

Queer world-making: a need for integrated intersectionality in science communication

Tara Roberson and Lindy A. Orthia

Abstract

This commentary aims to shed light on the neglected space of queer people in science communication. In this piece, we introduce queer theory to science communication literature to examine issues from the past, present, and future. We argue that to queer our field may entail a radical interrogation of some of science communication's deeply rooted cultural traits and working towards a rainbow-tinted future.

Keywords

Social inclusion

DOI

<https://doi.org/10.22323/2.20010305>

Submitted: 6th October 2020

Accepted: 9th November 2020

Published: 1st February 2021

Introduction

What does it mean to be an LGBTIQ+ person in science communication? Despite recent progress in some areas for queer rights around the world, lesbian, gay, bi+, trans, gender diverse, non-binary, intersex, queer, asexual, agender and aromatic (LGBTIQ+) people and their families still experience harassment and exclusion at work and further afield [Gibney, 2019]. Studies from the U.S. reveal many STEM work environments in university, government, and private sectors, as well as in STEM-related degree programmes, are passively or actively unwelcoming to queer people in various ways [Cech and Pham, 2017; Miller et al., 2020; Yoder and Mattheis, 2016]. This unhappy state of affairs is compounded by the uneven quality of STEM research conducted on the lives of queer communities, which can be both questionable and harmful [Milton, 2020]. There is little reason to think science communication is exempt from these patterns. Much more can be done in this neglected space.

We are two queer people working in academic science communication; one of us worked in queer activism for many years prior to becoming an academic and the other delivers university workshops on how to be an ally to rainbow communities, as LGBTIQ+ communities are sometimes known. In this commentary, we draw

on this experience as well as our academic backgrounds to argue for the need to queer science communication.

What does it mean to queer something? *Queering* is an instructional, communicative, and performative act which challenges heteronormativity — or the assumption and/or belief that people, places, and objects are straight unless otherwise, explicitly identified as LGBTQIA+ [Fox, 2013]. The word queer has a pejorative history, though it has been reclaimed by some communities, and today has various, contested meanings. In a narrow sense, the word queer refers to different individual identities within LGBTQIA+ communities. In another broader sense, queer signifies non-normativity [Kumashiro, 2002] or that which is not heteronormative but is, instead, a part of a diverse array of sex, sexuality, and gender. Heteronormativity is a default construct within Western structures of understanding, institutions, and practical orientations that makes ‘straight-ness’ not only the norm, but privileged [Gust, 2003]. It is automatically foregrounded in those worlds.

Queer world-making is more than including LGBTQIA+ themes in curricula. Instead, it implies a commitment to highlighting worldviews to ‘run alongside, rather than replace, master narratives’ [Fox, 2013, p. 62]. In queering science communication in this commentary, we are focusing on queer communities and issues from the past, present, and future. Along the way, we present a challenge for science communication in relation to who is included — as actors and in our publics as well as in our histories — and who is not [Fraser, 1990; Puwar, 2004]. We also highlight questions of *how* people are included because to be included as an object of study, as has historically been the case for queer people, is not the same as being able to exert control over research agendas, theories, and paradigms. As Dawson [2019] and Orthia [2020] have each argued, our field needs to learn how to value differences instead of erasing them. We can start by shedding light on the neglected space of rainbow people in science communication.

A historical account of science co-opting queerness

People have experienced sexuality and gender in diverse ways across the world throughout history [Chiang et al., 2019; Roughgarden, 2004]. In the Western tradition, scientists claimed these matters as objects of study in the nineteenth century. They promptly collapsed these diverse experiences into the familiar notion that there are distinct kinds of people who possess queer identities, thus creating ‘the homosexual’, ‘the trans person’ and so on [Holler, 2009; Sullivan, 2003].¹ This superseded the prevailing perspective that all of us might explore diverse sexual acts, partners, and gender variants during our lives. With this grammatical shift from verbs (queer actions) to nouns (queer people), scientists pronounced their proprietorial right to debate, define, and diagnose queer being. Sexuality and gender beyond binary, cis and, hetero models became public property: phenomena to be discovered and explained like stars, minerals, and microorganisms.

Science communication played a role in this from the beginning as sexologists and others worked out their ideas in public fora, often with aspirations of social change.

¹The original terminology was different. For example, an influential precursor of nineteenth century sexology, Heinrich Ulrichs, coined the terms ‘Urning’ and ‘Uringin’ for people with ‘the physical features of one sex and the soul or sexual instinct of the other’ [Sullivan, 2003, p. 5].

For example, Richard von Krafft-Ebing's influential 1886 work *Psychopathia Sexualis* was written for doctors and lawyers to use in court cases, and also became a best-seller [Oosterhuis, 1997]. Magnus Hirschfeld conducted research and activism through the Berlin Sexology Institute (Institut für Sexualwissenschaft), founding the world's first queer rights organisation there in 1897 [Sullivan, 2003]. In concert with these developments, less sympathetic scientists, doctors and psychologists tested cruel 'cures' for sexuality and gender 'conditions', applying their theories-of-the-month in the semi-public space of clinical medicine [Dickinson, 2015]. Unlike many scientific fields, this research was never obscured from public scrutiny behind institutional walls. It was always — and remains — a strikingly public endeavour which invites non-scientists to consider whether queerness is determined by genetics, brain structure, or psychology. In contrast, binary-cis-heterosexuality seems to not require scientific explanation and few invitations are issued. The language of public discourse about sexuality and gender has been heavily co-opted by science within this cis-hetero milieu, readily assisted by science communicators eager to communicate about these 'sexy' subjects in the news, popular books, and online.

Thus, in the past 150 years under Western science's influence, queer people became objects of science. We must navigate scientific language and theories when discussing our identities, our selves, our modes of being. The problem is compounded by the traction this area of science gained in the public imagination, leaving limited room to assert alternative perspectives built from queer experience while scientific frames dominate public discourse. The very idea that gender or sexuality can be scientifically explained constrains our voices, even though queer people have sometimes found comfort or strategic value in this science while some queer scientists and science communicators have researched and promoted it. Popular books by biologists demonstrating the magnificent diversity of gender and sexuality expression in the non-human world have countered the essentialism and biological determinism of other branches of science [Bagemihl, 1999; Roughgarden, 2004], but they also reinforce scientific framing for the topic to an extent.

These dynamics continually unsettle queer relationships with science. Understanding them is crucial if science communication is to begin to grapple with the extent of homophobia, biphobia, transphobia, aphobia, and binary-cis-heteronormativity infusing its culture. This notion that our identities are legitimate fodder for scientific debate has perpetuated problematic science communication practices. For example, the 2000s saw public debate about the research of Charles Roselli and colleagues, who sought to understand male-male sexual attraction in sheep to allow farmers 'better selection of rams for breeding', and also noted their research could 'provide clues to factors . . . involved with or influencing [same-sex attraction's] occurrence in humans' [Roselli et al., 2004, p. 243]. This raised alarm bells among queer activists aware of historical links between scientists 'just trying to understand sexuality and gender' and those seeking to 'cure' manifestations they considered undesirable, with some activists making links to Nazi experiments on gay men [Oakeshott and Gourlay, 2006]. Yet prominent science communicators dismissed these concerns as trivial, mocked the protestors, and attempted to reassure people of science's good intentions [Goldacre, 2007]. In this, they failed to acknowledge science's inhumane treatment of queer people, historically and today.

Scientific professionals still control much about queer experience: policing trans people's access to medical technologies [Latham, 2017], surgically altering intersex people's bodies without consent [Koch and Wisdom, 2017], advocating 'conversion therapy' for same-sex attracted people [Bartlett, Smith and King, 2009], seeking 'robust evidence' for the existence of bisexuals [Milton, 2020], and framing queer health in deficit terms rather than strength-based, resilience-oriented approaches [Colpitts and Gahagan, 2016]. Science communicators must be cognizant of this landscape moving forward, even as some disciplines begin to recognise the need for change and embrace more diversity of thought and practice.²

When we looked for examples of how science communication researchers engage with queer people, we found an absence of work to review in the literature. A search for the keyword 'queer' within the five major discipline journals (*Journal of Science Communication*, *Public Understanding of Science*, *Science Communication*, *International Journal of Science Education Part B*, and *Frontiers in Communication*) returned just eleven articles, all engaging with queer matters fleetingly or indeed not at all. We also reviewed how science communication research has referred to gay, lesbian, bisexual, transgender, and intersex communities over the past 27 years; this returned just 46 articles published between 1993 and 2020. Within this collection, we noted a small spike in research concerned with 'gay gene' controversies in the 1990s and early 2000s. Overall, while a handful of articles specifically engaged with or focused on queer communities and matters, references to queer people were usually made as indicative examples rather than anything deeper, for instance using views on homosexuality as indicators of political leanings.

Evidently, there is a gap in science communication research in terms of talking about the queer experience. That is to say, there is a lack of work which considers queer people as communicators, publics, and stakeholders for science. In addition, there is a gap when it comes to engaging with queer theory to examine the presence of heteronormativity within science communication itself. However, we are encouraged by parallel discussions, which include calls to apply feminist theory to science communication to encourage communicators to learn from marginalised publics and consider how communications practices do or do not account for diversity, equity, and power relations [Halpern, 2019; Riesch, Potter and Davies, 2017; Roberson, 2020b]. Elsewhere, there are attempts to better respond to communities and, indeed, involve them within research as it is conducted [Genus and Stirling, 2018; Pain, 2017]. Such attempts may answer calls for research to be done *with*, instead of *on*, queer people [Carpenter, 2019].

Promisingly, we are also seeing queer-related organisations and activities appear in the science communication practitioner space. A number of networks devoted to promoting and supporting queer people in STEM and adjacent fields such as the museum sector have started up in recent years (e.g. 500 Queer Scientists and Queering Museums). Queer individuals have also launched unique, queer-flavoured science communication products including YouTube channels and

²For example, consider the 2019 report 'Exploring the workplace for LGBT+ physical scientists' by the Institute of Physics, Royal Astronomical Society and Royal Society of Chemistry in the United Kingdom [Institute of Physics, Royal Astronomical Society and Royal Society of Chemistry, 2019]. This report sought to inform the physics community and outline key action points for making the workplace more inclusive and accessible for LGBT+ people.

podcasts (e.g. Science Queers Academy and Queer STEM History). These endeavours assert and celebrate the existence of queer people in the science communication realm. They help us start to understand the meanings of our presence, which has always been here, if too often closeted or suppressed.

Queering futures in science communication

The future is an important resource and space for research and innovation. Speculative imagined futures inform the work done by researchers, engineers, and developers as they envision new avenues for investigation, craft prototypes in the lab, and consider how their work might engage and affect the wider world [Fujimura, 2003; Roberson, 2020a]. In these ways of thinking, the future can be used in research grants, media coverage, and other fora as a commodity or a means for attracting investment and attention [Brown and Michael, 2003]. It can also be a site in which prospective troubles as well as benefits play out. For instance, researchers can use film to foreshadow dire future problems (e.g. the asteroid impact films *Deep Impact* and *Armageddon*) and to influence societal debate [Kirby, 2004; Kirby, 2013]. These kinds of films work as prototypes to depict particular futures and, in doing so, create expectations that help enact those futures.

In some instances, science fiction futures bode poorly for queer people. For example, in its depictions of scientist characters in the future, the sci fi television program *Doctor Who* has repeatedly linked scientific incompetence with gender non-conformity, queerness, and female power, while the scientifically-credible scientists it imagines for us are binary-cis-hetero, or, if queer, then compliant with a masculinist culture [Orthia and Morgain, 2016]. This is a sociocultural prototype we must counter with less oppressive alternatives.

In the realm of science fiction-like imaginings and promises, queer theory helps us question the underlying structures and values which influence how we think about science and technology, such as the reasons we work for technological progress. It can ask who benefits, what power relations are involved, and what it means to have a voice and to be included in a future — or excluded from one [Lothian, 2010; Browne and Nash, 2010]. It seeks to disrupt and interrogate the embedded practices and assumptions surrounding expectations for the future. Queer theory would question, for example, the consequences of contact-tracing apps developed to assist with pandemic management, when the same technology can be used to police and punish queer people, as has been the case in South Korea during the COVID-19 pandemic [Gitzen, 2020].

Science communication can simultaneously present and promote new science and technology futures while also critiquing and evaluating those messages. One avenue for queering science communication is to understand how ways of analysing and representing have worldmaking effects [Puig de la Bellacasa, 2011] and how those effects may be used to create change. In other words, science communication research should be more critical of whose voices are heard and why and which publics are engaged. It should consider how normativity and heteronormativity contribute to power relations in science communication, and how those relations marginalise groups, such as people of colour, LGBTIQ+ communities, and people with disabilities [Eguchi and Asante, 2016; McDonald, 2015]. An integrated intersectional approach would also attend to the different experiences of, for example, queer people of colour and white queers in science

communication. But to make that possible, we need to start engaging with questions of gender and sexuality in our field in addition to working towards equity among cis-binary genders [Rasekoala, 2019].

Conclusion

Here is something we each realised about science communication in the last few years. It can be something of a refuge for some queer people, especially those fleeing other STEM fields. Indeed, a science communication class was the first place where one of us *comfortably* outed ourselves in a professional context. And yet, explicitly queer voices and campaigns for inclusion and diversity are largely absent from our field. Is that because we sit within broader campaigns for queer visibility in STEM? Or is it because, as Elizabeth Rasekoala [2019, p. 3] has argued regarding the 'ghettoization' of women in science communication in which, despite increasing numbers of women in the field, men remain in positions of power:

'[Science communication] has fallen into the classic traps that bedevil other fields. This is the diversity strategy of considering gender equality as sameness, with gender-neutrality as the norm, in which women are treated as if they were equal to men. Yet, in this framework the dominant male norm is not challenged...'

Learning from this, queering science communication must entail more than recognising that queer people are present in our sector. Since queering is about challenging underlying structures and values in a dominant culture, to queer our field may entail a radical interrogation of some of science communication's deepest-rooted cultural traits and working towards a very different, rainbow-tinted future.

References

- Bagemihl, B. (1999). *Biological exuberance: animal homosexuality and natural diversity*. New York, NY, U.S.A.: St Martin's Press.
- Bartlett, A., Smith, G. and King, M. (2009). 'The response of mental health professionals to clients seeking help to change or redirect same-sex sexual orientation'. *BMC Psychiatry* 9, 11. <https://doi.org/10.1186/1471-244X-9-11>.
- Brown, N. and Michael, M. (2003). 'A sociology of expectations: retrospecting prospects and prospecting retrospects'. *Technology Analysis & Strategic Management* 15 (1), pp. 3–18. <https://doi.org/10.1080/0953732032000046024>.
- Browne, K. and Nash, C. J., eds. (2010). *Queer methods and methodologies: intersecting queer theories and social science research*. 1st ed. London and New York: Routledge, Taylor & Francis Group. <https://doi.org/10.4324/9781315603223>.
- Carpenter, M. (2019). *Researching intersex populations*. URL: <https://ihra.org.au/research/> (visited on 12th August 2020).
- Cech, E. A. and Pham, M. V. (2017). 'Queer in STEM organizations: workplace disadvantages for LGBT employees in STEM related federal agencies'. *Social Sciences* 6 (1), 12. <https://doi.org/10.3390/socsci6010012>.
- Chiang, H., Arondekar, A., Epprecht, M., Evans, J., Forman, R. G., Al-Samman, H., Skidmore, E. and Tortorici, Z., eds. (2019). *Global encyclopedia of lesbian, gay, bisexual, transgender, and queer (LGBTQ) history*. New York, NY, U.S.A.: Charles Scribner's Sons.

- Colpitts, E. and Gahagan, J. (2016). 'The utility of resilience as a conceptual framework for understanding and measuring LGBTQ health'. *International Journal for Equity in Health* 15, 60.
<https://doi.org/10.1186/s12939-016-0349-1>.
- Dawson, E. (2019). *Equity, exclusion and everyday science learning: the experiences of minoritised groups*. London, U.K.: Routledge.
- Dickinson, T. (2015). 'Curing queers'. *Mental nurses and their patients, 1935–74*. Manchester, U.K.: Manchester University Press.
- Eguchi, S. and Asante, G. (2016). 'Disidentifications revisited: queer(y)ing intercultural communication theory'. *Communication Theory* 26 (2), pp. 171–189.
<https://doi.org/10.1111/comt.12086>.
- Fox, R. (2013). "'Homo"-work: queering academic communication and communicating queer in academia'. *Text and Performance Quarterly* 33 (1), pp. 58–76. <https://doi.org/10.1080/10462937.2012.744462>.
- Fraser, N. (1990). 'Rethinking the public sphere: a contribution to the critique of actually existing democracy'. *Social Text* 25/26, pp. 56–80.
<https://doi.org/10.2307/466240>.
- Fujimura, J. H. (2003). 'Future imaginaries: genome scientists as sociocultural entrepreneurs'. In: *Scientists as sociocultural entrepreneurs*. Ed. by A. H. Goodman, D. Heath and S. M. Lindee. Los Angeles, CA, U.S.A.: University of California Press.
- Genus, A. and Stirling, A. (2018). 'Collingridge and the dilemma of control: towards responsible and accountable innovation'. *Research Policy* 47 (1), pp. 61–69. <https://doi.org/10.1016/j.respol.2017.09.012>.
- Gibney, E. (2019). 'Discrimination drives LGBT+ scientists to think about quitting'. *Nature* 571 (7763), pp. 16–17. <https://doi.org/10.1038/d41586-019-02013-9>.
- Gitzen, T. (18th June 2020). 'Tracing homophobia in South Korea's coronavirus surveillance program'. *The Conversation*.
 URL: <https://theconversation.com/tracing-homophobia-in-south-koreas-coronavirus-surveillance-program-139428> (visited on 21st August 2020).
- Goldacre, B. (13th January 2007). 'Science told: hands off gay sheep — updated'. *Bad Science*. URL: <https://www.badsience.net/2007/01/science-told-hands-off-gay-sheep/> (visited on 7th August 2020).
- Gust, A. Y. (2003). 'The violence of heteronormativity in communication studies'. *Journal of Homosexuality* 45 (2–4), pp. 11–59.
https://doi.org/10.1300/J082v45n02_02.
- Halpern, M. (2019). 'Feminist standpoint theory and science communication'. *JCOM* 18 (04), C02. <https://doi.org/10.22323/2.18040302>.
- Holler, J. (2009). 'Pathologizing sexuality and gender'. *Visions Journal* 6 (2), pp. 7–9.
- Institute of Physics, Royal Astronomical Society and Royal Society of Chemistry (2019). *Exploring the workplace for LGBT+ physical scientists*. London, U.K.
- Kirby, D. A. (2004). 'Science consultants, fictional films, and the "War Games effect"'. In: *8th International Conference on Public Communication of Science and Technology (PCST)* (Barcelona, Spain).
- Kirby, D. A. (2013). *Lab Coats in Hollywood*. Cambridge MA, U.S.A.: MIT Press.
 URL: <https://mitpress.mit.edu/books/lab-coats-hollywood>.
- Koch, C. and Wisdom, T. (4th July 2017). 'Surgery to make intersex children 'normal' should be banned'. *The Conversation*.
 URL: <https://theconversation.com/surgery-to-make-intersex-children-normal-should-be-banned-76952>.

- Kumashiro, K. K. (2002). *Troubling education. "Queer" activism and anti-oppressive pedagogy*. New York, NY, U.S.A.: RoutledgeFalmer.
- Latham, J. R. (2017). '(Re)making sex: a praxiography of the gender clinic'. *Feminist Theory* 18 (2), pp. 177–204. <https://doi.org/10.1177/1464700117700051>.
- Lothian, A. (2010). *Old futures: speculative fiction and queer possibility*. New York, NY, U.S.A.: NYU Press.
- McDonald, J. (2015). 'Organizational communication meets queer theory: theorizing relations of "difference" differently'. *Communication Theory* 25 (3), pp. 310–329. <https://doi.org/10.1111/comt.12060>.
- Miller, R. A., Vaccaro, A., Kimball, E. W. and Forester, R. (2020). "'It's dude culture": students with minoritized identities of sexuality and/or gender navigating STEM majors'. *Journal of Diversity in Higher Education*. Advance online publication. <https://doi.org/10.1037/dhe0000171>.
- Milton, J. (21st July 2020). 'Scientist who denied bisexual men exist finally comes to his senses and discovers, yes, bi guys are telling the truth'. *Pink News*. URL: <https://www.pinknews.co.uk/2020/07/21/bisexuality-bisexual-j-michael-bailey-gerulf-rieger-northwestern-essex-university-biphobia/> (visited on 21st August 2020).
- Oakeshott, I. and Gourlay, C. (31st December 2006). 'Science told: hands off gay sheep'. *The Sunday Times* (U.K.)
- Oosterhuis, H. (1997). 'Richard von Krafft-Ebing's "Step-children of nature": psychiatry and the making of homosexual identity'. In: *Science and homosexualities*. Ed. by V. A. Rosario. New York, NY, U.S.A.: Routledge, pp. 67–68.
- Orthia, L. A. (2020). 'Strategies for including communication of non-Western and indigenous knowledges in science communication histories'. *JCOM* 19 (02), A02. <https://doi.org/10.22323/2.19020202>.
- Orthia, L. A. and Morgain, R. (2016). 'The gendered culture of scientific competence: a study of scientist characters in *Doctor Who* 1963–2013'. *Sex Roles* 75 (3–4), pp. 79–94. <https://doi.org/10.1007/s11199-016-0597-y>.
- Pain, E. (2017). 'To be a responsible researcher, reach out and listen'. *Science*. URL: <https://www.sciencemag.org/careers/2017/01/be-responsible-researcher-reach-out-and-listen%5C#>.
- Puig de la Bellacasa, M. (2011). 'Matters of care in technoscience: assembling neglected things'. *Social Studies of Science* 41 (1), pp. 85–106. <https://doi.org/10.1177/0306312710380301>.
- Puwar, N. (2004). *Space Invaders. Race, gender and bodies out of place*. London, U.K.: Bloomsberg Academic.
- Rasekoala, E. (2019). 'The seeming paradox of the need for a feminist agenda for science communication and the notion of science communication as a 'ghetto' of women's over-representation: perspectives, interrogations and nuances from the global south'. *JCOM* 18 (04), C07. <https://doi.org/10.22323/2.18040307>.
- Riesch, H., Potter, C. and Davies, L. (2017). 'What is public engagement, and what is it for? A study of scientists' and science communicators' views'. *Bulletin of Science, Technology & Society* 36 (3), pp. 179–189. <https://doi.org/10.1177/0270467617690057>.
- Roberson, T. (2020a). 'Can hype be a force for good? Inviting unexpected engagement with science and technology futures'. *Public Understanding of Science* 29 (5), pp. 544–552. <https://doi.org/10.1177/0963662520923109>.

- Roberson, T. (2020b). 'On social change, agency and public interest: what can science communication learn from public relations?' *JCOM* 19 (02), Y01. <https://doi.org/10.22323/2.19020401>.
- Roselli, C. E., Larkin, K., Schrunk, J. M. and Stormshak, F. (2004). 'Sexual partner preference, hypothalamic morphology and aromatase in rams'. *Physiology and Behavior* 83 (2), pp. 233–245. <https://doi.org/10.1016/j.physbeh.2004.08.017>.
- Roughgarden, J. (2004). *Evolution's rainbow: diversity, sexuality, and gender in nature and people*. Berkeley, CA, U.S.A.: University of California Press.
- Sullivan, N. (2003). *A critical introduction to queer theory*. New York, NY, U.S.A.: New York University Press.
- Yoder, J. B. and Mattheis, A. (2016). 'Queer in STEM: workplace experiences reported in a national survey of LGBTQA individuals in science, technology, engineering, and mathematics careers'. *Journal of Homosexuality* 63 (1), pp. 1–27. <https://doi.org/10.1080/00918369.2015.1078632>.

Authors

Tara Roberson is a postdoctoral research fellow in responsible innovation at the Australian Research Council Centre of Excellence for Engineered Quantum Systems (EQUS). A science communicator and social scientist, Tara works with quantum physicists to understand the implications of emerging technologies in their field. Her research interests include: hype in science communication, diversity and inclusion in science and science communication, and public engagement. E-mail: t.roberson@uq.edu.au.

Lindy A. Orthia is a Senior Lecturer in Science Communication at the Centre for the Public Awareness of Science (CPAS), the Australian National University. Her research interests include history of science communication, science in popular fiction, and the intersections of science with sociopolitical identifiers such as race, gender and sexual orientation. E-mail: lindy.orthia@anu.edu.au.

How to cite

Roberson, T. and Orthia, L. A. (2021). 'Queer world-making: a need for integrated intersectionality in science communication'. *JCOM* 20 (01), C05. <https://doi.org/10.22323/2.20010305>.



© The Author(s). This article is licensed under the terms of the Creative Commons Attribution — NonCommercial — NoDerivativeWorks 4.0 License. ISSN 1824-2049. Published by SISSA Medialab. jcom.sissa.it