Charismatic microbes: adapting frameworks of non-human charisma to microorganisms

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Abstract

1. Microbes are important to life on the planet, and therefore of high interest to conservation. Public microbial literacy however is restricted. Non-human charisma, the ways in which humans recognise and relate to non-humans, has been identified as an important influence on scientific research and conservation outcomes. As interest in microbes both in research and in science communication is growing, museum and conservation educators should be conscious of emerging forms of microbial charisma and their potential impacts on human-nature relationships.
2. Non-human charisma develops in encounters and through reputational agents. In this paper, I am presenting a narrative material analysis of the exhibitions of two microbe museums as reputational agents for microbial charisma; the existing exhibition of ARTIS Micropia and the exhibition programme of the Science Centre MikroMondo.
3. Both museums use a spectrum of metaphors to interpret microbial encounters, but privilege laboratory and scientific forms of knowing microbes. This creates a laboratory charisma that makes curiosity safe by ordering microbial life. Microbial outputs are put into relation to people through pathogenic charisma, which channels

public health language and danger to make microbes memorable, and functional charisma, which emphasises the usefulness of microbes to human goals. These offer sites of encounter, but also alienate microbes from natural environments.

4. Representations of microbes that focus on their own characteristics such as adaptability, cleverness, or visible traits, develop a wild charisma through which microbes become part of wild natures. Symbiotic charisma emphasises the relationality of microbial life as an aspect of ecological wonder without centring human instrumental values. Some exhibitions introduce sensory and embodied forms of knowing microbes that extend charisma beyond laboratory encounters.
5. This work critically presents the variety of tools currently used in museum collections to make microbes charismatic. Extending the public charisma of microbes will be important in facilitating microbial conservation. By introducing the broad spectrum of microbial charismas, microbe education projects can contribute to developing more differentiated relationships between people and microbes, and challenge persistent nature-culture dichotomies that negatively affect biodiversity conservation as a whole.

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Introduction

Microbes make up the majority of biodiversity on the planet and are crucial to both ecosystems and the survival of individual organisms. Like all other organisms, they are affected by climate change and anthropogenic disturbance. Similar to animals and plants, some microbes thrive in Anthropocene landscapes like landfills (Hoag et al., 2018), while others are at risk. Microbial communities are highly sensitive to environmental change, and specialised bacteria like *B. coahuilensis* may disappear due to habitat loss (Rodriguez-Cruz et al., 2025). In recognition of their significance, in 2025 a Microbe Conservation Specialist Group was formed at the International Union for Conservation of Nature (IUCN, 2026).

Getting publics interested in and caring about microbes is necessary for future conservation work. Currently, public knowledge of microbial diversity is limited (Timmis et al., 2019), and lower awareness of microbial diversity is correlated with more germaphobic attitudes (Robinson et al., 2021). Research with fermentation-based food-makers demonstrates that honing scientific, sensory, and spiritual forms of knowing microbes, in these cases as allies in fermentation, fosters more differentiated and probiotic relationships with microbial communities (Eriksson and Bull, 2017; Paxson, 2008). Public discussions of microbiome and gut health have also been driven the idea of a "microbial sublime" (Lorimer et al., 2019), in which microbes become an awe-inspiring force of nature as determinants of health. Engaging with microbes reduces germaphobia and makes the public inclusions of microbes in ecosystems possible.

But how can conservation groups successfully advocate for organisms that are difficult to see and love? In this paper, I present an analysis of how the two microbe museums Micropia and MikroMondo portray microbes and ways of relating to them. They, alongside the new

IUCN group, are part of a scientific community advocating for microbes. My analysis shows a variety of narrative strategies used to develop microbial charisma in these collections. I assess the successes and limitations of current approaches to microbial literacy and biodiversity education within these museums. I demonstrate how different values are channelled into making microbial encounters, developing a novel adaptation of non-human charisma (Lorimer, 2007) to microbes. My analysis provides grounding for educational toolkits for the development of future education and outreach in microbe and ecosystem conservation.

Understanding microbial charisma is key to future conservation outreach as it influences public opinion and funding decisions (Colléony et al., 2017). Charisma emerges from the interaction of biological and social characteristics of organisms that shape how people come to encounter them. According to Lorimer (2007), different types of experience contribute to non-human charisma: ecological charisma describes how well two organisms can perceive each other, for example how far their niches overlap,[1] aesthetic charisma develops from immediate reactions to visual and descriptive encounters, and corporeal charisma from physical interaction over time. Animal charisma is often linked to visual appeal, rarity, endangerment, impressiveness, or potential danger (Albert et al., 2018) while in plants and fungi, charisma appears to be linked to size and visual appeals such as flowering (Fern, 2023). For ecosystems, descriptions of charisma often link to visually impressive settings such as coral reefs and geysers (Duarte et al., 2008; Fern, 2023).

[1] Charisma is usually considered between humans and another species. Maybe we should also ask in more detail which species other species might find charismatic, especially as encounter-based charisma is still considered to be informed by evolutionary relationships and resulting biophilias and biophobias (compare for example Prokop et al., 2024).

Developing microbial charisma poses a challenge. Conservation in general is biased towards larger and visible organisms, while many microbes and their interactions difficult to perceive without training or specialist equipment (Greenhough et al., 2025; Hodgetts et al., 2018). Just as bird counters learn to listen to corncrakes (Lorimer, 2015a), people need to learn to encounter microbes. To promote meaningful connections between humans and microbes, museums need to overcome challenges of perceptibility to bring microbes ‘on-show’ and guide the public to be able to register and appreciate them. Further, surveillance tools such as camera traps or population counts generally used in biodiversity conservation work are difficult to apply to microbes (O’Malley, 2016; Redford, 2023; Schrader, 2017; Sutcliffe et al., 2021). Information like endangerment and native status is also less available and achievable for microbes (Redford, 2023).

In confronting this challenge, museum educators and curators become reputational managers for microbes, shaping how people encounter and register them. Charisma is also socially bestowed on individuals by their social networks (Weber and Eisenstadt, 1968) (Weber, 1947). In application of Weber to non-humans, educators as reputational managers also bestow reputations and therefore social power onto non-humans through their interpretation work (Fordahl, 2024). For example, the marketing of “flagship” animals as faces for conservation projects draws public attention to them specifically and increases their charisma (Fern, 2023). Reputational managers are themselves not exempt from social contexts, and so exhibit interpretation and design can reflect and reinforce expectations (Braverman, 2018; Haraway, 1989). Meanwhile, existing reputations influence research funding and priorities (Heldke, 2026; Walker, 2020). Non-human charisma should be understood as a complex social project in which ecological and reputational factors interact, especially when encounters rely on interpretation. Researchers and curators as reputational agents likely have an even bigger influence on microbial reputations than for more visible organisms.

There is scope for a wide variety of microbial values, from instrumental and relational values to aesthetic and spiritual values (Bossert and Höll, 2025), to shape their reputation. However, microbe education and outreach does not start from a neutral position. Current popular knowledge is biased towards a minority of pathogenic microbes (Rappuoli et al., 2023). Emerging infectious diseases are charismatic via their danger and potential to spread (Herrick, 2019, 2017; Kelly, 2018). Because of their impact, fears of contagion dominate global health discourse and biosecurity education and therefore microbial socialities (Greenhough, 2023), creating a microbial narrative of feral and monstrous swarms (Hillman, 1998; Lorimer, 2007). Robinson et al. (2021) propose a "Covid-19 effect" as people who consider viruses to microbes have more negative attitudes towards microbes as a whole. This mirrors challenges of managing human-predator conflicts in wildlife conservation (Pooley et al., 2017).

Public knowledge of microbes as diseases also affect attitudes to wildlife and the environment more widely. For example, perceptions of bats in the US became less positive following the Covid-19 pandemic (Lu, 2024; Olson Nixon, 2024). The conflation of animal hosts and vectors with pathogenic microbes can turn them into 'epidemic villains', especially when there are scientific unknowns (Lynteris, 2019, p. 1). Parasitology has similarly been shaped by scientific-cultural conflations of the term parasite which has limited research funding and imagination (Heldke, 2026), and parasites have largely remained excluded from conservation (Carlson et al., 2020). However, antagonistic status is not permanent: some previously villainised large predators have become charismatic flagship species (Ducarme et al., 2013; Marshall et al., 2016); and some parasites are gradually being recognised as subjects of conservation, not only eradication (Kwak et al., 2024, 2019). Museum collections and other forms of public outreach matter because they can offer engagement with microbes not governed by the urgency of epidemic prevention. “We need new metaphors, and new stories, to replace the dominant tropes of species and pathogens”, propose Hodgetts et al. (2018, p. 7). In this paper, I show how microbe museums both fall into expectations, and develop novel stories to make space for more complex microbial worlds.

As I will present below, exhibitions hold on to instrumental values in their core narratives, reinforcing a view of microbes as a resource. I will present how museums reinforce the **laboratory** as the primary site of microbial encounter, and then highlight how **pathogenic and functional** traits of microbes are mobilised to create charisma based on the outputs of microbes. I then showcase how more intrinsic values come through to exhibit microbes as **wild and symbiotic** parts of nature, making them charismatic within conservable worlds. These choices highlight specific microbial qualities and relations over others and begin to set out particular flagship microbes to the public. Science and public ideas of science are not independent of each other but co-produce each other (Jasanoff, 2004), and it is therefore important that science educators consciously approach the tools and symbols they rely on to communicate microbes.

Methods

I conducted a thematic analysis of exhibitions of two microbe museums. ARTIS Micropia opened in Amsterdam in 2014 and is the only museum centre in the world that is specifically dedicated to microbes. Science Centre MikroMondo is currently in development in Austria. There are other permanent collections relating to microscopy and microbes, such as the

Alexander Fleming Laboratory Museum in the UK, the Pasteur Museum in France, the Museum in the Robert Koch Institute in Germany, and the Butantan Institute in Brazil (Insam and Ascher-Jenull, 2024).

I chose Micropia and MikroMondo for this comparative material culture analysis because they are/aim to be permanent and generalist collections on microbes, and in this are unlike any others. To match the scope of both collections, the term 'microbe' in this paper will cover bacteria, archaea, slime moulds, and fungi as well as viruses and small multicellular organisms like tardigrades and nematodes. Both institutions combine artistic displays and scientific elements. Like zoos, both keep (or intend to keep) living collections of microbes on their premises.

They also both have links to conservation organisations: ARTIS Micropia is part of ARTIS Amsterdam alongside a large zoo and a natural history museum. MikroMondo was originally intended to be a collaboration with the Alpenzoo Innsbruck, although this is no longer the case. Neither currently claim ownership of the term 'zoo' as a description of what they do (Braverman, 2023; Heribert Insam, 2024). The association is of interest as zoos are often active as reputational managers for non-human charisma in conservation through affective and ecological interpretation frameworks (Braverman, 2023; Carr and Cohen, 2011; Clifford-Clarke et al., 2022; Lorimer, 2015b).

In the following analysis I will be using thick description as an ethnographic technique for a thematic analysis of exhibitions within Micropia and MikroMondo. Thick description is used to document and analyse the nuances of cultural settings and capture the semiotics and webs of significance underlying social interactions and cultural representations (Geertz,

1973) and is therefore well-suited to analysing and collating the microbial metaphors and semiotics at work within the collections.

The different stage of development of the two museums was a practical consideration in this research. I visited ARTIS Micropia several times to document the exhibitions and interpretation within the museum. I was not able to formally interview anyone in association with the museum due to staffing constraints. Via an e-mail exchange I did gain support for my project from the Chair of Micropia at the University of Amsterdam. Science Centre MikroMondo has not opened yet and therefore I could not visit; however, I was able to interview project team members and access a detailed exhibition guide outlining all planned exhibit modules (Insam and Ascher-Jenull, 2024). Ethical approval for this study has been granted via the review process of the School of Social and Political Science, University of Edinburgh. Informed consent has been obtained from all human participants. A list of exhibitions for both sites is available in the supplementary materials.

Laboratory charisma: encountering microbes through science

Micropia foregrounds laboratory materials and references to develop a distinct visual language as a microbe museum. Staff known as “lab technicians” wear lab coats. A selection of vivaria, aquaria, and flasks hosts small animals and microbes. Microbe enclosures also recall laboratory settings: microbes are kept in round-bottom flasks filled with water and microorganisms (Figure 1), or placed under glass panes and glass cloches that create their exhibits and habitats. Cyanobacteria monocultures are displayed round-bottom flasks that are linked to a Mantella frog enclosure with a network of see-through plastic tubes, making visible the ecological relationship of the oxygen cycle through laboratory materials. Microscopes, holographic screens, laboratory glass wares, and the repeating images of petri dishes also contribute to laboratory optics. The materials used within the museum are stainless steel, glass, and smooth plastics – antimicrobial surfaces, or at least easily disinfected.

The single-species exhibits surrounded by artificial lighting are reminiscent of sanitary design in zoos, a zoo design phase in the early 20th century aligned with public health developments like germ theory (Boyle, 2017; Coe and Lee, 2014). Enclosures were generally built for single species and made predominantly out of easy-to-clean materials like glazed ceramic tiles (hence Coe and Lee use the term "blue tile" design), often with little access to enrichment or biological materials for the animals within. The microbes within Micropia react to the sanitary "blue-tile" designs that emerge from the use of the laboratory metaphor. Micropia's lab technicians emphasise that it is hard work to keep microbe colonies alive within the museum (*A tour around Micropia, the museum of microbes!*, 2021). While some scientists suggest that a microbe "doesn't know or care which … environment it's in" (Marcheselli, 2024), the effort involved in keeping microbes alive for museums suggests they might after all. After all, microbes can thrive in settings of captivity: the visible kelp and algae in zoo aquaria are often plastic, because living ones would grow too well and too quickly among the networks of fish, food, and excrements to maintain any visibility for visitors. Sanitary zoo design was both a way to enforce animals' visibility and a way to control the growth of microbes. Yet its rendition within microbe museums conjures a striking juxtaposition of antibiotic design in a setting that also aims to support microbes to flourish.

Other exhibits try to relate humans and microbes within the aesthetic sterility of the museum's design. Micropia's wall of agar plates is set above a cabinet of everyday items and information about microbes that live on and within them. The agar plates themselves also draw connections with the wider locality, for example containing colonies grown from air swabs in different locations within ARTIS Zoo. Nevertheless, the visual language of the agar plates, and the display of everyday items lit up in enclosed glass cases represent a world in which things are separatable, cleanable, and order-able. They contribute to a vision of modernity that reinforces an underlying illusionary nature-culture dichotomy pointed out by Latour (1993), where humans can govern over microbes both in laboratory usage and antibiotic control.

Both museums also feature microbial communities, both in Winogradsky columns, which are self-sustaining microbial ecosystems generally housed within glass bottles and gathered from collected soil samples and carbon and sulphur sources. Representing microbial life in communities, and playing with the visual artistry of them (MikroMondo proposes "Winogradsky planets" in round bottles (Insam and Ascher-Jenull, 2024, p. 52), Winogradsky columns still are laboratory research tools in microbial ecology and environmental science, and continue the emphasis on laboratory and scientific language over other forms of knowing microbial communities. Micropia for example also shows a single SCOBY culture, used in making kombucha and other fermented drinks outside scientific settings, yet does so in a clear glass container placed within a laboratory setting rather than taking this opportunity to represent post-Pasteurian worlds of fermenting (Paxson, 2008).

Figure 1 Colony-makers exhibit at Micropia (photo by author, 2025).

Following the tradition of natural history and zoological collections, interpretation is also often focussed on introducing individual species, adapting conventions of zoo interpretation. While for some microbes, common names of the phylum or genus are displayed with the scientific name, for example *Philodina roseola* as the rotifer, for others they use descriptive names. “Colony-makers”, for example, is used as a descriptor to give a shared common name to the individually displayed and identified *Volvox aureus, Gonium pectoral, and Chlamydormans reinhardtii* (perhaps inadvertently playing with bacterial insistence on connecting across taxa, though this is not made obvious to the visitor). These set up more approachable categories for visitors, and allow displayed microbes to act as ambassadors for wider groups, similarly to how zoo animals come to be ambassadors for their species (Braverman, 2012). And while the main text about each microbe tends to relate to a broader topic in microbiology, a small list introducing their “habitat”, “food”, and “enemy” contextualises microbes within their ecosystems. For *Philodina roseola*, those are respectively fresh water habitats, algae as food, and zooplankton and water moulds as enemies. A lit-up taxonomic tree covers one wall and reappears across the exhibition, ordering microbes through their evolutionary relationships into species.

Scientific language also reinforces classifications that not just simplify but hide the complexities of microbes. The species conventions generally step over the complexities and difficulties in applying species concepts to microbes, which can exchange genetic information laterally and whose strains can differ widely within one species (O’Malley, 2016; Schrader, 2017). In centring traditional natural-historic modes of display, the practice contributes to a representation of an ordered and clean microbial world rather than embracing the challenges that microbes bring to our understandings of biology as a point of curiosity.

Using metaphors and materials of "science" is useful in drawing visitors in, the founder of MikroMondo explains to me in an interview. MikroMondo's branding started out as a zoo, but over its development shifted towards a science centre. "We want to show more about technology, microbes in action, water purification. It goes beyond the microbe zoo", explains one of the team members of MikroMondo, and "the story developed to science centre, that's nowadays the way to work with young people." Laboratory charisma channels the influence of wider STEM outreach, tying microbes to scientific progress, development, and experimentation. Yet the sanitary designs of the laboratory metaphor also produce conflict. They contextualise microbes outside of their natural environments and habitats, and stand in tension with the worlds of microbial communities and contemporary scientific understandings: isolating individual microbes from their ecologies and through only laboratory knowledge could reinforce public perceptions of microbes as single species and pathogens and detract from other forms of knowing microbes.

Charismatic outputs: functional & pathogenic charisma

Functional and pathogenic charisma centre the metabolic and chemical outputs of microbes instead of a mode of knowing microbes as laboratory charisma does. Here, they become charismatic through their function, both in the sense of their instrumental values to human aims (Bossert and Höll, 2025), and their metabolic and chemical outputs. Functional and pathogenic charisma are useful tools in inviting connections between visitors and microbes: microbes become ecologically perceivable to visitors through their outputs; learning about their involvement in diseases or food production for example makes it possible to see, feel, smell, and taste proxies for microbes in the museum and outside of it. This makes ecological, aesthetic, and corporeal charisma (Lorimer, 2007) possible. Engaging with microbes through their outputs underlies both Pasteurian biosecurity, encountering microbes based on their potential pathogenicity, and Paxson's post-Pasteurian biopolitics, differentiating between microbes as productive allies in for example food production and microbiome regulation (Lorimer, 2017; Paxson, 2008).

Pathogenic charisma contextualises them through their 'unhelpful' outputs of disease and mouldiness, leaning into fear and disgust also sometimes channelled in the non-human charismas of creepy invertebrates (Dudley Zoo, 2025) or "trickster" pest animals such as raccoons (Pacini-Ketchabaw et al., 2016, p. 157). Pathogenic charisma often is developed alongside existing public health references. On their ground floor, Micropia uses public health campaigns to introduce several groups of microbes within their exhibition. In the "Dangerous beauties" exhibit (Figure 2), glass artworks of individual pathogens sit in glass vitrines. Cabinets underneath them display material culture or artworks associated with the diseases and public health measures they elicit: the HIV cabinet holds a collection of condoms on bananas, drawing connections to HIV/AIDS prevention campaigns and health education, MRSA's cabinet contains a model of a hospital to bring home the risk of hospital-born multi-resistant infections. Microbes here are labelled first by the disease name as a common name; for example, parasitic gastrointestinal disease, then *Giardia lamblia* underneath; making the disease the microbes' "common name". Interpretation signage explains the impacts of each disease on people, its deadliness, and its spread. Positioned in front of large windows, the glassy microbes are illuminated from below, and also reflect light coming in from outside. They float superimposed upon the Dutch cityscape outside, reinforcing their almost-invisible threat to civilisation. The diseases they can cause becomes these microbes' primary relation to visitors in this display, and their pathogenicity is used as a measure of fear-inducing impressiveness.

Figure 2 Dangerous beauties exhibit in Micropia (photo by author, 2026)

Pathogenic narratives also contribute to the microbial sublime (Lorimer et al., 2019), in which collections channel microbial monstrosities of consumption and overgrowth into fascination. Strange creatures can become popular attractions because they evoke "fascination, fear, and disgust" (Ginn et al., 2014). One MikroMondo exhibit introduces AMR as a danger to humans and animal health, but in its presentation highlights how impressively adaptive bacteria are as a quality in itself (Insam and Ascher-Jenull, 2024, p. 100). The exhibit aims to convey "the incredible and incredibly fast adaptability of bacteria to changing environmental conditions". The associated exhibition piece is a video relatively well-known within AMR education and science communication, it is a video recording published by the Harvard Medical School (2016) showing how *E. coli* cultures navigate and adapt to bands with different concentrations of antibiotics across a 2x4 feet large Petri dish, gradually extending into each new band of antibiotics, then quickly colonising the area once advantageous mutations arise. Microbial growth can be narrated as both a potentially dangerous public health concern and as an impressive capability of survival.

The AMR storyline functions similarly to those narrating the hunts of metazoan predators, emphasising the impressiveness of their strength, speed, growth or hunting abilities (Albert et al., 2018; Campbell and Lancaster, 2010; Sergio et al., 2006). Pathogenic charisma is therefore a form of 'feral' charisma (Lorimer, 2007) based on the incomprehensibility and power of swarms, the impressiveness of predation, and danger to humans. In previous conservation research, perceived danger has been shown to be important to the charisma of large predators such as lions (Albert et al., 2018). And in invertebrate conservation, praying mantids are a flagship species in part because of their cultural associations as an impressive predator (Greyvenstein et al., 2020). Infectious diseases are charismatic within global health: they attract more funding than non-communicable diseases because of their boundary-crossings and the scale of potential distress (Herrick, 2019, 2017), showing how pathogenic charisma, danger, and impressiveness already come into action. These narratives reshape pathogenicity as a form of infectious charisma that invites wonder.

On the lower floor of Micropia, next to the pathogenic microbes, visitors also pass exhibits that showcase the use of microbes for the production of fungal furniture and bioplastic production. One central ground floor exhibit introduces streptomyces fungi as indispensable antibiotic producers, assembling petri-dishes on a wall alongside a lit-up green cross (Figure 3). The green cross is a widely used pharmacy symbol (Griffenhagen, 1990), drawing a visual connection between the fungi and familiar pharmacies, though putting microbes in the service of public health rather than against it.

Microbes become valued “not in and of themselves, but in recognition of the services they provide” (Greenhough, 2023, p. 223). These functional uses of microbes were the basis of the first proposals for microbe conservation (Cockell and Jones, 2009), while recent work emphasises intrinsic values alongside instrumental ones (Gilbert et al., 2025; Redford, 2023). Drawing on instrumental values (Bossert and Höll, 2025), functional charisma emerges across public health, food production, air quality, and industrial goods, showing visitors where they might encounter microbes positively in their daily lives. Microbes that foster life, make food, or produce building materials become partners or co-workers in achieving a good life. Functional charisma offers another site of ecological encounter. It makes microbes relevant to human life and facilitates human-microbe interactions through the re-narration of daily processes as microbial relationships.

Figure 3 The Medicines on the ground exhibit showing streptomyces as functional antibiotic producer, displayed in a green cross (photo by author, 5.1.2026).

MikroMondo’s core narrative leans strongly into functional charisma. One of the developers explains the pedagogical idea of the museum in our interview as follows: “The current storyline is 24/7 microbes: you get up in the morning covered in microbes, the fresh air you breathe, 10% of it is made by bacteria, you drink water, again it is microbes purifying water.” The approach centres the uses and functions of microbes to make them interesting to the visitor. Even when it comes to biodiversity, their instrumental values are important, as a MikroMondo researcher states in an interview: “soil biodiversity for growth, increased resilience to disturbance or maybe more or less vulnerable to climate change; or in terms of new-borns, if you know that new-borns delivered by C-section have poorer microbiota”. The exhibition guide for MikroMondo (Insam and Ascher-Jenull, 2024) also regularly highlights the use cases of different microbes in the introduction of different exhibition modules, for example “How can algae clean water?” (p.69), “Why are lichen signals of clean air quality?” (p.73), “Can bacteria deliver the light source of the future?” (p.105), or “What role do microbes play in waste water cleaning?” (p.117). A bioreactor exhibit (p.122) and a biotechnology shop in which visitors can scan bar codes of products to learn how microbes contributed to their production (pp.124–125) stay with microbes as workers for human goals. Other exhibits explore the potential uses of microbes and microbial products for building materials and climate-neutral energy production (pp.126–127, 128–129, 132–133). Several exhibits frame microbes as awe-inspiring “universal geniuses” (p. 129, 133), extending functional charisma into a positively-connotated form of the microbial sublime: still powerful and everywhere, but gently in our favour.

However, the focus on microbial outputs also reinforces the often-criticised good-microbe-bad-microbe dichotomy (Greenhough et al., 2018; Höll and Bossert, 2022). MikroMondo’s exhibits on pathogenic microbes are often paired with storylines around their potential useful contributions. For example, biofilms can be incredibly dangerous to implants, but they are also important to trophic chains (Insam and Ascher-Jenull, 2024, pp. 110–111), and mushrooms can be deadly, but they can also be healing (p.114-115). Micropia's curators establish the dichotomy in neighbouring "Friendly virus" and "Hostile virus" ground floor exhibits in which one explains the use of viruses in medicine development and the other hosts a video game protecting a teddy bear creature from sneezes. A similar dichotomy carries through the neighbouring exhibit "Microbes on your plate – they like your food too": there are two glass cabinets next to each other, one filled with a selection of foods produced by microbes underneath glass cloches, the other with jars of different decomposing foods, labelled by food and deposition date and left to decay (Figure 4). Interpretation signage beside it shows animated videos of how microbes are used to produce different food products and sped up recordings of how they affect food conservation and decay over time. Microbial outputs for example in the form of packaged orange cheese (Figure 4a) or a mouldy jar of peaches (Figure 4b) create a site of recognition, and therefore a potential baseline of charisma, interpreted through an anthropocentric definition of usefulness. The values of microbes in these narratives are placed in relation to systems of production, fostering a human-microbe relationship that understands microbes as labourers or resources and seeks to extract value from their functions. Yet different strains of the same microbial species can be good or bad by measure of their contribution to our good lives – consider for example the breadth of E. coli strains from laboratory work horse to diarrhoeal disease. In their categorisation into good and bad, microbes become alienated from other organisms as either pathogenic abnormalities or functional tools. Making charisma by whether their output is beneficial to human purposes or not and also carries anthropocentric and capitalist conceptions of value into human-nature relationships, reinforcing the systems that have contributed to the current extinction crisis.

Figure 4 Microbes on your plate exhibit at Micropia (photo by author, 2025).4a. the top photo shows cheese and soy sauce in the food production cabinet. 4b. The bottom photo shows the food conservation cabinet with the food production cabinet in the background.

Wild enough: wild charisma, symbiotic charisma, and potential flagship microbes

To counteract their alienation from wild conservable worlds, what could it look like to encounter microbes outside anthropocentric functions? Both microbe museums already also work towards developing a wild charisma of microbes. Instead of explaining microbes by their functional or pathogenic relations, they are presented as intrinsically interesting in themselves, leaning on charisma-building narratives used in wildlife conservation. MikroMondo did initially set out to structure their exhibition along the lines of the extraordinary and “extreme” capabilities of microbes in order to invite curiosity (Insam and Ascher-Jenull, 2024, p. 136), leaning into impressiveness, cleverness and beauty as charismatic categories before pivoting to the science centre marketing and more functional approaches, an approach that still comes through in their development of pathogenic charisma as described above.

Micropia’s exhibit on extremophiles uses a hologram screen to place microbes in exotic environments. Stepping into a small booth on the museum’s 1st floor, visitors can scroll through illustrations of several extremophile microbe species and their extreme habitats: for example, *Fragilariopsis cylindrus* which thrive in freezing Antarctic climates, or *Pyrococcus abysii* which flourish under high heat, pressure and salinity on the ocean floor (Figure 5). Surviving within extreme and even incomprehensible environments, extremophiles carry their own potential for the development a wild charisma through their rarity and impressiveness, both charismatic properties of wildlife (Albert et al., 2018; Fern, 2023).

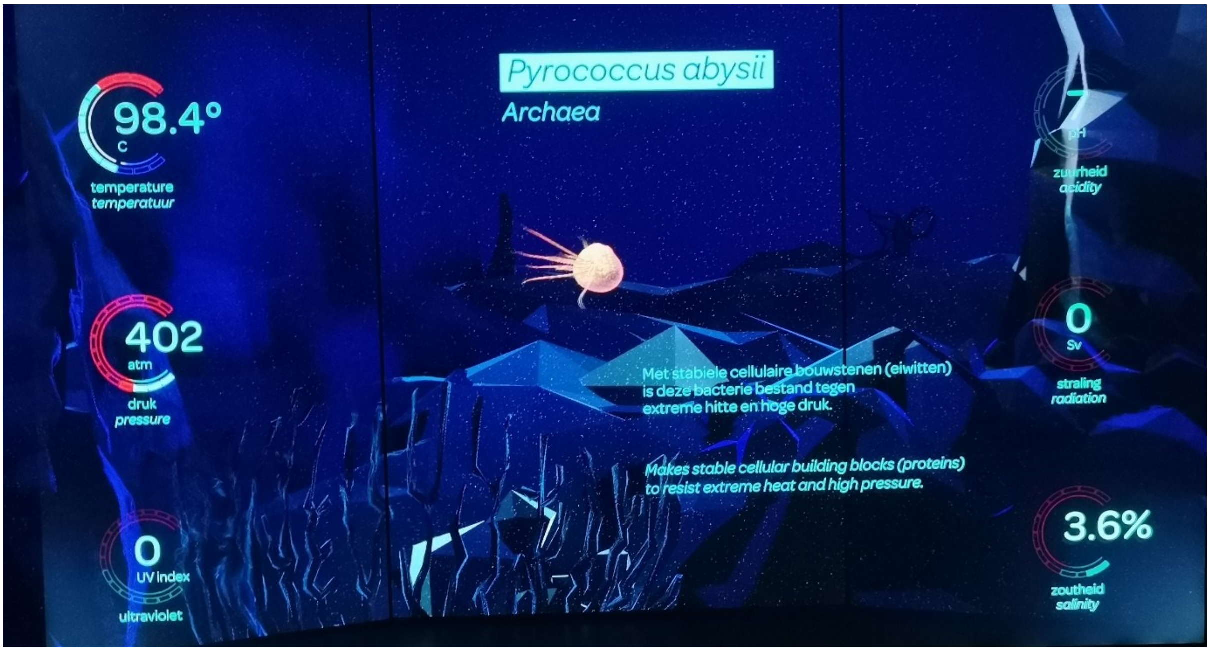


Figure 5 Extremophiles exhibit at Micropia (photo by author, 2026).

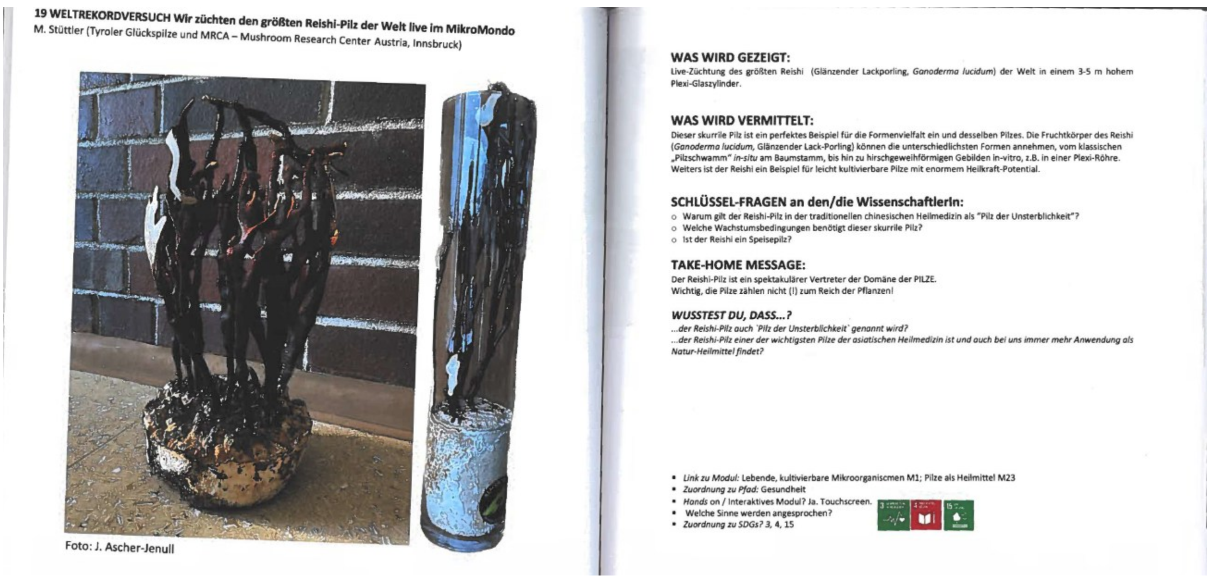
In both museums, *Physarum polycephalum* and *Photobacterium phosphoreum* have dedicated exhibits that highlight their cleverness or their ability to luminesce, developing charisma using the organisms' intrinsic attributes. Both museums' displays of the slime mould *Physarum polycephalum* highlight its "intelligence" in solving mazes. They also both relate it to the cultural reference point of "the Blob", a horror movie in which the blob devours everything in its path.[2] MikroMondo also add a potential audio exhibit in which visitors are able to hear the mould grow via electrodes that record and amplify electric signals (Insam and Ascher-Jenull, 2024, pp. 78–79). The exhibits combine cultural touchpoints, similarly to how a zoo might reference the film Madagascar around a lemur exhibit, with the visual and auditory observation of the slime mould in action, solving a maze. The exhibits on *Photobacterium phosphoreum* meanwhile set up an aesthetic encounter with the microbes directly. Micropia's exhibit invites the visitor to step into a

[2] MikroMondo staff have visited Micropia and are aware of Micropia's exhibits.

darkened chamber illuminated by several glowing flasks, and an aquarium visitors can light up by pressing buttons linked to models of bioluminescent fish.

Instead of outputs, these exhibitions rely on microbes' inherent traits and behaviours to make them charismatic. This engagement makes space for the microbes themselves; engaging with them as a sort-of wildlife and developing a wild charisma. In their visual qualities of growing and glowing, their narratively-appealing characteristics, and representation in both museums, these two bacteria may be on the way to becoming flagship microbes, popular representations of microbes to endear publics to wider microbial conservation.

Using models, micrography, artworks, and animations, the museums set up additional indirect aesthetic encounters. Visual features such as colour, size, or geometry are highlighted to invite aesthetic appreciation. In both museum sites, wall displays of agar plates with colourful microbial colonies create another aesthetic microbial encounter. In MikroMondo's design plan, impressive microbial growth is also reconceptualised from a feature of disease into a property of microbial art. The team aim to grow the world's largest reishi fungus to show the diversity of forms that one species of fungus can grow into, aiming for an up to 5-meter-tall fungal body (Figure 6). The incredibly large reishi fungus artwork for example celebrates the microbial ability to grow, and overgrow, wildly, even if restrained here within the constraints of the artwork's exhibition space. Through colourful colonies in flasks or in symbiosis with each other as lichen, microbes become visible as collectives. Artwork falls between intrinsic and functional features. Microbes are cultured and made to grow in the service of art, as they may be grown in the service of research in a laboratory (Hartigan, 2019), yet they are valued for their aesthetics (Bossert and Höll, 2025).



19 WELTREKORDVERSUCH Wir züchten den größten Reishi-Pilz der Welt live im MikroMondo
M. Stüttler (Tyroler Glückspilze und MRCA – Mushroom Research Center Austria, Innsbruck)

Foto: J. Ascher-Jenull

WAS WIRD GEZEIGT:
Live-Züchtung des größten Reishi (Glänzender Lackporling, *Ganoderma lucidum*) der Welt in einem 3-5 m hohem Plexi-Glaszylinder.

WAS WIRD VERMITTELT:
Dieser skurrile Pilz ist ein perfektes Beispiel für die Formenvielfalt ein und desselben Pilzes. Die Fruchtkörper des Reishi (*Ganoderma lucidum*, Glänzender Lack-Porling) können die unterschiedlichsten Formen annehmen, vom klassischen „Pilzschwamm" *in-situ* am Baumstamm, bis hin zu hirschgeweihförmigen Gebilden in-vitro, z.B. in einer Plexi-Röhre. Weiters ist der Reishi ein Beispiel für leicht kultivierbare Pilze mit enormem Heilkraft-Potential.

SCHLÜSSEL-FRAGEN an den/die WissenschaftlerIn:
- Warum gilt der Reishi-Pilz in der traditionellen chinesischen Heilmedizin als "Pilz der Unsterblichkeit"?
- Welche Wachstumsbedingungen benötigt dieser skurrile Pilz?
- Ist der Reishi ein Speisepilz?

TAKE-HOME MESSAGE:
Der Reishi-Pilz ist ein spektakulärer Vertreter der Domäne der PILZE.
Wichtig, die Pilze zählen nicht (!) zum Reich der Pflanzen!

WUSSTEST DU, DASS…?
…der Reishi-Pilz auch `Pilz der Unsterblichkeit` genannt wird?
…der Reishi-Pilz einer der wichtigsten Pilze der asiatischen Heilmedizin ist und auch bei uns immer mehr Anwendung als Natur-Heilmittel findet?

- *Link zu Modul:* Lebende, kultivierbare Mikroorganiscmen M1; Pilze als Heilmittel M23
- *Zuordnung zu Pfad:* Gesundheit
- *Hands* on / Interaktives Modul? Ja. Touchscreen.
- Welche Sinne werden angesprochen?
- *Zuordnung zu SDGs? 3,* 4, 15

Figure 6 World record attempt: we breed the biggest reishi fungus of the world live in MikroMondo (Insam and Ascher-Jenull, 2024, pp. 86-87).

While functional and pathogenic charisma are generally set up in relation to humans, and wild charisma describes individual properties of the microbe itself, I propose a final category of *symbiotic charisma* that centres the relationality of microbes without immediately relating them to their instrumental values for people. In both sites, exhibits on symbiotic relationships between ant and fungi and lichen as symbionts between fungi and algae/cyanobacteria move towards representations of multispecies interactions as a core feature of microbial life.

The ant exhibit in Micropia shows the parasol ant (*Atta cephalotes*) and the fungus *Leucocoprimus gongylophorus*. There are glass vivaria around a table which holds glass flasks filled with leaves and other ant feed. Vivaria and bottles are connected to each other by ropes for the ants to travel on, and isolated from the rest of the museum by water that prevents the ants from exploring beyond the ropes and flasks, a design that is common for ant exhibits in zoos. The fungus is visible within the anthill vivaria. MikroMondo instead plans to exhibit the ant nests of ants that live in symbiosis with fungi and ants that don't, for visitors to compare the nest structures.

Although both museums' farming ants exhibits assign agency to the ants as "farmers", their symbiotic farming relationships with fungi are represented differently than those in biotechnology or food production exhibits. MikroMondo's exhibit of fungi-farming ants (Insam and Ascher-Jenull, 2024, pp. 88–89) invites wonder at the nest structures that arise from the symbiosis with fungi, rather than emphasising potential applications like two exhibits on the fungus *Pleurotus ostreatus* do (p. 130-133). The latter's take-home message is "microorganisms are universal geniuses with game-changing potential, also producers of sustainable materials by recycling or upcycling qualitatively valuable waste products" (p. 133), whereas the ant exhibit emphasises relationality and asks "can the fungi live without the ants, and the ants without the fungi?". The exhibit emphasises awe at co-existence: symbiotic charisma and functional charisma are both relational, but symbiotic charisma emphasises relations as a subject of awe in themselves rather than a source of applications for human ends.

Some exhibitions use metaphors of balance to differentiate symbiotic charisma from pathogenic. One exhibit in MikroMondo states "Cows affect the climate: but it's not the cow, it's their husbandry and global number of livestock that is the problem. Nature has brought out optimally attuned microbial communities to master natural nutrient cycles" (Insam and Ascher-Jenull, 2024, p. 91), placing responsibility on humans rather than villainising methane-producing bacteria or cattle. In Micropia, a module on microbes as important decomposers or "crucial cleaners" also draws on ideas of balance stating "bacteria and fungi complete the circle of life". Balanced ecosystems are an ecological metaphor for belonging, yet complicated for microbes who change quickly. Kent Redford, one of the core figures in microbe conservation, said in a public interview: “Conservation as a practice has traditionally been about trying to keep things the way they are and maybe even the way they were, and microbes are not down with that at all” (Cohen, 2025). Balance as an ecosystem metaphor is useful in moving away from pathogenicity as the assumed-normal microbial state, yet as a microbial metaphor it too should be seen critically in relation to the agencies of microbes.

Conclusion

Developing microbial charismas in multi-faceted approaches will make important contributions to public microbial literacy. Yet the task of representing microbes is a mammoth one. While most wildlife charisma is shaped in direct ecological encounters, recognising distinct microbes is far more difficult than recognising distinct animals or plants (and even plant blindness is already a known conservation issue, Balding and Williams, 2016). A similar “microbe blindness” may arise as different bacterial groups and similar-bacteria-in-different-contexts become conflated within the categories of pathogens or (even good) microbiomes that homogenise microbes in their outputs. Developing differentiated forms of microbial charisma within outreach like museum collections is one core way of making the diversity and complexities of microbes encounter-able. Relying on individual species to drive conservation risks maintaining a classificatory system that doesn’t serve microbes well, yet maintaining microbes as a collective also prevents the emergence of affective relationships specific to particular microbes and locations. Finding a working composition of different microbial charismas is a challenge for microbe education to meet.

Hygienic design, species-based representation, and experimental visual language come together to form a **laboratory charisma** for the microbes in the collection. They are known through science, in a safely hygienic and ordered scientific format as the way of encountering them. Even the messier displays remain in order through laboratory glassware and hygienic designs. All in all, these exhibition designs perhaps convey a sense of ordered microbial worlds and clearly differentiated species rather than fostering wonder at the strangeness and rule-breaking of many familiar microbes. In doing so, the collections draw on scientific representations of modernity (Latour, 1993) in which humans govern over nature. This allusion to mastery within the collection retains the objectifying underlying both colonialism and extractivism rather than encouraging organisms to 'make meanings together' (Haraway, 2008, p. 158).

Focussing on outputs as a site of encounter meanwhile gives plenty of opportunities for humans to learn how to recognise the microbes around them for example when breathing, eating, or sneezing. The "good microbe – bad microbe" dichotomy is memorable, yet has been recognised as an oversimplification of microbial relations. Pathogenicity is situational, it depends on environments, bodies' immune systems and access to resources, and more (Greenhough, 2023). Building too closely onto dichotomous narratives in exhibit design and reputational management carries the risk of passing on this oversimplification. While **pathogenic and functional charisma** create sites of encounter, focussing on microbial outputs and their usefulness to humans risks restricting human-microbe relationships into transactional exchanges in which 'good' microbes are expected to work in human service to be worth knowing.

Wild and symbiotic charisma instead come to integrate microbes into our understandings of nature and wildness. Microbes are not too small to be wild, I argue: features such as their rarity and impressiveness, but also their pathogenicity as a form of autonomous overgrowth reflect notions of wildness. This facilitates the development of a “wild charisma” that is significant for understanding the present and potential future place of microbes in conservation. The IUCN Microbial Conservation Specialist Group follows a related strategy aiming to designate places of microbial diversity as conservation targets (Gilbert et al., 2025). In associating microbes with rare and stunning landscapes, they integrate the microbial sublime into place-based conservation that channels wider ideas of sublime wildness. Another option for channelling wild and symbiotic charisma may be to play further with the idea of epidemic villains – associations between an infectious microbe and its hosts/vectors – and expand these to host-microbe associations more broadly, as MikroMondo begins to do in an exhibit on cow rumen bacteria. On the other hand, exoticizing microbes as wildlife comes to undermine the fascinating ubiquity through which microbes refuse distinctions of nature and culture.

Invoking the microbial sublime (Lorimer et al., 2019) through microbes as ‘universal geniuses’, extremophile masters of survival, scarily impressive pathogens, and basis for all life on earth encourages awe, yet at the same time narratives of microbial resistance and fast evolution may weaken public perceptions of the need for conservation interventions. If microbes as a collective can evolve and adapt quickly and survive everywhere, why would we worry about conserving them? By conflating microbial diversity back into one microbial unit that is all powerful and agentive, “universal genius” narratives too risk alienating microbes from conservation. Fostering encounters with microbes as equally rare and wild parts of nature may alleviate this while maintaining awe at their autonomy, capabilities, and strangeness.

Microbial tensions underpin the need for multiple forms of charisma, so publics can engage at multiple scales with microbes as very small and yet somehow also a hugely distributed and awesome 'hyper-object'. The potential of their charisma, for improving microbial literacy and pushing further for a dissolution of nature-culture dichotomies that hinder conservation, may indeed lie in the movement among these different scales of affective engagement.

Yet in the challenges that microbes present to our ways of ordering the world, microbe museums could be a space to encourage more multi-faceted perspectives and multi-modal forms of knowing. And there is clear interest in moving beyond the laboratory in both museums scattered within the laboratory framings: both experiment with multisensory exhibits: Micropia includes several smelling stations, buttons that release the smell of different food products, food decomposition, and woodland soil (streptomyces). MikroMondo plans for an outside area to include microbial encounters as with rotting wood in-situ outside the museum (Insam and Ascher-Jenull, 2024, p. 135). Building on these experiments in sharing microbes, microbe museums could become spaces to represent science as one tool among others of knowing microbes, rather than placing it in dominance over all other forms of knowledge. Laboratory charisma is a useful tool in fostering curiosity, yet it also limits curiosity into one form of expertise. There is a world beyond laboratory charisma, in which museums could begin to invite publics to meet nature in a less ordered fashion. Potential areas for expanding interpretation could include for example engaging food fermentation methods that recognise microbial unruliness (Hafstein et al., 2024; Hey, 2025; Sariola, 2021) to teach sensory ways of recognising and interacting with microbes outwith the laboratory.

Challenging the limits of parasitic and microbial encounters will generate more differentiated and honest relationships between humans and microbes, and humans and natural environments more widely. Microbes are *good to think with* because they challenge current classifications and stratifications of humans and nature in their ubiquity, autonomy, and resistance. Current exhibition designs already demonstrate a broad variety of approaches to developing microbial charisma through different microbial values and characteristics and the inevitable connections between them. At the same time, they return to culturally expected classifications and metaphors that restrict both microbes and microbial communication into scientific tropes and good-bad dichotomies in which some microbes become "cultured" to work for people, while pathogenic ones overgrow in another application of a nature-culture dichotomy. Embracing microbial wildness not just in the depths of hydrothermal vents, but even in the mundanity of our own stomachs may come to challenge both the reduction of microbes into their outputs, and the separation of nature and culture that still underlies many modern assumptions beyond the microbial. Developing a breadth of microbial charismas can contribute to interest in microbes and their conservation, but also to nature conservation as a whole in challenging preconceived notions that separate decay from green conservation natures (Wartmann and Cary, 2026) and building more differentiated relationships between people and nature.

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