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A Call for a Cultural Shift in Oceanography

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Abstract

Oceanography stands at a critical juncture, confronting the coupled challenges of climate change and biodiversity loss while also addressing calls for equity and justice in ocean economic development and governance. This paper defines and advocates for the weaving of three perspectives into oceanography education, research, and policy practice: the Socio-Ecological Lens, the Humanist Approach, and Equitable Intercultural Practice. By embracing these frameworks, the field can transcend the challenges of classical oceanography, paving the way for academic and professional practices that are more inclusive, equitable, and attuned to the intricacies of human-ocean relationships. Such a shift will foster interdisciplinary and transdisciplinary collaboration, elevate the role of humanities in oceanographic education, and push for decolonizing methodologies for ocean policy engagement, thereby enabling ethical career paths. Ultimately, these perspectives will empower oceanographers to cultivate a deeper and more equitable bond with the oceans, helping them to steer society with the transformative science practices that are fundamentally needed in a successful United Nations Decade of Ocean Science for Sustainable Development.

Key-words: equity and inclusion in Ocean Sciences; marine socioecology; decolonizing Ocean Sciences; Ocean sustainability and justice.

Introduction

Oceans are an increasingly human space: these are spaces of transit, production, recreation, and cultural sustenance (Bennett 2019). Oceans and marine resources are fundamental for coastal communities, which represent ~37% of the global population (UN 2021). Oceans produce critical resources for humanity (e.g., food, medicines, mineral resources), sustain global transport and commerce—over 80% of international trade in goods is transported by sea (UNCTAD 2021)—, and provide numerous intangible benefits. Oceans are vital for human sustenance, providing 3.3 billion people with at least 20% of their average animal protein intake—with a higher proportion consumed in low-income countries—and provide livelihoods for at least 600 million people through fisheries and aquaculture, with 97% of fishers living in low- and middle-income countries (FAO, 2022). Simultaneously, emerging threats such as deep-sea mining and oil drilling, increasing maritime transport, ocean debris and pollution, unsustainable fishing, sea-level rise, ocean acidification, and, critically, climate change, exacerbate environmental degradation and biodiversity loss (UN 2021).

As the ocean and coastal ecosystems, along with their dependent communities, face unprecedented transformations due to the intertwined crises of climate change and biodiversity loss, a fundamental shift in our approach to oceanography is required. Equity and justice considerations are increasingly called for in ocean sciences, particularly in the face of growing sustainability challenges (de Vos et al. 2023; Bennett 2019), accompanied by increasing calls for diversity, equity, and inclusion (DEI). While these considerations are broadly discussed in the fields of marine conservation, fisheries management, and marine policy, practical and theoretical approaches for integrating equity, justice, and social considerations into oceanography are limited.

Various perspectives have emerged in the examination of human-ocean dynamics, including Social or Socio-Environmental Oceanography (Moura, 2017; Narchi et al., 2018) and Socio-Oceanography (Popova et al., 2023). Additionally, disciplines rooted in the humanities, such as Marine Social Sciences (McKinley et al., 2022), Oceanic Humanities (Hofmeyr and Lavery, 2022), and Marine Studies (Spalding and Suman, 2023), focus on understanding marine environments from diverse angles centering human-ocean relationships. While these approaches offer unique epistemological insights, herein we highlight the needs of careers in oceanography, with potential applicability to these interconnected fields. Throughout the text, we also introduce concepts and terminologies from the social sciences, humanities, and philosophy of science which may be new to some readers. These terms are in **bold** and can be found in the glossary (Box 1).

I. Charting troubled waters in classical oceanography

On September 9th, 2022, an international webinar was convened by The Oceanography Society and multiple partner organizations to explore the contributions of critical perspectives coming from social sciences and humanities in addressing these challenges (Supplementary Material - <https://bit.ly/vidOSSP>). The webinar, which brought together diverse perspectives from various geographical, social, and cultural contexts, underscored current modes of thinking that are inadequate for understanding ocean realities, and identified threads to foster a shift to more positive futures for oceanography. Herein, we outline why this shift is necessary, how it can propel oceanography forward, and some of the pathways to achieving it. Our proposed cultural shift in oceanography goes beyond an academic pursuit: it has far-reaching implications for how oceanographers approach the study of the ocean, the training of human resources, and engagement with ocean policy and development in efforts to achieve sustainable ocean futures.

Despite the growing recognition of the importance of critical perspectives from humanities research in oceanography, the dominant knowledge systems and cultural values of North America, Europe, Australia, and other large, industrialized economies continue to shape scientific inquiry, often overlooking the unique social-ecological and socio-environmental challenges faced by the rest of the world (Hornidge et al. 2023). Oceanography, the scientific study of the seas, is a field historically guided by **positivist** methodologies (emphasizing empirical and observable phenomena), data-centric strategies (focusing on quantitative data analysis), and a conservative multidisciplinary approach often void of human rights concerns, stands at a crossroads. These 'epistemic inequalities'—inequalities related to knowledge, including what is considered, included as, or what is valued as knowledge—persist in oceanography despite increasing calls for interdisciplinary engagement (Trisos et al., 2021).

Recent critical evaluations of classical oceanography have identified five **paradigmatic** pillars in need of pragmatic change: i) Oceanocentrism, ii) The Tragedy of the Oceans, iii) Epistemic Totalitarianism, iv) Cultural Monochromatism of the Seas, and v) Structural-Oceanographic Machismo (Moura and Diegues, 2023). The first pillar, Oceanocentrism, views the ocean as an unpredictable and universal influencer of human life, an extension of the biocentric preservationist mindset from land to sea (Kroll, 2008). The second, The Tragedy of the Oceans, stereotypes traditional resource users as homogenous, profit-maximizing rational actors who cannot collectively manage natural resources, recommending privatization or nationalization (Longo, Clausen and Clark, 2015). The third, Epistemic Totalitarianism, sees classical oceanography as the only valid source of knowledge about the seas (Moura, 2017;

2019; Narchi et al., 2018; Narchi and Beitzl, 2022). The fourth, Cultural Monochromatism of the Seas, results in the racialization of coastal social groups (Moura and Diegues, 2023). The fifth, Structural-Oceanographic Machismo, emerged from the blending of scientific and maritime cultures, enforcing a macho logic that renders women and other genders invisible in the field (Revelle, 1980; Rozwadowski, 2005; Kroll, 2008).

Likewise in other scientific disciplines, there are also growing calls to shift away from “parachute science”, based on unequal partnerships between researchers from the Global North and Global South, which are still present in ocean science (de Vos et al. 2023). Ignoring these social and epistemic inequalities can result in social harms; and undermine expertise, thus narrowing the knowledge bases required for confronting complex problems; and hindering the potential for ocean conservation success (Lobo and Parsons 2023; Moon et al. 2018; de Vos et al. 2023). Next, we encourage our readers to reflect on how to foster a more inclusive, equitable, and holistic understanding of the ocean by challenging traditional disciplinary boundaries, embracing diverse perspectives, and acknowledging intricate human-ocean relationships.

II. Three perspectives for a cultural shift in oceanography

An understanding now prevalent in transformative sustainability sciences is that the escalating complexities of contemporary challenges (climate change, biodiversity loss, environmental injustice, *inter alia*) require a shift towards knowledge co-production, **transdisciplinary research** — weaving from knowledge of researchers identified with any academic discipline and non-academic knowledge and rights holders — and inclusive and equitable approaches guided by social justice. Each of the three perspectives described next (illustrated in Figure 1) contributes to the overall argument for a cultural shift in oceanography, and will help to make the field more transformative (examples of practical application of each perspective are provided in Table I).

The Socio-Ecological Lens

We define the Socio-Ecological Lens as a non-dual view of social and ecological systems, with the latter as communities of non-human beings and the former as governance structures (regimes of appropriation and access to resources), meanings, relationships (ethics, reciprocity, etc.), domination (power flows and patterns of authority), and legitimacy (norms, routines, rules, procedures, etc.) and knowledge production (Foppa et al, 2020). The adoption of this perspective departs from historically favored modern science as the sole reliable

knowledge source. This perspective implies a transition from a primarily positivist construction of the ocean to an in-depth examination of the complex interplay between human societies and marine ecosystems (Popova et al. 2023) - one that is anchored in a critical and human rights perspective (Foppa et al, 2020). After years of struggling to "integrate" diverse academic traditions within interdisciplinary research, and to incorporate multiple ways of knowing into transdisciplinary research (Bingham et al. 2021), this socio-ecological perspective now promotes knowledge "weaving" or "co-production" with various social actors. This approach involves co-leadership, co-design, co-production, and co-evaluation, aiming to foster mutual understanding and benefits, regardless of geographic or professional backgrounds (Gerhardinger et al. 2023).

Achieving this cultural shift in oceanography is not without its challenges. The inertia of academic institutions, the highly competitive, narrow, and restrictive nature of funding scopes and cycles, and the disconnect between ocean-related industries and broader society are significant hurdles. The Socio-Ecological Lens, in turn, offers a roadmap for overcoming these challenges by fostering a more inclusive and equitable viewpoint. It encourages a departure from norms that privilege modern science as the only valid knowledge source. This involves moving from viewing the ocean as a neutral, value-free zone, understood only through "objective" quantitative data, to exploring the intricate and ever-evolving dynamics between human societies and marine ecosystems (Popova et al. 2023).

The Humanist Approach

We define the **Humanist Approach** as a critical perspective that looks for socio-environmental justice via the decolonization of power, knowledge, nature, and being. This approach focuses on the analysis and co-creation of (ethno-)oceanographic spaces¹, and reveals the potential for alternative worldviews that can challenge dominant systems and help manage and enhance marine socio-biodiversity. Oceanocentrism is replaced by social ecologism in the "oceanography of productivities", making alternative productivities visible. Rooted in Social Ecologism, this critical perspective seeks cognitive justice by treating the knowledge systems of different social groups as equal. These knowledge systems are rooted in their past, requiring engagement with their history and collective memory. In this way, epistemic totalitarianism is

¹ From the perspective of territory as knowledge, it can be defined as "a set of socially organized practices applied to knowledge production in the engagement process by social groups (hegemonic or subaltern) with the coastal-marine worlds" (Moura, Diegues, 2023: 2).

replaced by an "oceanography of knowledges" (Narchi et al, 2024). It works with subaltern social groups, such as artisanal fishers (Pierri and Azevedo, 2021), Indigenous Peoples, quilombolas (Narchi et al, 2018), surfers (Matoso et al, 2023), queer communities (Lins et al, 2022), and others. This new oceanography is also ecofeminist, queer, anti-racist and anti-fascist. The Tragedy of Oceans, the cultural monochromatism of the oceans, and the oceanographic structural machismo are therefore replaced by the more inclusive "oceanography of recognitions".

In short, this new oceanography constructed from a critical perspective looking for socio-environmental justice is a "citizen oceanography" (Narchi et al, 2024). This approach prompts reflection on how our perceptions and cultural values shape our relationship with the marine environment, acknowledging human dignity and a range of values, rights, and welfare. It challenges systemic inequities and the underrepresentation of Indigenous and Local knowledge systems (Poto et al., 2022), while also recognizing the enduring impacts of colonialism on our understanding and interactions with the ocean. By embracing a humanistic approach to oceanography, we gain deeper insights into the ocean as a socio-environmental entity intricately linked to our cultural, economic, and political landscapes. This allows an expansion beyond **reductionist** scientific perspectives which limit the complexity of human-ocean relationships.

Equitable Intercultural Practice

Interculturality is referred to here as the interaction between different cultures within a shared social space, which may be equal or unequal and internal or external to science. The internal epistemological plurality results from the diversity of historical periods, perspectives, schools of thought, and methods. There is a diversity of sciences and maps of reality with different perspectives and scientific points of view. In this sense, science is a social process (Feyerabend, 2007).

An important step towards Equitable Intercultural Practice in Oceanography is to engage with the external epistemological plurality that enhances diverse cultural perspectives and interactions across peopled oceans. This practice fosters an appreciation for the myriad ways cultures coexist with the marine environment (Moura, 2017). It promotes inclusive values and recognizes colonialism's enduring impacts (de Vos, 2022), advocating for ethical, inclusive, and transformative ocean governance and development that benefits from an equitable academic culture (Cronin et al. 2021). More than a theoretical stance, this approach is a practical necessity, urging oceanographers to engage in equitable intercultural practice and

learning to restore social and ecological relationships across geographical and professional boundaries.

The unequal aspect of the oceans often emerges in societies affected by colonialism and domination. Fostering competencies for equitable intercultural practice starts with acknowledgment, necessitating self-awareness about existing power dynamics that affect identities and groups (Sanfuentes 2023). A critical and decolonial approach to interculturality emphasizes the need to address and transform underlying issues in structures, relationships, and institutions (Uzieda et al. 2010).

Combining the Socio-Ecological Lens, the Humanist Approach, with Equitable Intercultural Practice is imperative for the future of oceanography. Each perspective mutually contributes to a much-needed cultural shift in oceanography, offering insights to advance ocean science and policy. Together, they foster a more inclusive, equitable, and sustainable relationship with the oceans, by promoting socioecology, humanism, and interculturality in oceanography so it can effectively contribute to development goals.

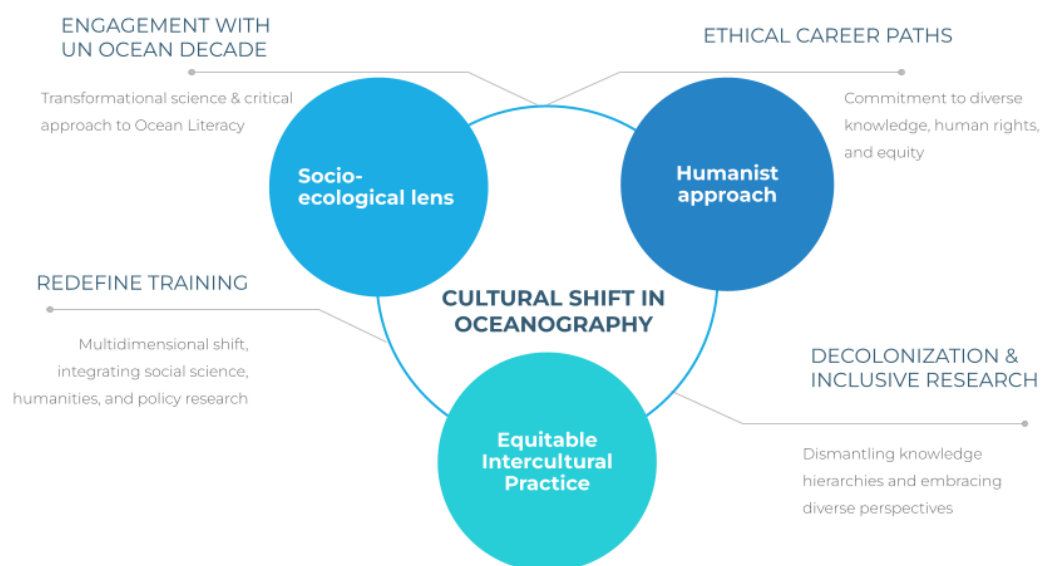


Figure 1: A Call for a Cultural Shift in Oceanography.

Table I: Examples of practical applications of the three perspectives for a Cultural Shift in Oceanography.

Perspective	Practical Application 1	Practical Application 2
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Socio-Ecological Lens	Community-based fisheries management: In contrast with the support to traditional, top-down, technocratic, and positivist management approaches, oceanographers now engage in community-based management with a socio-ecological lens hence supporting fisheries managers to weave local fishers' ecological knowledge and scientific data into decision-making to solve real-world problems across the value chains. This collaboration renders culturally relevant, socially equitable, and environmentally sustainable practices and outcomes in seafood systems.	Urban coastal resilience planning: Shifting from traditional infrastructure-focused urban planning to urban resilience with a socio-ecological lens also incorporates local insights on the fairer distribution of ecosystem services and assessment of risks (e.g., flooding) across the city. This participatory approach results in adaptive strategies that respect local customs and address social vulnerabilities.
Humanist Approach	Decolonizing marine conservation: Moving beyond externally imposed solutions, conservation efforts with a decolonial and humanist approach now partner with Indigenous and local communities, co-producing with their knowledge and practices. This empowers local communities and fosters an ecologically and culturally appropriate, human-rights-based approach to marine conservation.	Inclusive marine spatial planning: Traditionally dominated by historically powerful economic interests, marine spatial planning with a humanist approach is now set to break asymmetric power relations, and adequately include and empower marginalized groups in decision-making such as Indigenous and traditional small-scale fishers. This ensures plans reflect diverse needs, rights, and livelihoods, promoting social justice through recognition of traditional territorial rights on the coast and at sea, and defending them against the on-set of new competitive blue economy agents.
Equitable Intercultural Practice	Intercultural marine science education: Previously focused on Western paradigms, marine science curricula now integrate Indigenous knowledge and intercultural communication and practice. This experience prepares oceanographers to engage ethically with vulnerable communities and to conduct culturally sensitive professional services, notably needed in careers in environmental licensing and corporate/private entrepreneurship, but also in academic research, advocacy for civil society organizations and social movements, and other jobs in oceanography.	Cross-cultural marine policy development: Historically underpinned by Western science and epistemologies (e.g., systems thinking), marine policies incorporating equitable intercultural practices now facilitate cross-cultural dialogues, building upon a pluralistic knowledge base, ensuring policy-making and implementation are culturally relevant and socially equitable.

III. Sailing the Currents of Change

Addressing the challenges and facilitating the cultural shift in oceanography requires a collaborative effort that integrates social-ecological, humanistic, and intercultural perspectives. This can be achieved by redefining oceanographic training to include diverse disciplines, decolonizing oceanography, building ethical career paths, and engaging critically with the UN Ocean Decade.

Redefining oceanographic training: Education and training in oceanography, and marine science more widely, need a multidimensional shift, integrating social science, arts and humanities, and policy research, countering the historical, and indeed still prevalent, natural science focus (Moon et al. 2019). In 2020, hundreds of Brazilian oceanography students emphasized this in an online conference during the COVID-19 pandemic, advocating for a more holistic approach to oceanography (MARES, 2020). The three perspectives outlined above champion inclusive research, inter- and transdisciplinary dialogue, and value both Global North and South insights. Emphasizing socio-environmental justice, these students have called for a deeper understanding of human-ocean relationships, moving beyond just scientific views. Young scholars, especially through continued collaboration with grassroots movements, challenge the evolution of traditional science norms. Integrating diverse disciplines in marine training is crucial, necessitating updated curricula and institutional support (Hart et al. 2015). Fostering an inclusive, anti-racist culture within academic institutions that supports transdisciplinary research and champions community-based research is crucial. For instance, the University of Washington's College of the Environment has strategically embraced this approach in its latest 2024-2029 strategic planning (University of Washington 2023). Addressing practical challenges, such as funding restrictions, is also vital to ocean sustainability science's success (Messerli et al. 2019).

Decolonizing Oceanography: It is paramount that oceanographers challenge colonial legacies and imbalances, including those inherent within "parachute science," where researchers from the Global North often neglect local contexts in their research and in building their careers (Vos and Schwartz 2022; Shanker et al. 2023). The inertia of educational institutions compounds the challenge of transforming STEM fields towards more equitable pedagogies, requiring intersectional perspectives that address the North-South divide and biases and embrace ecofeminist, queer, anti-racist, and anti-fascist viewpoints (Moura and Diegues 2023). This approach involves dismantling knowledge hierarchies, realigning power dynamics, and transforming institutions to enable inclusive and equitable research. Embracing such an approach necessitates comprehensive transdisciplinary engagement between academic disciplines and non-academic knowledge and rights holders (Narchi et al. 2018).

Build Ethical Career Paths: The rise in Blue Economy initiatives also highlights the need to weave humanities in oceanography to offer diverse and accessible career pathways. Central to this is the commitment to diverse knowledge, human rights, and equity. A cultural shift in oceanography demands advocating these values and offering expertise in areas like policy development and community outreach alongside biophysical studies. Such an interdisciplinary approach is required to challenge paradigms like growth-based economic rationale, emphasizing diverse perspectives in ocean-based socially equitable, and environmentally sustainable development. Oceanographers play a crucial role in this, especially in ethical environmental consulting once their powerful knowledge shapes policies with profound consequences for coastal communities. Consulting firms, and indeed all research institutions, must ensure responsible practices (Gerhardinger and de Carvalho 2013), in both ocean resource exploitation and recruitment. This includes holding corporations accountable, and ensuring they do not misuse or misappropriate scientific, local, or Indigenous knowledge in their management and developmental strategies. Furthermore, the importance of paid internships and fair compensation, especially outside the often dominant consulting job market that backs up ocean economic growth through environmental licensing and technology development, is paramount. For many marginalized students in the South, the challenges posed by unpaid placements and the often low wages associated with academia and social or environmental movements, despite their inherent value, make the pursuit of ethical oceanography careers daunting considering the frequent need to challenge the agendas advanced by powerful sectors, corporations, and elites (Osiecka et al. 2021).

Engage with the UN Ocean Decade: Launched by UNESCO's IOC in 2021, the UN Ocean Decade aims for transformative science that changes human-ocean relationships, centering the concept of Ocean Literacy which emerged in the USA during the early 2000s (Payne et al. 2021). Alongside 10 key challenges, the Ocean Decade sets goals for 2025 and 2030, emphasizing a need to foster and enhance global Ocean Literacy through education, policy, and corporate strategies (McKinley et al., 2023). The Ocean Decade advocates for improved collaboration among scientists, businesses, and society, weaving local and Indigenous knowledge. Social sciences and humanities, therefore, have an integral role in the Ocean Decade's ambitions for transformative science and changing relationships between society and the ocean. To achieve the UN Decade's inclusivity goals, broader participation, especially from the Global South, is essential. UNESCO-IOC's recently proposed 'Critical Ocean Literacy' approach; the recent guidance on Indigenous and Local knowledge relationship with Ocean Science (UNESCO-IOC, 2022; UNESCO-IOC, 2023); and the Ocean Decade

Conference Barcelona Statement (UNESCO-IOC, 2024) indicate a shift towards this inclusivity. Better integration of the objectives from across the SDGs - especially those concerning life below water (SDG 14), peace and justice (SDG 16), climate action (SDG 13), gender (SDG 5), partnerships (SDG 17) and sustainable communities (SDG 11) - into Ocean Literacy initiatives would highlight the importance of education in understanding marine ecosystems and societal well-being.

Conclusions

A cultural shift in oceanography requires more than conceptual evolutions, but a necessary transformation across the field to realign with the intertwined realities of social-ecological systems, human dignity, and intercultural interplays. The three perspectives hence offer mutually supportive foundations for redefining oceanographic practice. By weaving together these perspectives, the field is poised to advance beyond classical, siloed paradigms and embrace a more inclusive and equitable trajectory, one that embodies a deep respect for the plurality of knowledge systems that coexist across peopled oceans.

This shift requires the reimagining of oceanographic education, opening doors for disciplines that have historically been sidelined, e.g., the social sciences and the humanities. Redefining training will catalyze interdisciplinary and transdisciplinary thinking, essential for tackling the nuanced challenges that have persistently troubled ocean science. Decolonizing oceanography, meanwhile, is paramount in dismantling entrenched inequities and ensuring that diverse voices are amplified in shaping the future of the field, particularly those of early career ocean professionals. Ethical career paths must be built on a foundation of justice and inclusivity, aligning with the overarching goals of environmentally sustainable and socially equitable Blue Economy initiatives while staying rooted in a commitment to human rights. A proactive yet critical engagement with the UN Ocean Decade will serve as a compass, guiding the discipline toward a future where oceanography is synonymous with equity, sustainability, and transformative science.

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Box I: Glossary

- Decolonization:** The process of dismantling colonial structures and ideologies that perpetuate inequalities in oceanography, recognizing and valuing the knowledge and contributions of marginalized communities, especially those from the Global South.
- Humanist Approach:** A perspective in oceanography that prioritizes socio-environmental justice by addressing inequalities and advocating for human rights, anti-racism, and decolonization in marine research and governance.
- Transdisciplinarity:** Research weaving/co-producing from multiple academic disciplines and non-academic knowledge and rights-holders, to create holistic solutions for complex oceanographic challenges.
- Positivism:** A scientific approach emphasizing the value of empirical and observable phenomena, and a philosophical system assuming that only assertions that can be scientifically verified or proven through logic and mathematics are meaningful, rejecting metaphysics (the study of the fundamental nature of reality beyond physical science) and theism (belief in a god or gods).
- Paradigm:** A framework of theories, methods, and practices that shape the understanding of a field, often in need of change to address contemporary challenges in oceanography, as emphasized in the proposed cultural shift.
- Socio-Ecological Lens:** A perspective that integrates social and ecological dimensions, focusing on the interconnectedness of human societies and marine ecosystems to promote equitable and sustainable ocean management.
- Intercultural Viewpoint:** An approach that emphasizes the interaction between different cultures in the context of oceanography, promoting inclusive values and recognizing diverse perspectives to enhance marine governance.
- Reductionism:** A philosophical approach that explains complex phenomena by reducing them to their simpler components, often focusing on the smallest parts to understand the whole system, and is commonly applied in both science and philosophy.

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