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The uses of evidence: Multidisciplinary insights on oppression and empowerment

Significance:

Interdisciplinary conversations about how knowledge is produced are significant in that they allow for reflection and exchange between different research traditions. This Structured Conversation explores a range of views on how evidence is defined and deployed from four diverse disciplinary perspectives: international law, filmmaking and environmental communication, astrophysics, and psychology and disability studies.

Introduction

Mehita Iqani (M.I.) and Anna Feigenbaum (A.F.): This Structured Conversation explores some epistemological questions about what is counted as science, how science is communicated, and the power dynamics that shape scientific practice, with a particular focus on *evidence*. Four researchers were invited to grapple with three themes: what counts as compelling evidence in their field; how evidence can or has been deployed by powerful actors; and what role evidence might play in resistance or activism. These discussion points were crafted as entry points into complex and shifting debates around data, methodology and authority as they play out in policy and practice in diverse scientific disciplines. Contributors brought perspectives from their disciplinary positions to explore different conceptual, theoretical and epistemological perspectives on how evidence functions in different ways in research and science communication. Contributors work in the fields of international law (Melanie Klinkner), filmmaking and environmental communication (Pawas Bisht), astrophysics (Sthabile Kolwa), and psychology and disability studies (Leslie Swartz). Their views are, of course, based on their personal and professional experience in scientific research, and cannot be taken to offer comprehensive explanations of their field of science. This Structured Conversation offers not generalisable explanations backed by evidence, but a curated set of subjective opinions, offered here as an exploratory contribution to ongoing conversations and debates about epistemology as well as scientific practice.

The shapes of evidence

M.I. and A.F.: The first provocation offered to our collaborators was organised around the question of the status of evidence. What counts as compelling evidence differs in various scientific disciplines, as do methods of gathering and analysing that data. Apart from the classic divide between quantitative and qualitative approaches, other nuances of what is considered verifiable and convincing also play a role in disciplinary standards of evidence quality. The following observations are drawn from the perspectives of disciplinary framing, and are in relation to individual careers in research and practice in a specific field of research.

Melanie Klinkner (M.K.): In international criminal law, for example at the International Criminal Court, there are different evidential thresholds that need to be met during various stages of proceedings. The highest standard of proof required before the court is that of “beyond reasonable doubt”, which is needed for a conviction. The onus is on the prosecution to prove this and the evidence that is typically presented during proceedings is varied, and could consist of documentary, digital and physical evidence, witness statements and testimony. For the prosecutor to start an investigation, the burden of proof is significantly lower. Here we talk about a “reasonable grounds to believe” threshold which, if met, triggers an investigation. Potentially, then, cases can arise out of an investigation.

Forensic sciences also operate with standards and probabilities, and evidence here can often be pieced together from a variety of sources. DNA identification, which is crucial in the realm of mass graves when recovering human remains, stands out in this regard because a very high threshold (close to 100%) needs to be met for a positive identification to be made.

With processes such as inquiries or truth-finding commissions, they may stipulate what can be considered as fact and what can be considered sufficient evidence to become part of the official records or findings. For example, the Commission on the Truth for El Salvador¹ distinguishes the following three: overwhelming evidence, which is conclusive or highly convincing evidence to support the commission’s finding; substantial evidence, which is very solid evidence to support the commission’s finding; and sufficient evidence, which means that there is more evidence to support the commission’s finding than to contradict it (the balance of probability is in favour of inclusion rather than exclusion of this evidence). This shows the practical ways in which evidence and categorising evidence can happen to signify how compelling it is.

Sthabile Kolwa (S.K.): Within physics and astronomy, what is considered and counted as compelling evidence are the empirical results based on observations obtained from telescopes. Astrophysicists take the data that telescopes accumulate, process it, and analyse it using the physical principles that are based on discoveries made in physics and astronomy over hundreds of years. Astronomers use the data to understand the basis for the observations. These are what we call empirical results. Those who do not use observations but rather come up with a theory based on the foundations of physics already available, essentially build on that foundation by forming new relations. The relations may be empirically based or originate from a sequence of logical steps that allow us to model our physical world. Such models and frameworks for our observations are considered compelling evidence.

What has been described here is an application of the scientific method, which requires us to come up with a hypothesis of how we understand objects in our physical reality to operate. What follows is the experimental phase in which the hypothesis is tested using the experiment to obtain a set of results. From these results, evidence is

gleaned of how an object or set of objects interact with one another or evolve with time.

Observations and theory are constantly interlinked, which means that they support each other. Without the theory, we would not be able to fully understand our observations, and without any observations to test our theory against, we would not be able to make sense of what we observe. Essentially, theory and observations are the two types of scientific evidence that are considered compelling in astrophysics. The manner through which such evidence becomes compelling is through peer review. Scientific peers validate how compelling or valid the evidence put forward by a scientist or group of scientists is. Without acceptance through peer review, evidence is not considered worthy of assimilation into our body of knowledge of how the universe works.

Pawas Bisht (P.B.): In environmental communication, particular forms of evidence are mobilised in media storytelling around environmental harm. Marginalised communities that suffer environmental harm and activists (and social movements that work with them) are able to articulate claims around harm and enter conversations around justice. Air pollution is a year-round environmental crisis on the Indian subcontinent, in particular, in the capital city of Delhi.² The city has an annual average of $PM_{2.5}$ levels of around $100 \mu g/m^3$ (micrograms per cubic metre). $PM_{2.5}$ is particulate matter that is smaller than 2.5 microns in diameter.³ These are fine particles that can enter the bloodstream and cause a wide range of severe health problems, and they are in the air. The World Health Organization (WHO) specifies a limit of $5 \mu g/m^3$ as an acceptable level for this kind of particulate pollution.⁴ Delhi averages nearly 20 times this figure all year round – it is a huge public health crisis. In terms of media storytelling, however, the problem only assumes a position of credibility in the winter months, when the pollution is visible as a heavy blanket of toxic smog enveloping the city. This idea of visibility is necessary to create a compelling public narrative and becomes crucial in relation to media storytelling.

Another key type of evidence in media storytelling around environmental harm is numerical data, particularly categorisations of levels of pollution and poor air quality. Our analysis demonstrates that there is a focus on numerical categorisations with media coverage tracking movements up and down the scale. This decontextualises environmental contamination and normalises certain levels of environmental harm. The media reporting happens only when the air moves into the very top two categories of contamination, which are 'very poor' and 'severe'. At this point, contamination levels are more than 40 times the WHO-specified limit. Prior to that level of catastrophic environmental harm, all the previous categories did not enter media consciousness at all. This highlights the problematic nature of which evidence forms the basis of media attention.

Leslie Swartz (L.S.): In psychology and disability studies, there is much contestation about the question of evidence itself. A fundamental question is to do with who knows what about whom, who is allowed to know what about whom, and how much people are allowed to know about themselves. There is a long, contested and ongoing history about this. In South Africa, the first census that tried to capture demographic information about disability took place 30 years ago: "We Also Count."⁵ From the position of people with disabilities, they are often counted out or discounted, yet also demand to count and to account. Relating the evidence question to disability studies, there has been very little action because of the fight about what actually constitutes evidence. From outside views, which tend to be very medicalised historically, to the centring of insider views and insider accounts, the place we give in disability studies to subjectivity, and how we take account of it, is an ongoing and central question.

The big movement in establishing what came to be known as the British social model of disability was based on a slogan now known far beyond disability studies: "Nothing about us without us."⁶ There is the argument that knowledge is not possible, and action on knowledge is not possible, without the input at all levels from people who are affected and controlled by that knowledge in various ways.

When evidence is powerful

M.I. and A.F.: As the observations shared in the previous section highlight, different scientific disciplines find and construct evidence in different

ways, with some prioritising objectivity and quantitative rigour, and others privileging subjective lived experiences. Evidence is central to the scientific project in terms of how it is deployed into analysis, findings and, often, policy and law. We asked our collaborators to reflect on the ways in which evidence enters into formations of power and can be deployed in specific ways to produce specific outcomes, which are, of course, different in each domain of science. Because there are also power dynamics that shape how evidence is gathered (what counts as evidence and how), there are also power dynamics that shape how evidence is used. Existing power structures can shape not only what evidence counts, but how it is made to count. Although certain traditions of scientific enquiry demand rigorous and objective evidence bases, we invited our collaborators to consider how the subjective and political also, inevitably, creep into scientific praxis, and how the uses of evidence cannot always be seen as neutral.

M.K.: In international law, court judgments are top-down in that they issue a verdict, but, like truth commissions, they rely on evidence provided by witnesses and survivors. There are different types of evidence that at different stages and processes can be considered compelling enough to issue verdicts. Investigations of mass graves stand out, as these have been found to produce a reliable set of evidence. This evidence has come before the courts, particularly in relation to the Srebrenica genocide that happened in the 1990s in Bosnia. Indeed, both Radovan Karadžić⁷ and Ratko Mladić⁸ were found guilty of genocide. In both cases, there were investigations on the ground in Bosnia, which produced evidence considered legitimate and authoritative and which remains largely uncontested. In the case of mass grave investigations in Bosnia, the point was to corroborate victim and witness accounts of the actual massacres through physical evidence and determine an accurate count of who the victims were, in terms of sex, age, cause and time of death, ethnicity, etc.

What was so striking in the Karadžić and Mladić cases is that the Chambers really did say, "this is beyond reasonable doubt"⁹; the evidence met the threshold of proving genocide. Patterns and systematicity were shown through those investigations. The bar is high in proving genocide, because you also have to prove the intent to commit genocide, which can be inferred from the evidence. It is an important example of how a plethora of evidence has come before a court and resulted in this verdict that meets the "beyond reasonable doubt" threshold. And yet, even though this forensic evidence and other evidence was tested in court, rigorously taken apart, peer reviewed, and, as far as we know, collected in an impartial manner, the independence and credibility are still contested by supporters of the accused. There are voices that reject those findings as unpersuasive or unacceptable, despite the fact that there is physical evidence to prove the contrary, which continues to shape narratives, politics and historical accounts.

Forensic investigations also have another purpose; not just to produce information and evidence for the courts, but also to ultimately speak for the victims and assist in processes to return human remains. So, even though the historical accounts might be contested, the ultimate benefit to the survivors still can accrue by virtue of the human remains being returned, and in that sense, there is that element of persuasiveness for the individuals to whom it matters.

S.K.: Within the domain of astrophysics, there are plenty of examples and ways in which compelling evidence and evidence in general has been used as an instrument of power. There is a competitiveness within the landscape of academia, and within physics and astrophysics in particular. Such competitiveness is generally associated with the push to publish the most compelling and noteworthy scientific results possible.

For those who wish to position themselves high up within the hierarchy of academia, scientific results obtained from the observational and theoretical sides can be used to elevate their status within the field. They can do so by publishing widely, being highly cited in journals, and using that compelling evidence to apply for funding for prestigious grants and gain accolades because of their noteworthy findings.

For those who are capable of doing harm, this level of prestige can be used as a way of wielding power over others who are lower down within academic hierarchies, such as master's and doctoral students, postdoctoral researchers, and early-career scientists who have not yet

obtained the level of experience that would put them in a position to garner the prestige that comes from publishing compelling and noteworthy results.

Actual examples of such wielding of power by so-called prestigious scientists have come about through the silencing of abuse victims within the field—those who have been harmed through verbal and sexual assault, and those who have also been harmed financially by the employment structure. Such individuals, for instance, may have experienced a lack of access to funding and permanent jobs, or been pushed out of the field entirely. The case of Geoffrey Marcy is a well-known example of a highly accomplished scientist who wielded his position to proposition, solicit, and harass women for many years before he was placed on trial, and excommunicated from the astronomy community.¹⁰

Other harmful behaviours in astrophysics include the tendency to scoop or steal noteworthy research results from those who do not possess a high enough position within the academic hierarchy. This is common with students, and the most famous example of this is Dame Jocelyn Bell Burnell, who discovered pulsars through an instrument and experimental setup that she herself built.¹¹ This find was scooped by her PhD supervisors who went on to win the Nobel Prize for the discovery of these astrophysical objects. This is a famous example of how individuals can use their level within the academic hierarchy to essentially silence and steal scientific results and push themselves even higher up within the academic structure. It is a vicious cycle that perpetuates inequality. These are the ways in which neutral or objective scientific evidence can be captured and used as an instrument of power and self-advancement, at the cost of others, within the framework of astrophysics.

P.B.: In the context of representing environmental harm, the choice of evidence and its framing in media storytelling become clear instruments of inclusion and exclusion. What is seen in the actual experience of environmental harm, from an issue such as air pollution, is that there are inequalities in the capacities of populations to mitigate that harm. A small section of the population can remove themselves into private atmospheres of sanitised air, using air purifiers or limiting their exposure to polluted air, but most of the urban workforce and poorer communities are at the forefront of exposure and harm. In media storytelling that is driven by numerical, abstract categorisations of harm or contamination, there is little space for sharing these experiences of vulnerability.

Relatedly, data tend to be framed in line with the interest of government stakeholders and unhelpfully reproduce party political conflicts. For instance, what is seen in the storytelling and data presentation around air pollution is its categorisation as 'local' (from urban sources within the city) and 'non-local' (pollution from largely rural, non-metropolitan sources outside the city's administrative boundaries). This oppositional framing tends to pit the suffering of the urban citizen subjects against backward, polluting, rural 'others', reinforcing party political frames where blame and responsibility are shifted onto political actors across administrative boundaries. Scientifically, and from a policy perspective, this kind of oppositional categorisation is deeply unproductive. Air pollution needs to be understood and managed through a transboundary 'airshed' approach which requires cooperation and coordination between different local, regional and federal administrations and agencies.¹²

Some people 'don't matter' as citizen subjects in media narratives, for example, agricultural workers, and farmers who reside in Delhi's neighbouring Indian states of Punjab and Haryana. These farmers are forced to burn some of their agricultural residue for a complex set of reasons, including that agricultural policies are failing them. This agricultural residue burning contributes a small percentage of pollution in the winter months, but there is an inordinate focus on it in media storytelling.^{13,14} Political and media actors underplay systemic large-scale urban sources of pollution such as transport, construction and industry and instead blame rural others.

Linked to this is a politics of visibility around technological interventions from the state, such as smoke towers and water cannons. These, scientifically, have little credibility in terms of mitigating harm or solving air pollution¹⁵, but they function effectively as symbols of a technological modernity and are picked up by the media. There is a confluence of

interests between media storytellers and state policy actors that excludes voices of vulnerable urban poor and rural 'others'. The voices of excluded actors need to be foregrounded for a new set of transformative media narratives to emerge. A new, more inclusive set of air pollution narratives, on our project website², is addressing these challenges.

L.S.: If you are unfortunate enough to be involved in an accident, insurance companies (if you have insurance) will make some sort of assessment of how much you should be paid out in compensation. One of the methods that is used by insurance companies is a map of the body showing payouts for injuries. So, if, for example, you lose one finger, it is X amount. If you lose two fingers, it is 2X. Part of what we talk about in disability, in terms of the use of power, is how these methods of counting, which look very objective, and in some ways are, have very profound social and economic implications for people. Part of the history of how disability has been thought about, is linked to technologies of counting and ideas about the objectivity of science. We know that, historically, ideas about what the 'ideal' body should look like, what a diseased body is, and what an 'unacceptable' body is, have had profound implications for people's lives.

Under Nazism, the people who were killed before Jewish people and other groups were in the so-called T4 group. These were people who were seen as having bodies that were not useful to the economy. The term that was used in Nazi ideology was "useless feeders"¹⁶. So, there is a link between a particular kind of body, and whether it is seen as useful to society in general, that links to other histories of counting. For example, the concept of mental age that comes from psychology, which remains influential, serves in a whole range of ways to determine who is allowed to be in certain spaces, whether a person should be institutionalised, and so on. 'Mental age' uses a form of counting which appears objective and scientific, and is in some ways, but also links to a whole range of subjective ideas about evolution and Social Darwinism—the relationship between people and animals, and who deserves to be called a human.

Within the context of colonialism, one theorist has noted, colonialism in an objective sense is disabling, and extractive economies produce disabilities.¹⁷ In South Africa, in agriculture and mining, impairments have been created through a particular way of forcing human beings to interact with nature through difficult and dangerous work. As well as this, there is also an ideological way in which disability operates through capitalist labour practices. For example, if you think about the gaze of Westerners onto so-called 'non-Western people', we can see that they were labelled as disabled by their lack of conformity to a particular, biased, body ideal. But, if those people were to conform to the dominant colonial ideal, then they might have become alienated from their own cultures, and become constructed as disabled in another way.

This politics of counting, which is one way to describe how evidence is manipulated by oppressive regimes of power, is a way of excluding not only disability but disabilities implicated in a whole range of broader exclusions, including racial and colonial exclusion.

Can evidence liberate?

M.I. and A.F.: As illuminated by the reflections on the ways in which evidence can be absorbed into structures of power in ways that can be oppressive, alienating or marginalising, evidence cannot be treated as neutral or objective, even when it purportedly is. Of course, the personal experiences and interpretations of lone scientists cannot be taken as representations of entire fields and their relations to evidence, but they do offer some insight into the multiple ways in which data and evidence can be harnessed by those who already hold political or social power, whether it is the judges of international courts or senior scientists building individual spheres of influence. Even though evidence can sometimes be used in oppressive ways, as some of the reflections offered so far have hinted, it can also play a strong role in rewriting oppressive systems and creating space for progressive politics. The third theme explored in this Structured Conversation turned to the question of whether, and how, evidence can contribute to strategies and practices of empowerment, especially for people and communities who are excluded by existing hierarchies of knowledge, policy and representation.

M.K.: An arrest warrant was issued by the International Criminal Court on 15 August 2017, which was based largely on evidence collected from social media. The warrant was issued against Mahmoud Mustafa Busayf al-Werfalli in the context of the Libyan conflict.¹⁸ He allegedly ordered or committed 33 murders in the Benghazi region. Proceedings have since been terminated, because Mr Al-Werfalli has died, or so social media reports say. This is significant because the arrest warrant initially was based on seven separate incidents that were captured on videos that appeared on social media. Courts are renowned for not necessarily embracing innovation, but this case is an example of a new willingness to take social media posts as sufficient evidence.

A wealth of information collected, documented and archived from digital evidence and on-the-ground evidence has since been repeated in numerous contexts. Of course, there is a flip side to the use of social media as evidence: it can also be used as propaganda or misinterpreted. That is something that needs grappling with: the verification of bottom-up evidence, and how to make sense of it.

The important questions are not, “What’s bottom up? What’s bottom down?”, but rather, “How can the two meet?” In the social sciences and humanities, researchers are privileged because they can do research collaboratively, so the rules of engagement start to matter. Who is invited to the table? Who is allowed to speak? Who is being privileged at any given point in time when we are trying to get to the substance of a subject? These are critical considerations that both scientists and legal scholars can shape.

S.K.: Some physicists have begun to borrow from the social sciences, as far as compiling evidence to counter malpractice within academia. It would benefit scientists to look to social science to enable an effective understanding of systemic and structural inequalities that exist within the sciences. Methods such as case studies, interviews and compiling statistics can offer a sense of the social, interpersonal and professional experiences that scientists have. Such data could allow for the extrapolation of systemic issues encountered by scientists within their field, and how their advancement can be dependent on their identity, whether they are disabled or not. Such insights can shed light on what is considered the norm in their field.

Astrophysics has historically been white men dominant. In the USA, less than 0.5% of physics PhDs were awarded to black individuals between 2018 and 2019.¹⁹ The white men who have been able to achieve a level of status in the field come from privileged backgrounds, because financial privilege contributes to success within academia due to how the system is structured. Up until the time that a person can achieve a permanent position, they need to go through a series of short-term contracts and postdoctoral positions. They must, over the course of two or three years, produce compelling evidence, have it peer reviewed and published, and then use that evidence as motivation to find their next postdoctoral contract. All of this may continue indefinitely until one finds a permanent position, which are few and far between. Therefore, there is a sense of great instability that one experiences in their early career as an astrophysicist. Social science can help to explain the roadblocks and challenges facing academics in their early careers in astrophysics, and to tackle the systemic issues that inhibit young scientists, specifically those who are not the dominant identity in the field, from achieving a level of status.

In astrophysics, there is a sense of prestige that is ascribed to the field itself, as an academic practice that exists at a higher level above other forms of knowledge. It is possible that some astrophysicists do not trust social science methods to help them understand the systemic issues that result from discrimination, inequity, and how structural obstacles prevent astrophysics from becoming a field full of diverse individuals. Developing a sense of trust in the social sciences and humanities might be a way of tackling this challenge.

P.B.: In media coverage around environmental harm, the problem lies in storytelling that is decontextualised, and does not leave any room for differentiated senses of responsibility and vulnerabilities. For empowerment to come from the bottom up, it is necessary to develop an ethics of storytelling that foregrounds marginalised and silenced perspectives, speaks to a differentiated sense of harm, and clearly attributes responsibility

for the minimisation of harm. Storytelling should foreground lived experiences of other ways of being that are already providing pathways for solutions. New environmental storytellers should be empowered, and new spaces for storytelling should be expanded.

Good examples of this are the documentary films produced by the ‘Pollution Stories’ project.² The film *Delhi, 2.5* looks at the experiences of younger residents of the city. It focuses on two young people in the city: one from a more affluent, middle-class background, and one from a poorer, out-of-city, industrial area. The narrative demonstrates that while there are shared experiences of harm that these two young people suffer, there are vast differences in the ability of these young people and their families to mitigate that environmental harm.

Another film from the project, *More Than Smoke: Stubble, the Farmer’s Dilemma* focuses on agricultural crop burning, and the storytelling perspective is deliberately shifted away from the middle-class, urban point of view to that of the farmers. What is uncovered is a more complex narrative of a food system on the point of breakdown, showing linkages between climate change, food production and air pollution. The mitigation and solution of these problems requires systemic, complex thinking and a shifting of perspectives to allow complex storytelling. In telling the story from the perspective of the farmers, their awareness of these issues is highlighted, as well as their ways of working with nature, which are largely left out from the more dominant media storytelling.

The film *City Moves* focuses on mobility justice within the city. Desirable urban space is often defined by a narrow, middle-class outlook of a certain kind of green aesthetic. The film disrupts this outlook by bringing in the perspectives of a Muslim housewife from a working-class background and a carpenter who uses a bicycle to go to work in the city of Delhi. The city is shown through their eyes, and the difficulty that they have in navigating the city in a non-motorised way is highlighted. This dislodges some of the very embedded green aesthetics and the middle-class politics of visibility that is in play around the air pollution narrative, and, more broadly, the imagination of what a sustainable city looks like.

In summary, data and evidence are a very crucial part of environmental storytelling in the media, but they need to go hand in hand with an ethics of storytelling which brings in the experiences and perspectives of marginalised populations, who are often the majority and more vulnerable members of the community. It is crucial to demand this of the new generation of storytellers. But of course, structural and systemic hindrances still need to be overcome. We need to create more resources and space for new, transformative, evidence-driven narratives. There needs to be greater infrastructural support, training and capacity building for this kind of storytelling.

L.S.: An important contribution of contemporary theory about disability is the idea that disability is a relational construct.²⁰ Disability is not something that you have inside you but rather something that emerges from your relationship with an environment. The classic example is that if someone in a wheelchair looks for a job in a building where there are staircases and no ramps and lifts, the disability is located somewhere in the relationship between them and the environment. Mobility is a key part of how we are rethinking disabilities – who can go where and on what basis? It is not a question of impairment to the body.

A second contribution of a disability theory that is very important, is understanding the distinction between disability as an identity and how disability affects what you can and can’t do. If you look at the history of censuses, they used to ask questions like, “Are you deaf, blind, or crippled?” Because of that line of questioning, we thought that there were quite low rates of disability.

The Washington Group on Disability Statistics (which was formed as a United Nations Statistical Commission City Group) has refashioned how we ask questions about disability²¹, with questions like “Do you have difficulty doing this?” or “Do you have a lot or little?” in various domains. As a result of this new way of collecting evidence, the global rates of disability have gone up, not because people have changed, but because researchers are asking questions in different ways. That is important in terms of including people and providing the resources that people need to be able to participate on an equal basis to others within society.

Disability brings a new perspective to how we think about the environment, both physical and online, which is the concept of universal design. If we change the environment in such a way that it is good for people with impairments, it is usually good for other people as well. For example, if you have lifts or ramps, you are designing a city with kerb cuts and so on; it is good for people who use wheelchairs, but it is also good for people with young children. This example reminds us how environments themselves can be disabling.

Sharing perspectives on evidence: Concluding thoughts

M.I. and A.F.: The conversation so far has offered several perspectives on what evidence looks like, how it can be deployed by those in power, and how it might also contribute to emancipatory projects. All these perspectives are rooted in the specific disciplinary traditions and theoretical frameworks shaping the knowledge projects held by each of our participants. Although limited to the stances of our four co-authors, this Structured Conversation represents a multidisciplinary conversation, and we are struck by how this has in turn created an opportunity for each researcher to listen to the disciplinary perspectives of the others. This offers a possibility to reflect on what it means to consider evidence bases from disciplines outside of those in which we were trained, and also to think more openly about what the role of listening could and should be in relation to the democratisation of knowledge. How can researchers from a variety of disciplinary positions orient themselves towards ideas of listening when building evidence bases?

M.K.: Most people do not have enough capacity to listen and cognitively compute the wealth of evidence and information we receive. A way to get around that, as a researcher, is to have a brilliant team. But that means you need the money to pay for that team. So, we are back to the discussion of how to get a grant or a post? How do you bring talented people in? How do you have a diverse team so that you are exposed to all these things that you ought to listen to?

S.K.: Imagining a more democratised structure within a hierarchy of physics and astrophysics almost seems fantastical, but it helps to try and imagine what this would look like. What comes to mind is those who enter astrophysics and are positioned immediately as the so-called 'ontological others' (those who are neurodiverse, those who have so-called 'hidden disabilities', those who are from cultural backgrounds that are not commonly represented within astrophysics, those who are first-generation graduates; those from low-income backgrounds, etc.) and if there is a way in which these individuals can find support from the structure, can be provided with an environment where they are listened to, where their concerns, as far as discrimination or a lack of access to the funding that they need to thrive within the field, are heard. All of these challenges that ontological others face within the field should be taken seriously by those who already operate within the existing power structures.

As a result, we would be able to move towards a more democratised academic hierarchy. As long as those who are in power seek only to hold on to their power and use it to wield authority over the scientists who are developing their careers, this disadvantageous structure will not change, and academia will remain a broken system that privileges only a few. Democratisation requires a complete restructuring of the entire academic system, and all hands on deck are required for such a process.

P.B.: Transdisciplinarity is key to overcoming some of these hierarchies of knowledge and the siloed thinking that often stifles solutions to the problems. In environmental communication, we can develop ways of working together that disrupt hierarchies of knowledge and create multilayered storytelling. Methods based on listening and collaborative narrative are pathways for creating a more equal space of understandings. Where can we create those spaces? Where is the funding, money and policy support for creating those spaces?

L.S.: A key question for disability studies is always the question of accessibility: who has access to what and on what basis? These are technical but also attitudinal questions. What disability research brings to transdisciplinarity is a more general question: who is allowed to be

here in this conversation? Who is thought to have knowledge? If we get disability right, it helps us to think about other ways of exclusion, so one could argue we should always start there.

One of the things that is not talked about much is the prejudices of people from certain scientific disciplines about other scientific disciplines. This is also misinformation, and comes from the way that the academy is organised. People from different fields are organised to be strangers to one another and are incentivised to disrespect other disciplines. We should think about how we can resist our own socialisation and reproduction of interdisciplinary competition and prejudice.

M.I. and A.F.: This Structured Conversation has explored some perspectives on what evidence is from the macro to the micro, from the perspectives of four researchers based in four disciplines. The discussion has revealed how evidence is contested, multifaceted, layered and indeed variable. This requires us to continue expanding ways of listening across disciplinary boundaries and sharing perspectives on the data that we are gathering, the status that it has in our disciplines, as well as the status that it may take on in other disciplines. Questions of visibility and listening will remain key in terms of thinking about how evidence can be deployed in emancipatory and progressive ways.

Declarations

We have no competing interests to declare. We have no AI or LLM use to declare. All authors read and approved the final manuscript. L.S., as Editor-in-Chief, was screened from the assessment of this paper.

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