Hyphen Journal
Issue 3.1 March 2022 Ecologies

Indora: an Audiovisual Short for Digital Dome

Sara Melissa Gallego Quiroz

Shanghai Academy of Fine Arts, Shanghai University 上海大学 设计学

Abstract

Colombia is one of the richest countries in terms of biodiversity, but its natural resources suffer due to mining and deforestation.*Indora* is an audiovisual short for digital dome; this video art piece addresses the loss of ecosystems and puts forward a call to protect Colombia's environment and to live in balance and be in harmony with the organic network that sustains everything. This essay is a reflection on the fieldwork conducted for this project, the creation process and, finally, the possibilities that lay in immersive projection spaces for art practices, and their potential for raising awareness and activating spectators.

Keywords: digital dome; ecosystems; experiential media; immersive projection; planetarium

Indora: an Audiovisual Short for Digital Dome

Sara Melissa Gallego Quiroz

After a four-hour walk, I climb to 3,350 metres above sea level and find myself in the Páramo de Santa Inés, located in the upper Andean forest and páramo belts in the Department of Antioquia, Colombia. Here is where I film a large part of the audiovisual project *Indora*, a short for a dome planetarium. Colombia is located in the intertropical zone, in the equatorial region. This gives rise to particular conditions for the country, such as a combination of intense solar radiation and high rainfall, generating exuberant biodiversity. This privileged location allows the country to be one of the richest in biodiversity, with more than 50,000 known species.

While walking, I find myself surrounded by members of Espeletia (Asteraceae), also known as Frailejones or Bigmonks. These plants typical of this ecosystem can absorb large amounts of water and store it in their thick trunk. These ecosystems are among the country's most critical water sources and provide water to some of the main cities, such as Bogotá, Medellin, Duitama and Bucaramanga. According to the Bogotá-based Alexander von Humboldt Institute, the Northern Andean Páramos ecoregion supplies more than 70 per cent of the country's population with water. According to this research institute, the country has 36 *páramos* regions, representing approximately 3 per cent of its surface.

The conservation of water and biodiversity is fundamental to the continuation of human life; thus the

Colombian government has initiated the protection of certain areas by creating environmental parks and natural reserves; according to the Ministry of the Environment, about 31 million hectares of the country are protected areas, equivalent to 15 per cent of the national territory. But despite this, the protected regions suffer from problems such as deforestation and illegal mining: during 2019, 158,894 hectares were deforested across the country (IDEAM 2020).

As I walk through the *páramo*, I am aware of its importance to Colombia's ecosystem. As an artist, I find nature an inexhaustible source of inspiration, and I have a strong need to communicate and draw attention to the loss of ecosystems in the country. That is how I came to the intention of creating *Indora*. This piece of video art addresses this loss of ecosystems and calls for the protection of Colombia's natural environments, and for humans to live in balance and be in harmony with the organic network that sustains everything.

Figure 1: Native Forest, Quindío, Colombia, image credit: Sara Melissa Gallego Quiroz

DIGITAL DOME AS A MEDIUM

I remember when I was little, the first time I sat in a planetarium. The lights in the room went out, and a soft luminosity gently emerged on the horizon. More lights began to emerge over my head, towards my right and my left, filling my vision, and the constellations were forming in the virtual sky. The feeling of being immersed in this system was simply outstanding. I remember holding my mother's hand because I felt that everything was moving, as if the seats we were in were turning under a starry sky.

Digital planetariums or full-dome theatres, as they are also called, allow for a relation with the image in a very different way to other mediums like the cinema or television by enabling images to surround the viewer on a semi-spherical screen. Full-domes are physical spaces surrounded by a hemispherical dome or cupola whose walls are used as a canvas where the visuals are projected, usually images of the cosmos for astronomy education. These digital planetariums also have a surround sound system with different channel configurations for 5.1, 7.1, 14.2 or 22.2 audio.

Full-dome theatres have the property of being immersive places of large proportions, allowing the viewer to be in a state of presence where the images fill their field of vision, and managing to abstract the perceiving subject, leading them to a new relationship with the vision and surround sound. The relation with the images is different from that experienced in virtual reality environments shown on head-mounted displays. While both are 360-degree immersive environments, with head-mounted displays, users must move their heads to see their surroundings; the field of view is more restricted, and the experience is individualised. By contrast, the full-dome offers more peripheral view information and allows for a shared experience: due to its large dimensions, its auditorium can typically accommodate between 100 and 200 people. In head-mounted displays, as there is head-based rendering, the display follows the user's head movements, shifting the image displayed on the screen. This is different in a full-dome theatre, where the film is pre-rendered, so the image does not change in response to user movement (Schnall et al. 2012).

One advantage of this medium is that the screen's size combined with the experience of peripheral vision significantly impact the audience's attention (Yu et al. 2017). Learning in this space can be effective for teaching concepts, particularly those requiring students to change reference frames, as is the case with Earth and space science, for example (Sumners and Reiff 2004; Heimlich et al. 2010).

Digital domes also carry strong potential as experiential spaces for other kinds of science communication. Scientific visualisation has roots traced to before 1600 with statistical graphics and thematic cartography (Friendly and Denis 2006). Since the 1970s, there has been a continuous increase in data visualisation thanks to a variety of new computer systems, graphic techniques and data visualisation methods. Today, there is a continuously expanding accumulation of scientific datasets and data repositories such as Open Science Framework, Qualitative Data Repository or figshare. The immersive, experiential medium of full-dome projection offers excellent possibilities for scientific visualisations that can provide a better understanding of natural phenomena (Lantz 2009), allowing for collaborations between scientists and artists for the development of creative visualisations of scientific data.

Beyond science communication, digital domes can be used for immersive storytelling to express creative ideas in new and experimental formats. Already, digital domes are opening their doors to these new potentials: we can now see festivals like Dome Under (Melbourne), FullDome Festival (Jena) or Macon Film

Festival (Georgia, USA) that show video art projections in digital domes. Using dome spaces for artistic projections creates open-ended possibilities beyond astronomical visualisations, allowing for highly contemplative works in which the audience can 'navigate' the emotive spaces created by artists.

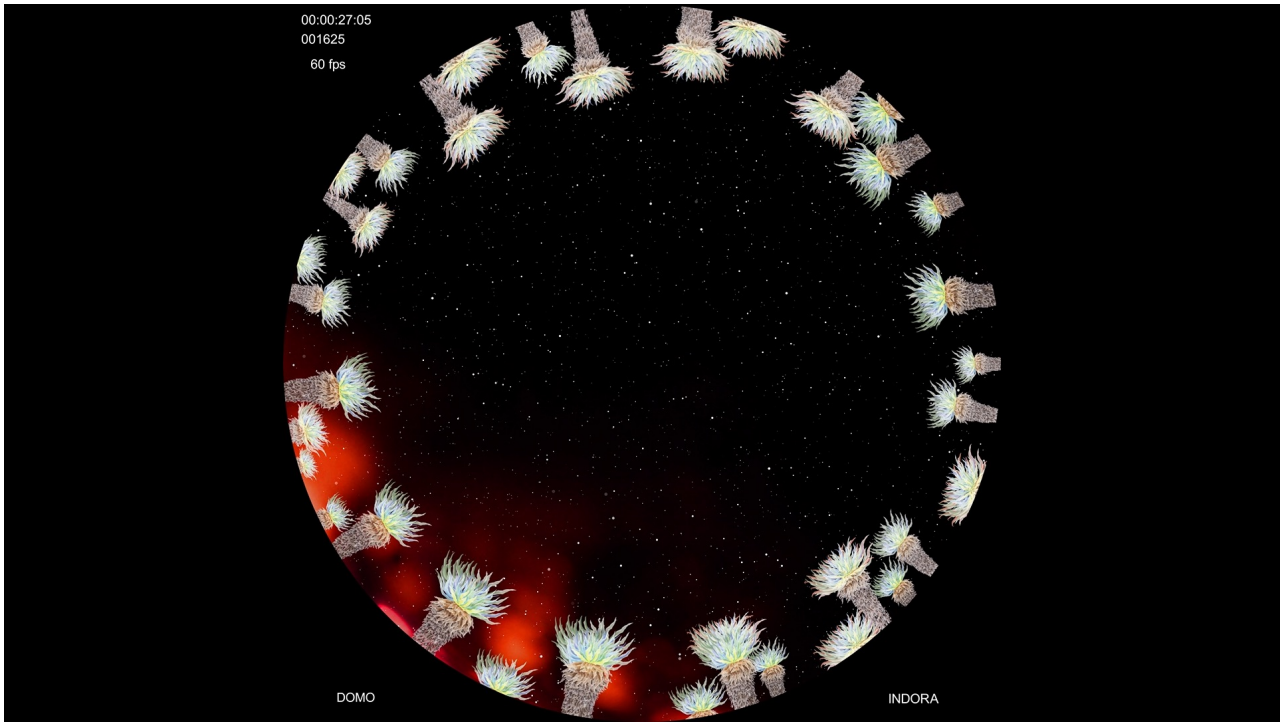

Figure 2: *Indora* capture in Dome Master format, image credit: Sara Melissa Gallego Quiroz

TECHNICAL ELEMENTS AND AESTHETIC ESSENTIALS OF *INDORA*

Dome audiovisual projects are made in the Dome Master format; this is the general format for dome pieces that are made under international standards. *Indora* is made with a 4096px x 4096px resolution, at a frame rate of 60 fps. The frame rate may vary depending on the dome or the needs of a project; in the case of *Indora*, 60 fps was chosen since the piece was projected in the planetarium of the city of Bogotá, one of the largest domes in Latin America with a 23-metre diameter. This being so wide a space, both the video resolution and frame rate had to be high.

This piece employs mixed-media aesthetics with the use of 3D animation, photography, video and illustration for the development of modelling and the composition, with the help of techniques such as spherical projection and the use of fisheye lenses and video from multiple cameras.

Among the procedures for developing illustrations, I used the technique of foreshortening to give a sensation of depth, both for drawings and for photographic elements. The graphical projections made use of a curvilinear perspective; with this perspective, it is possible to eliminate marginal distortions that occur with linear perspective in dome projections. The artists and art historians Barré and Flocon (1968) were among the first to describe this type of perspective in their book *La perspective curviligne: de l'espace visuel à*

l'image construite (*Curvilinear Perspective: From Visual Space to the Constructed Image*), which I used as a study.

The soundtrack of the piece has been developed in 5.1 surround sound, using 48Khz 24-bit audio. The music was designed with the musician Sebastian Villada; our aim was to create a soundscape that evokes nature through an organic type of ambience. Visitors can hear sounds like those of crickets or water; these were recorded directly in a native forest and the *páramo*. At points where the visual becomes a little denser to put forward a critique of mining and extraction of natural resources, the music grows more intense with the foregrounding of sounds of machinery and bass. The flow of the music plays a powerful role in the project's communication of environmental issues.

The images shown in the dome are varied. There are digital illustrations of different plants like Espeletia (Asteraceae), also known as Frailejones or Bigmonks, which is the representative plant in the *páramo* region due to its storing of water. Also shown are illustrations of the ten most threatened fauna species in Colombia, some of which are sea turtles, jaguars and pink dolphins. Furthermore, I have created some images related to resource extraction, including illustrations of petroleum machinery and governmental mining approval stamps.

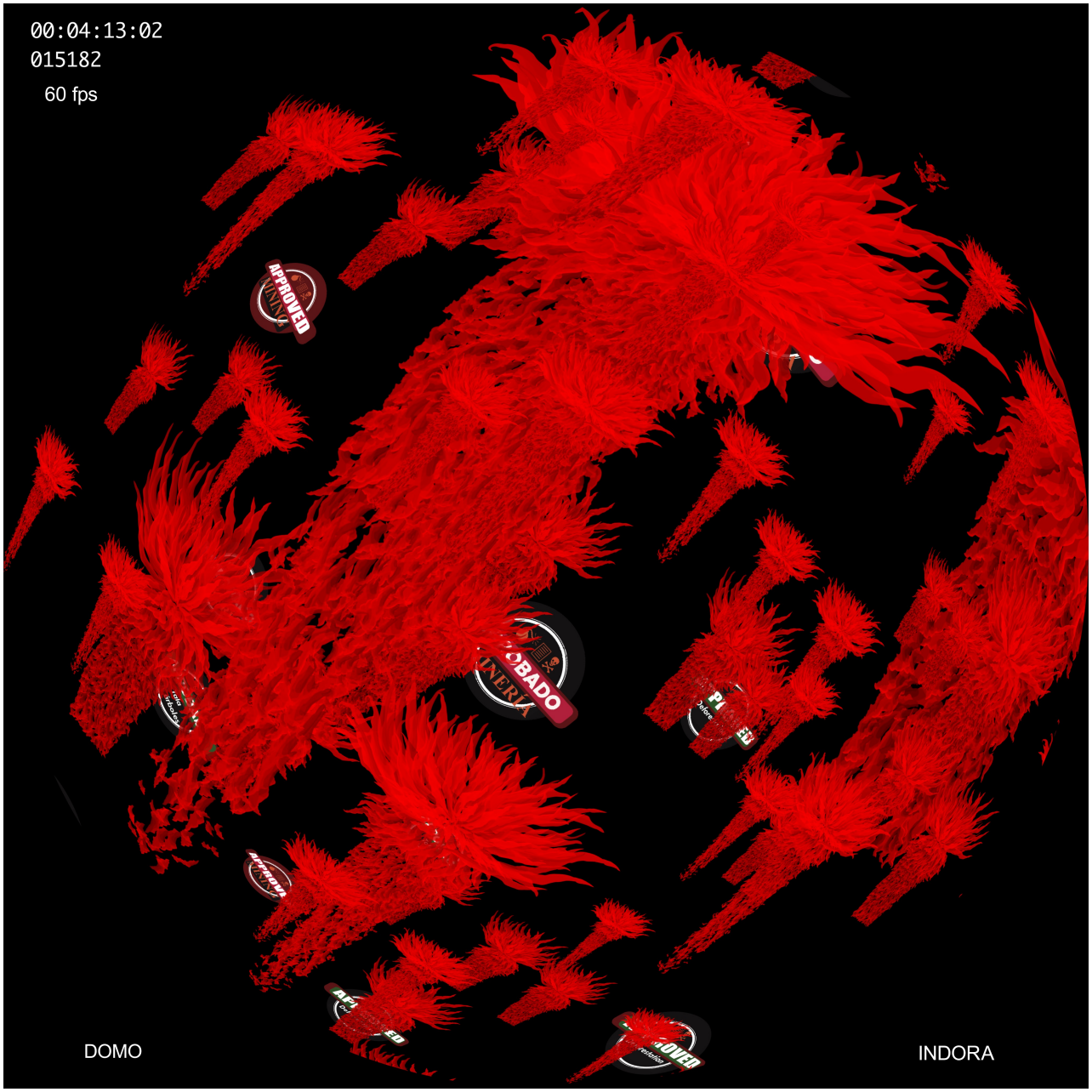

Figure 3: Digital Illustration of Espeletia (Asteraceae). *Indora* capture in Dome Master format, image credit: Sara Melissa Gallego Quiroz

The overall process of creation has involved a preproduction stage during which I have developed the research by conducting interviews with scientists and collecting data, then I created a narrative script and from this the storyboard. The production stage has involved the development of 3D modelling, field visits, the collection of video recordings and creation of illustrations. Once this part was completed, video elements were rendered into a first preview sample. Finally, in the postproduction stage, I carried out digital editing and composition; after the last adjustments, the final render was finished. The final project for display was submitted in a sequence of high-quality 4k PNG images, as a seven-minute short film.

To create the project's mixed-media aesthetics, it was important to use different software packages as well as visual elements. Videos were filmed with a 360-degree camera, including footage of the *páramo*

ecosystem showing native forests, water streams and related imagery. I invited two nature photographers to contribute, David Gómez and Camilo Botero, whose images are an essential part of the project. Both have photographed animals in the wild, some of which are at critical risk of extinction, such as the puma, the Andean (spectacled) bear, the howler monkey and the spider monkey. For the animation, I used software such as Processing and Magic Music Visuals for the creation of audio-reactive visuals. I used Cinema4D for 3D modelling. An important tool for the assembly was Camsphere V2, which is an After Effects 3D template developed for Montreal's SAT (Société des arts technologiques), a specialised tool for the creation of immersive content for full-dome production, which made possible assembly of the different elements in the Dome Master format.

It is necessary to consider the space for which the piece is created; a planetarium is a place that is frequented by different population groups, from children to the elderly. Working with mixed media, I can include animation, illustrations of plant and animal species and video footage. In my view, this combination creates a more dynamic visual experience that can engage all audiences. I found the immersive environment of the dome special for addressing environmental questions through artistic means. The screen size and the sensation of depth in the images, combined with surround sound, allow for the possibility to capture and greatly impact the audience's attention, which makes dome projection an excellent medium for addressing important and urgent matters. Projects such as *Indora* can be used in pedagogy, as is the case with the Bogotá Planetarium's educational programme which takes portable domes to schools and outdoor activities at which *Indora* has been projected.

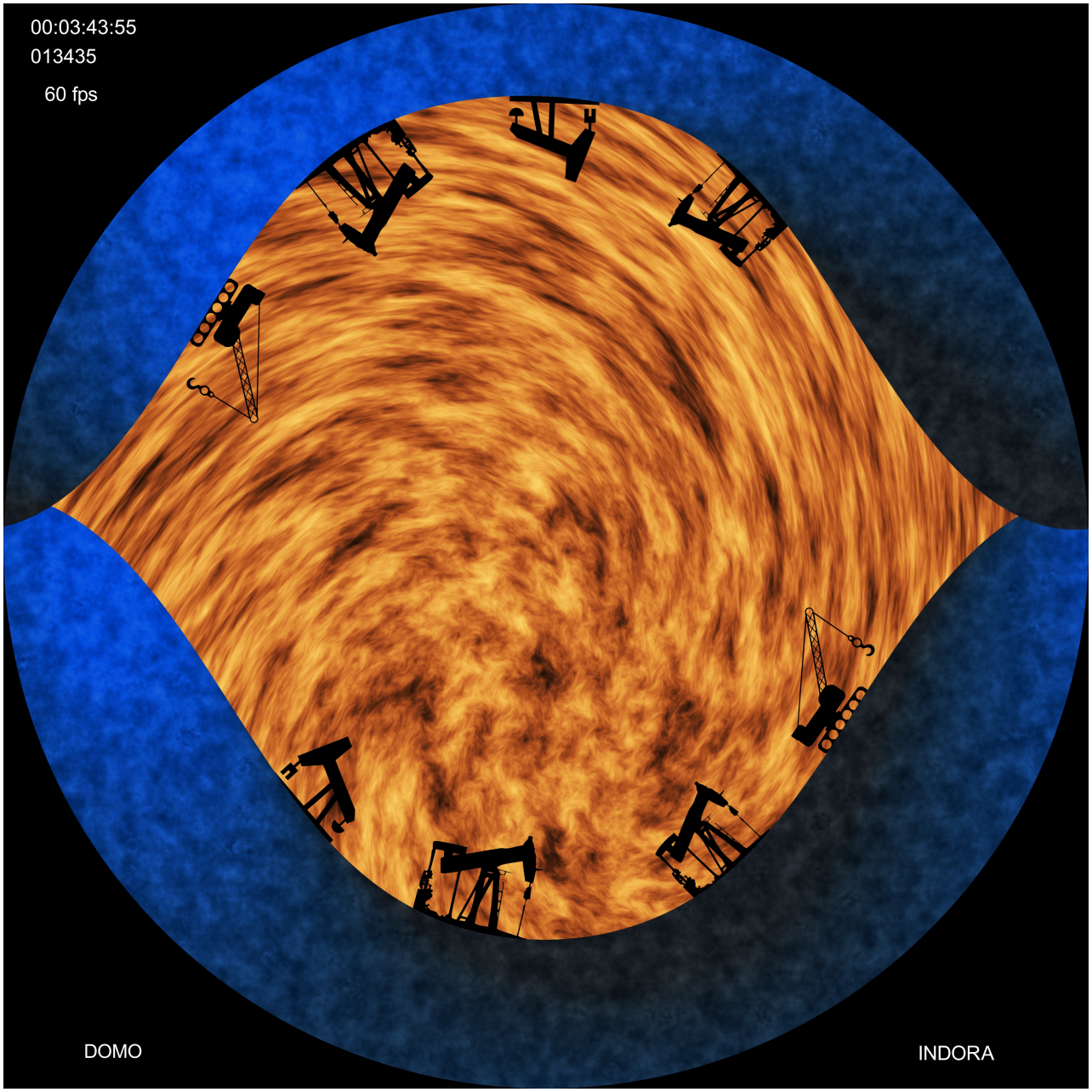

Figure 4: Digital Illustration. *Indora* capture in Dome Master format, image credit: Sara Melissa Gallego Quiroz

The project's main objective is to draw attention to the loss of Colombia's biodiversity and ecosystems due to changes in land use and the continued extraction of natural resources, mainly through coal and gold mining and logging in tropical regions. The audiovisual piece criticises excessive exploitation of natural resources and the effects of prioritising extraction companies' profits over public goods and common resources such as water and air, invaluable assets that cannot be accounted for in monetary terms. It is also a call for the government to act as a regulatory entity; the government approves mining licences and can also regulate the extraction of these resources, as well as monitor deforestation and loss of ecosystems at the national level.

ACKNOWLEDGEMENTS

Indora has won a Video Art Creation Grant for dome 2019, is supported by the District Institute of the Arts IDARTES and was exhibited in the Bogotá Planetarium during the 2019 FullDome Festival.

References

Bailenson, Jeremy N., Yee, Nick, Blascovich, Jim, Beall, Andrew C., Lundblad, Nicole and Jin, Michael (2008), 'The use of immersive virtual reality in the learning sciences: Digital transformations of teachers, students and social context', *Journal of the Learning Sciences*, 17, pp. 102–41.

Barré, André and Flocon, Albert (1968), *La perspective curviligne: de l'espace visuel à l'image construite*, Paris: Flammarion.

Friendly, Michael and Denis, Daniel (2006), *Milestones in the history of thematic cartography, statistical graphics, and data visualization*, http://old.nationalcurvebank.org/greatlinks/milestone.pdf. Accessed 12 November 2021.

Heimlich, Joe E., Sickler, Jessica, Yocco, Victor and Storksdieck, Martin (2010), *Influence of Immersion on Visitor Learning: Maya Skies Research Report*, Edgewater: Chabot Space and Science Center.

IDEAM (2020), *Resultados de Monitoreo Deforestación 2019*, http://www.andi.com.co/Uploads/PRESENTACION%20DEFORESTACION%202019%20(julio%209)_compressed.pdf. Accessed 12 November 2021.

Lantz, Ed (2009), 'Immersive scientific visualization in education, storytelling and art', *Proceedings of the IFSV 2009*, Tokyo, Japan.

Schnall, Simone, Hedge, Craig and Weaver, Ruth (2012), 'The Immersive Virtual Environment of the digital full dome: Considerations of relevant psychological processes', *International Journal of Human-Computer Studies*, 70:8, 561–75.

Sumners, Carolyn and Reiff, Patricia (2004), 'Creating Full-Dome Experiences in the New Digital Planetarium', in C. Narasimhan, B. Beck-Winchatz, I. Hawkins and C. Runyon (eds), *NASA Office of Space Science Education and Public Outreach Conference: proceedings of a meeting held at the Union League Club of Chicago, Chicago, Illinois, USA, 12–14 June, 2002*, pp. 155–59.

Yu, Ka (2005), 'Digital Full-Domes: The Future of Virtual Astronomy Education', *Planetarian*, 34:3, pp. 6–11.Yu, Ka, Sahami, Kamran, Sahami, Victoria, Sessions, Larry and Denn, Grant (2017), 'Group immersive education with digital fulldome planetariums', *2017 IEEE Virtual Reality (VR)*, Los Angeles, 18–22 March, pp. 237–38, doi: 10.1109/VR.2017.7892264.

About the author

Sara Melissa Gallego Quiroz is a designer and artist who has been awarded a master's in Transmedia Communication by EAFIT University. Currently she is a PhD student in Design Science at Shanghai Academy of Fine Arts, Shanghai University 上海大学 设计学. She works as an assistant professor and as coordinator of the MediaLab of the EAFIT University and works as a visual artist on the development of interactive pieces.