Hosted in Barcelona every year, the Mobile World Congress is the world´s largest exhibition for the mobile industry. The last two editions, also featured Mobile Week Barcelona (MWB), which highlights the positive effects of technology on our lives, during a week of exhibitions, talks and screenings. MWB brings together artists, scientists, philosophers, engineers and industry professionals in an open initiative to encourage debates and citizen participation.

Quo Artis, an Art and Science Foundation, organized within MWB the debate "Art and aesthetic perception outside the Earth", to reflect and theorize on how the gravitational forces of planet Earth influence them. They also presented the project "The Zero-Gravity Band", an artistic and scientific project that investigates and experiments the potential cultural implications of human life in space.

The following is a transcription of the debate opened by Tatiana Kourochkina, Co-founder and President of Quo Artis:

Tatiana Kourochkina: During the next 45 minutes we will talk about the future, but this time focusing on art. Have you ever wondered how art will be in the future? Human beings have always lived among art because of their need to express themselves…So, in the future, art will still be present in our lives, even if we don´t live on this planet anymore. This might sound like science fiction to some of you, but you need to think about the efforts people like Elon Mask, Richard Branson and other geniuses –along with the American, Russian and European Space agencies- are making to bring us closer to other planets.

Have you asked yourselves how art might be outside planet Earth? Does lack of gravity affect our aesthetic perception? Do new instruments need to be created? What artistic

materials will be used? How will museums be in the future? What about auditoriums or concert venues?

At Quo Artis, we indeed ask ourselves these questions, because our Foundation aims to relate art and science and favor their mutual feedback. Last year we took a ship to Antarctica, where for 12 days, artists and scientists co-lived, sharing conversations and thoughts about the future of mankind and climate change while making artwork, expositions and articles on the white continent. That project was the Antarctic Biennale. But today we want to talk about another project: The Zero-Gravity Band (TZGB). The members of this "music band" are here and are two scientists and one musician. One of the scientists is also a musician. Let´s meet them:

Elisa R Ferrè: PhD, Director of VeME Lab (Vestibular Multisensory Embodiment) and professor at the Department of Psychology at Royal Holloway University of London. Previously Postdoctoral Researcher at the Institute of Cognitive Neuroscience at University College London. At her Lab, she investigates how the absence of gravity affects our aesthetic perceptions. Her findings will surprise you.

Albert Barqué-Duran: PhD, is a Postdoctoral Researcher in Cognitive Science at City, University of London and a Contemporary Artist. He leads disruptive projects at the intersection of art and research with the aim of finding novel formats of generating scientific knowledge to reflect on contemporary and futuristic issues and their cultural implications. He has exhibited and performed at Sónar+D (Barcelona, Spain), Creative Reactions (London, UK), Cambridge Neuroscience Society
(Cambridge, UK), Max Planck (Berlin, Germany) and SciArt Center (New York, USA).

Marc Mazenti: his talent has a personal, almost unprecedented aspect that sets him apart from many other talented artists -taking electronic music beyond the dance floor with projects such as his "Suite on Clouds", a 3D mapping show with eight violinists, one harp, symphonic percussion, several synths and a grand piano. These projects draw on his classical background and show his integrated vision of electronic music: combining acoustic, analogue and digital instruments together in the same show. He has performed

in almost every country you could imagine and, being the musical part of the group, has been asking himself how musical instruments will be in the future. We went with him to the French Space Agency, where he took a parabolic flight. Astronauts take these flights to train for zero gravity environments. It is the only way to experience this sensation. Marc will share his flight experience with us.

Finally, I would also like to introduce a dear friend that joined us in Antarctica and will moderate the debate:

Barbara Imhof: is a space architect, researcher and journalist. She is also the cofounder and co-manager of LIQUIFER Systems Group (LSG), the only Space Architects Agency. Barbara researches living modules that people would inhabit in outside planet Earth.

Barbara Imhof (BI): Thanks Tatiana for your introduction. So, Albert, why did you invent the Zero-G band? What is the aim of the project?

Albert Barqué-Duran (AB): The decision of creating the ZGB comes from the necessity to start tackling one of the big questions we are facing as humanity. We are again in the midst of a space technology revolution; with the ultimate goal of enabling people to live on other planets. It is time to reflect and discuss what it means to leave planet Earth. It is time to research and experiment with its potential cultural implications. The ZGB perfectly combines art and research to explore the concept of art outside planet Earth. Specifically, it examines how both the production and perception of art changes when we are not restricted to the physical laws and framework that planet Earth's gravity imposes on us.

BI: Elisa, tonight we are talking about gravity, but what is gravity?

Elisa Ferrè (EF): Gravity is a pretty amazing thing. I would like to cite Albert Einstein who said that "gravity is the only thing that we don´t think about". But gravity is always there. Can you feel it right now? So, at this moment you have 1 G acceleration, which is gravity, which attracts your body and your brain towards the center of the Earth. But you cannot notice that. Nevertheless, your brain is always receiving this information to allow you to move around the environment without falling down or without having any problems. How do we do it? Well, not in an easy way. We need to zoom in inside the head and in particular inside the temporal bone, where two tiny, small, sophisticated, beautiful organs called the vestibular system, which detects all type of acceleration of your head in space. These organs tell the brain what your position in 3D space is. Every time there is a movement, they are tell the brain exactly where it is, the direction of the movement, the acceleration and all the possible information that you can imagine about the movement of your head. A critical piece of information is lineal acceleration by gravity. So if we zoom-in into the vestibular system we find some tiny stones which are called otoliths, and if your head is upright, as it is now, the otoliths are perpendicular to the direction of gravity and lie on a sort of liquid. So if your head is upright then they are perfectly in balance and there is only a tiny signal reaching the brain. But as soon as you move your head up or down, the otolith will shift around and tell the brain that your head in not aligned with gravity anymore. Amazing! And, can you perceive that? Can you perceive gravity? Probably you don't. We are here, we are under 1 G, and we don't have any type of perception of gravity. So this makes my life very difficult because in my lab I investigate how we perceive gravity.

BI: Albert, due to medical reasons you couldn´t fly on the zero-G plane. What were your expectations of floating in zero gravity and how do you imagine you would have perceived the environment differently?

AB: I was extremely interested in experiencing this idea of "losing verticality". More specifically I wanted to experience how this lack of gravity would affect my aesthetic perceptions when performing and producing an artwork in microgravity. The fact of not being able to fly introduced me to some other important aspects of the project that I

was unfortunately missing, such as the biological limitations of humans when it comes to traveling outside planet Earth.

BI: Mark, you were the only member to take part in the parabolic flight. Could you tell us more about the experience?

Marc Mazenti (MM): One of the most beautiful things I discovered during my zero gravity experience, was that orientation disappears. You could be upside down and have the same feeling as you do standing up or lying with your face up or down. I had some reference points to orient myself, the plane seats, floor or ceiling. Maybe removing these reference points would increase the beauty of the experience; for example, flying in a square room where every wall is the same shape and color. I can also say that at first it took me some time to get use to zero gravity, but then I felt comfortable and could connect and get inspired in that feeling of microgravity. I would say that for about seven seconds while I felt this lightness, I was able to do what I wanted and play some melodies over pre-made backing tracks. Furthermore, from this experience I learned that micro gravity can be very hostile to humans. We're so used to gravity that when they take out that physical element from our bodies, we find ourselves totally outside our comfort zone. Everything we're so used to normally doing, could be something new that requires new skills in order to do it. I was preparing the experiment for months, writing the exercises I wanted to do, programming the software and hardware, training, etc. But once I was in zero gravity I immediately realized that no matter how much you prepared on earth, that to fully feel comfortable in that environment, you need to train in real zero gravity conditions.

Whatever you plan on earth to do in zero gravity, is just imagination.

BI: Elisa, at your Lab you investigate how we perceive gravity. But, as you mentioned before, we can´t actually do it. How did you solve this to carry out your investigations?

EF: We had to come up with some sort of trick to look at how people see gravity and how the brain computes it. Usually we ask people to judge what is vertical. So gravity is a linear acceleration that is perpendicular to the ground, therefore gravity is a vertical linear acceleration. So the way we should estimate how people perceive gravity is by asking them whether some lines for instance, are aligned or not to the vertical. And they are actually very good at doing that. If you try you will see that you are incredibly good at perceiving something that is not aligned to the vertical. Usually the error for unhealthy participants is about +/- 2 degrees. Great! So we were working on verticality for a while; how people perceive verticality, how people perceive gravity and usually we show them some lines and ask them to judge whether the lines are vertical or not, which is quite boring. So we came up with the following question: do people prefer vertical lines, do they prefer the objects that are aligned to the direction of gravity? People tend to find Mondrian paintings very attractive and there are a lot of vertical components in Mondrian style paintings. Mondrian actually got obsessed with verticality and only used vertical lines to portray power and gender. So, it might be possible that because we are here on Earth, we like vertical objects more. And that is what we asked in the lab. We didn't use Mondrian style paintings, we removed all the attractiveness of the stimuli and we simply used some lines and we asked the participants to judge their attractiveness. They were vertical and tilted lines and were presented in a way that the observer could only see the lines or a black background. As you can imagine, it is a very interesting experiment to do and they were very happy, looking at hundreds and hundreds of lines and judging how much they liked them.

We found out that when participants were upright so the direction of their body was congruent to the linear acceleration of gravity, they liked much more vertical lines. So, looking at attractiveness rates you can see that participants don´t really like those lines. Well, this is not surprising, they are grey lines on a grey background. But when we look at the stimuli at zero degrees, such as vertical lines, they liked it much more compared to all the other inclinations ranging from -45 degrees to +45 degrees.
We were very interested in these effects and we thought, well, what would happen if we asked the participants to be tilted and not congruent with the direction of gravity anymore? So we displaced their body and tilted it 90 degrees toward the left or to the

right and we asked them to judge the same stimuli. What we found is that if the body is not aligned to the direction of the gravitational vertical they don't like vertical lines anymore. So, taking together all the results seems to suggest that our daily perception might be biased by the presence of gravity because we are here on Earth we are used to having some gravitational bias in our perception.

BI: Speaking about difficulties, was the noisy environment of the plane disturbing to your music?

MM: I know that planes are really noisy, so I set up a system with wireless in-ear headphones that could isolate me very well. At the same time, for security reasons, I needed to be able to listen to the captain's messages inside the plane. I used my computer's microphone to capture the sound inside the flight, mixed with the music I was playing and send it to my headphones with the volume levels I wanted. The result was very good and I felt very comfortable with the system.

BI: Would you have wished to perform in a floating sound studio instead?.

MM: Obviously I would have loved to be in a real studio under micro gravity conditions. I'm sure in the near future that will be possible, and we'll see musicians training in space, because the way we learn to play most of the instruments on earth has gravity inside those techniques. Humans need to start creating zero gravity techniques to play musical instruments, and also start creating new musical instruments designed to be played in zero gravity

BI: When artists and scientists get together, everyone wonders how they work together. Could each of you from your own perspective describe the work method you adopted and how it was different to your other work methods?

EF: My perspective is the cognitive neuroscience perspective. I am using methods from cognitive neuroscience and experimental psychology to investigate the effects of gravity on aesthetic experience.

AB: For me it is extremely difficult, almost impossible, to describe the creative method we followed. I wanted to test the idea of "Anti-disciplinarity" for this ZGB project. An anti-disciplinary project isn't a sum of a bunch of disciplines but something entirely new. What it means to me is someone or something that doesn't fit within traditional academic discipline. A project with its own particular words, frameworks, and methods.

BI: What are your next steps in your Zero-G band and how do you want to evolve the findings into another project?

EF: Well, on the scientific side there is still a lot of work to do. This would need to be done mainly in the lab in order to build up a neurocognitive model of how gravity contributes to aesthetic preferences.

MM: We recorded the parabolic flight using 360° technology to try to emulate this zero gravity vision, where there is no up nor down, left nor right. So one idea is to create an installation where the viewer can get a glimpse of this feeling. We want to create an artwork perceived as if in zero gravity.

AB: The ZGB still has a long life. This is just the beginning. The aim is to produce an artwork designed and motivated to be experienced and perceived in microgravity. We are designing some music and fine art prototypes that are designed to be performed in zero-gravity (i.e. the SAVNAC and the TELEMETRON) and we want to test them in a parabolic flight.

BI: Finally, if you had a free ticket to space: where would you go and why would you go there?

EF: This is a difficult question... I hope that these tickets might include visiting different planets: I would love to get the experience of zero-g but also, moon and mars gravity. I am fascinated by the idea of how our brain can adapt to different g environments.

AB: One of my dreams would be to see a black hole with my own eyes.