The next 20 years: A vision for planetariums in the 21st century

By Staffan Klashed, CEO and founder of Sciss | August 11, 2015

Introduction

If someone had asked the thinkers and leaders of the planetarium industry anno 1995 what 2015 will be like for planetariums, what would their answer have been? This was a world where most people did not know what the Internet was, 0.8% of the world's population was connected [1]. Smartphones only existed in labs and the digital planetarium was still using almost exclusively analog slides and stars, sometimes coupled with digital monochrome vector graphics [2].

Watching and extending the major tendencies in technology at the time, we could probably have said with some confidence that the development of computers is likely to drive the development of planetariums. The clear-sighted could perhaps have seen that the then-embryonic internet explosion would eventually change how humanity handles data, and began to speculate about data-driven visualization under the dome.

The last 20 years has set the stage for a new vision for planetariums. By understanding where we stand today and what the major tendencies are for the next two decades, we can shape a strategy to grow and remain increasingly relevant.

I will assume that for the foreseeable future, relevancy means maintaining current, growing and recurring audiences, and providing to them an experience that feels meaningful and inspirational while maintaining scientific integrity. Attracting new audiences does not equal abandoning science for commercialism, in fact I will set out to prove that the opposite is true.

My intention is not to get all the details about the future right, nor am I offering a secret silver bullet to success. But I hope to add a reasonable voice to the debate, to provide a view on the choices and major tendencies that planetariums as an industry are facing, and hopefully provide some guidance and inspiration to institutional leaders in the field.

Table of contents

Major tendency: Competition for talent

The digital planetarium industry is standing in the middle of the playing field of a major league derby game. The sport is "competition for talent". For a long time now, planetarium companies have tried to hire the best display and theater designers, software developers and user experience designers to build their visualization, playback and interaction systems. Producers are relying on creative directors, pipeline programmers and artists to produce quality. Planetariums are increasingly setting out to build their own in-house expertise in marketing, visualization and live presentation.

To take one of the most competitive areas of talent, software and content developers are in demand. IDC estimated that in 2014 there were approximately 11 million professional developers in the world, and 18.5 million with hobbyists included [3]. The best ones will choose a career in those industries that reward them best, financially, creatively but perhaps even more important socially. The best ones will create those audiovisual experiences in film, gaming and online that everything else, including the digital planetarium, is compared against. They will create the new models that shape how the world thinks about interactivity and immersion.

A comprehensive market survey [4] from 2013 presented by Alan Caskey at the Imersa 2013 conference in Denver listed *user interfaces* and *real-time system functionality* as the two most important features of a planetarium. This was from a survey of 139 responding planetariums. Ability to encourage *repeat visits* and availability of *new content* were the two major concerns. All of these points are related to advanced software and content development, work that will be carried out by some of those 18.5 million professionals for whom we are competing with every other IT industry on the planet.

> "All of these points are related to advanced software and content development, work that will be carried out by some of those 18.5 million professionals for whom we are competing with every other IT industry on the planet."

Rated as third most important in this survey were *display resolution*, followed by *display contrast*, and the third major concern was *cost of maintenance*. All of which are points related to display technology. And while our industry will be wise to piggyback on the research and development of bigger industries, our ability to integrate this into robust solutions and tailor them to our needs will remain critical. Our ability to attract this talent, and maintain it by providing challenging but professional and robust working environments, will grow increasingly important.

Today: Public perception and how to attract talent

The world's population is just as interested in astronomy and space exploration now as they have ever been. Data from the United States (which, admittedly, is not "the world") General Social Survey from 2012 [5] says that approximately two thirds of the American public thinks government is spending too little or about right on space exploration. This is the highest number since the early 1960's. Numbers seem to be similar for Europeans based on the European Commissions' Eurobarometer [6], and I would be forever grateful for data from other parts of the world.

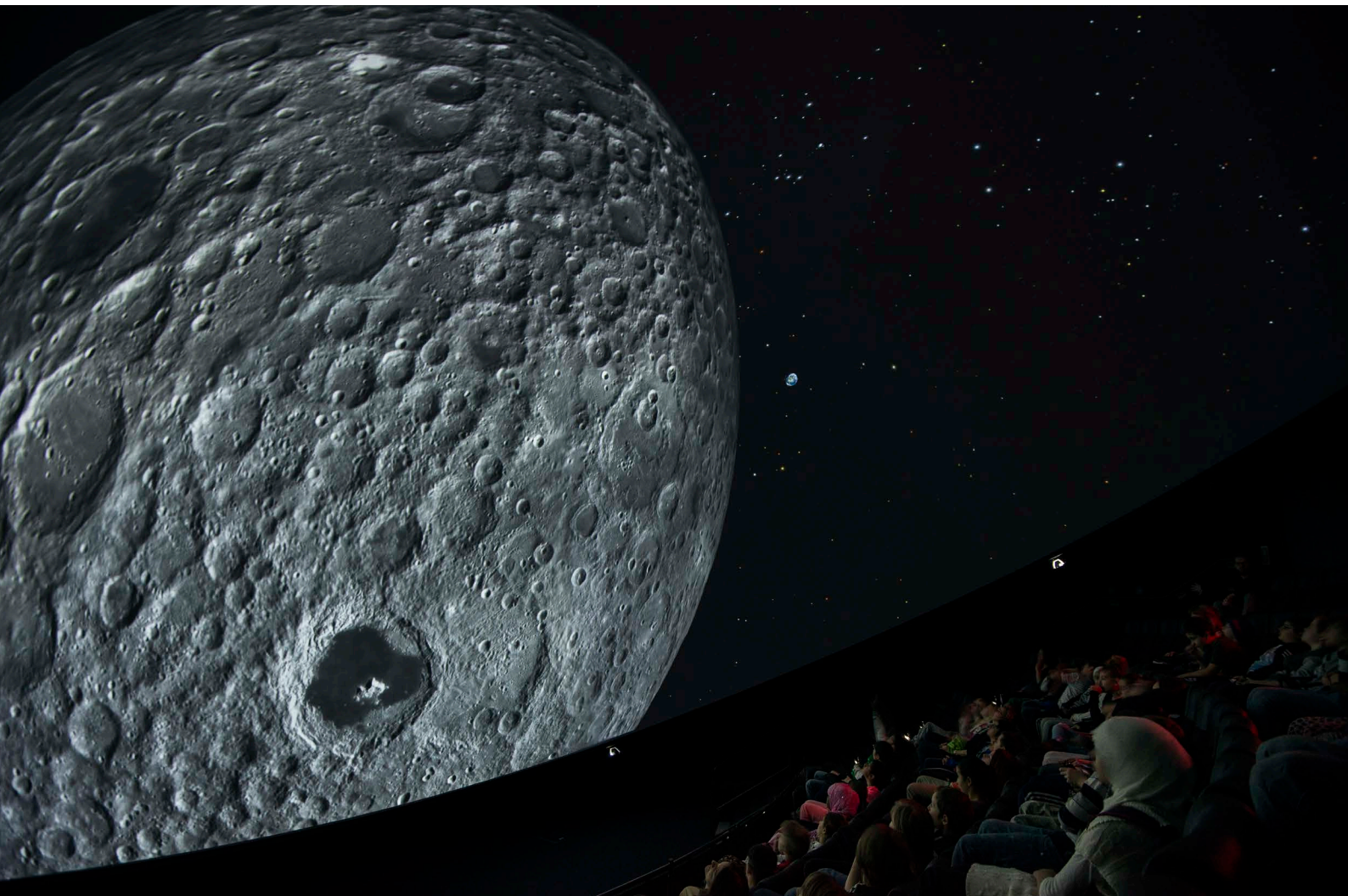
It could be argued that these numbers should be weighed against actual spending. Compensated for inflation, the spending levels have remained fairly consistent since the 1970's. When considered as a fraction of the federal budget, spending levels

have declined. However, I'm thoroughly unconvinced that such a weighing is relevant. How many respondents know what current spending levels are?

So what is the public's perception of planetariums? Are we considered a primary place to go to pursue this interest in astronomy and space exploration? Surprisingly, there is little quantitative data on this. A study by the Field Museum in Chicago (not a planetarium), published in Informal Learning Review (Jan/Feb 2015) [7], discussed what visitors expect from a museum. Their qualitative study suggested that visitors come to the museum with a mental model of knowledge as infinite rather than finite. There's no way that they could know everything about the topic anyway, so the learning they seek from the museum is less about filling in the gaps in their current understanding and more about having their sense of the world reshaped and expanded. There is just no way to not consider this when thinking about how planetariums should be positioned.

To get some quantitative data we conducted our own survey by analyzing reviews on TripAdvisor. Analyzing 300 reviews of a total of 24 planetariums, it appears as though visitor satisfaction comes from four primary factors; *things to do outside of the dome* (24.5% of reviews explicitly mentioned this as a positive factor), *good shows*, in particular with astronomy focus (23.5%), *location, view and the building itself* (16%) and *good live presenters* (15.5%). Programming that connects visitors with space exploration and the humans behind the science, such as meeting scientists, is met with overwhelmingly positive reviews.

Disappointment seems to primarily come from aspects such as *worn down or poorly maintained facilities*. Top negative factors were *bad or low quality programming* (14%), *technical issues and lack of quality* (8.5%), *lack of things to do outside the dome* (6.0%) and *cost of admission* (3.5%). This TripAdvisor survey will be extended and more refined results published in a separate paper at a later date.



Passus: How are we doing?

Mark C. Petersen of Loch Ness Productions does our industry a tremendous service by assembling data into the LNP Dome Theater Compendium every year. As of April 2015, the best estimate is that approximately 107 million people visit planetariums every year [8]. That sounds like an amazing number and I think we can be proud of our industry. As a comparison, the documentary giant screen industry attracts a total of 36 million people per year, and that's including their flat screens.

On the average, the world's 4,000 planetariums each attract approximately 26,000 visitors per year. Factoring out those under 15 meter in diameter (to compare better against giant screens), a planetarium attracts an average 135,000 visitors per year. The documentary giant screen equivalent is 162,000.

> "We have an opportunity to cater to those two thirds of the public who are actually interested in our topics and give them meaningful experiences of science visualization."

I don't think our planetarium industry's numbers are bad. But there is a tremendous growth potential in our industry, especially considering that a lot of those 107 million visitors went with a school group and did not actually choose to go to a planetarium. We have an opportunity to cater to those two thirds of the public who are actually interested in our topics and give them meaningful experiences of science visualization.

Building a virtuous circle

Transforming the public's perception to regard planetariums as a primary place to follow events in astronomy and space exploration appears to have great potential to grow audiences and repeat visitations. These audiences will expect planetariums to maintain the scientific integrity.

The planetarium industry is increasingly successful in the competition for talent. As an industry, we are increasingly investing in research and development of products that are technically stimulating, considered relevant by a majority of the public, and socially much cooler than the conventional planetarium technology.

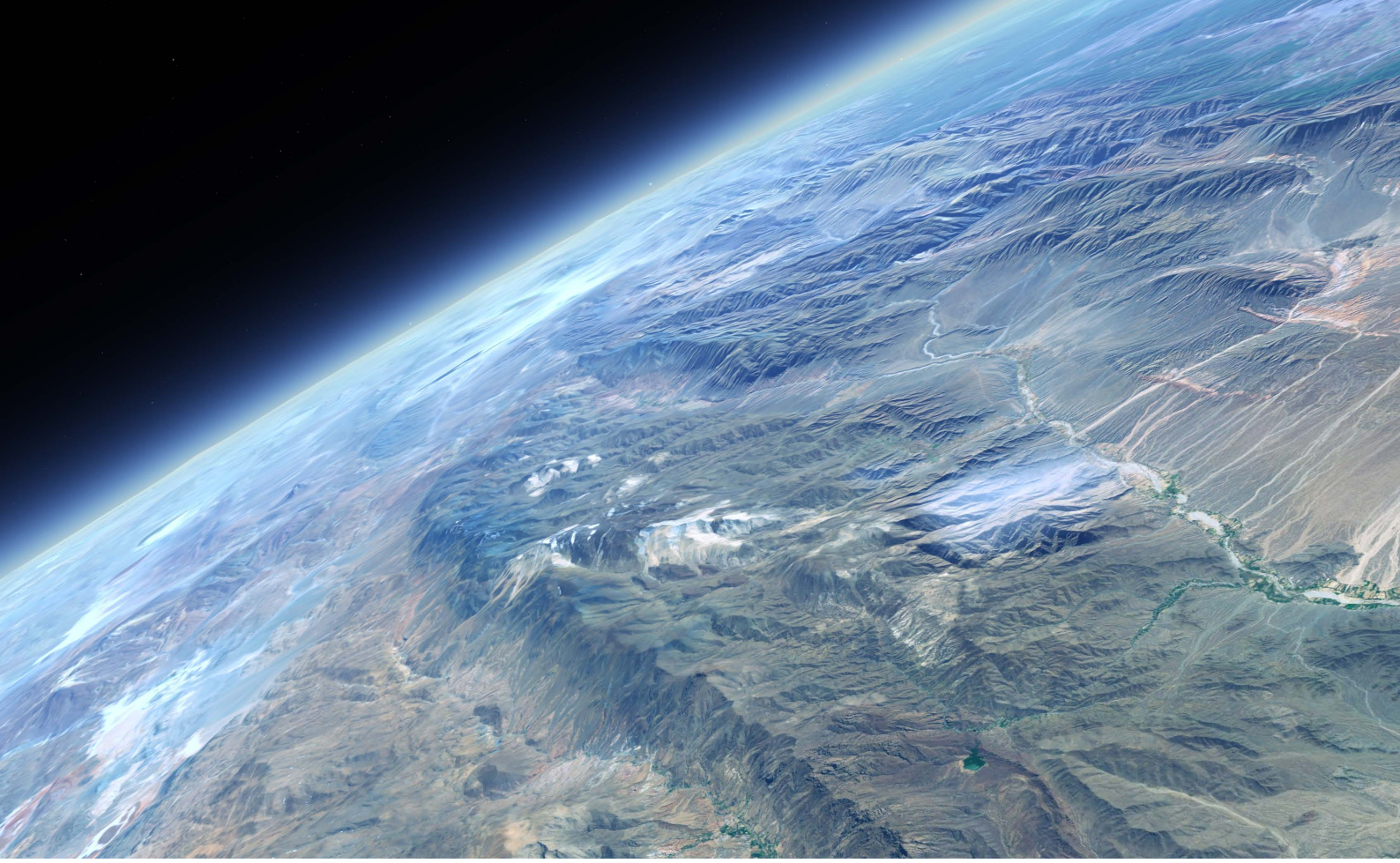
There is a virtuous circle here that is being set in spin today. We don't have to abandon our scientific integrity to grow increasingly relevant and socially cool. In fact, the opposite appears to be true, evidently the public is quite invested in astronomy and space exploration. This makes planetariums more interesting places for talented individuals to work for, which increases the quality of our programming and in the long run also our audiovisual systems. This virtuous circle has just begun, the next 5 years will accelerate it.

The next 5 years: The data tsunami

The next 5 years will inevitably be about "big data", the vastly increased amount of meaningful data accessible to the public. Space exploration will produce an ever increasing amount of data, made available to the public through agency channels such as the NASA Open Data API [9] and hopefully similar efforts from other agencies. Private initiatives such as Autodesk's Reality Capture [10], the emergence of drone-mounted 4K cameras, ongoing efforts by museums to publish their collections online, will accelerate what the IPS science & data visualization task force calls the data tsunami.

Marketing planetariums in the era of big data

Every now and then the discussion about what we should call our venues pops up in the industry. Planetarium, dome theater, immersive theater and visualization theater



are some of the common brand names. I don't want to linger on that discussion. Each institution will find their own name, logo and graphical profile. It's not the most significant success factor for the industry. Increased focus on marketing, and understanding our identity and value proposition, is more relevant. To fill the brand name with value, and communicate that value in a clear and attractive way. Dr. Jim Sweitzer presents an interesting model that he calls SPECTACLE [11]. The model can be used to illustrate the effects of the many factors at play during the early months and years of a new planetarium. In the model we can see the long-term importance of having a balance between good marketing, innovation, high quality of the programming, and the ability to attract new markets.

At the same time, we need to think carefully about message and target groups. We know what the public finds relevant, and we can pinpoint our target groups much better now. These target groups will expect quality content and services that they find meaningful and can engage with themselves. As an industry, we are in possession of a unique intellectual property that will ensure our relevancy for the next 20 years or more – we are knowledge centers for astronomy and space exploration.

It's pretty logical, isn't it? To attract repeat visitations, planetariums have to give the right people a reason to go. Perhaps target all those 50 million people who visit Reddit's subreddit "space" [12] every year and offer them a nice café and a nightly event could be the top priority for planetariums trying to become as repeat destinations? The key besides spending money and effort on marketing is to make sure that the content and marketing message aligns with the overall identity of planetariums.

Planetariums vs. Giant Screen Cinema: An identity crisis?

Before we continue, there is an argument to be made that the digital planetarium technology is converging with giant screen cinema. While this is arguably true for display technology, I would say that there is very little such convergence in terms of purpose and usage of the technology.

Planetariums have a value proposition in that they are centers of excellence for astronomy and space exploration. We have already proven that this is an attractive proposition to the public, especially if we keep it real and maintain our scientific integrity (which is not to say we shouldn't explore all avenues to increase the commercial/popular quality of our product). This is a sustainable value proposition. There is some indirect competition, but generally speaking planetariums are the exclusive public attraction for astronomy and space exploration. The formats will vary: fulldome shows, live presenter-led discussion formats, audience-driven production of the experience and probably more. But don't mistake format for value proposition.

Giant Screen Cinema have a completely different value proposition to their audiences. Their theme is documentaries in general, not necessarily about astronomy and space exploration. Giant Screen Cinemas shows documentaries about butterflies, artificial intelligence, dinosaurs and aviation. And space exploration. Their value proposition is not that they are a center of excellence, it is

> "The formats of planetariums and giant screen cinemas will, in some cases, converge."

that they show documentary films in a really cool format. I love giant screen cinemas; my company builds giant screen cinemas, because technically it is very similar to planetariums. The formats of planetariums and giant screen cinemas will, in some cases, converge. But the value proposition to the public is completely, utterly different. Don't mix it up.

Projectors and formats

When considering the future of any industry, there will be limiting factors and enabling factors. In this paper, I am not addressing projectors and image formats. This is not because it's not relevant, it is. 8.5% of reviewers on TripAdvisor complains about the image quality, remember? Our planetariums need to be renowned as magical immersive theaters, where technical artefacts have no influence on the end user experience.

The reason why I'm not addressing projectors is because projectors is currently a limiting factor, not an enabling factor. Even with 8K chips, dual modulation laser illuminated DLP with superb contrast and stable high brightness, it's still not an enabling technology. It's just less limiting. Unless we change our value proposition to be a technology showcase, which might hold value but seems a very expensive avenue to explore.

We are wise to draw from the research and development of bigger industries, such as simulation, automotive and digital cinema. Luckily, their requirements with higher bit depth, better black levels and high, stable brightness are the same as ours. When we get into fulldome stereoscopic displays without glasses, that's when displays become enablers once again, as the multichannel CRT projector was once the enabler for digital planetariums. But that's another white paper.

Other sciences

Fulldome display technology and data visualization are generally slightly less cross-disciplinary than many thinkers in the industry like to believe. But data visualization pipelines will continue to improve. Projectors will increasingly be able to offer both high contrast and high brightness.

Planetariums will need to align their programs with the identity of their parent institutions. And in a natural history museum, or at a university, it makes commercial sense (return on the investment increases, to put it bluntly) to expand the planetarium to cover a wider range of topics.

This leads back to the value proposition of planetariums. It's not just the impressive 6.5K display technology, though that is of course important. It's the inherent expertise that planetariums have in the field of astronomy

and space exploration. To move into other sciences, planetariums need to acquire this expertise to keep their value proposition credible. Either by including existing scientific or educational staff from other sciences, or by deploying technologies that can make out-of-house expertise available to their visitors.

The talent of the world will love the data visualization planetarium. It's challenging, it's meaningful and with the right marketing it will be socially cool. So what will happen if we extend the virtuous circle another five years?

The next 10 years: New platforms

The data visualization explosion will obviously happen foremost on other platforms than under the dome. With this, the sense of identity in the industry will change. At the moment, most planetarians think of their planetarium as a building and everything under the dome. However, increased visualization capabilities online are already starting to change this. And pretty soon, virtual and augmented reality glasses will change the perception and value of immersion. In 10 years' time, to think of the planetarium as only the dome will be a conservative standpoint. Rather, the planetarium is a mission to evangelize and breed interest in astronomy. This can happen online, in exhibitions, in the classroom and under the dome.

Supported by multiplatform software solutions, planetarians will gradually start to roll out programs and extend their relationships with their visitors. This creates new business opportunities, thus injecting more resources and more talent into our industry. The planetarium becomes the magnet, the central point of gravity around which a vast number of satellite programs are orbiting. Experiential hubs for astronomy and space exploration first, buildings second. Which is an incredibly strong position to use to increase attendance to the building itself.

Audience relationships

With multiple platforms to operate on, interactivity and participation will go from voting systems in the armrests to a participatory production pipeline where audiences can be invited to play a role in the content generation process for their own in-dome experience. Coupled with the already very successful discussion-based format of today's real-time presenter-led shows, this level of engagement with the audience will support the mission of engaging audiences with science and space exploration.

The relationship with our audiences will no longer be a one way supply of astronomical facts. It will be an experiential two-way street, where we strive to make audiences feel like they are a part of space exploration. Citizen science projects that actually make audiences participate in the scientific process. Exhibitions and experiences under the dome or in the classroom that make participants feel like they are space explorers themselves.

Planetariums that engage with updated data on multiple platforms will have a fantastic identity in the public mind as windows into space exploration. Take this identity now and extrapolate another decade.

The next 20 years: Education redefined

Two decades out, the very way we think about learning will have been dramatically transformed. In CFM's Building the Future of Education: Museums and Learning Ecosystems [13], Katherine Prince describes what she refers to as vibrant learning grids. These are communities where learning is not bound by a time and a place, but happens everywhere, all the time. Where our relationship with formal institutions have changed so the place we refer to as "school" may be the classroom, the library, the internet or, yes indeed, the multiplatform planetarium. Where learning is not motivated by authority but curiosity.

This theme is everywhere already today. But it will take two decades to transform the world's education system. What we are talking about is redefining the purpose of education. Sugata Mitra, an educational researcher and TED Prize winner, has shown that in the absence of formal teaching, children can teach themselves and each other, if they are motivated by curiosity and peer interest. And with planetariums now having attracted a large pool of talent, expanded to multiple platforms, we will be the world's primary source for inspirational and engaging experiences about astronomy and space exploration. As such, we have a given role in these vibrant learning grids.

> "This can happen online, in exhibitions, in the classroom and under the dome."

The transformation of the education system holds great potential for society at large. With less emphasis on schools as formal institutions, the differences between rich private and poor public schools can be reduced. For institutional leaders who are faced today with the challenge of growing and recurring audiences, maintaining their planetarium's relevance, and participating in the transformation of the educational system, this journey to reshape the identity of the planetarium seems highly rewarding.

Conclusions

I suppose it is wise to be careful with conclusions from a speculative 20 year vision. But there are some clear tendencies that go deeper than any individual trend, event or product.

The first one for me is the competition for talent. This will define our success or failure. If we can attract and pick from the top layer of those 18.5 million developers, science visualizers and artists, planetariums will flourish. If we have to select from the bottom, the future will be different. This is not an elitist point of view per se, talent comes in many shapes and forms. But talent matters, and don't ever let anyone tell you that a small group of talented people cannot make a difference. Because that's all that has ever happened.

Planetariums should continue to try to attract data visualization talent from this group. And for those who cannot afford an in-house content developer, reach out to other planetariums and share a content developer resource between you. It is easy to argue that this is the most affordable way for a planetarium to produce regularly updated high quality new content and thus the potential for repeat visitations.

This is not necessarily about developing software from scratch, the planetarium companies have large development teams who are set up to do that and who will continue to improve the data visualization pipeline, delivery methods such as "Domecasting" (shared live presentations between venues) and new interaction techniques. It is about getting out there to find that latest data, massage it into consumable content and ultimately experiences on the dome, using the software systems you have or will have from software companies servicing our industry. To have a healthy dynamic between planetariums and companies, both parties need to bring in talent to staff their side of the table.

We need to face the data explosion and the fact that two thirds of the public are interested in the astronomy and space exploration stories contained in this data. How we respond will decide how audiences and talent will respond to planetariums. Some planetariums will gravitate towards giant screen cinemas. But for those who wish to build an identity as a center of excellence in astronomy and space exploration, data visualization on multiple platforms should be the core output of their production efforts.

Adjusting their marketing to change old perceptions of what the planetarium can offer will be a key success factor. The multiplatform aspect of planetariums will help with this, the visitor can be more attached to the experience by engaging and participating online. But we also need to think more professionally about our message to those two thirds of the public who share our interest and fascination for astronomy and space sciences.

Finally, the third major tendency is the evolution of the educational system. With learning increasingly unbound by a time and a place, planetariums who have expanded onto multiple platforms can take a strong position as their communities' centers of excellence for astronomy and space exploration. Hopefully the educational paradigm will also have evolved by then from a facts-first model to an interest-first model, which makes the planetarium value proposition both for the in-dome and out-of-dome experience even stronger.

References

[1] http://www.internetlivestats.com/internet-users/ viewed 2015-06-22 9:39pm GMT.

[2] GOTO Virtuarium and E&S Digistar

[3] Al Hilwa, 2014 Worldwide Software Developer and ICT-Skilled Worker Estimates, International Data Corporation, published in December 2013.

[4] Alan Caskey, Market Synergies & Characteristics, Global Immersion, Presented at IMERSA Summit 2013, Denver, Colorado.

[5] http://www3.norc.org/gss+website/ and https://brainoids.files.wordpress.com/2013/03/gss_2012_prelim-002.png, viewed 2015-06-22 10:05pm GMT.

[6] http://ec.europa.eu/public_opinion/archives/ebs/ebs_403_en.pdf, viewed on 2015-06-22 10:05pm GMT.

[7] Karlene Hanko, Sarah Lee, Nnenna Okeke, What Makes a Great Museum Experience and How Can Technology Help, Informal Learning Review, Jan/Feb 2015.

[8] https://www.lochnessproductions.com/reference/attendance/attendance.html, viewed 2015-06-22 10:02pm GMT.

[9] https://data.nasa.gov/developer

[10] https://recap.autodesk.com/

[11] Dr. Jim Sweitzer, SPECTACLE: A Model for Understanding New Planetariums, Science Communications Consultants.

[12] http://www.reddit.com/r/space/about/traffic, viewed 2015-06-25.

[13] Center for the Future of Museums, Building the Future of Education: Museums and the Learning Ecosystem, 2014. ISBN 978-1-933253-97-8.

Writer's bio

Mr. Staffan Klashed is the CEO and co-founder of fulldome theater company Sciss. He holds a vast experience in the field of science visualization and immersive digital spaces. Over a decade ago, Staffan introduced the visualization software Uniview to the fulldome industry, a project that started as a thesis project in cooperation with the American Museum of Natural History. Sciss and Uniview was quickly established in the industry, and today Sciss is the principal of one of the world's leading fulldome system vendors with over 150 installations worldwide. For more info, please visit www.sciss.se.

