ETHNOBIOLOGY AND CONSERVATION

HYPOTHESIS

Ethnobiology and Conservation, 14:38 (3 November 2025)
doi:10.15451/ec2025-11-14-38-1-19
ISSN 2238-4782 ethnobioconservation.com

Epistemic bubbles and echo chambers in the progress of science

Ulysses Paulino Albuquerque

ABSTRACT

Does epistemic diversity necessarily promote scientific progress, or does this idea persist more as a normative principle than as an empirical finding? In this hypothesis-essay, I argue that scientific pluralism does not automatically entail epistemic fluidity. Distinct scientific communities may share publication venues and rhetorical commitments while remaining epistemically insulated. Building on recent debates about epistemic bubbles and echo chambers, I suggest that even within science, traditionally conceived as a self-correcting enterprise, mechanisms of selective exposure and institutional filtering can restrict genuine epistemic permeability. Frequently presented as an inherently diverse discipline, ethnobiology offers a revealing context for exploring whether declared plurality translates into dialogical openness or stabilizes into parallelism. The argument does not treat ethnobiology as a confirmed case, but as a field in which this hypothesis of pluralism without fluidity can be examined. I invite a reconsideration of how epistemic contact, reflexivity, and institutional design shape the moral and cognitive architecture of scientific progress.

Keywords: Cognitive barriers; Critical epistemology; Epistemic resistance; Institutional constraints; Knowledge production; Scientific community.

1 Laboratório de Ecologia e Evolução de Sistemas Socioecológicos, Centro de Biociências, Universidade Federal de Pernambuco, Brazil.

* Corresponding author ✉. E-mail address: UPA (upa677@hotmail.com)

RESUMO

A diversidade epistêmica promove necessariamente o avanço científico, ou essa ideia persiste mais como princípio normativo do que como constatação empírica? Neste ensaio, proponho a hipótese de que o pluralismo científico não implica, por si só, fluidez epistêmica. Comunidades científicas distintas podem compartilhar espaços de publicação e compromissos retóricos, mantendo-se, contudo, epistemicamente isoladas. Com base em debates recentes sobre bolhas epistêmicas e câmaras de eco, sustento que, mesmo na ciência, tradicionalmente concebida como empreendimento autocorretivo, mecanismos de exposição seletiva e filtragem institucional podem restringir a permeabilidade entre perspectivas. Frequentemente apresentada como uma disciplina intrinsecamente diversa, a etnobiologia oferece um contexto para investigar se a pluralidade declarada se traduz em abertura dialógica ou se estabiliza como paralelismo. A argumentação trata a etnobiologia não como um caso comprovado, mas como um campo no qual essa hipótese de pluralismo sem fluidez pode ser examinada. Eu convido a reconsiderar como o contato epistêmico, a reflexividade e o desenho institucional moldam a arquitetura moral e cognitiva do progresso científico.

Palavras-Chave: Barreiras cognitivas; Comunidade científica; Epistemologia crítica; Resistência epistêmica; Restrições institucionais; Produção de conhecimento.

SIGNIFICANCE STATEMENT

Pluralism is often presumed to guarantee openness in science, yet the article demonstrates that diversity of perspectives can coexist with deep epistemic isolation. Ethnobiology serves as a case study to argue that scientific communities may function as epistemic bubbles even when interdisciplinarity is explicitly celebrated. The argument challenges dominant assumptions about collaboration in complex research environments. A framework is proposed in which epistemic contact is actively engineered through mediated structures of reciprocity.

INTRODUCTION

I investigate how epistemic dynamics shape scientific practice, paying particular attention to the tension between resistance and fluidity in the development of knowledge. Also, I introduce the concept of fluidity as a framework for understanding scientific progress, building on Nguyen's (2020) canonical concept of epistemic bubbles. Fluidity describes a process of expansion and interconnection among scientific communities, in which different approaches, theories, and fields converge, creating bridges for dialogue and exchange that generate new ideas and practices.

I broaden the debate by considering science not only as a self-regulated system of knowledge production but also as a field of moral dispute (Blancke 2022), in which ethical values and political interests intertwine to shape the progress of knowledge. The analogy with social network algorithms (see Güngör 2023; Turner 2023) illustrates how science, like digital environments, can establish filters limiting the diversity of perspectives. If, in online environments, algorithms prioritize content that reinforces preexisting beliefs, in science, institutional mechanisms, for example, can privilege certain theoretical and methodological traditions, restrict the circulation of alternative ideas, and reinforce established paradigms (see Turner 2023).

A growing body of empirical research has highlighted how algorithmic personalization on digital platforms contributes to the fragmentation of knowledge and the deepening of polarization (Bakshy et al. 2015; Cinelli et al. 2021; Oliveira and Albuquerque 2021; Arruda et al. 2021; Sun et al. 2022; Al-Omoush et al. 2023). Such technologies tend to generate self-reinforcing loops in which users are repeatedly exposed to familiar perspectives while opposing views are systematically excluded. Just as online algorithms foster ideological insularity, various institutional, social, and cognitive processes in epistemic communities can suppress the introduction of novel viewpoints.

The central question raised is whether and how science can overcome these barriers without compromising its methodological and epistemic integrity. The concept of fluidity is introduced as a disruptive force that fosters interconnection between different epistemic communities, facilitating the circulation of perspectives and the emergence of new theoretical syntheses. However, fluidity does not occur spontaneously. It is shaped by institutional, political, and cognitive factors that influence how knowledge is produced and shared. To avoid treating epistemic bubbles as merely digital or hypothetical structures, I will discuss how similar mechanisms also operate within academic fields themselves. Ethnobiology serves as a heuristic hypothesis of declared pluralism without epistemic permeability.

Because the notions of bubble, echo chamber, and fluidity, along with other concepts mobilized throughout this essay, are analytical tools, Box 1 defines these terms as they are specifically applied in this discussion.

Box 1. Glossary of key terms used in this essay.

Algorithmic Filtering: A process in which computational systems prioritize certain information over others based on previous user behavior, thus reinforcing familiarity and reducing exposure to novel or conflicting perspectives. In the context of science, the term serves as a metaphor for institutional mechanisms that privilege dominant theories or methodologies through citation patterns, funding criteria, or publication norms.

Confirmation Bias: A cognitive tendency in which individuals preferentially seek, favor, or recall information that aligns with their preexisting beliefs while overlooking or discounting contradictory evidence. Within scientific communities, this bias may reinforce established paradigms by making dissenting perspectives appear less credible, regardless of their empirical validity.

Echo Chamber: An epistemic environment in which external sources are not simply ignored but actively discredited, creating a closed loop of self-validation. Members of an echo chamber distrust alternative perspectives, often preemptively dismissing them as biased or illegitimate, thereby reinforcing group cohesion at the expense of epistemic openness.

Epistemic Bubble: A structure in which members are not exposed to alternative perspectives, not due to explicit rejection but due to informational omission. Unlike echo chambers, bubbles operate through passive exclusion rather than active discrediting, creating environments where individuals may believe they are well-informed despite limited access to dissenting views.

Epistemic Community: A group of individuals who share a common set of epistemic commitments - including standards of evidence, methodological assumptions, interpretive frameworks, and criteria of justification - which enables coordinated practice and mutual intelligibility. Epistemic communities are not inherently exclusionary. They are necessary structures for sustaining coherence and cumulative inquiry within a field. An epistemic community becomes an epistemic bubble only when its internal coherence turns into insulation, preventing contact with external perspectives.

Epistemic Expansion: A process through which separate knowledge communities begin to interact and exchange insights in ways that generate new conceptual or methodological syntheses. Unlike abrupt paradigm shifts, epistemic expansion suggests gradual growth through contact zones between once-isolated frameworks.

Epistemic Fluidity: A proposed dynamic in which scientific communities become increasingly permeable, allowing ideas, theories, or methods to cross institutional, cognitive, or ideological boundaries. Fluidity contrasts with mere plurality by implying movement and transformation rather than passive coexistence.

Epistemic Goods: Values traditionally associated with responsible inquiry, such as truth, justification, accuracy, and intellectual honesty. The term is used to highlight that genuine commitment to epistemic goods may involve personal or institutional cost, especially when revising one's beliefs requires confronting entrenched norms.

Epistemic Permeability: The degree to which a scientific community is open to external ideas, critiques, or alternative methods. High epistemic permeability allows for mutual influence between research programs, whereas low permeability results in intellectual stagnation or insulated factions.

Epistemic Relativism: The position that no single epistemic framework holds privileged access to truth because standards of justification are always context dependent. The term is invoked to signal a risk of excessive pluralism, in which the diversity of perspectives devolves into an inability to evaluate knowledge claims.

Knowledge Regime: A structured system of norms, institutions, and credibility mechanisms that determine which forms of knowledge are recognized as legitimate within a given community. A knowledge regime encompasses not only methodological standards but also power relations, interpretative authorities, and implicit hierarchies of value. While sometimes overlapping with the notion of epistemic communities, a knowledge regime refers to the structural and normative framework within which such communities operate, rather than the communities themselves.

Informational Isolation: A condition in which individuals or communities have restricted access to diverse perspectives due to structural, social, or cognitive barriers. In science, informational isolation may occur through linguistic segmentation, disciplinary specialization, or selective publication practices.

Institutional Filtering: The process by which academic structures such as funding agencies, peer review systems, or editorial policies prioritize certain forms of knowledge over others. While not inherently malicious, these filters may reinforce homogeneity by discouraging unconventional or interdisciplinary work.

Parallelism (Epistemic): A condition in which multiple theoretical or methodological approaches coexist within the same field but operate in isolation rather than interaction. Parallelism differs from pluralism in that it lacks productive encounter; communities remain side by side without epistemic exchange.

Paradigmatic Stability: The persistence of a dominant conceptual framework over time, maintained not only through empirical success but also through structural mechanisms such as education, publication, and resource allocation.

Scientific Pluralism: The view that no single theoretical framework or methodological approach is sufficient to capture the full complexity of reality. Rather than seeking unification, scientific pluralism argues that multiple, sometimes even conflicting, perspectives may be necessary and complementary.

Selective Exposure: The tendency of individuals or groups to seek information that reinforces existing beliefs while avoiding sources that challenge them. In scientific communities, selective exposure may manifest through conference attendance, citation practices, or journal preferences that reinforce intellectual comfort zones.

EPISTEMIC BUBBLES AND ECHO CHAMBERS IN SCIENCE

In everyday practice, science operates as a system with well-defined boundaries, demarcated by epistemic communities controlling access to scientific discourse and validation. Although essential for the organization and standardization of science, these communities often function as epistemic bubbles. I appropriate the concept proposed by Nguyen (2020) to understand such bubbles as spaces where certain types of information are omitted, not through active discrediting but through a failure of circulation. Such omission shapes the scientific agenda and determines which approaches and theories receive funding and institutional recognition (e.g., Martin 2016; Wu et al. 2018; López-Castellano 2024; Simon 2025). As a result, some lines of research, even promising ones, can remain marginalized for long periods, reflecting a kind of epistemic inertia comparable to algorithmic filtering on social networks. Ideas often remain confined within bubbles, struggling to cross boundaries and challenge established paradigms. For Nguyen (2020: 9):

> Epistemic bubbles can easily form accidentally. But the most plausible explanation for the particular features of echo chambers is something more malicious. Echo chambers are excellent tools to maintain, reinforce, and expand power through epistemic control. Thus, it is likely (though not necessary) that echo chambers are set up intentionally, or at least maintained, for this functionality. My account thus bears some resemblance to some work on testimonial injustice and the epistemology of ignorance, but it is importantly distinct. Miranda Fricker has argued for a kind of testimonial injustice, based on a gap between actual reliability and perceived credibility. For example, says Fricker, being white and being male are both bonuses to credibility. Since credibility is a source of power, anybody with credibility will seek to increase it, using that very credibility.

The epistemic bubbles and echo chambers in the context of science suggest that such structures are not mere accidents or system failures but rather intrinsic elements of any network of knowledge production and dissemination (see Sheeks 2023). It is easy to assume that science should be immune to these phenomena

because of its commitment to the search for truth. However, epistemic bubbles function as filters (see Arguedas et al. 2022) that delimit what can or cannot be considered valid knowledge within a given epistemic community (Figure 1). I apply the concept of knowledge regimes (Box 1) to understand how knowledge is produced, legitimized, and disseminated within scientific communities. The term, commonly used in political and economic sciences, refers to the institutional and social configurations that structure the generation and circulation of ideas. Campbell and Pedersen (2008) describe knowledge regimes as systems composed of actors, organizations, and institutions that shape how policymaking and production systems are organized and operate. Similarly, Romer (2020) draws attention to historical orders, practices, norms, hierarchies of authority, and power relations influencing the production and dissemination of knowledge.

When these bubbles become echo chambers, the problem intensifies (see Sîrbu and Giannotti 2019; Matviyenko and Kirtz 2023). We are no longer dealing only with the epistemic inertia that keeps specific ideas on the sidelines, but with a structure of self-validation that discredits new perspectives before they are critically examined. Echo chambers create an environment where the rejection of external information becomes almost instinctive. The issue goes beyond the lack of space for divergent ideas and involves active strategies of delegitimization. Such mechanisms reinforce the authority of those who already possess credibility within the system, thereby creating barriers to the advancement of knowledge. The findings of Sun et al. (2025) on the formation and evolution of echo chambers in social networks support the thesis that exclusionary epistemic structures also operate within science. Their study shows that digital echo chambers emerge through mechanisms of homophily and selective exposure, in which users with similar views cluster into tightly connected networks where divergent perspectives are gradually filtered out, ignored, or actively delegitimized.

Also, empirical evidence from digital environments further illustrates how epistemic isolation can emerge and persist even in highly networked systems. Drawing on cultural evolution theory, we examined the spread of fake news about COVID-19 on Twitter/X (Oliveira and Albuquerque 2021). Our findings revealed that maladaptive cultural traits, such as health-related misinformation, can be adopted and disseminated with the same intensity as accurate information. Algorithmic filtering, cognitive biases, and the confinement of users within homogeneous communities facilitate the diffusion of maladaptive traits. These dynamics closely mirror the formation of epistemic bubbles within scientific communities. In culturally unstable contexts, such as pandemics, limited intergroup connectivity and the lack of epistemically diverse exchanges contribute to the persistence of dysfunctional beliefs (see also Tomasi et al. 2024). Thus, networks do not ensure epistemic fluidity even in highly connected information systems. On the contrary, it may entrench self-validating discourse zones, a challenge that resonates deeply with contemporary scientific environments.

These digital networks remain stable over time, even after reorganization, indicating that patterns of epistemic exclusion exhibit high resilience (Sun et al. 2025). The fractal notion of self-similarity, in which a structure reproduces the same pattern at multiple scales, as described by Sun et al. (2025), serves as a helpful metaphor for understanding how resistance mechanisms operate in science. Knowledge networks tend to grow by reiterating the same forms of validation and exclusion, reproducing their structure at every new layer of expansion unless interrupted by internal or external forces.

Epistemic communities set norms defining what counts as valid knowledge, which methods are legitimate, and who holds epistemic authority (see Nguyen 2020). As authors such as Wu et al. (2018) and López-Castellano (2024) have shown, institutional logic can obstruct the incorporation of dissenting perspectives and reinforce dominant paradigms, even when theoretical innovation is needed. The analogy with digital networks is not merely illustrative—it is structurally revealing. Just as algorithms privilege content aligned with prior beliefs, systems of funding, evaluation, and publication in science operate as filters that restrict the circulation of alternative ideas. The circulation of scientific knowledge is not a neutral or exclusively epistemic endeavor; selective, politically mediated dynamics shape it, as van Eck et al. (2024) demonstrate in their critique of the so-called 'neutrality myth' in climate science.

The transition from epistemic bubbles to echo chambers (see Nguyen 2020; Sheeks 2023; Figure 1) marks the point at which the exclusion of novelty becomes not just a byproduct of structure but an active mechanism for maintaining epistemic dominance. The illusion of completeness typical of echo chambers reinforces the authority of hegemonic discourses and turns divergence into a threat rather than an opportunity.

Epistemic fluidity is not spontaneous. It must be catalyzed by pluralistic and inclusive practices that recognize the limits of established epistemic authority and encourage contact across diverse domains. Only a deliberate effort to promote epistemic contact can break the self-similarity of scientific echo chambers and allow genuinely transformative ideas to emerge. As already argued, such structures should not be treated as aberrations within science but as natural expressions of any information system. Managing them does not

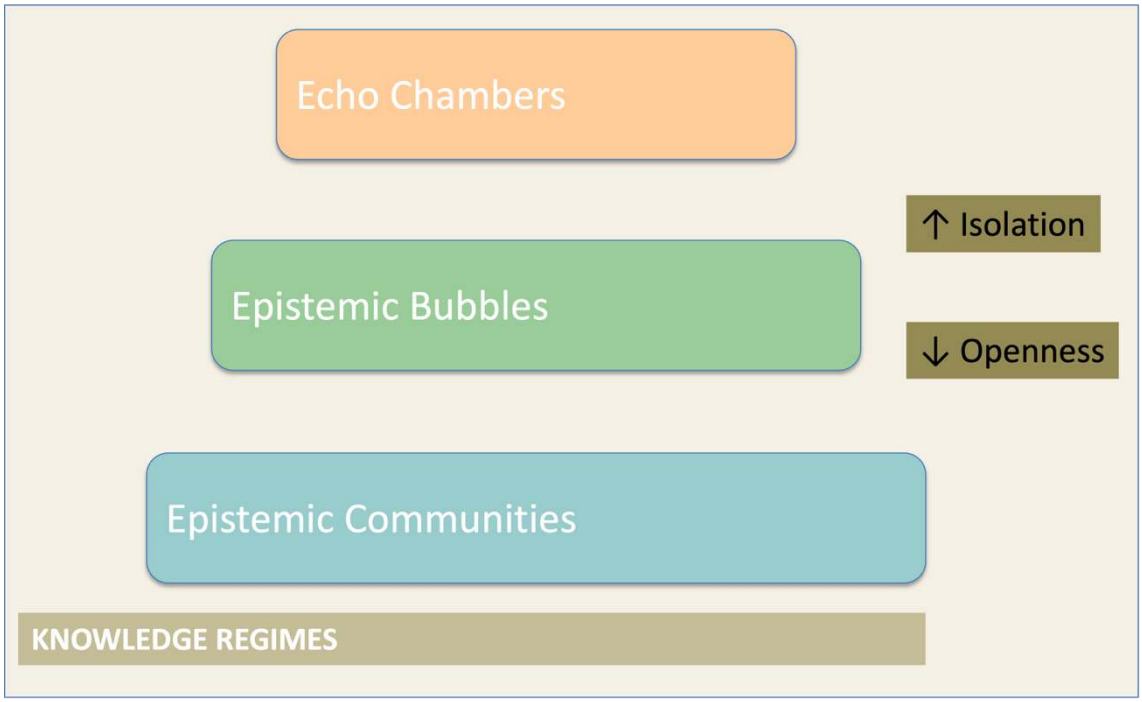

Figure 1. Structural model of epistemic permeability. Scientific groups evolve from communities to bubbles and echo chambers depending on their degree of exposure or resistance to external perspectives. Knowledge regimes serve as the overarching framework regulating upward isolation or downward openness.

amount to fixing science but to acknowledging their dynamics and seeking more balanced ways of engaging with them. Güngör (2023: 4) makes a distinction between the individuals in these chambers:

> The main difference between active and passive membership is that, unlike passive members, active members intentionally exercise epistemic vices, such as laziness, carelessness, and the ignoring of contrary evidence. This is what makes active members blame-worthy. I agree with Nguyen about the moral responsibility of passive members. Motives and reasons play a key role in ascribing moral responsibility. In the absence of intention to be part of an echo chamber, it is unfair to hold passive members accountable for their poor epistemic practices. However, I disagree with Nguyen about active membership. It is sometimes reasonable for echo chamber members to engage in bad epistemic practices when they intentionally choose to be part of them. In the rest of this paper, friendship might provide strong reasons for an epistemic agent to choose to participate in echo chambers. Therefore, the members of echo chambers might not be as blameworthy as the received view takes them to be.

Individuals who reject evidence contrary to their beliefs do not act in accordance with the idea of epistemic goods (truth, knowledge, justification, for example). However, what does it mean to seek knowledge and truth indeed? Shields (2025) challenges the traditional assumption that epistemic ideality consists solely in following the evidence and avoiding mistakes, arguing that such a definition falls short. What truly matters is a genuine commitment to epistemic goods, especially when changing one's mind comes at a personal cost. If epistemic responsibility is not a matter of polite rhetorical balance but of genuinely crossing one's own informational boundaries, then it becomes necessary to ask whether scientific communities are in fact structured to foster such crossings.

To better understand the dynamics of epistemic bubbles, echo chambers, and the possibilities of fluidity, it may be helpful to think of science as an ecosystem—not a machine or a closed system of rules, but a living, complex field composed of interactions, tensions, and transformations. In that metaphor, epistemic communities resemble distinct environments where ideas, methods, and theories develop, stabilize, and occasionally come into contact. Like all living systems, such an ecosystem is marked by patterns, unpredictability, order, and surprise.

Such a perspective aligns closely with David Hull's

evolutionary view of science. In his seminal work *Science as a Process* (1988), Hull argues that the development of science resembles biological Evolution, not in a metaphorical or superficial sense, but in its underlying dynamics. According to him, science consists of a population of conceptual and social lineages—ideas, theories, methods, and even reputations—that compete for acceptance, replication, and institutional support within epistemic communities. These communities serve as semi-autonomous environments where such lineages flourish or are filtered out.

If Hull is correct, and my model points in the same direction, the dominance or survival of a scientific idea is not entirely determined by its objective adequacy or some inherent rational superiority. Drawing on elements from cultural evolution theory, it becomes evident that specific ideas are more likely to gain acceptance or widespread dissemination not necessarily due to their intrinsic merit but because of external factors -such as their compatibility with preexisting beliefs, ease of transmission, or the prestige of those who promote them (see Wu et al. 2023). The dynamics described above can be illustrated through the following hypothetical scenario (Box 2), which exemplifies how pluralism may persist without epistemic fluidity.

Box 2. Hypothetical pluralism without epistemic fluidity.

An international conference titled Science for the Future brings together researchers from various traditions. The program is divided into two parallel sessions located in opposite wings of the venue. In the Quantitative Evidence Session, participants present statistically driven analyses grounded in experimental validation. Across the hallway, the Decolonial Knowledge Session features oral testimonies, community-based accounts, and critical reflections on epistemology and power. Each room constitutes an epistemic community with its own internal coherence, sustained by shared standards of legitimacy, specialized terminology, and mechanisms of reciprocal recognition. However, similar epistemic processes unfold symmetrically within both communities. In the quantitative session, selective exposure and confirmation bias reinforce the assumption that knowledge without measurable data lacks rigor. In the decolonial session, a parallel move occurs: numerical abstraction is preemptively interpreted as a tool of historical erasure. Both communities, still legitimate in their constitutions, begin to function as epistemic bubbles in which external perspectives are neither actively rejected nor encountered. Once distrust becomes explicit, when statistics are framed as instruments of domination and narrative accounts as irrational subjectivity, the insulation deepens, and bubbles shift into echo chambers. At this stage, disagreement is no longer treated as cognitive divergence but as moral misalignment.
Above these fragmented spaces operates an invisible knowledge regime, composed of journal rankings, citation networks, and funding criteria - that ultimately determines which forms of knowledge gain institutional authority. The conference appears to celebrate scientific pluralism, yet there is no epistemic fluidity. There are no mechanisms for crossing boundaries, establishing operational overlaps, or enabling minimal translation across distinct validation regimes. Plurality without fluidity results not in dialogue, but in disciplined parallelism.

Epistemic expansion

Fluidity is the exception, and resistance is the rule (Box 3). Active and passive resistance shape epistemic bubbles and echo chambers, reinforcing existing frameworks rather than challenging them. The prevailing state of science is characterized by norms, barriers, and practices that control the flow of ideas and act as a repressive force, stifling creativity and innovation (scientific regimes). The initial process of fluidity occurs when scientific bubbles expand their boundaries and interact. These interactions can be facilitated by interdisciplinary collaborations, technological advances, or crises that force the search for solutions outside conventional paths. Barriers begin to loosen, allowing ideas that would previously have been considered irrelevant or incompatible to be explored.

When connections between epistemic bubbles intensify, a phenomenon we can call epistemic expansion emerges. New ideas emerge not only from individual bubbles but also from their interactions. Echo chambers, unlike epistemic bubbles, are refractory to fluidity. The problem lies not only in the rejection of the new but also in the illusion of completeness that these structures generate—an environment where thought feeds on itself and any attempt to break away is treated as a threat, not an opportunity.

Recent empirical studies, although primarily focused on the resilience of echo chambers, provide valuable insights into the conditions under which epistemic fluidity may emerge. Sun et al. (2025), for instance, show that while mature echo chambers tend to exhibit structural stability, emergent echo chambers, those still forming, are located at transitional nodes between network clusters and display greater plasticity. Also, fluidity is more likely to occur during the early phases of chamber formation, before rigid polarization sets in. Moreover, Garimella et al. (2018) demonstrate that targeted interventions such as cross-cutting content recommendations can successfully bridge polarized groups, offering empirical support for the notion that echo chambers, though resilient, are not impervious to change. Fluidity does not necessarily imply the dissolution of boundaries but rather their strategic reconfiguration, enabling the circulation of perspectives across formerly disconnected communities. In a similar vein, Bakshy et al. (2015) show that even in heavily personalized environments, weak ties and residual exposure to diverse views can promote interaction beyond ideological silos.

Box 3. When critique becomes ritual: the case of evolutionary psychology

Epistemic communities do not always evolve at the same pace as the fields they critique. In many cases, they consolidate around oppositional narratives that must remain intact to preserve their own positions. When this happens, critique ceases to function as an instrument of clarification and instead becomes ritual: it is repeated not to understand the other, but to reaffirm a boundary. Gantt and Holmes (2025) illustrate this phenomenon. Their indictment of evolutionary psychology as reductive, deterministic, and corrosive of human rationality could have been published thirty years ago (e.g., McKinnon 2005) without requiring substantial revision. This is not an accidental repetition: it is the recirculation of a fossilized critique, kept alive because the enemy it combats (biologism) must continue to exist for the critical stance to remain justified. Such resistance is not grounded in contesting current data or models, but in the refusal to update the image of the adversary. Instead of epistemically productive disputes, we witness confrontations that resemble performances designed to signal allegiance to a particular epistemic community. This dynamic generates repetition and actively polarizes and fragments entire fields. Dialogue between the evolutionary sciences and the human sciences becomes, in many cases, virtually impossible, not due to structural incompatibility, but because the exchange operates under the presumption that one side is morally suspect. In my courses, I routinely welcome students from biology, sociology, and psychology. They frequently report that biological or evolutionary approaches to behavior are introduced to them as inherently eugenic or deterministic. These critiques, often formulated in the past century, are repeated as though still necessary, even when they no longer resonate with the current state of the debate, if indeed they ever did (see Varella 2018). When an epistemic community is rejected not for what it demonstrates but for who is presumed to be authorized to use it, we have moved beyond science. What remains is a disciplinary liturgy, sustained by rigid echo chambers.

Catalyzing fluidity

The epistemic fluidity proposed in this essay resonates strongly with historicist theories of scientific rationality, as developed by Kuhn, Lakatos, Feyerabend, and Laudan. These approaches marked a turning point in the philosophy of science by rejecting the traditional view of rationality as a universal set of rules valid across all contexts. Instead, they argued that science is a historically, institutionally, and socially situated process shaped by contingencies that influence how knowledge is produced, validated, and transmitted (Nickles 2021).

Thomas Kuhn, for instance, demonstrated how scientific paradigms define what counts as legitimate knowledge at a given time, shaping both the criteria for theory acceptance and the interpretation of data (Nickles 2021). What Thomas Kuhn termed normal science appears less as a stable, unified enterprise and more as a superficial descriptor of an internally fragmented knowledge regime. While a dominant paradigm may structure practices and expectations, it does not erase internal dissent or eliminate the formation of epistemic bubbles or zones of selective interaction.

These structures persist even within so-called normal science, shaping the questions asked, the methods deemed valid, and the interpretations acceptable. The field of evolutionary biology offers a compelling illustration. The Modern Synthesis, long held as the central framework for understanding evolutionary processes, has been increasingly challenged by a constellation of research programs - such as evo-devo, developmental plasticity, inclusive inheritance, and niche construction - that together form the basis of the Extended Evolutionary Synthesis (EES) (see Pigliucci and Müller 2010; Laland et al. 2015; Albuquerque et al. 2024a; Savy et al. 2025). The EES questions its conceptual constraints, particularly the genecentric, unidirectional view of causation, and calls attention to reciprocal causation and constructive developmental processes. While scientifically robust, alternative approaches have historically occupied marginal or contested spaces within the broader evolutionary discourse, exemplifying how differentiated epistemic communities operate within the confines of an overarching paradigm. Thus, what Kuhn described as periods of consensus may be better understood as periods of structured dominance, in which pluralism survives in constrained niches and paradigm stability rests not on complete agreement but on the management, and often suppression, of internal conceptual diversity.

The parallel with epistemic bubbles becomes evident. Analogies with digital algorithms reveal that scientific life is molded not merely by institutional or historical infrastructures but also by cognitive mechanisms that condition how individuals access, filter, and retain information. Confirmation bias, selective exposure, and other psychological tendencies reinforce exclusionary structures and barriers to inter-community dialogue (Rathje and Bavel 2025).

By framing science as a moral dispute field, as Blancke (2022) suggested, I relegate the ideals of objectivity, rationality, and linearity to a secondary position. While still relevant, these ideals are insufficient to account for the actual dynamics of knowledge production. Instead, scientific advancement emerges as a contingent trajectory, marked by social pressures, institutional inertia, and often by stochastic events—moments of inflection arising from unexpected convergence between epistemic bubbles rather than from a continuous rational accumulation of knowledge.

Imre Lakatos, with his methodology of scientific research programs, had already acknowledged that scientific rationality is contextual and historical, judged by a program's ability to generate theoretical progress over time (Nickles 2021). The concept of fluidity is built by emphasizing movement across epistemic communities, recognizing that even the criteria for progress are shaped by institutional and cognitive filters that either block or enable innovation.

Paul Feyerabend's radical epistemological pluralism, which rejected the notion of a single scientific method, anticipated key concerns: the valorization of epistemic diversity, the critique of institutionalized power, and the defense of creativity in scientific practice (Nickles 2021). However, the notion of epistemic fluidity presented here differs from epistemic anarchism. It proposes a deliberate, strategic opening between bubbles—an intentional movement aimed at pluralism without collapsing into epistemic relativism.

The concept of epistemic fluidity does not break from the historicist tradition; it extends and updates it. Science can be understood as a landscape of bubbles and chambers that simultaneously restrict and propel innovation. Such a landscape demands a model of rationality grounded in situated relations rather than universal rules. Progress, therefore, does not emerge solely from accumulation or rupture but from the deliberate forging of contact zones between heterogeneous epistemic communities. Turning that strategy into a routine, rather than an exception, may be one of the most pressing tasks facing contemporary science.

Fluidity thrives in a favorable scenario when grounded in scientific pluralism, mainly through the interaction of diverse theories, methodologies, and approaches that enrich knowledge production. However, as Veigl (2021) highlights, the central concern in the debate over scientific pluralism is preventing it from degenerating into unrestricted epistemic relativism. Unlike monolithic views of science, scientific pluralism acknowledges that no single path leads to

truth; instead, multiple perspectives offer complementary understandings of reality (see Ludwig and Ruphy 2024). Veigl (2021) argues that responsible pluralism must avoid the trap of renouncing judgment, ensuring that epistemic diversity does not translate into an inability to assess and rank scientific approaches. Fluidity is the mechanism that allows knowledge systems to engage in productive cross-fertilization while maintaining epistemic standards. While pluralism establishes diversity as a foundational principle, fluidity serves as the force that breaks through the resistance imposed by epistemic bubbles and weakens the rigid structures of echo chambers, fostering the renewal of scientific knowledge.

SCIENTIFIC PLURALISM WITHOUT EPISTEMIC FLUIDITY: THE CASE OF ETHNOBIOLOGY

Ethnobiology is often portrayed as an intrinsically plural discipline. This plurality is frequently celebrated as a virtue, as it reflects the field's capacity to integrate languages and methods drawn from anthropology, ecology, botany, zoology, pharmacology, geography, history, and even philosophy. Throughout its trajectory, ethnobiology has taken multiple forms (Box 4): as a science of documentary rescue of traditional knowledge; as a cognitive science concerned with classification systems (cognitive ethnobiology); as an ecological science focused on the interaction between human populations and natural resources; as a politically engaged science in defense of local peoples and their rights (political ethnobiology); as an applied science for informing public policy; and, more recently, as a decolonial science, interrogating its own epistemological and ethical foundations (e.g., Ludwig 2018; Albuquerque et al. 2024b,c, 2025; McAlvay et al. 2021; Soldati and Almada 2024; Flachs 2025; Zank et al. 2025; Teixidor-Toneu et al. 2026).

Box 4. What is ethnobiology?

There are different ways to define ethnobiology. For some, it is the science that studies the relationship between Indigenous and traditional communities and nature, specifically local or traditional ecological knowledge. For at least two decades, however, debates have persisted over which of these terms is more appropriate, since each carries a distinct view about the nature of knowledge and its relation to time, territory, and culture. The term 'local' emphasizes the geographical, historical, and cultural context of knowledge systems. It assumes that all knowledge is situated and that its categories, classifications, and values emerge from the specific interactions between human groups and their environments. This emphasis, although important, may slide into relativism when it rests on the assumption that each knowledge system is incommensurable, unique, and cannot be evaluated or compared with others. The result is a plurality that does not engage in dialogue—a mosaic of irreconcilable truths, incapable of generating mutual understanding or explanatory synthesis. In such a case, ethnobiology would be reduced to the mere description of each reality, since the search for patterns or synthesis would be deemed irrelevant. The term traditional, in turn, accentuates intergenerational continuity and the preservation of ancestral knowledge. This historical and identity-based emphasis grants legitimacy to practices and cosmologies threatened by modernity. Yet, it can slip into essentialism—the idea that communities possess a fixed, pure, and immutable body of knowledge transmitted unchanged over time. Under this lens, knowledge is seen as a static inheritance rather than a dynamic process of reconstruction and adaptation. These two poles, relativism and essentialism, define one of the central epistemological tensions within which ethnobiology operates. Both claim to protect diversity but can paradoxically suffocate it. It is precisely between these extremes that space opens to understand ethnobiology as the science of coevolution between humans and biota. In this sense, ethnobiology is not limited to documenting knowledge about species or ecosystems. It investigates how human cognition, culture, and biology have evolved in reciprocal interaction with living systems. It is a boundary discipline—concerned not only with understanding how humans know the natural world, but also with how human behaviors, values, and symbolic systems have shaped that world. Adopting this perspective does not dissolve ethical debates about the relationship between researchers and the people involved in ethnobiological studies (see, for example, Fernández-Llamazares and Teixidor-Toneu 2025). On the contrary, it renders such debates even more pressing, deepening the epistemic and moral tensions that define the field itself.

This multiplicity of framings recurs in both panoramic accounts, such as historical phase proposals for the field (see Bussmann et al. 2025), and in autobiographical or editorial reflections in which researchers explicitly recognize the coexistence of different regimes of scientific value within the same community. In recent debates, there is an apparent consensus that such diversity should be understood as complementary rather than antagonistic (see Albuquerque and Alves 2024; Reyes-García 2023). However, empirical reality over decades of production shows that this plurality seldom translates into productive dialogue. Instead of a joint effort, segmentation mechanisms emerge, through which subsets of the community come to recognize only specific modes of scientific practice as legitimate. A paradigmatic illustration of this dynamic can be found in Crivos (2014:146-147), who, while claiming to defend the epistemological integrity of ethnography, effectively raises the banner of disciplinary closure by prescribing who may or may not legitimately operate within the field:

> (...) we are witnessing the appropriation of an impoverished version of ethnography, reduced to the erratic use of interview and survey techniques by the so-called ethnosciences—ethnobotany, ethnozoology, ethnoecology, and the like. These latter variants, which have invaded the professional market not only from within anthropology but also from disciplines that claim to account for the *emic* dimension of the knowledge domains they address, are characterized by the selective use of a few qualitative research techniques in the field. Consequently, those who implement them—often without any training or formal qualification as ethnographers—are transformed into "experts" on local conceptions across a wide range of knowledge domains that, "coincidentally," correspond to those already delineated by Western science.
>
> (...) In this way, by transforming the ethnosciences into a domain of specialization for biologists rather than a field of interaction between Biology and Ethnography—an interdisciplinary space—all the benefits of the ethnographic approach to understanding this relationship are lost [1].

Ethnobiology serves as a heuristic hypothesis for observing how scientific communities may remain blocked, not due to a lack of diversity, but rather due to an inability to transform that diversity into epistemic fluidity. Empirical evidence already indicates a high degree of epistemic insularity within the field. Campos et al. (2016) demonstrated that both ethnobiology and ethnozoology (treated in their study as a subfield of ethnobiology) exhibit such insularity, as these areas display a higher proportion of national citations and a smaller proportion of international citations than expected. This pattern is particularly pronounced in studies from countries such as the United States, Mexico, and Brazil, contexts characterized by strong internal citation networks and limited cross-national permeability. Different perspectives coexist, are published in the same journals, and attend the same conferences, yet they seldom cross one another's epistemic borders. The result, as I will argue below, resembles the formation of epistemic bubbles more closely than a virtuous regime of scientific pluralism.

Epistemological divergences are not confined to the superficial opposition between quantitative and qualitative methods or between descriptive and analytical approaches. Instead, they reflect distinct regimes of scientific value, each operating with implicit assumptions about what constitutes disciplinary legitimacy and utility (Albuquerque 2022a,b, 2025). On the one hand, some maintain that the field's central mission remains the documentation of knowledge at risk of disappearing, conceiving ethnobiology as a science of rescue (see Łuczaj 2023; Bussmann et al. 2025). For these authors, methodological or theoretical advancement only makes sense insofar as it contributes to preserving and restituting documented knowledge; any form of excessive abstraction is perceived as a distortion or detachment from the voices that ought to be prioritized (see Łuczaj 2023; Bussmann et al. 2025). Scientific work approximates an ethics of testimony: rather than formulating generalizing interpretations, the priority should be to ensure documentary fidelity to local realities.

On the other hand, a recurrent criticism holds that an insistence on wholly descriptive studies may lead to inventorial paralysis (Albuquerque and Alves 2024), in which the accumulation of accounts fails to yield an understanding of the patterns underlying ob-

[1] "(. . .), asistimos a la apropiación de una versión empobrecida de la etnografía, limitada al uso errático de técnicas de entrevista y encuestas por parte de las llamadas etnociencias –etnobotánica, etnozoología, etnoecología, etc. Estas últimas versiones, que han invadido el mercado profesional, no solo desde la antropología sino desde disciplinas que aspiran a dar cuenta de la versión "emic" de los dominios de conocimiento que abordan, se caracterizan por la utilización en terreno de algunas técnicas de investigación cualitativa lo cual convierte a quienes las implementan, aún sin ningún tipo de entrenamiento ni habilitación profesional como etnógrafos, en "expertos" en el estudio de las concepciones locales acerca de un amplio espectro de dominios de conocimiento que "casualmente" corresponden a los delimitados por la ciência occidental. (...). De este modo, al convertir las etnociencias en un dominio de especialización de los biólogos y no en un campo de interacción de la Biología y la Etnografía –un campo interdisciplinario–, se pierden todos los beneficios del aporte del enfoque etnográfico a la consideración de esta interacción."

served phenomena. Proponents of hypothesis-driven approaches (Albuquerque and Ferreira Júnior 2023) assert that, without systematic testing, the discipline risks reproducing an appearance of progress that does not lead to explanatory accumulation. Description is seen as necessary but insufficient: knowledge becomes theoretically productive only when subjected to systematic inference.

There is also a second, transversal axis of tension, which relates to the relationship between political engagement and methodological rigor. A segment of the community maintains that ethnobiology maintains its historical relevance only by aligning itself with struggles for rights, socio-environmental justice, and the epistemic sovereignty of traditional communities (see McAlvay et al. 2021; Stein et al. 2024). Terms such as decolonial, political, or activist ethnobiology are mobilized to emphasize that scientific production cannot be restricted to neutral observation (see Soldati and Almada 2024). However, if pushed too far, this stance risks sliding into ideological relativism, eroding the very criteria of evidence and enabling any discourse to demand legitimacy merely by appealing to cultural identity.

Thus, the field becomes divided even when all parties profess to share common goals. Authors call for conciliatory syntheses, such as proposals to integrate ethnographic depth and analytical rigor (see Reyes-García 2023; Albuquerque and Alves 2024), yet such appeals rarely translate into effective practices of epistemic translation. Instead of dialogical circles, parallel approaches emerge. Researchers employing statistical analyses seldom cite ethnographically dense works; politically engaged narratives tend to reject theory or hypothesis-oriented formulations as reductive; descriptive studies often ignore theoretical propositions, perceiving them as unnecessary abstractions.

In some segments, however, this informational isolation deepens and becomes an epistemic echo chamber. In such contexts, the absence of interaction is no longer limited to not hearing. However, the process often evolves into a preemptive disqualification of any production that fails to meet internal criteria for legitimacy. Such escalation occurs when one side, for instance, not only privileges engaged scholarship but also labels any statistical analysis as cold, colonial, or detached from community realities (see Bussmann et al. 2025); or, conversely, when politically oriented approaches are dismissed as controversial, anecdotal, or methodologically weak, regardless of their empirical content (see Lackey 2007; Messling et al. 2025). At that stage, epistemic disagreement becomes systematic distrust; the other is no longer simply different but already unreliable. In such cases, beyond epistemological disagreement, a moral register may be introduced (see Blancke 2022).

Ethnobiology is not merely a scientific discipline in internal tension but a model field for observing the formation of selective closure regimes within science itself. Mechanisms that manifest in digital environments as recommendation algorithms are here reproduced through citation networks, formative trajectories, and normative expectations. Resistance constitutes a strategy of cognitive stability, one that secures belonging to a specific knowledge regime, even at the cost of cross-fertilization. It shows that diversity of viewpoints alone does not guarantee epistemic vitality. What matters is not the coexistence of perspectives, but their capacity to disturb one another. Without mechanisms that reward epistemic permeability rather than factional stability, pluralism solidifies into parallelism. Moreover, a science constituted by parallel certainties, no matter how diverse, becomes indistinguishable from a set of carefully curated echo chambers.

TOWARD A RELATIONAL ARCHITECTURE OF SCIENTIFIC DIALOGUE

The earlier diagnosis reinforces the hypothesis that pluralism, by itself, does not ensure epistemic permeability. A field may contain multiple coexisting approaches while maintaining minimal interaction between them, resulting in stable segmentation rather than conceptual exchange. If epistemic bubbles and parallelism are not exceptions but recurring features of scientific practice, then the solution cannot rely on generic calls for openness or mutual recognition. What is needed is a framework that specifies how distinct epistemic communities might enter productive relations without presupposing consensus or methodological assimilation.

The paradigm of transformative transdisciplinarity proposed by Ludwig and El-Hani (2025) offers an instructive structure. Although formulated to mediate relations between scientific and nonscientific knowledge systems, I reinterpret it here as a tool for analyzing relations within science itself. Rather than assuming that collaboration requires fusion or harmonization, transformative transdisciplinarity is grounded in the notion of partial overlaps, structured zones of encounter where epistemic systems converge just enough to exchange insights while retaining their distinct assumptions, values, and ontological commitments.

Under this vision, epistemic fluidity must be actively designed rather than passively expected. Dialogue between divergent research lineages does not emerge spontaneously from institutional proximity or collegial goodwill. It requires infrastructures of encounter and, more fundamentally, a redistribution of

epistemic authority: a shift from self-referential validation toward reciprocity of justification, where claims are evaluated not only according to internal standards but also in relation to alternative frameworks.

Abandoning the search for a universal criterion of validity allows for a cartography of partial overlaps between epistemic frameworks, enough convergence for collaboration, enough divergence for integrity. Unity is no longer the objective; situated cooperation becomes the operative ideal. By exploring the zones of epistemic overlap between scientific communities, we create conditions for forms of knowledge production that are not only more plural and just but also more responsive to the problems they seek to address. (see Ludwig and El-Hani 2025).

For such an effort to be transformative—that is, capable of catalyzing change within epistemic communities—it must redistribute epistemic power, enabling multiple actors to participate in agenda-setting rather than merely in validation. It must also restructure existing knowledge regimes, rendering them more fluid and accountable to ethical and political commitments that support equilibrium rather than dominance among perspectives.

Relational epistemology suggests that the worth of a knowledge system is measured not by how effectively it excludes others but by how competently it engages them. Rigor remains intact, yet it operates through situated objectivity, a recognition that knowledge is historically embedded and becomes more robust when exposed to competing viewpoints. Such a stance fosters triangulation, correction, and cumulative refinement without dissolving into relativism.

Ludwig and El-Hani (2025) further emphasize that many conflicts between scientific and local knowledge systems are not only epistemic but ontological—they concern what exists, who or what holds agency, and which entities are granted moral standing. The same is true of relations within science, where communities often operate according to divergent ontological premises. A pragmatic ontological pluralism, as proposed by the authors and reinterpreted here, allows for cooperation grounded in partial ontological alignments, enabling coordination without demanding homogenization.

This reconfiguration of transdisciplinarity is not merely formal or procedural. As Ludwig and El-Hani (2025: 58-59) argue that

> Transdisciplinary practice requires navigating a complex politics of knowledge between diversity and decolonization. We have argued that the shift from epistemic paternalism to epistemic diversity creates spaces for transdisciplinarity engagement. Instead of a one-directional export of modern science and technology "from the West to the Rest," the move toward epistemic diversity highlights the plurality of relevant knowledge systems and the need to integrate them in responding to complex social-environmental challenges, from climate change to food security to public health. Rather than treating communities in the Global South as passive beneficiaries of academic knowledge production, the emphasis on epistemic diversity centers on the plurality of epistemic agents whose knowledge needs to be recognized and integrated. As such, the move from epistemic paternalism to epistemic diversity converges with the move from disciplinary to transdisciplinary practices that harness the epistemic resources of diverse actors in addressing global challenges.

Following the reasoning above, I suggest that pluralism within science becomes transformative only when epistemic diversity entails shared authority over problem-framing rather than mere coexistence of perspectives. Box 5 translates the analytical reframing into an operational contrast, distinguishing between pluralism as coexistence and pluralism as a structured relation.

Box 5. Illustrative contrast between epistemic coexistence and mediated relation within ethnobiology.

Within ethnobiology, one can imagine two research communities operating side by side without ever entering substantive relation. One is dedicated to ethnopharmacology analysis, quantifying concentrations of biochemicals, as alkaloids, flavonoids, or phenolic compounds in medicinal plants as indicators of objective efficacy. The other examines local healing practices, analyzing how therapeutic value is constituted through ritual, kinship structures, or moral obligation. Both groups speak of evidence, yet their standards are mutually illegible. Instead of waiting for dialogue to emerge spontaneously, interaction must be actively engineered through knowledge regime redesign. Pharmacological studies may be necessary to clarify how their efficacy claims can be understood within the experiential and moral frameworks of local practitioners. At the same time, sociocultural analyses could identify whether their accounts presume or preclude biochemical compatibility. Joint panels might be organized not to harmonize perspectives but to force reciprocal questioning, making assumptions explicit rather than silently operative. Shared repositories could allow ethnographic reports and chemical profiles to be cross-referenced - not to enforce integration, but to establish partial overlaps. Under such conditions, epistemic agency is redistributed: justification is no longer insulated within a single regime but becomes accountable across communities. The difference is not eliminated but rendered negotiable.

FINAL REFLECTIONS

While offering a promising alternative to rigid structures of knowledge production, epistemic fluidity requires ongoing theoretical refinement and careful consideration of its normative implications. What follows is a reflection on some of these issues aimed at deepening the conceptual robustness of the hypothesis presented here.

First, it is necessary to clarify the apparent ambiguity between the naturalness of epistemic bubbles and echo chambers and the proposal to mitigate them. When I describe such structures as natural expressions of any information system, I do not intend to justify or legitimize their effects but rather to highlight their structural inevitability. In other words, the functional naturalness of bubbles - derived from cognitive, institutional, and social filtering mechanisms - does not entail their normative acceptability. Recognizing them as recurrent features does not mean accepting them as desirable. On the contrary, it calls for us to identify them as objects of critical intervention, intervening deliberately to limit their exclusionary effects.

Second, I acknowledge the need to more precisely delineate the boundary between epistemological pluralism and epistemic relativism. Pluralism serves as a basis for fluidity, yet it should not be mistaken for permissiveness. Diversity of perspectives becomes epistemically valuable only when paired with minimal standards of responsibility and rational justification. Following Veigl (2021) and Ludwig and Ruphy (2024), I maintain that genuine pluralism demands coherence, openness to critique, and demonstrable problem-solving capacity. Fluidity, therefore, is not unchecked eclecticism but disciplined cross-fertilization.

In the same direction, it is important to address the role of individual epistemic agency in the face of structural dynamics. In discussing the distinction between active and passive echo chamber members, the essay may give the impression that individuals are merely passive components within institutional machinery. A structuralist diagnosis may be accurate, yet it can obscure the ethical stakes of scientific practice. Shields (2025) argues that epistemic goods (truth, justification, intellectual honesty) reveal force precisely when they demand effort, self-correction, and sacrifice. The argument advanced here retains agency by affirming that even within intense structural pressures, virtues such as courage, humility, and openness to dialogue continue to matter.

Epistemic fluidity, understood as a strategic force of reconfiguration and openness across epistemic communities, offers a valuable lens for understanding and transforming the dynamics of contemporary science. The case of ethnobiology makes clear that the challenge is not securing pluralism but ensuring that pluralism becomes epistemically operative. Epistemic communities do not suffer only from uniformity but from stable segmentation. When scientific exchange lacks fluidity, it ceases to function as an open forum and becomes a collection of closed, self-protective domains.

ACKNOWLEDGMENTS

The ideas developed in this article were enriched by ongoing discussions with Dr. Washington Soares Ferreira Júnior and by the active engagement of the young researchers in our research group during our weekly debates. I also acknowledge the invaluable experience gained through international cooperation within the project *Adaptive Strategies in the Face of Climate Change: A Tri-National Analysis of Traditional Ecological Knowledge*, conducted in partnership with Dr. Ana Ladio (Universidad Nacional del Comahue) and Dr. Maria Teresa Pulido Silva (Universidad Autónoma del Estado de Hidalgo). Their collaborative spirit has shown me that it is possible to build productive academic partnerships grounded in mutual respect for differences.

CONFLICT OF INTEREST

Dr. Ulysses Albuquerque declares that he serves as a Co-Editor-in-Chief for Ethnobiology and Conservation and has removed himself from the peer-review process for this paper.

DISCLOSURE OF AI USE

The author used ChatGPT (OpenAI, GPT-5 model) to refine and translate language and check reference formatting. All AI-generated content was carefully reviewed, edited, and validated by the author, who assumes full responsibility for the final material presented.

REFERENCES

Albuquerque UP (2022a) **What is the métier of ethnobiology or why should this science be busy?** *Ethnobotany Research and Applications* 24:9. doi: 10.32859/era.24.9.1-7.

Albuquerque UP (2022b) **How to become an ethnobiologist: against the cultural monopoly**. *Ethnobotany Research and Applications* 24:1–8. doi: 10.32859/era.24.6.1-8.

Albuquerque UP, Ferreira Júnior WS (2023) **Hypothesis Testing in Ethnobotany: 30 years After Phillips and Gentry's Seminal Work**. *Ethnobiology and Conservation* 12:14. doi: 10.15451/ec2023-06-12.14-1-3.

Albuquerque UP, Alves RRN (2024) **Integrating depth and rigor in ethnobiological and ethnomedical research**. *Journal of Ethnobiology and Ethnomedicine* 20:6. doi: 10.1186/s13002-023-00643-y.

Albuquerque UP (2025) **The Ethnobiology of Absurdities**. *Ethnobiology and Conservation* 14:01. doi: 10.15451/ec2025-09-14.01-1-2.

Albuquerque UP, Alves RRN, Ferreira Júnior WS (2025) **The contemporary challenge for ethical research involving the knowledge of indigenous peoples and local communities and afrodescendants and other marginalized, minority, or minoritized groups**. *Journal of Ethnobiology and Ethnomedicine* 21:29. doi: 10.1186/s13002-025-00774-4.

Albuquerque UP, Magalhães AR, Gusmão RAF (2024a) **Niche construction**. *Reference Module in Earth Systems and Environmental Sciences* 1: 1–9. doi: 10.1016/B978-0-443-21964-1.00026-4.

Albuquerque UP, Alves RRN, Carmo RFR (2024b) **Is there a neocolonial stance in ethnobiology?** *Ethnobiology and Conservation*. doi: 10.15451/ec2024-01-13.06-1-4.

Albuquerque UP, Maroyi A, Ladio AH, Pieroni A, Abbasi AM, Toledo BA, Dahdouh-Guebas F, Hallwass G, Soldati GT, Odonne G, Vandebroek I (2024c) **Advancing ethnobiology for the ecological transition and a more inclusive and just world: a comprehensive framework for the next 20 years**. *Journal of Ethnobiology and Ethnomedicine* 20:18. doi: 10.1186/s13002-024-00661-4.

Al-Omoush KS, Lassala C, Al-Debei MM, Ribeiro-Navarrete S (2023) **Social innovations during unprecedented crises: the roles of crowd wisdom, echo chambers, and social trust**. *Transformations in Business and Economics* 22(3A):787–808.

Arguedas AR, Robertson CT, Fletcher R, Nielsen RK (2022) **Echo chambers, filter bubbles, and polarisation: a literature review**. *Reuters Institute for the Study of Journalism*. doi: 10.60625/risj-etxj-7k60.

Arruda HF, Benatti A, Silva FN, Comin CH, Costa LF (2021) **Contrarian effects and echo chamber formation in opinion dynamics**. *Journal of Physics: Complexity* 2(1):025010. doi: 10.1088/2632-072X/abe561.

Bakshy E, Messing S, Adamic LA (2015) **Exposure to ideologically diverse news and opinion on Facebook**. *Science* 348(6239):1130–1132. doi: 10.1126/science.aaa1160.

Blancke S (2022) **Science as a moral system**. *Synthese* 200:454. doi: 10.1007/s11229-022-03877-7.

Bussmann RW, Paniagua Zambrana NY, De Meyer E (2025) **What are the most significant chal-**

lenges that ethnobiology and ethnomedicine have faced so far, and how were they dealt with? *Journal of Ethnobiology and Ethnomedicine* 21:63. doi: 10.1186/s13002-025-00814-z.

Campbell JL, Pedersen OK (2008) **Knowledge regimes and comparative political economy**. Department of Business and Politics, Copenhagen Business School.

Campos JLA, Sobral A, Silva JS, Araújo TAS, Ferreira Júnior WS, Santoro FR, Santos Gc, Albuquerque UP (2016) **Insularity and citation behavior of scientific articles in young fields: the case of ethnobiology**. *Scientometrics* 109: 1037–1055. doi: 10.1007/s11192-016-2067-2.

Cinelli M, De Francisci Morales G, Galeazzi A, Quattrociocchi W, Starnini M (2021) **The echo chamber effect on social media**. *Proceedings of the National Academy of Sciences* 118(9):e2023301118. doi: 10.1073/pnas.2023301118.

Crivos MA (2014) **Mario Bunge y la etnografía**. In: Denegri GM (Ed.), *Elogio de la Sabiduría: Ensayos en homenaje a Mario Bunge en su 95° aniversario*, pp. 143–148. Buenos Aires: Eudeba.

Fernández-Llamazares Á, Teixidor-Toneu I (2025) **Towards a forward-looking ethnobiology: envisioning and co-creating biocultural futures**. *J Ethnobiology Ethnomedicine* 21: 72. doi: 10.1186/s13002-025-00820-1.

Flachs A (2025) **Ethnobiology and degrowth: a review of the opportunities for collaboration, generative inquiry, and solidarity in socio-ecological research**. *Journal of Ethnobiology*. doi: 10.1177/02780771251374886.

Gantt EE, Holmes B (2025) **The structure of non-scientific revolutions: Evolutionary psychology, explanation, and the ruination of reason**. *The Humanistic Psychologist* (Advance online publication). doi: 10.1037/hum0000405.

Garimella K, De Francisci Morales G, Gionis A, Mathioudakis M (2018) **Political discourseonsocialmedia: echo chambers, gatekeepers, and the price of bipartisanship**. In: *Proceedings of the 2018 World Wide Web Conference* (WWW 18), New York: ACM, pp. 913–922. doi: /10.1145/3178876.3186139.

Güngör A (2023) **Echo chambers and friendship**. *Episteme* 20(3):1–13. doi: 10.1017/epi.2023.57.

Hull DL (1988) **Science as a process: an evolutionary account of the social and conceptual development of science**. University of Chicago Press, Chicago.

Lackey RT (2007) **Science, scientists, and policy advocacy**. *Conservation Biology* 21(1):12–17. doi: 10.1111/j.1523-1739.2006.00639.x.

Laland KN, Uller T, Feldman MW, Sterelny K, Müller GB, Moczek A, Jablonka E, Odling-Smee J (2015) **The extended evolutionary synthesis: its structure, assumptions, and predictions**. *Proceedings of the Royal Society B: Biological Sciences* 282(1813):20151019. doi: 10.1098/rspb.2015.1019.

López-Castellano F (2024) **Neoliberalism, institutional change and the new culture of the university professoriate: the Spanish case**. *Studies in Higher Education* 50(1):140–154. doi: 10.1080/03075079.2024.2331071.

Łuczaj Ł (2023) **Descriptive ethnobotanical studies are needed for the rescue operation of documenting traditional knowledge**. *Journal of Ethnobiology and Ethnomedicine* 19:37. doi: 10.1186/s13002-023-00604-5.

Ludwig D (2018) **Does cognition still matter in ethnobiology?** *Ethnobiology Letters* 9: 269-275. doi: 10.14237/ebl.9.2.2018.1350.

Ludwig D, Ruphy S (2024) **Scientific pluralism**. In: Zalta EN, Nodelman U (eds) *The Stanford Encyclopedia of Philosophy* (Fall 2024 Edition). `https://plato.stanford.edu/archives/fall2024/entries/scientific-pluralism`.

Ludwig D, El-Hani CN (2025) **Transformative Transdisciplinarity: An Introduction to Community-Based Philosophy**. Oxford University Press, New York. doi: 10.1093/9780197815281.001.0001.

McAlvay AC, Armstrong CG, Baker J, Elk LB, Bosco S, Hanazaki N, Joseph L, Martínez-Cruz TE, Nesbitt M, Palmer MA, Priprá de Almeida WC (2021) **Ethnobiology phase VI: decolonizing institutions, projects, and scholarship**. *Journal of Ethnobiology* 41:170–191. doi: 10.2993/0278-0771-41.2.17.

McKinnon S (2005) **Neo-liberal genetics - the myths and moral tales of evolutionary psychology**. Prickly Paradigm Press.

Martin BR (2016) **What is happening to our universities?** *Prometheus* 34(1):7–24. doi: 10.1080/08109028.2016.1222123.

Matviyenko S, Kirtz JL (2023) **Echo chambers of paranoid knowledge: on cyberwar epistemology**. *Discourse* 45(3):381–403. doi: 10.1353/dis.2023.a923675.

Messling L, Lu Y, van Eck CW (2025) **Advocacy – defending science or destroying it? Interviews with 47 climate scientists about their fundamental concerns**. *Public Understanding of Science*

34(4):479–494. doi: 10.1177/09636625251314164.

Nguyen CT (2020) **Echo chambers and epistemic bubbles**. *Episteme* 17(2):141–161. doi: 10.1017/epi.2018.32.

Nickles T (2021) **Historicist theories of scientific rationality**. In: Zalta EN (ed) *The Stanford Encyclopedia of Philosophy* (Spring 2021 Edition). https://plato.stanford.edu/archives/spr2021/entries/rationality-historicist.

Oliveira DVB, Albuquerque UP (2021) **Cultural evolution and digital media: diffusion of fake news about COVID-19 on Twitter**. *SN Computer Science* 2:430. doi: 10.1007/s42979-021-00836-w.

Pigliucci M, Müller GB (2010) **Evolution – the extended synthesis**. The MIT Press, Cambridge.

Rathje S, Van Bavel JJ (2025) **The psychology of virality**. *Trends in Cognitive Sciences* 29: 914-927. doi: 10.1016/j.tics.2025.06.014.

Reyes-García V (2023) **Beyond artificial academic debates: for a diverse, inclusive, and impactful ethnobiology and ethnomedicine**. *Journal of Ethnobiology and Ethnomedicine* 19:36. doi: 10.1186/s13002-023-00611-6.

Römer F (2020) **Evolving knowledge regimes: economic inequality and the politics of statistics in the United Kingdom since the postwar era**. *KNOW: A Journal on the Formation of Knowledge* 4: 325–352. doi: 10.1086/710513.

Savy T, Flanders L, Karpanasamy T, Sun M, Gerlinger M (2025) **Cancer evolution: from Darwin to the extended evolutionary synthesis.** *Trends in Cancer* 11(3):204–215. doi: 10.1016/j.trecan.2025.01.001.

Sheeks M (2023) **The myth of the good epistemic bubble**. *Episteme* 20(3):685–700. doi: 10.1017/epi.2022.52.

Shields M (2025) **On the value of changing your mind**. *Episteme* 1–23. doi: 10.1017/epi.2024.54.

Simon G (2025) **Neoliberalism in academia—what we can learn from physiology**. In: Essop F (ed) *Fundamentals of physiology, truth unveiled*. Academic Press, pp. 63–82. doi: 10.1016/B978-0-443-23655-6.00004-6.

Sîrbu A, Giannotti F (2019) **Algorithmic bias amplifies opinion fragmentation and polarization: a bounded confidence model**. *PLoS ONE* 14(3):e0213246. doi: 10.1371/journal.pone.0213246.

Soldati GT, Almada ED (2024) **Political ethnobiology**. *Ethnobiology and Conservation* 13. doi: 10.15451/ec2024-07-13.20-1-18.

Stein S, Ahenakew C, Valley W, Sherpa PY, Crowson E, Robin T, Mendes W, Evans S (2024) **Toward more ethical engagements between Western and Indigenous sciences**. *FACETS* 9:1–14. doi: 10.1139/facets-2023-0071.

Sun M, Ma X, Huo Y (2022) **Does social media users' interaction influence the formation of echo chambers? social network analysis based on vaccine video comments on YouTube**. *International Journal of Environmental Research and Public Health* 19(23):15869. doi: 10.3390/ijerph192315869.

Sun Y, Gao Y, Tobias-Webb J, Wang R, Liu F (2025) **Fractal property: a tool for understanding the generation mechanism of echo chambers**. *Expert Systems with Applications* 274:127036. doi: 10.1016/j.eswa.2025.127036.

Tomassi A, Falegnami A, Romano E (2024) **Mapping automatic social media information disorder: the role of bots and AI in spreading misleading information in society**. *PLoS ONE* 19(5):e0303183. doi: 10.1371/journal.pone.0303183.

Teixidor-Toneu I, Odonne G, Leonti M, Hudson M, Jordan FM, Mattalia G, Pankararu CGJ, Silva MT, Silva LS, Ulian T, Vandebroek I, Wall J, Hanazaki N (2026) **Improving visibility for knowledge holders in ethnobiological and ethnopharmacological publications**. *Journal of Ethnopharmacology* 355(Part A): 120632. doi: 10.1016/j.jep.2025.120632.

Turner C (2023) **Online echo chambers, online epistemic bubbles, and open-mindedness**. *Episteme* 1–26. doi: 10.1017/epi.2023.52.

van Eck CW, Messling L, Hayhoe K (2024) **Challenging the neutrality myth in climate science and activism**. *npj Climate Action* 3: 81. doi: 10.1038/s44168-024-00171-9.

Varella MAC (2018) **Mal-entendidos sobre a psicologia evolucionista**. In: Yamamoto ME, Valentova JV (Org.) *Manual de psicologia evolucionista*. EDUFRN, Natal, 142–166.

Veigl SJ (2021) **Notes on a complicated relationship: scientific pluralism, epistemic relativism, and stances**. *Synthese* 199:3485–3503. doi: 10.1007/s11229-020-02943-2.

Wu D, Yuan L, Li R, Li J (2018) **Decomposing inequality in research funding by university-institute sub-group: a three-stage nested Theil index**. *Journal of Informetrics* 12(4):1312–1326. doi: 10.1016/j.joi.2018.10.007.

Wu J, O'Connor C, Smaldino PE (2023) **The cultural evolution of science**. In: Tehrani JJ, Kendal

J, Kendal R (eds) *The Oxford handbook of cultural evolution*. Oxford Academic. doi: 10.1093/oxfordhb/9780198869252.013.78.

Zank S, Julião CG, Lima AS, Silva MT, Levis C, Hanazaki N, Peroni N. (2025) **Ethnobiology! Until when will the colonialist legacy be reinforced?** *Journal of Ethnobiology and Ethnomedicine* 21:1. doi: 10.1186/s13002-024-00750-4.

Received: 18 October 2025
Accepted: 29 October 2025
Published: 03 Novembro 2025

Editor: Rômulo Alves