

Collaborating with Space-related Research Institutes, Government Agencies and an Artistic team to create a series of Space-themed public events in Ireland in 2014

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Abstract

A suite of informal interactive public engagement initiatives was created, to promote the importance of Space exploration, to ignite curiosity and discover new and engaging platforms for science in the Arts & in STEM Education, and to increase awareness of careers in Ireland's Space science industries.

These included: (1) 'To Space' - A live multimedia theatre performance aimed at the general public & young adult, (2) an adaptation of 'To Space' for 13-17 year old students entitled 'ToSpace for School leavers' and (3) 'My Place in Space', created for families.

Blending humour, warmth and humanity and positioning science within story is a highly effective public engagement tool in igniting curiosity across many audience types. The nurturing and investment of artists working within these new cross-disciplinary relationships should be encouraged and supported to further broaden and develop new methodology in public engagement of the planetary sciences.

1. Introduction

In Ireland, the government warns that interest in Science among school leavers in Ireland is waning, but that science and technology is key to future economic growth and development¹. Research centres in Ireland are obliged to invest in public engagement initiatives, to disseminate their work². Current forms of public engagement are limited to panel discussions and other non-participatory forms of communication. There is scope to consider new and engaging platforms for communicating the sciences to a diverse audience demographic. Dr. Niamh Shaw, scientist/engineer and performer is passionate about igniting people's curiosity and is interested in making new forms of public engagement, laying in the middle ground between Arts and science.

2. Objectives

To create a series of public engagement events utilizing a collaboration between CIT Blackrock Castle Observatory, ESERO Ireland office of Science Foundation Ireland, European Space Agency Research and Technology Centre (ESTEC), Dr. Niamh Shaw and a number of theatre, and other multimedia artists, to create work which would fulfil the following criteria:

- (1) To stimulate interest and debate about the importance of Space Exploration.
- (2) To radically re-invent science, ignite curiosity again, and discover new and engaging platforms for science in the Arts & in STEM Education.
- (3) To increase awareness of careers in Ireland's Space Science industries and research fields.
- (4) To awaken people's natural curiosity in STEM

3. Methodology:

The work was created through an intensive 6 month research phase by Dr Niamh Shaw, whilst artist in resident at CIT BCO and funded by Science Foundation Ireland's Discover Programme 2014. Collaborating between CIT Blackrock Castle Observatory, ESERO Ireland offices of Science Foundation Ireland, European Space Agency Research and Technology Centre (ESTEC), a series of site visits to these facilities was achieved, interviewing scientists, engineers, and former astronauts to incorporate new and innovative scientific discoveries in space science & its related disciplines. This research was then crafted by the artistic team to create an informal, cross-curricular lecture/performance on STEM, Space Exploration & its human implications, using multi-media, movement, personal memoirs and content from ESERO, Irelands Space-related industries & researchers, astronauts & space centres internationally. The research also explored the wider

social & cultural implications of Space exploration and the realistic possibility of human colonization of Mars as a possible solution to the dwindling energy & food reserves on our planet to sustain human life long-term³.

4. Results & Discussion:

Three related pieces were created, aimed at 3 separate demographics:

(1) 'To Space', A live performance aimed at the general public & young adult, to inform them of the human effort of space exploration in engaging and entertaining platforms. The success of this piece emerged from critical & theatrical reviews published in the national press & in journals^{4,5}. The show was initially presented as a 'Work In Progress' event at The Festival of Curiosity in both Dublin (Smock Alley Theatre) & Cork (Blackrock Castle Observatory) venues. The full theatre show 'To Space' premiered at Science Gallery from September 8th -14th as part of Tiger Dublin Fringe Arts Festival^{4,5,6,7}. In addition a special one-off performance occurred at The LAB as part of Dublin City Council Arts Office annual Culture Night celebrations. In 2015, 'To Space' toured Ireland nationally and will be performed at Summerhall venue at Edinburgh Fringe Festival 2015 with the support of CultureIreland. In 2014 'To Space' was performed a total of 10 times and was seen by 680 audiences. Response to the piece was very strong, indicated by excellent critic reviews in national press and online^{4,5} and its inclusion in European Space Agency communication sources⁸.

(2) 'To Space for School leavers', an adapted piece for secondary school students to increase their awareness of Ireland's involvement in Space Exploration & to remind them that STEM is everywhere and that they have permission to dream big. This show toured nationally as part of World Space week 2014 and National Science week 2014 events in conjunction with ESERO Ireland, CIT Blackrock Castle Observatory, Cork, Armagh Planetarium & Dunsink Observatory as well as theatre venues in Dundalk, Dublin and Carlow. Careers events & discussions with the students about STEM careers in the Space industry were held afterwards, to provide further support for students with any queries about pursuing a career in STEM. In 2014 'ToSpace for School leavers' was performed 12 times and was seen by 570 students. Careers events

& discussions with the students about STEM careers in the Space industry were held after each presentation of 'To Space for School leavers at CIT Blackrock Castle events, to provide further support for students with any queries about pursuing a career in STEM. A suite of Space Industry Career videos were prepared from interviews during the research phase of the project and posted on Science Foundation Ireland's careers portal SmartFutures, to promote careers in STEM¹¹.

(3) 'My Place in Space' A family workshop and highly interactive event telling the story of our place in Space⁹. Taking the audience from the smallest thing to the furthest reaches of the Observable Universe, making our Solar System, smashing atoms, and creating a human Carbon model to show how we are truly made from Stardust. 'My Place in Space' was presented at Festival of Curiosity, the Mallow Science Fair and The Curiosity Lab as part of Science week 2014. This workshop was also brought to art spaces including VISUAL gallery in Carlow. 'MyPlace in Space' was performed 8 times and has been seen by 420 people.

A key strategy of Dr. Niamh Shaw's presentation style of mixing art with science was to engage the audience in new ways, crafting a narrative on which to hook scientific content. It was shown that the result of this style of performance encourages audiences to learn subliminally whilst being entertained in a new non-threatening way, whilst accessing their innate sense of curiosity & wonder. In all 3 presentations (To Space, To Space for School leavers, My Place in Space), this strategy was highly effective in delivering the core science behind Space exploration and was particularly effective among new audiences to science events and school leavers, as indicated by favourable theatre reviews^{4,5}, online promotion of these event on European Space Agency¹⁰ and Science Foundation Ireland websites and audience numbers.

All 3 performance pieces (To Space, To Space for Secondary schools & My Place in Space) were presented in very accessible forms, clearly delivering the rationale behind Space exploration and the wealth of Irish talent involved in the Space industry^{11,12}. From many post-show discussions & audience feedback, it was apparent that this content stimulated audience curiosity about Space and also helped them

understand a little better the importance of Space exploration and Ireland's role in it.

Placing the events in dedicated Arts & non-educational, community performance spaces, such as the Science Gallery Dublin, was shown to be an effective method of public engagement where the traditional learning platforms for the audience were altered, and where space science was presented in a new, more human context.

6. Summary and Conclusions

Telling science within a story and placing the human at the centre of the narrative is highly effective, but recommend that this type of work, and artists collaborating in this cross-disciplinary form require further nurturing and support.

The Space industry and research centres in Ireland are keen to participate with ESERO Ireland and public science learning centres in initiatives to promote careers in STEM.

Bringing Science within new forms of public engagement is an effective tool in igniting curiosity across many audience types.

Acknowledgements

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Natali Blugerman

Ice Observatories

My project is to make ice observatories to perceive astral movements as well as light phenomena in the shape of cosmic rays and heat, for example. I find the idea of creating an observation point in space, that in time will change shape and eventually disappear, in consonance with the way we humans have been approaching the exploration of the universe since we started doing it. The transformation in the elements we use to understand big and small transformations, within the universe elements.

ExoLab Space Mission Simulation: Expanding life with art & science

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Abstract

In the context of building a minimum autonomous modular architecture for the Moon & extreme environments on earth, a simulation has been performed considering also the potentiality for Art & Science applications. In specific ExoHab and ExoLab has been equipped as technical mockup at ESTEC for multidisciplinary mission simulation [1,2, 3].

1. Introduction: Art in Space

Space must be a place for both scientific and cultural applications.. “Art in Space will give a new dimension to the artistic production expanding human culture” (B. Foing in [4]). In this context, Art & Science has been selected as a high potential form of art to use Space as a media. The use of Space as a media could extend the scope of art & science crossovers and generate new forms, ideas and applications for both the space industry and the arts.

1.1 Art & Science

As explained by the Royal Academy of Art [5], artists specialized in art & science are artists who translate their experience of the world into visions that could enhance the quality of life with future forms of art. Those artists are inspired both by art & science and are able to create new form of medium for art project. In particular by questioning the human-environment relationship from both artistic and scientific point of views, those artists propose to develop new mediums and new ways to apprehend space missions. A form of collaboration in “which scientific concepts are seen as a kind of 'content', and where the artist translates these concepts into images,

sounds or other experiences” triggering radically new kinds of artistic development [6] .

2. The simulation

On 29 May 2015, a simulation procedure, structure and equipment were prepared as technological mock up to perform a space mission simulation. A team of nine members was invited by the ILEWG to address specific tasks inside the simulation verifying how persons from different humanistic and technical fields could bring an added value to space mission.

2.1 Crew structure & background

The crew has a classical task and hierarchy structure, but with members from different humanities & scientific fields, divided between: remote support, ExoHab & ExoLab module and ATV observatory.

- **Remote support:** Campaign director (Bernard Foing – science, technology & logistics), Commander (Irene Lia Schlacht - design & engineering), Mission support (Jolanda W. Preusterink – operations and education)
- **ExoLab:** Executive Officer (Miha Tursic - art); Crew Engineer (Desmet Guillaume - Engineering architecture); Health & Safety Officer (Eva Petric - art & psychology)
- **ExoHab:** Crew biologist (Spela Petric - bioart)
- **ATV observatory:** Crew astronomy specialists (Ludwig Pasenau - exoclimatic art); Crew scientist (Natali Blugerman – Art & Science)

2.2 Crew tasks

During the simulation the crew in EVA performed research of form of life, while the crew astronomer and biologist worked on their field of research

getting inspired also on cultural application. During the EVA it was plan a communication break down and two astronauts in EVA perform a safety emergency procedure while the crew biologist and the crew health & safety officer were left alone each in one of the module trying in reconnecting the communication. The crew member left alone experienced psychological reactions related to the feeling of isolation. We summarise here results relevant to artistic inspiration derived from the simulation.

3. Results

The simulation inspired the members on cultural and artistic level:

- Executive Officer Miha Tursic: performing EVA search for life forms was inspired by questions of developing new life or life-like forms to inhabit the Moon or other planets.
- Crew scientists Natali Blugerman: performing EVA & planet observation, was inspired on her project on ice observatory as connection between human and space with elementary elements such as ice and fire developed with ice lens.
- Crew astronomy specialists Ludwig Pasenau: performing a telescopic solar observation to prevent the crew from radiations, was inspired by a video (Image1) shooting of the sun and the atmospheric activity to develop a series of space weather videos. These works could nurture an exoclimatic art project for future astronauts engaged on a long duration mission.
- Crew biologist Spela Petric: providing communication support for EVA team, was inspired on a new artistic concept on difference of growing biological life in the different planets of our solar system
- Health & Safety Officer Eva Petric: being isolated in the ExoLab module, giving access to her body perception and inside, was inspired a text on her sensory perception.

4. Conclusion



Image 1: Space Weather Artistic Video, © Pasenau.

During this simulation, the members from different art & science background could perform the mission tasks and found inspiration to new cultural applications with art & science.

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Image 1: The Team Columbus lab ESTEC, 2015.

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Art & Space: the webbing projects of Eva Petrič

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Abstract

1. Art & Perception in Space

Art is considered a form of communication often related to the perception of personal emotion of the artist. Space is the most extreme environment that a human could approach, this environment affects the human body and the individual's personal perception with metamorphosis created by factors such as, isolation, radiation and difference of gravity. This alteration of the perception could be viewed as a potentiality from artists to acquire and communicate new emotions. To investigate the capacity of an artist to come faster and closer to emotions and to communicate their feeling, a mission simulation has been performed in the ExoLab module [1] from ILEWG [A] on the 29th of April 2015.

Table 1. Personal report of Petrič emotions in space mission ExoLab simulation

EXPERIENCE OF ISOLATION Space mission simulation, Eva Petric, 29 Mai 2015, ExoLab ESA ESTEC, The Netherlands
<p><i>"After the two astronauts left I found myself listening carefully to try to hear them, and because of this I began to become aware of all the sounds around me much more intensely. While I heard them I was still calm, but after a while I could not hear them anymore and I began to become a bit worried...I waited and waited with a sense of hope and belief that I will hear them again soon and that this will mean that they are returning, but this did not happen. So I began to panic. I began to imagine how something had happened to them and they will not come back and that I was now left abandoned on the moon. I became scared. I began to check all the equipment, but none of it was working. This made me really scared and i began to feel a feeling of extreme isolation. I felt also physically very cold... I sat back and tried to calm myself by breathing deeply. Images of earth, memories, my family, friends began to flood my mind and this helped to distract me from my fear and feeling of isolation- it helped...then again suddenly a feeling of extreme panic set in and lose of hope and thought of what to do, will I die?! I tried again to calm myself and create poems in my head- melodies. The later all calmed me down and gave me a good feeling... and suddenly I heard again the voices of the two astronauts and I was filled with joy! This whole experience seemed to me to last for 20 min, but in reality it lasted more then an hour! Time seemed to me to pass by much more quickly to me then it did in reality..."</i></p>

The crew was composed of artist and scientist. In particular during the simulation Eva Petrič inside the module tried to imagine to be in a real confined and isolated place. This brought her a strong perception of her body and emotions that she reported in a short text composition (*Table 1*).

2. The projects of Eva Petrič

Below two specific Art works are presented related to Space personally introduced by Eva.

2.1 Project 1: Earthling's mark – E mark

Earthling's mark – E mark, a series of tattoos in the form of a human shadow, translated into the pattern of Idrija [B] lace, denoting the unique features of human beings as well as of human society that is resulting from the interconnectedness among human beings, illustrated with web like lace patterns. The tattoo, applied to astronauts' wrists, would have a double function: a function of changing the astronaut as a carrier of the tattoo into a living art; and a function of providing the astronaut with emotional charge that the art provides. Particularly the form and shape of the Earthling's mark - E mark on astronaut's wrist would serve as a source of association when the astronaut would look at it, reminding him/her with the loops of lace pattern on his/her connection to other people, other generations, to Earth and on the other hand, to show through its lace pattern that Earth is part of a huge interplanetary and interstellar webs.

The proposed Earthling's mark – E mark stems from my project Gr@y Matter – language of shadows in which I explored the communication abilities of shadows, expressed as emotions. In the periodic table, borrowed from natural sciences, I replaced chemical elements with emotions visualized with images of shadows. These to me denote the DNA of our emotional existence. Parallel to our material existence, presented through chemical elements and molecules, emotions determine our immaterial existence. I decided to rely on emotions and shadows

to make Earthling's mark - E mark because both, emotions and shadows, are equal to all human beings, regardless of the cultural, social, linguistic, or any other differences. Shadows, when looked at, usually produce an association, connected to emotions.

Shadow emotions, translated into curves and loops of Idrija lace, show not only zig zags twists and turns of life but interweaving, connecting us, similarly as Idrija lace does, into unconscious patterns. *We are like threads, caught into loops of emotions in patterns of past and future generations.*

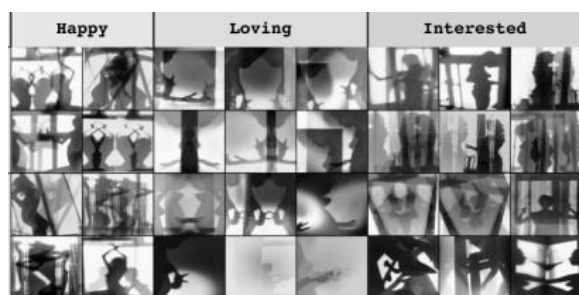


Image 1: Particular of Image 2 © Petrič

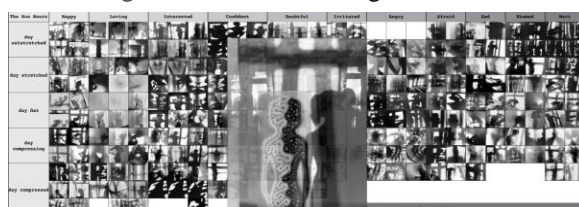


Image 2: Earthling's mark – E mark © Eva Petrič

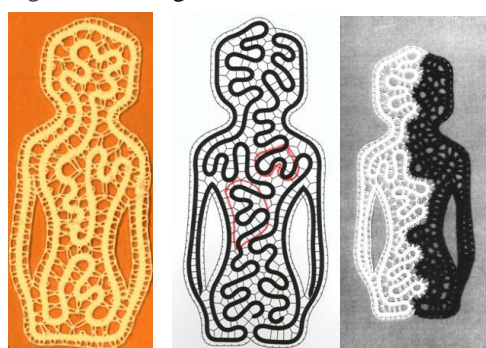


Image 3: Earthling's mark – E mark © Eva Petrič

2.2 Project 2: DBE xx xy

DBE xx xy (unisex fragrance) – to keep the astronauts in track with the Earthling in them. I propose to equip astronauts with fragrance tissues to keep them »in track« with the Earthling in them.

Function: to call on the memories on life on Earth. Scientists have found out the connection between smell and memories – certain smell has the ability to evoke certain memories. Smell can evoke even the most distant memories, the unconscious memories, transgenerational memories and even the primordial ones. Instead of EDT (Eau de Toilette) I invented a new term, DBE, Data Bank of Emotions, denoting that this is not just a fragrance but rather an emotion tuner, tuning one into one's optimal feelings. I propose to print the Earthling's mark – E mark (described in project 1) on these fragrance tissues. The printed figure, which is a translated shadow silhouette into the pattern of lace, denotes the human body. The loops, twists and turns of the lace demonstrate the interweaving and interconnecting process in a human body as well as society, the form thus preserving and accentuating our human origin. The fragrance used would be: pure double spicy, formulated according to my instructions.

3. Conclusion

“Art in Space will give a new dimension to the artistic production expanding human culture” [Foing in 2 p.4]. The correlation of artistic activity through cooperation with space could increase the potentiality of communication of space exploration.

Acknowledgements

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References & Notes

Note A: International Lunar Exploration Working Group, sci.esa.int/ilewg

Note B: Idrija is a place in Slovenia where a unique pattern of making lace developed in the 19th century.

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non-humane sight

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Abstract

‘non-humane sight’ is a film investigation project that uses the RAW and CALIBRATED image data of the AMIE sensor on board the SMART-1 mission. With particular interest in the RAW image data, the work uses a processing patch to load the data from IDL to an image format and explore noise. Noise in all of its formats in captured the space CCD photography: shot noise, object noise, sky noise, dark noise and dark current noise, the work wonders about what happens to all this captured information that gets eliminated when the data is properly calibrated. Would it be possible to subtract the calculated data from the raw data and what we are left with will it be clear noise ? How come we build mechanical eyes that can see all the things we can’t and then calibrate them to only see what we can see ? What do all the things we can’t see look like ?

2. Figures

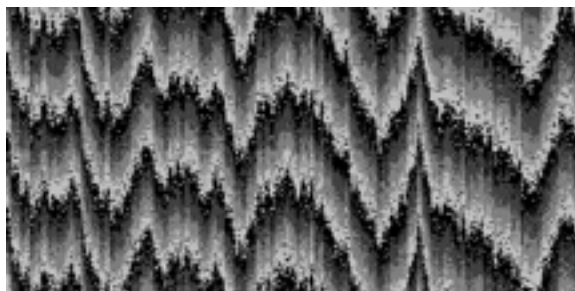


Figure 1: first RAW capture of Bandpass filter 750 nm of the AMIE instrument from the Earth Escape Phase of the SMART-1 mission on 18/11/04 exposed for 10 ms pointing towards the moon

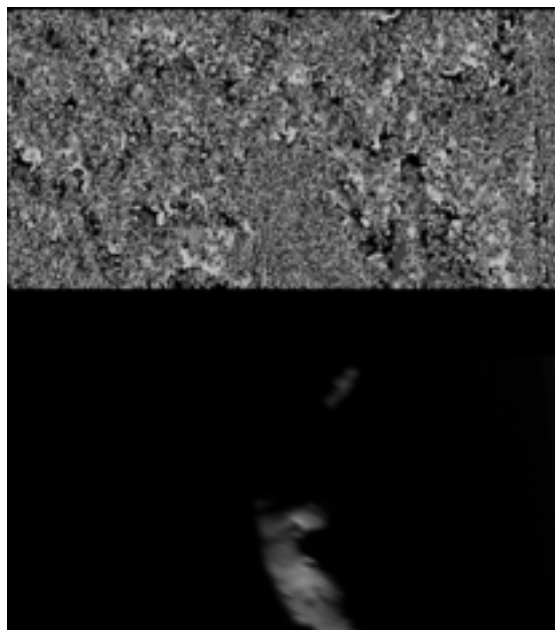


Figure 2: (above) RAW capture of Bandpass filter 750 nm of the AMIE instrument from the Lunar Phase of the SMART-1 mission in orbit R00099 exposed for 1000 ms point towards the moon (below) calculated image after processing

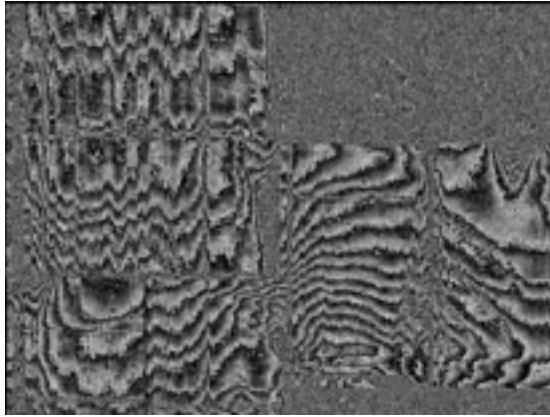


Figure 3: joined picture of all RAW captures of the filters : Bandpass 750 nm, Bandpass 915 nm, AR coating, Longpass 960 nm, Bandpass 847 nm, Bandpass 915 nm of the AMIE instrument from Earth Escape Phase of the SMART-1 mission on 03/10/03 with exposures ranging from 1 to 10000 ms pointing towards the moon

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I would also like to thank Bernard Foing, Evelina Domnitch and Dmitry Gelfand for their support in the advancement of this project

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SPEAKING IN LIGHT - Jupiter radio signals as deflections of light-emitting electron beams in a vacuum chamber

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Abstract

Light emitting electron beam generated in a vacuum chamber is used as a medium for visualizing Jupiter's electromagnetic radiation. Dual dipole array antenna is receiving HF radio signals that are next amplified to radiate a strong electromagnetic field capable of influencing the propagation of electron beam in plasma. Installation aims to provide a platform for observing the characteristics of light emitting beam in 3D, as opposed to the experiments with cathode ray tubes in 2-dimensional television screens. Gas giant 'speaking' to us by radio waves bends the light in the tube, allowing us to see and hear the messages of Jupiter - God of light and sky.

1. Introduction

Ancient roman god of light and sky and the protector of State and its laws, Jupiter, unapparent as it seems, still holds its influence today. Once a strong religious and political force, the 'Shining Father' of the Roman Empire, today Jupiter transcribes as an influence on our electromagnetic spectrum. Referred to as a gas giant, this planet stands out in our Solar system by its mass and magnetosphere and is easily distinguishable on our night sky by being the third brightest object after Moon and Venus.

Electric glow discharge, visible in neon tubes or cathode ray tubes of early television sets is generated in a plasma state where the excitation collisions of the electrons generate photons. Crookes tube is one of the early experimental discharge tubes consisting of a (partial) vacuum chamber, a cathode and an anode. Electron beam is generated by a high DC voltage applied between the electrodes and is projected in a straight line. One of the early realizations is that the electron beam is deflectable by both electric and magnetic fields. This peculiarity is what I would like to build upon and experiment with.

2. Installation framework

The intention is to use Jupiter's radio signals as a deflecting electro-magnetic field in a Crookes tube setup. A dual dipole array antenna is setup to a frequency range of about 18 – 22 MHz, having 20.1 MHz as an operating frequency. Jovian radio antenna is steered to the Jupiter's south elevation angle in the northern hemisphere as predicted for the time of observation in order to obtain the highest gain (dBi). Signal is then amplified and introduced to the vacuum chamber as an accelerating electric field, perpendicular to the cathode ray trajectory. Depending on the strength of the electro-magnetic field induced the deflection rates will vary and in accordance to the L-bursts and S-bursts transmitted from Jupiter the deflection frequency will vary, exhibiting patterns of electron beam bending.

3. Summary and Conclusions

There have been very few artworks dealing with light emitting beam properties in accordance to the electromagnetic fields. One of the most known ones are the "Magnet TV" by Nam June Paik from 1965 and "CRT MGN" by Carsten Nikolai presented at the 17th Media Festival in Japan in 2013. Both works are using cathode ray tubes and 2-dimensional surfaces to show the propagation deflection patterns. *Speaking in Light* aims to replace the television screen with a clear glass vacuum tube thus facilitating 3-dimensional observation of this natural phenomenon. Electromagnetic wave imaging of Jupiter signals in plasma therefore represents a separate layer striving to bring forth the analogies or connections between mythology and nature - archetypes and scientific facts.

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ART-SCIENCE OF THE SPACE AGE: towards a platform for art-science collaborations at ESTEC

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Abstract

In 2013, in collaboration with ESTEC scientist Bernard Foing and the ArtScience Interfaculty (Royal Academy of the Arts, The Hague), Synergetica Lab (Amsterdam) developed a course, which was repeated in 2015, for bachelor's and master's students aimed at seeding interactions with ESA researchers. The participants created artworks investigating space travel, radio astronomy, microgravity, ecosynthesis as well as extraterrestrial physics and architecture [1] [2]. After their initial presentation at the Royal Academy, these artworks were shown at ESTEC, Today's Art Festival (The Hague), and TEC ART (Rotterdam). These presentations prompted diverse future collaborations and outreach opportunities, including the European Planetary Science Congress 2014 (Cascais) and the AxS Festival (Los Angeles).

1. Introduction

Even before the space age began, already in the 1910s artists such as Kazimir Malevich envisioned art laboratories orbiting the Earth and traveling to other celestial bodies. Though such laboratories have yet to be launched, a vast variety of art experiments are being conducted in preparation for future missions and research projects. Inspired by historical and present-day orbiting laboratories such as Space Lab, MIR and the International Space Station, numerous artists are joining forces with space scientists and engineers, collectively fostering unprecedented cross-disciplinary artworks with pivotal aesthetic, philosophical and educational impact. [3]

2.1 Synergetica Lab

Founded in Amsterdam in 2007, Synergetica Lab is a platform for art-science collaborations with an emphasis on photonics, fluid dynamics, acoustics, quantum chemistry and cognitive science. In addition to facilitating the production of artworks in these domains, Synergetica serves as a curatorial and educational entity, disseminating interdisciplinary artworks and art-science research. In 2011, Synergetica was selected as the Dutch representative of Studiolab, a 12-country European Commission initiative bringing together major players in scientific research with centres of excellence in the arts and experimental design including Le Laboratoire (Paris), Science Gallery (Trinity College Dublin), Royal College of Art (London), Ars Electronica (Linz) and MediaLab Prado (Madrid).

2.2 ArtScience Interfaculty and an overview of 'Space Science in the Arts' projects

As part of the ArtScience Interfaculty, the Royal Academy of Art and the Royal Conservatoire in the Hague have been offering a two-year interdisciplinary master since 2002. At the ArtScience Interfaculty students and teachers are developing new forms of interdisciplinary art, and the goal of the teaching programme of the Interfaculty is to investigate and possibly shape the intersection between artistic concepts and recent developments in science and technology.

3. Summary and Conclusions

The two year collaboration between ESTEC, the ArtScience Interfaculty (Royal Academy of the Arts,

The Hague) and Synergetica Lab have demonstrated a robust potential of art projects, art education and art-science collaborations in promoting public awareness regarding the importance of space exploration and space science.

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Moon Horizon

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Abstract

1. Introduction

Does visual representation of a moon horizon affects our concept of moon exploration and possible life on the moon? Only a few photos have demonstrated the moon horizon from human perspective, it's hard to imagine what it is like to see the moon horizon unless we have visual representation. A simulation of experience of moon horizon will be the means to investigate how such vision changes our ideas and actions.

1.1 First earth picture and its impact

The first image of our earth seen from the space created a new sensation and has contributed to our understanding of the concept of our earth.^{[1][2][3]}

1.2 Horizon and exploration

If we read the humanity origin as narrated by Buckminster Fuller, ^[3] the imagery that dominates our ancestors were the horizon of sky and the ocean. How does that vision influence our exploration activities?

1.3 Horizon in its metaphysical context

To investigate beyond “horizon” is the vocabulary we use for exploration, and lays the ground both for scientific and artistic breakthrough. ^{[4][5]}

2. Investigation Methods

I plan to study the surface of the moon, create or obtain 3D model and produce a diorama in which the surface of the moon is represented visually.

3. Diorama

Diorama is a intuitive way to investigate our imagination, and our concept of the world. To recreate the surface of the moon in the form of a diorama also bears a certain art historical heritage. (Examples: Duchamp's diorama)

4. Summary and Conclusions

Visual experience hugely influence our concept of the world, the line of our earthly horizon defines our curiosity. The urge to get as close as possible to capture the definitive line—a conceptual line without width drives our inquiry, no matter scientific or philosophical. To extend our imagination of living on the moon, a reasonable first step would be getting used to the imagery of moon horizon.

Acknowledgements

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Feeling the Science, Thinking about Art

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Abstract

MAARBLE (Monitoring, Analyzing and Assessing Radiation Belt Loss and Energization) was an FP7-funded project, involving monitoring of the geospace environment through space and ground-based observations, in order to understand various aspects of the radiation belts (torus-shaped regions encircling the Earth, in which high-energy charged particles are trapped by the geomagnetic field), which have direct impact on human endeavors in space (spacecraft and astronauts exposure).

Besides interesting science, the MAARBLE outreach team employed a variety of outreach techniques to provide the general public with simplified information concerning the scientific objectives of the project, its focus and its expected outcomes. An outstanding moment of the MAARBLE outreach experience was the organization of an international contest of musical compositions inspired by impressive sounds of space related to very low and ultra-low frequency (VLF/ULF) electromagnetic waves.

The MAARBLE international contest of musical composition aspired to combine scientific and artistic ways of thinking, through the science of Astronomy and Space and the art of Music. It was an original idea to provide scientific information to the public, inviting people to “feel” the science and to think about art. The leading concept was to use the natural sounds of the Earth’s magnetosphere in order to compose electroacoustic music. Composers from all European countries were invited to take part at the contest, using some (or all) of the sounds included in a database of magnetospheric sounds compiled by the MAARBLE outreach team.

The results were astonishing: the contest was oversubscribed by a factor of 19 (in total 55 applications from 17 countries) and the musical pieces were of overall excellent quality, making the selection of winners a very difficult task. Ultimately, the selection committee concluded on the ten highest ranked compositions, which were uploaded on the MAARBLE website. Furthermore, the three winning compositions received important awards and they were officially presented in a dedicated event during the international conference “Geospace revisited: a Cluster/MAARBLE/Van Allen Probes Conference” in September 2014.

The awe inspiring music was deeply felt by the public as it was uniquely combined with the projection of related space images and videos. The artists themselves described what feelings the music generated in them and how these inspired their compositions, characterizing this as an exhilarating experience, a “time capsule of sounds”, a “cosmic wind of music” and, ultimately, a creative path of discovery. As one of the winners put it: “It was like a myth about evolution, randomness, and mysteries, but ultimately the fragility of life and our existence”.



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