
EMBRACING THE VISION OF CITIZEN SCIENCE: AN HISTORIC OPPORTUNITY FOR SCIENCE CENTERS

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This piece builds on some ideas first expressed in [my blog post on Paul Orselli's site](#)¹ that was looking to new ways of learning in science centers based on changes that occur around us in other places of society that are relevant to our field. Amongst other things, I made the point that we could no longer see science education and public engagement with science as two separate things, mainly because the best way of educating the public from young to old about science is to put them into the role of a researcher and educate them about the scientific method. This will only work however if there is a situation of dialogue and trust between the scientific community and the public. The recent PEW study shows that we may be further away from a creative dialogue than we think². But before diving briefly into this I like to emphasize how PEW motivates the reason for the research itself. The research center is a permanent observer of what is going on in US society and estimates that:

Because scientific advances and challenges are influencing an ever-greater share of American and global life, the pace of innovation and the urgency of scientific issues have captured a growing share of policy attention and at times are generating more and more dispute.

This statement is relevant in and of itself, and sharpens even more the image of the gap or absence of creative dialogue that I mentioned above. Especially since the study shows that there are shifts, although modest, over time in the perceived effect of science on health care, food and the environment. Over the last five years (2009 -2014) US adults opinion's about the positive effects of science on health care has dropped 6% and the negative attitudes increased by 8%. For the quality of food this is respectively - 4% and + 10% and regarding the environment -4% and +8%. So despite, or maybe because of the more prominent part of science in society, the public perception on its positive impact is lower than before. And actually whether it is despite or because of doesn't really matter. All that we and others have been doing to improve public's scientific literacy and create a more favorable environment for science doesn't seem to work that well.

Why is that? In terms of climate change, especially in the US, we may assume that it is very much the result of the ideological and political divide. But that's not necessarily the case in other areas of science. My opinion is that we have not acted enough upon the areas of the scientific enterprise that would really change the relationship between the scientific community and the public. We usually focus on methods and outcomes but rarely on the initial part of the scientific endeavor. What should the

¹ Staveloz, W. (2015). How do Museums Adapt to What's Changing Around Us? [blog post]. Retrieved from <http://blog.orselli.net/search/label/Walter%20Staveloz>

²Funk, C. & Rainie, L. (2015). Public and Scientists' Views on Science and Society. Retrieved from <http://pewrsr.ch/1DkHxQX>

research question be and what or how will scientists take into account the public's expectations and recommendations about the research? The flipside being the question of how would the public be willing to learn more and put in the effort to understand how science is made? Impossible? Not really. This practice is actually called "upstream engagement" and is quite developed in the UK.

The concept can be described as follows:

In deliberative engagement processes the participants are given the opportunity to consider an issue in-depth. Made up of peers and experts, deliberative engagement groups come together to discuss information new to them and to develop an informed view. Deliberative engagement methods are different from other more "traditional" tools, such as opinion polls that measure more immediate views on an issue.

By using deliberative methods you can engage with the public, who hold valuable knowledge. These methods can provide you with much richer data on attitudes and values, and offer opportunities to explore more fully why people feel the way they do. They can also help the emergence of a new consensus about a controversial issue as participants – both experts and lay persons – move towards deeper understandings. It can take place on any scale; from 10 participants to thousands³.

One example is a deliberative decision-making which builds on partnership and joint decision making, in institutional reorganization or collaboration between universities and communities in urban regeneration projects. In 2007-2008, Sarah Whatmore (Professor of Environment and Public Policy at the Oxford University Centre for the Environment), with co-investigators Neil Ward (Dean of Social Science at the University of East Anglia) and Stuart Lane (Director of the Institute of Hazard and Risk Research at Durham University) conducted a project to understand environmental knowledge controversies in Ryedale, North Yorkshire (UK). Scientists and residents met in six bi-monthly meetings, with additional activities (e.g. a reading group) in between. A member of the research team acted as coordinator and facilitator. Residents participated as individuals affected by flood risk, rather than as representatives of pre-existing constituencies. Using local knowledge and working with objects (maps, historical documents, photographs, and video) the group developed a collective competency in exploring conflicting perspectives on flood risk management, and built a computer model specifically designed for the local catchment to try out their ideas. And as a Ryedale participant said at the end of the project:

The flood research project promised nothing, but ultimately delivered a lot. It successfully combined the knowledge and expertise of the university-based scientists with ideas and local knowledge of the Ryedale residents, ultimately resulting in an ongoing flood alleviation scheme. What a wonderful learning experience⁴.

³National Co-ordinating Centre for Public Engagement (2014). Upstream Engagement: Introduction. Retrieved from <http://www.publicengagement.ac.uk/do-it/techniquesapproaches/upstream-engagement>

⁴National Co-ordinating Centre for Public Engagement (2014). Understanding Environmental and Knowledge Controversies [case study]. Retrieved from <http://www.publicengagement.ac.uk/case-studies/understanding-environmental-knowledge-controversies>

More about this and many other examples of upstream engagement can be found on the website of the [National Coordinating Centre for Public Engagement \(NCCPE\)](#).

On a larger scale and perhaps closer to our field, our European colleagues at the [European Network of Science Centers and Museums \(ECSITE\)](#) have been involved in an EU project based on the principles above with the clear, but still modestly-funded objective of inspiring new research programs. "VOICES"⁵ is a one year EU funded project ending in July 2015 with a very innovative and challenging objective. The project aims to conduct a Europe-wide public consultation initiative to involve one thousand European citizens in discussing the European research priorities on the theme of "Urban Waste and Innovation." The consultations will take place in 33 locations across all 27 European countries, and so far 29 institutions from the ECSITE network have been actively involved. Compared to many other consultation initiatives, the VOICES project represents a breakthrough because of its scale (covering all of Europe) but most importantly because of the stated commitment of the European Commission to formally include the results of the citizens' consultations in the main policy document that will shape the priorities of European research.

And as I mentioned in my [previous blog](#), there is related movement in the scientific community as well. The latest most significant one I believe is: "[Beyond Cockpit-ism: Four Insights to Enhance the Transformative Potential of the Sustainable Development Goals](#)."⁶

The authors, supported by some of the most important scientists and decision makers working on the issue, including Johan Rockström, Yvo De Boer and Frans Berkhout, comment on the potential of the Sustainable Development Goals (SDGs) to become a powerful political vision if they can avoid what they call "cockpit-ism" or the illusion that top-down steering by governments and intergovernmental organizations alone can address global problems. To affect change the SDGs need to additionally mobilize new agents of change such as businesses, cities and civil society. To get all these actors on board, the authors suggest four connected perspectives: the "planetary boundaries" (based on Rockström's research) to stress the urgency and to target governments to take responsibility for public good; the "safe and just operating space" to highlight the interconnectedness of social and environmental concerns; the "energetic society" to benefit from the willingness of a broad group of actors to take action and "green competition" to stimulate innovation and new business practices.

It is clear to me that science centers can be at the center of the connected perspectives. They are places where the science (planetary boundaries) and safe and just operating space come together and innovation can be stimulated for the greater good.

And that is actually what our audiences want. In the zoo, aquarium and botanical garden field, for example, the pressure from the public to practice better stewardship to preserve the planet has been a

⁵ European Network of Science Centers and Museums (2013). VOICES [project description]. <http://www.ecsite.eu/activities-and-services/projects/voices>

⁶ Hajer, M., Nilsson, M., Raworth, K., Bakker, P., Berkhout, F., de Boer, Y., Rockström, J., Ludwig, K. & Kok, M. (2015). Beyond Cockpit-ism: Four Insights to Enhance the Transformative Potential of the Sustainable Development Goals. *Sustainability* 7(2): 1651-1660. Retrieved from http://informal-science.org/research/ic-000-000-010-615/Beyond_Cockpit-ism

reality for a long time. In “The future of zoos and aquariums: conservation and caring,” Rabb and Saunders state that:

The success of zoos and aquariums as conservation centers depends on the holistic embrace of conservation, including acting as model citizen, wildlife conservationist, agent for conservation and mentor/trainer. Success also depends on truly reaching our audiences, from policy-maker to land manager to citizen, to help them care about and care for nature. In pursuing our conservation goal, we must acknowledge our general lack of experience in effectively changing the behavior of these different audiences, which function at both the global and local level. To start with those closest to us, the visitors to our institutions, we should appreciate that we do not have deep understanding of the effect our business has on them by providing close-up experiences with a variety of animals. Nevertheless,(...)our institutions can become transformative models, inspiring and motivating urban people around the globe to have a more harmonious and sustainable relationship with the natural world⁷.

From its side, [The Ocean Project](#) (with the help of a professional research bureau) runs regular surveys amongst the general US public to evaluate the engagement with the protection of the Oceans. The findings are consistent over recent years. There is an increasing demand for the public for guidance and a greater frustration about the tools offered to act, as expressed in “America, the Ocean and Climate Change: Research Insights for Conservation, Awareness and Action⁸.” One of the major outcomes is that compared to a similar study in 2005, there is now a negative balance between supply of tools for conservation compared to the demand from the public. On a scale from 1 -100, respondents indicate for 2005 a demand of 58 and a supply of 62. In 2010, supply is slightly down to 60 and demand up to 75 (from + 4 to -15). Which prompted the Ocean Project to conclude that “The public wants aquariums and zoos to inform and guide them, offering specific suggestions for conservation action (“We can be bold!”)”.

Of course even if we see some great examples of science centers trying to join the movement, there is a long way to go. However I see some possibilities to bring our centers closer to that path. One would be to fully embrace the promising transformation of citizen science.

In: “Convergence Between Science and Environmental Education⁹,” Wals, Brody, Dillon, and Stevenson describe how citizen science can become the glue between traditional science education and environmental education. They put forward the idea that environmental education (EE) emerged in the early 1960s out of a need to respond to emergent environmental crises. It tried to do so by developing the ecological and environmental literacy required to understand the sociopolitical, value-laden, place-based, and emotional contexts in which environmental issues arise and need to be resolved. This sets it

⁷ Rabb, G. & Saunders, C. (2005). The future of zoos and aquariums: conservation and caring. *International Zoo Yearbook*, 39: 1-26. Retrieved from <http://onlinelibrary.wiley.com/doi/10.1111/j.1748-1090.2005.tb00001.x/abstract>

⁸ The Ocean Project (2012). *America, the Ocean and Climate Change: Research Insights for Conservation, Awareness and Action*. Retrieved from [http://informal-science.org/research/ic-000-000-010-616/America the Ocean and Climate Change](http://informal-science.org/research/ic-000-000-010-616/America%20the%20Ocean%20and%20Climate%20Change)

⁹ Wals, A., Brody, M., Dillon, J. & Stevenson, R. (2014). *Convergence Between Science and Environmental Education*. *Science* 344(6148): 583-584. Retrieved from [http://informal-science.org/research/ic-000-000-010-614/Convergence Between Science and Environmental Education](http://informal-science.org/research/ic-000-000-010-614/Convergence%20Between%20Science%20and%20Environmental%20Education)

apart from the traditional science education (SE) that primarily focuses on teaching knowledge and skills. Therefore, the relationship between SE and EE has been characterized as distant and competitive. However, the complex nature of current sustainability challenges, and the need for competent *citizens* who can adequately respond to them, is such that EE and SE need to develop a mature symbiotic relationship.

The recent *International Handbook of Research on Environmental Education*¹⁰ describes a trend in favor of such convergence, which, in combination with increased interest in *citizen science* supported by information and communications technology (ICT), may make education more responsive to current global challenges. The data gathered and shared using ICT can provide useful input to environmental scientists while simultaneously empowering *citizens* to engage in ongoing debates about local and global sustainability issues and what needs to be done to address them.

Very recently, the EU published a [White Paper on Citizen Science](#) that begins with the definition they developed after 1 year of research and the involvement of 1000 discussants:

*In Citizen Science, a broad network of people collaborate. Participants provide experimental data and facilities for researchers, raise new questions and co-create a new scientific culture. While they add value, volunteers acquire new learning and skills and gain a deeper understanding of the scientific work in appealing ways. As a result of this open, networked and transdisciplinary scenario, science-society-policy interactions are improved, leading in turn to a more democratic research based on evidence and informed decision making*¹¹.

Maybe still more an aspiration (European) view to some, although the keynote speech presented at the first [Citizen Science Association Conference](#) this past February 11 & 12 in San Jose comes quite close to that viewpoint. In a sneak preview, Chris Filardi, Director, Pacific Program, Center for Biodiversity and Conservation (CBC) at the American Museum of Natural History states:

The interplay between science and broader society is central to modern life. Citizen science is a natural upshot of this reality. From mariner input into early wind charts that revolutionized trans-oceanic travel, to the Christmas Bird Count or crowd-sourcing of sight records for imperiled species, relationships between societal needs and public participation in the scientific process have not only improved understanding of the world around us, but have also expanded the impact of science on our lives.

The history of citizen science suggests we can do more. In a variety of contexts, broadening the process of how scientific questions are framed, and expanding who is involved in the framing, is transforming how we do science. I will explore the potential impacts on society of broader public participation in the full life cycle of scientific inquiry – from framing questions and guiding data collection, to analyzing and communicating new knowledge.

¹⁰ Stevenson, R., Brody, M., Dillon, J., & Wals, A. (2012). *International Handbook of Research on Environmental Education*. Routledge.
<http://www.aera.net/Publications/Books/InternationalHandbookofResearchonEnvironmenta/tabid/14753/Default.aspx>

¹¹ Sanz, F., Holocher-Ertl, T., Kieslinger, B., Garcia, F., & Silva, C. (2014). Paper on Citizen Science for Europe. Retrieved from http://informal.science.org/research/ic-000-000-010-617/White_Paper_on_Citizen_Science_for_Europe

It is my hope to inspire active dialogue during the conference and beyond on the evolving role of citizen science in society¹².

If more of our centers would consider creating such programs, it would not only increase the understanding that citizens would have of the scientific method, but at the same time give them the tools to participate in the local debates on the creation of a sustainable future and become informed actors of that change. Above all it could become one of the main instruments to bridge the gap between citizens and scientists that still exists despite all our efforts as we mentioned at the beginning.

RELATED READING

[2015 Citizen Science Association Inaugural Conference: Updates from the Field](#)

[Advancing Citizen Science: Q&A with Karen Cooper](#)

[The AZA Framework for Zoo and Aquarium Social Science Research](#)

[The Evolving Field of Citizen Science: Q&A with the Citizen Science Association](#)

¹² Filari, C. (2014). A Place in the World – Science, Society, and Reframing the Questions We Ask [blog post]. Retrieved from <http://citizenscienceassociation.org/2014/11/07/keynote-speaker-announced-for-citizen-science-2015/>

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