galaxy Studios and an overview of the company, along with photos.

1980
Brothers Wilfried and Guy start the construction of their first studio in the backyard of their parents home in Mol, Belgium (heart of Europe).

1982
Foundation of 'Studio Galaxy' by Wilfried and Guy van Baelen.

1991
First 3348 Sony Dash 48-channel digital multitrack recorder

1992
Construction start of the new Galaxy Studios facility on top of the old 'Studio Galaxy'.

Order of the first ever NEVE digital Capricorn console with 96 track (2 x 3348 Sony)

1995
Opening of the new Galaxy Studios interactive studio-complex, breaking world records including the 100,7 dB isolation between the rooms with visual connection, the most silent recording areas with only 14 dB background noise Airco on (NR 5).

1996
Order of the first ever large format console for 5.1 music productions (SSL 9000J 96 channel in-line console)

1999
Opening of the first ever 5.1 Surround Sound dubbing stage certified by Dolby

2002
Opening of the first ever Mastering Studio with the SPL MMC1 (7.1 surround Music Mastering Console)

2005
AURO-3D format, invented by Wilfried Van Baelen

2006
Announcement of AURO-3D 9.1 to the world during the Audio Engineering Society convention in Paris and San Francisco in the workshop "Surround Sound with Height", chaired by Kimio Hamasaki

2007
- Opening of the Post Production facility for 4K picture, Digital Intermediate (DI)

workflow in 4K.
- Design and first purchase order of AMS-NEVE 88D, the first ever large format digital console for Immersive Sound productions

2009
Launch of Mollywood, the film financing and Tax Shelter Company of Galaxy Studios.

2010
- Launch of AURO-3D format by Wilfried Van Baelen at the Tokyo, AES Spatial Conference.

- Founding of Auro Technologies.
- Install the AMS-NEVE 88D and opening the first ever control room with AURO 12.1 install (7.1+4+1), see picture (the picture where i stay in that room behind the console)

2011
Install of the first ever AMS-NEVE DFC-3D console and dubbing stage in which the first ever Hollywood movie (Red Tails by George Lucas) in Immersive Sound was mixed.

2013
Start construction of the new building to strengthen the position of Auro Technologies and to expand services towards the motion picture industry

2014
- Launch of Zilvermeer Productions. The dedicated in-house motion picture (co)production company.
- Opening of the Aurotorium Dubbing stage. One of the most advanced dubbing stages in the world offering everything from 5.1 to AUROMAX 26.1

2016

Launch of Galaxy Studios Interactive to provide authoring and encoding to the world of distribution.



<Photo13: Galaxy Studios founders Wilfried (left) and Guy Van Baelen's brother>



<Photo 14 : The main hall of Galaxy Studios. A glass window on one side of the wall of the hall allows outside light to come in. A large, extremely thick and heavy double glazed window allows for a world class silence and a relaxed atmosphere for long recordings, with Patrick Lemmens' main microphone arrangement for classical orchestral recording. >



<Photo 15: Each recording area and control room at Galaxy Studios is structurally separated from each other by blocks, each of which is floated by powerful springs, providing exceptional isolation of 100.7 dB SPL between recording areas and control rooms and the world's quietest 14 dB(A) of background noise (NR value of 5). >



<Photo 16: Studio 1 at Galaxy Studios, a recording studio space secondly bigger to the main hall, which is used for multi-booth recording of drums and wind sections. >



<Photo 17: Studio 3 at Galaxy Studios, the third largest recording studio space after Studio 1, which is used for multi-booth recording. >



<Photo 18: Surround Mastering Studio with SPL MMC1 (7.1ch Surround Music Mastering Console)>



<Photo 19: Aurotorium, a large dubbing stage that supports 5.1ch to AUROMAX 26.1>



<Photo 20: A view of the current Galaxy Studios, including the Auro Technologies facility. >

Finally.



<Photo 21: Mr. Patrick Lemmens (right) and the author (Kimio Hamasaki) >

Galaxy Studios was the perfect environment to record acoustic instruments. Due to its quietness and natural spatial acoustics, it has been used for a variety of recordings, including immersive sound recordings for sampling musical instruments. It will continue to play an increasingly important role as a studio where immersive sound recording and production is done on a daily basis.

It can be found out more about Galaxy Studios' facilities below.

<https://www.galaxystudios.com/music/rooms/>

If you would like to contact Galaxy Studios in Japanese, please contact them at the email address below.

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