Column

Planetariums as venues for dynamic storytelling

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From 2023 to 2025, we celebrate the centennial of the planetarium: one hundred years of storytelling under the dome. As the projector technology has changed and become much more sophisticated, so have the ways in which we communicate science in the immersive environment of the planetarium. However, throughout this century, planetariums have remained an exciting venue to learn, share stories, connect, and experience the awe of a truly dark sky.

Introduction

For more than 23 years, the book *Window to the Universe* (*Hagar, 1980*) has sat on my office shelf. An inherited gift from the previous Planetarium Director, it describes the quintessential planetarium of the late 70's era and details the extraordinarily precise inner workings of optomechanical star projectors, the usage of slides and special effect projectors, and step-by-step instructions for the planning and production of original planetarium shows. This matches the nostalgic memories of my first childhood visits, when the ultra-dark night sky of my local planetarium transported me, like magic, instantly outside, allowing all of us in the room to gaze up into the infinite expanse. While this experience still represents the essence of a planetarium's general allure, much else has changed in the last 40+ years.

Today, modern digital planetariums are one-of-a-kind venues unmatched in their versatility and range of programming. These domed theatres continue to be a place to celebrate and share the beauty and mystery of the cosmos with schoolchildren, adults, and general audiences. The planetarium's advanced technological systems display immersive 360-degree imagery and access astronomical datasets and visualisations based on active research to create experiences unlike any other digital medium. Here, science, technology, and art blend seamlessly to bring visitors into the cosmos and inspire awe and curiosity in a way that any other form of educational material cannot.

A quick search on the Worldwide Planetariums Database[1], which was developed by industry colleagues from the Association des Planétariums de Langue Française (APLF), reveals a map of over 4,000 Planetariums around the globe. No two planetariums are exactly alike – they range from small, portable setups that can inflate and be set up within minutes to enormous, multi-million-dollar installations and represent every level of technology from simple pinhole-and-light-source devices to classic optomechanical projectors to elaborate digital projection systems backed by high-powered graphics computers. Many of the most famous venues are part of science centres or natural history museums; others are affiliated with universities and colleges, and some are found within elementary, middle, and high schools.

While each Planetarium facility is unique, they all serve the same notable purpose: to convey the concepts of astronomy through impactful storytelling techniques and strategies while bringing in a sense of physical immersion and engagement that allows viewers to personalise the experience. Just as there are multiple ways to build a planetarium, there are even more ways we can use these environments to astonish, excite, and fascinate. And, just as planetarium technology has evolved over the years, storytelling has flexibly adapted to the ever-changing medium.

Multimedia storytelling

As digital production technologies have advanced and become ubiquitous in media such as films, immersive room exhibits, projection mapping, VR experiences, and more, new opportunities have emerged for skilled creative and documentary writers and large-format filmmakers to use the dome to inspire awe through the spectacle of high-quality prerecorded feature shows – often referred to in the planetarium field as fulldome productions. Storytellers, scriptwriters, 3D animators, and multimedia producers develop 360-degree experiences designed specifically for immersion in a dome, which can bring astronomy concepts to life through artistic renderings and animations, allowing audiences to make impossible journeys across space to explore new environments and imagine possible worlds. The multisensory audiovisual experience rounds out with elaborate sound design, often including celebrity narrators and/or original musical scores.

Science visualisation and data storytelling

Complimentary to artistic renderings of 3D worlds, the planetarium is also emerging as a powerful display and storytelling vehicle driven by data visualisation tools. More software packages are emerging that add to the planetarium's toolkit and open up doors for showcasing massive amounts of data from the astronomical research community on the large-format immersive dome. In fact, most major planetarium software packages now include, by default, impressive dataset libraries and feature access to user-generated data visualisations. When discoveries are made, new data can be imported directly into planetarium systems to showcase, for example, orbital paths, or can be handled by other open-source visualisation software that is mapped onto the dome and "flown through" in real-time. Planetariums can

share data and scripts with other planetariums worldwide, pull instantly from thousands of unique user-created submissions (e.g., images, audio, video, 3D models, etc.), as well as access diverse and continually growing scientific data from projects such as DATA2dome[2], Science on a Sphere[3], OpenSpace[4], and astronomical research databases. With this ability to bring data and display it in immersive, three-dimensional environments, planetariums can support researchers and enable them to become explorers of their own data and, in turn, create opportunities for them to share those experiences with fellow researchers or general planetarium audiences.

Live, interactive storytelling

Although the planetarium – both technologically and as a venue for storytelling – has advanced over the years, the exchange of stories and human-to-human interaction underneath a dark, starry sky (whether natural, digital, fibre-optic or otherwise) is still very effective at drawing people together in shared experience, awe, and wonder. Live, interactive, unscripted storytelling by an adept and charismatic presenter brings the visual experience to life and can provide a personal, in-the-moment connection to unfolding cosmic stories. The direct interaction of the presenter with audiences can add relevancy and accessibility to the experience, as the presenter can respond extemporaneously to the room's dynamic. Thus, visiting the planetarium becomes a fun, memorable tour of the Universe and a unique learning experience that can stay with an individual forever.

Community-building storytelling

None of these approaches to planetarium content and storytelling will inspire the broad swaths of audiences – particularly those who are traditionally marginalised and underserved – or have a positive impact if we cannot make planetariums and their tools inclusive and accessible to everyone. It is our responsibility as science communicators to ensure that the repertoire of content we share within our domes is relevant and can meaningfully resonate with all communities. There is, unfortunately, no one-size-fits-all model for achieving this. Instead, planetariums can strive to become true conveners by diversifying offerings, opening their doors to all voices, and actively seeking out opportunities to welcome the many lenses through which science stories are told and shared, using any and all of these storytelling tools to elevate and amplify community voices. In recent years, there has been a shift in the industry that aims to dismantle the traditional notion of "expert delivering information" in favour of co-creation and collaborative models of programme development with strategic partners (e.g., research, public, government, industry, and local community sectors). This work is expanding how we can experience science and can include innovative forms of science communication such as live theatre pieces in the dome, music performances, audio works based on the sonification of data, and other products at the intersection of science, technology, and art. By bringing community into this work and encouraging others to participate directly in the creation of these experiences, we enrich our storytelling of the Universe with a diversity of knowledge and perspectives on science and re-examine the kinds of stories we tell. Through this intentional practice, we will better engage and inspire audiences and reach more communities in authentic and relevant ways in the hopes that more people can see themselves reflected in the scientific narrative.

The years 2023 and 2025 bookend the 100th anniversary of the planetarium. As we all partake in this breathtaking new era for astronomy and space science, where our understanding of the Universe is growing at an astonishing rate, we value modern planetariums and their unique ability to serve as conveners, connecting the work of astronomers and multidisciplinary researchers with the general public, K- 12 schools, communities, artists, makers, innovators, dreamers, and many more.

Each year, we lose more and more of the beauty of the night sky to light pollution, and the opportunities to gaze up at a natural star-filled sky in wonder are becoming rare. The planetarium, just like the real night sky, is a place where we can preserve a sense of wonder and awe, contemplate our humanity, share stories, inspire hope for the future, and stand in common ground on our one planet, under one sky.

Notes:

[1] Refer to the Worldwide Planetariums Database: https://planetariums-database.org/

[2] Refer to the Data2Dome website from ESO: https://www.eso.org/public/outreach/data2dome/

[3] Refer to the Science On a Sphere website: https://sos.noaa.gov/

[4] Refer to the OpenSpace website: https://www.openspaceproject.com/

References:

Hagar, C. F. (1980). *Planetarium: Window to the universe*. Carl Zeiss.

Biography

Danielle LeBlanc is the inaugural Director of the Center for Space Sciences, the Director of Immersive Theaters and Programs, and the strategic programming and vision lead for the Charles Hayden Planetarium at the Museum of Science, Boston. Ms. LeBlanc currently sits on the Advisory Council for Immersive Media Entertainment, Research, Science & Arts (IMERSA), and since 2019, has served as a founding co-Chair of the Equity, Diversity, and Inclusion Committee for the International Planetarium Society (IPS). She received her BA in astronomy and physics from Boston University.