



RESEARCH ARTICLE

Houston, we have a problem...or do we? The trajectory of astrobioethics and Indigenous thought

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Abstract

Background. At the 2022 meeting of the American Society for Bioethics and Medical Humanities, a new affinity group was formed: astrobioethics. This is the branch of bioethics for space exploration, extraterrestrial environments and possible extraterrestrial organisms. Bioethics has traditionally operated from Western/Global North dominated thought structures and it is difficult to introduce alternative frameworks. However, astrobioethics is forming and is primed to include alternative frameworks, such as pre-Columbian Indigenous American philosophy/ethics and Global South frameworks and knowledge.

Methods. The methods utilized include Indigenous research methodologies and standpoint, an overview of Indigenous American philosophy/ethics, and reflection on how this may impact astrobioethical considerations of space exploration.

Discussion and Conclusions. Indigenous philosophies and ethics consider space exploration and its associated risks and impacts on potential extraterrestrial lifeforms, systems and environments. The nuances of using terms like ‘colonization’ are considered and the paper concludes by considering how Méxica philosophical concepts and the four main Indigenous pragmatic dimensions can interact with established bioethical principles to guide future space exploration.

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Introduction

A new affinity group was launched at the 2022 annual meeting of the American Society for Bioethics and Medical Humanities (ASBH) – the largest bioethical professional association in the United States

and globally influential. This group for astrobioethics is the latest recognition of the importance and intersection of ethics, physical sciences, humanities and social sciences. As more nations reach space and begin their own explorations – increasingly without being semi or totally reliant on the big 3 (US, China, Russia) – the big 3 are rapidly implementing plans for returning objects to our planet and sending humans to other cosmic bodies. This exploration and expansion demands that we consider our actions, their implications and how we will advance into our cosmic future. Beyond the physical dangers of space exploration there are also the conceptual dangers as it relates to how exploration and settlement will proceed, whose ideas will *matter*, and the thought framework of our future multi-planetary civilization.

As humanity proceeds into its future we will have to continue contending with the scientific, social and intellectual legacies of colonialism, Western thought privilege and Global North dominance. Since astrobioethics is in its infancy it is the perfect opportunity to diligently work to ensure that the pervasive legacies of colonialism and epistemic privilege do not continue. This means that the scientific community, governments and public must work to learn, understand and meaningfully incorporate historically repressed thought frameworks. Global South scholars have argued that this can only be achieved through a determined decolonial epistemic justice (Santos, 2014; Mignolo and Walsh, 2018).

As a mixed Indigenous sociologist, bioethicist and public health researcher – who loves anything space related (my Dad even took me to NASA's overnight Space Camp in Alabama when I was about 9) – I believe that astrobioethics studies are ripe for the inclusion of Indigenous philosophies from the pre-Columbian eras, Global South frameworks, experiences with death and destruction from colonization and resilience in the face of ongoing 21st century colonization and oppression (Cornum, 2015; Drake, 2018; Renstrom, 2022; Milligan, 2023). My own ancestry and familiarity with Indigenous concepts that appear in this paper are based on the knowledge of my ancestors, particularly the Méxica (Aztec). Méxica knowledge that survived is well-recorded and provides a rich philosophical tradition to explore many topics. This paper will begin with a background that centres these Indigenous frameworks and briefly explains their structure. The essay then turns to an analysis of the current state of astrobioethics and provides examples of how Indigenous thought frameworks can be used to understand the ethics of space exploration.

Methods

This paper follows from strong Indigenous-led studies, knowledge and researchers who have identified Indigenous research methodologies. The Indigenous method stems from millennia-knowledge (Sánchez-Antonio, 2022) which has been passed down from generation to generation (Kovach, 2010) and in some cases recorded in books, murals and more. Science from an Indigenous method involves three key aspects (Kovach, 2010: 43–44):

1. Cultural knowledge that guides one's research and writing
2. The methods used to search for knowledge
3. Interpreting knowledge to give it back in a purposeful, helpful and relevant manner.

Indigenous scholars are rightly concerned with ensuring that our knowledge is not viewed through a colonial lens or subordinate to that framing and that it stands on its own merits in a way that aims to decolonize the topic (Kovach, 2010: 47; Sánchez-Antonio, 2022). The cultural knowledge that I present here was not only gifted to me by previous generations it is also knowledge that has been discussed in the public domain previously and as such I believe that my contribution will help it continue to flower and bloom for all those that see it. The millennia-knowledge here are supported by additional works from non-Indigenous authors that have done much for many areas of Indigenous scholarship and built strong relationships with Indigenous communities in their commitment to epistemic justice and decolonization.

Indigenous thought and philosophy

To begin, we must consider what is meant by the word philosophy. Philosophers James Maffie (2014) and Scott L. Pratt (2002) have highlighted how many scholars argue that philosophy is a uniquely Western invention and that outside of the Western-Greek-Roman tradition there is no true philosophy. However, they and V. F. Cordova – the first Indigenous American woman to earn a PhD in philosophy – remind us that philosophy describes the intellectual act of communities considering their place in the world, relations to others and what that all means (Cordova, 2007). Cordova argued beautifully for employing an Indigenous philosophy that can be common to all Indigenous peoples based on shared thought structures across Indigenous cultures – something that other scholars have identified as well (Cordova, 2007; Graeber and Wengrow, 2021; Mackay, 2022b).

Indigenous philosophies have existed for millennia and are as complex as Western frameworks (Léon-Portilla, 1963; Pratt, 2002; Cordova, 2007; Maffie, 2014; Sánchez-Antonio, 2022). These philosophies were developed and in full use when the first Europeans arrived (Pratt, 2002) and evolved as they encountered Europeans. Despite centuries of physical and intellectual attack these ideas have managed to survive and critique the ideas and strategies of their European opposites (Cordova, 2007; Graeber and Wengrow, 2021; Mackay, 2022b).

Indigenous peoples are not a monolith, and their diversity in thought must be recognized while also considering that their thought frameworks and values developed in contexts specific to time, place and people. However, despite this diversity scholars like the preeminent Indigenous American philosopher V. F. Cordova (2007), Zapotec philosopher Juan Carlos Sánchez-Antonio (2022) and Scott L. Pratt (2002) have identified a commonality in thought frameworks that many Indigenous communities and philosophies share. These scholars identify that Indigenous philosophies are primarily concerned with balance, maintaining balance and human responsibilities to each other, their community, their environment and an appreciation for diversity in all things – on and off earth. These concepts were recently highlighted in a special issue of *American Indian Culture and Research Journal* guest edited by David Delgado Shorter and Kim TallBear about Indigenous knowledge and the search for intelligences beyond our planet (2021).

Pratt coalesces these ideas into what he terms the Indigenous Pragmatic which he states has four dimensions: interaction, plurality, community and growth (see Pratt 2002: 20–38 for full explanations of these dimensions). Cordova (2007) argues that Indigenous people fundamentally view the world and the cosmos differently and that the Indigenous view includes a duty to everything and everyone and responsibility to maintain that balance. Maffie (2014) similarly argues this through Méxica philosophy and the concepts of Olin, Malinalli and Nepantla which define and shape the universe in abstract and literal senses. Additionally, the Aymara/Bolivian sociologist Silvia Rivera Cusicanqui (2020) affirms the Indigenous appreciation for plurality and ambiguity through the Aymara concept of Ch'ixi, which stresses the uniqueness and beauty of the plurality and diversity that arises from interactions among all things. These diverse Indigenous concepts all exemplify what Méxica philosophies call 'Tlacoqualli in Monequi' or 'the center good that is required' (Maffie, 2019; Mackay, 2022a) – i.e. balance in all aspects of existence.

Science and indigenous philosophy

Science as a concept and experimentation as a method have a long and legitimized legacy in Indigenous philosophies. A prime example of this is the pre-Columbian creation narratives of many communities that are defined by what we would now call the scientific method. The K'iche' Maya beautifully illustrate this in their living work, the *Popol Vuh*. In the *Popol Vuh* the K'iche' tell of the creation of the world and detail the various hypotheses, designs, experimentations and results of the creationary forces in their quest to create a sentient species that can speak and honour the gods and cosmic forces (Tedlock, 1996). Thousands of years before European arrival Indigenous peoples independently established, understood and used the scientific method. The prominence of this method in such important stories shows that Indigenous communities saw science and empirical enquiry as a

fundamental aspect of being and not antithetical to life, spirituality, knowledge and more (Mackay, 2022b).

Indigenous Americans throughout what is now called North and South America have a long history of tracking the stars and studying cosmic phenomena. The most famous examples of this are the observatories, records and celestially aligned cities of the Mississippian alliances, Méxica, Maya and Inca. However, this fascination with space and the cosmos can also be found in countless other Indigenous communities. The cosmovision – ways of being and interacting with reality and the universe – of Indigenous people have been created in various contexts: large multi-city nations, smaller regional towns, subsistence and large-scale farming, written and spoken language and histories, deserts, oceans, lakes, rivers, jungles, forests, ice and sand and more. Many Indigenous peoples view the world and their place in the universe as impermanent, cyclical, reciprocal and balanced. In Méxica philosophy everything in existence stems from a single fundamental building block that is constantly reshaping and transforming itself (León-Portilla, 1963; Cordova, 2007; Salomon and Urioste, 2010; Leeming, 2013; Maffie, 2014). Since the same fundamental energy – *teotl* in Nahuatl, the language of the Méxica – permeates all things throughout the cosmos there is no logical foundation in Indigenous philosophies to assume that humanity and our needs are more important than those of other life forms in other places and throughout all times. Interestingly the words and concepts that cosmologists use in describing the universe, quantum mechanics and the end of the universe (Mack, 2020) are similar to many ancient Indigenous philosophies and cosmologies, another area of science ripe for Indigenous people and ideas to contribute to and explain.

Indigenous thought and astrobioethics

Astrobioethics has grown out of the discipline of astrobiology and is primarily concerned with the philosophy of science and the ethics of how we explore the universe. It has received attention through scholarly and media articles (Keim, 2008; Dick 2018), a book (Chon-Torres, 2021a) and the Scholarly Community Encyclopaedia (Peters, 2022). According to an Encyclopaedia of Astrobiology entry astrobioethics is defined as ‘...the study of ethical questions in connection with astrobiology...among the key issues, we find the following: the moral status for extraterrestrial life and its implications; how to interact with extraterrestrial life; how to handle risks to humanity and other Earth life when interacting with extraterrestrial life...’ among others (Persson, 2021).

Since astrobioethics has grown out of astrobiology, astrophysics and other natural sciences – disciplines with strong Euro-Western histories (Prescod-Weinstein, 2021; Chon-Torres, 2021a, 2021b) – the focus on ethics and science have largely been based on dominant Western systems. This focus continues to marginalize other systems of ethics and science and reduces them to minor aberrations in the overall discourse (Santos, 2014; Mignolo and Walsh, 2018). Astrobioethics asks many of the same questions that traditional bioethics does but on a larger cosmic scale and is already considering how we might ‘colonize’ future planets and environments. That word itself is loaded with history and connotations that I will discuss below. Bioethics as a discipline must consider and earnestly implement alternative ethics and philosophies (Mackay, 2022a), however astrobioethics has an opportunity to ensure that these dominant Western discourses do not receive over-warranted attention or the limelight. Since this is a burgeoning branch of ethics there is a rare opportunity for scholars to mitigate the prevailing histories of colonialism and systemic racism in science and ethics, particularly as related to Indigenous peoples (Feagin, 2006; Feagin and Bennefield, 2014; Mackay and Feagin, 2022).

Discussion

Astrobioethics should consider its relation to Indigenous peoples and knowledge frameworks now, before it is too late. Indigenous knowledge frameworks are largely excluded from the literature and have relatively few members in the disciplines and academics. However, the numbers of Indigenous scholars are increasing as is consideration of Indigenous knowledge frameworks across the sciences

and humanities. Astrobioethics is primed to include these ideas and other Global South knowledge in ways that more established branches of science and humanities are not and have not.

On the term ‘colonize’

Many astrobioethical conversations continue to use the word ‘colonize’ which has a racio-linguistic association – colonize and its variations have become co-naturalized with race and anti-Indigenous sentiments (Rosa and Flores, 2017). Co-naturalization makes it difficult to disentangle the word from its associated history and racialization (Veronelli, 2015; Rosa and Flores, 2017; Mackay and Feagin, 2022) and continuing to term our exploration as ‘colonization’ invokes images of colonization by European empires. Colonization in the Americas includes well-documented Indigenous genocide, slavery, oppression, resource exploitation and ongoing marginalization and culturicide (Stannard, 1993; Williams, 2012; Fenelon, 2014; Dunbar-Ortiz, 2015; Townsend, 2019; Sjursen, 2021; Mackay and Feagin, 2022). Framing our space exploration as colonization risks reinforcing that these missions are patterned on previous and current colonization events (Chon-Torres, 2021b).

A new term should be debated and considered, but it won’t be easy. ‘Settlement’ still has connotations with settler-colonialism but is less likely to reinforce the same violence and exploitation as ‘colonize’; ‘inhabitation’ could be a potential replacement but it may not adequately encompass our exploits. Even the word ‘expansion’ risks a colonial overtone as it conjures references in the US to Manifest Destiny and westward expansion which were based on the same violence and colonial policies as initial colonization itself (Drinnon, 1997; Williams, 2012; Johnson, 2022; Mackay and Feagin, 2022).

While terminology co-naturalizes ideas and people (Rosa and Flores, 2017), the very philosophical foundations of astrobioethics must be considered and reformulated. While Indigenous philosophies are concerned with the four core bioethical principles (Beauchamp and Childress, 2019) – autonomy, beneficence, non-maleficence and justice – they are defined and understood differently and in concert with additional Indigenous ethical and philosophical concerns (Barkin, 2022; Sánchez-Antonio, 2022; Mackay, 2022a). The preeminent Indigenous philosopher, the late V. F. Cordova, identified many of these shared Indigenous philosophical ideas and James Maffie (2014) and Scott L. Pratt (2002) separately synthesized those same ideas in their works. Pratt called his framework ‘Native pragmatism’ and identified its four main principles: interaction, pluralism, community and growth. Maffie (2014) uses three Méxica concepts to anchor his arguments: Olin, Malinalli and Napanlla. We will turn to considerations of these frameworks and astrobioethics now.

Olin and interaction

Olin is a Méxica philosophical concept that integrates interactionism and has physical and qualitative dimensions – olin is a process of literal and abstract movement and change (Maffie, 2014: 186–190). Olin motion-change (Maffie, 2014) shapes cyclical processes like life-death, day-night, pulsating objects and much more. Space exploration includes both olin and interaction dimensions: leaving Earth, exploring a new place and returning information/people/specimens. Missions are cyclical by design and the nature of the environment they enter and whether the olin motion-change of that system is being disrupted by our interactions should be considered. If human presence causes olin-disruption, then it is seen as a violation of Indigenous ethics and steps must be taken to return to balance. Much as chaos theory and quantum mechanics state that one little change in a system can alter a larger system – even as large as the known universe (Mack, 2020: 155) – violation of a system’s olin could lead to a decay and fatal disruption (Léon-Portilla, 1963). We must be even more careful than we already are during our explorations.

Missions and astronauts must not only consider their autonomy, but also the autonomy of the very things with which they interact. The interaction between these two autonomies must be balanced for the universe to be balanced itself. In the context of space exploration, astrobioethics and Indigenous pragmatism this is understood as humanity having no inherent or universal right to affect the balance of the

environments we enter. This extends to non-animal life such as plants, micro-organisms, rocks and other ‘beings’ (Kimmerer, 2015). Indigenous ethics and philosophy assign an aspect of ‘being’ to everything as everything is constituted of the vivifying and basic foundational particles known as *teotl* and participates in *olin* motion-change (Maffie, 2014). This means that assuming humans are the natural owners of anything on and off earth is unethical and any missions with this express purpose are equally unethical (Barkin, 2022).

For example, a mission to Mars to ‘colonize’ it utilizing Martian resources, such as Martian ice for water, is problematic under an Indigenous framework. That water is part of a balance on Mars that is vitally important and humanity’s actions for our own ends can upset that *olin* defined system. Lacking a strong understanding of the environment, its balance and how we could affect this system could be catastrophic to all of Mars and its systems – which would be an extreme violation of Indigenous ethics. Indigenous ethics does not demand that space exploration not occur – merely that it involves far more consideration, debate and nuance than is typically considered (Neilson and Ćirković, 2021; Milligan, 2023). Additionally, the life that may be present on another cosmic body would have an inherent right to maintain the balance in its own way. This could mean that the environment becomes unsuitable for humanity even after inhabitation and an ethical action by humanity would be to respect that reorientation in balance, even if it means abandoning the mission.

Nepantla and plurality

Nepantla in Méxica philosophy is an essential concept that defines the universe and all things in it – it is the necessary comingling, mixing and weaving of all things into a unity that is constantly pulling, pushing and redefining itself and its parts (Maffie, 2014). In Indigenous pragmatism frameworks this is called plurality (Pratt, 2002; Cordova, 2007). Plurality recognizes that individuals and societies have their own frameworks from which they operate, those frameworks may be highly different from our own, but they are not to be oppressed or marginalized (Pratt, 2002). This means that a bioethically defined autonomous and beneficent action of humanity is to respect and consider the *nepantla*-plurality of other beings and places.

This could mean in space exploration that the astrobioethical prerogative will be to assume, respect, appreciate and learn from the autonomy of all systems. This *nepantla*-plurality increases the diversity of humanity’s knowledge and experience and allows for other systems to exist in agonistic unity with our own. Unlike the philosophies undergirding colonization of the Americas (Stannard, 1993; Pratt, 2002; Williams, 2012; Mackay and Feagin, 2022), which demand the supremacy of one system over another, Indigenous philosophy states that the systems, life, etc., found on other planets must be respected. Through a balanced *olin* defined and *nepantla* structured interaction there will arise solutions.

Nepantla and plurality can be difficult for those who have not be raised with it or deeply exposed to it. Plurality demands respect for all beings vivified by the fundamental structure of *teotl* such as micro-organisms, plants, water, minerals, time and place (McLeod, 2017; Barkin, 2022). Through recognition of the importance of *nepantla*-plurality and a balanced *olin*-interaction can *malinalli*-community flourish and grow. Diversity is essential under Indigenous philosophy for the survival of all parties across times and places.

Malinalli and community

Malinalli is the Méxica concept that is defined by the underlying forces through which *olin* motion-change can occur (Maffie, 2014: 172). It is the twisting, spiralling and spinning of all things and forces to ensure the continuation of cyclical *olin* systems – the Indigenous pragmatic calls this community. Indigenous peoples, philosophies and pragmatic see community as made up of many autonomous beings that must be respected and cared for which benefits the wellbeing and balance of the overall community. The extreme individualism and resource extraction of Western philosophies and societies is not ethical under Indigenous structures (Lahontan, 1703; Graeber and Wengrow, 2021; Mackay, 2022a, 2022b) – individual responsibilities exist in an overall responsibility to a larger

community and system (Barkin, 2022; Sánchez-Antonio, 2022). This demands respect not only for yourself and others, but respect for the animal and non-animal environment in which all things exist.

For example, on Mars or Jupiter's moon Europa this would mean that not only do missions and astronauts exist for themselves and are obligated to their individual duties, but that these duties are in malinalli defined interactions with other beings and systems to ensure the continuation of the larger olin defined system or mission. The Western idea of teamwork is similar in concept, but it still emphasizes the individuality of team members. It only partially encompasses the communal duties and responsibilities shared by all under an Indigenous framework whereby individuality comes second or third to the community.

Ometeotl and growth

The Méxica concept of ometeotl encompasses everything that we have discussed here. It is olin-interaction, nepantla-plurality, malinalli-community, humans, planets, the universe, atoms, particles and everything else (Maffie, 2014: 169–170). Ometeotl is the fundamental structuring and shaping of the universe from which all things emerge, and which constantly incorporates changes into itself – the Indigenous pragmatic calls this growth (Pratt, 2002). Growth in the Indigenous pragmatic is not only measurable change – it is also qualitative change and evolution through the combination of interaction, plurality and community. Ometeotl-growth is neither positive or negative, it just is and always will be.

Conclusion

Though we may see the future of humanity as off-world, Indigenous philosophy and pragmatic would ask us to interrogate why we think that is (Chon-Torres, 2021b)? Is it really the solution to our perceived problems or our alleged right to impact systems we likely will never be truly prepared to encounter? Or should we accept that humanity is olin defined and through its cyclical nature has always existed and has a conclusion – or many conclusions since both cyclic Indigenous philosophies and quantum theories state this is possible (Léon-Portilla, 1963; Maffie, 2014; Mack 2020). Indigenous philosophy in astroethics asks us to honestly consider if the risk and hazard of space travel and otherworldly inhabitation, for ourselves and other environments, is truly the balance of the cosmos.

Astroethics is a burgeoning field that is primed for innovative research. Including an astroethics affinity group within ASBH shows that this branch of ethics is rapidly growing and is likely here to stay. Since bioethics as a field/discipline is already established with a Western mindset and framework – which is changing slowly – the risk exists that this same Western and Global North domination could be imported into the fledgling structure of astroethics. Since astroethics is still forming it is the optimal chance to make sure that oppressed and marginalized thought traditions and ethical frameworks are included, such as those from pre-Columbian Indigenous American philosophies. Indigenous ethics can help to frame our future space technologies and explorations in a new light that gives everyone and everything an intrinsic value beyond its value as a tool or commodity. This will likely be important to avoid the exploitation and destruction traditionally accompanying human exploration and colonization.

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