

Why Multispecies' Flourishing?

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As a science teacher I often tried to "shift" the viewing of the world by my middle-school students from being very human-centric towards one that was more focused on the world as experienced by the organisms in the (eco)systems we were studying, to think about the world from the "level" of the organisms and the richness of the lived experiences they were having. One approach I used was showing them scenes from the movie "Honey I Shrank the Kids" where the world view of the human participants was considerably shrunken to that where they could "ride" on the back of a bee and experience simple rainfall as a small organism would. I used Barbara McClintock's description of her thinking like corn, trying to imagine what it would be like to be corn (see Keller, 1983; Henry, 1997), as a foundation for my thinking on this as a teacher, and engaged my students in science talks (Gallas, 1995) to get them to start thinking about the world in more complex ways, in some senses as experienced by other organisms and

from a different point-of-view, a different perspective and scale, than humans doing science usually start from. – GMB

For a while now we have been working on an idea, a framework/perspective/way of knowing, being, and doing that we believe needs to be more explicitly considered and written about in mathematics, science and technology education. In this editorial we intend to introduce this idea, what the important parts of it are, discuss why we believe it is important for both research and the teaching of children, how it could be incorporated into science, mathematics and technology classes, and why we think it important enough to be researched and written about for future issues of this journal.

In this editorial we lay out the framework of multispecies' flourishing as we see it connecting to education (within our individual interests of mathematics (Steven) and science (Michael) education). By "multispecies" we refer to the study of (the) complexity of living, learning, and becoming with/alongside/through other planetary beings and cosmological phenomena. Through combining these concepts and connecting them to math/science/technology education we see the emergence of a framework that redirects and focuses student learning in ways that we would argue other

frameworks have not. In the editorial we argue why we believe this re-framing is important, and why we believe that those in math/science/technology education who write for this journal should consider adopting, or at least incorporating, the framework we have laid out.

Why Flourishing?

Flourishing as a concept in education is not new. Many versions of Flourishing (psychology, political economics, philosophy and education) draw on the concept of *eudaimonia* as articulated by Aristotle. Gorski (2017) traces the etymology as, “*Eu* means ‘good’ and ‘*daemon*’ means ‘spirit’, so to be ‘*eudaimon*’ literally means to be ‘of good spirit’” (p.30). Martin Seligman’s (2011) PERMA framework is one that has been widely used in a number of disciplines, including education, to think about how to promote/cultivate flourishing. The elements of this framework are **Positive emotion, Engagement, Relationships, Meaning and Accomplishment**. We see flourishing as an emergent effect of complex inter-related networks ranging in scale from the physiological, psychological, personal, professional, pedagogical, socio-political and mytho-ecological. Mathematician Francis Su (2020) is currently the main individual actively promoting the idea of the doing of mathematics as a route to human flourishing. He also draws on the Aristotelian idea of *eudaimonia*. Tunstall and Ferkany (2017) posit a role for mathematics in promoting flourishing, though they draw their inspiration from Lynn Arthur Steen’s quantitative literacy (critical data literacy for active democratic citizenship) framework. Kutsyuruba, Cherkowski and Walker (2021) in their work on educational leadership and change also draw on Seligman and others in the

positive psychology / emotional well-being literature.

So, why flourishing? The facile/facetious answer is why not flourishing (or related terms like thriving) as an equally valid value proposition for Science, Mathematics and Technology Education at this particular time as other existing ones? SMTE has many ends and values and goals motivating its practitioners. These include (non-exhaustively) - ‘discovery’ of knowledge(s), ‘production’ manufacture and distribution of useful goods and services, ‘serving’ humanity, preparation of a labour force, economic ‘competitiveness’, military preparedness/superiority, sustainable development, and others. What flourishing adds is an explicit focus on well-being that challenges the taken-for-grantedness, anachronistic, inequitable, and unnecessarily limiting aspects of some of those values. At present flourishing gets taken up in a limited sense through notions of socio-emotional learning (SEL), well-being, and mindfulness initiatives. However, what the works cited above share in common is an anthropocentrism that fails to acknowledge that there has never existed widespread human flourishing anywhere without simultaneous attention to multispecies flourishing (the flourishing of a multiplicity of biological and other forms) and Multispecies’ Flourishing (the right of other species to flourish). It is the latter which is our main concern in this editorial.

What Multispecies’ Flourishing points to is the need to always consider and work to include considerations from the multi-level, multi-system complex networks of relations with the other-than-human world. As Hannon and Peterson (2021) point out in *Thrive: The purpose of schools in a changing world*, globally at

this inflection point in human and planetary history we are desperately in need of new purposes for education whose assumptions are “under-examined and out of date” (p.xiii).

We note that the focus in psychology, philosophy AND education thus far has been to keep an imagined version of the human or the human child at the centre of its theorizing and praxis as a bio-exceptional species. Our argument is that there is a need to re-situate the human within the network of ‘living’ beings and within a mytho-ecological framework. This is a decentering but not devaluing of the human—it is a recognition that human flourishing has always been, and will continue to be, dependent, and intimately tied to the flourishing of multispecies partners who also have a fundamental right to flourish. As Tsing (2019) notes, “despite the awkward label ‘multispecies,’ which perhaps might best be read as ‘concerning many kinds of beings,’ the nonhumans do not have to be living at all” (p.239). In other words, we can consider entities like rocks (Reinert, 2016) and other physical entities (see Johnson, 1988), and also phenomena like light (decolonizing light, n.d.) and sound and mathematical concepts, as part of the multispecies world. In order to do this, we turn to multispecies scholarship.

Why Multispecies?

A variety of recent scholarly work could be placed within the frame of multispecies studies (Kirksey, 2014). This work connects with other established and emerging fields of study such as Anthropology (Kohn, 2013; Omura et al., 2019), Archaeology (Birch, 2018), Ahuman (MacCormack, 2020) and Dehuman (Singh, 2018) Studies, Critical Animal Studies (Asdal et al, 2016; Bull et al, 2019; Gillespie & Collard, 2015,

Jenkins et al., 2020), cultural studies of plants and fungi (Kimmerer, 2003, 2015; Sheldrake, 2020; Simard, 2021), environmental humanities (Monami & Adamson, 2017; Schaberg, 2020), ethnography (Nagarajan, 2018), sensory ethnobotany (Miller, 2019), speculative fictions such as solarpunk (Rupprecht et al, 2021), as well as postcolonial literary studies (e.g, Walther, 2021). In contrast, in the sciences, particularly in ecology and conservation biology, their historical practices have been primarily based on single-species modeling and management, although the shortcomings of this and the need for multispecies approaches are recently more discussed (Mace et al, 2006). For example, while North American bison (buffalo) conservation is lauded as a success story from their near extinction, the last update on the status of the American Bison in Alberta concluded, “[f]uture prospects for restoration and recovery of free-ranging plains bison...are limited by the amounts of intact grassland habitats available in today’s predominantly anthropogenic landscape” (Nishi, 2017, p. v).

Kirksey and Helmreich (2010) describe the emergence of multispecies ethnography as centering on “how a multitude of organisms’ livelihoods shape and are shaped by political, economic and cultural forces” (p. 545). van Dooren, Kirksey and Munster (2016) use the concept of “passionate immersion” as a frame for multispecies studies that unsettles notions of species, opening up ways of knowing and understanding others with implications for epistemology, political philosophy and ethics around questions of, “liv[ing] with others in entangled worlds of contingency and uncertainty” and “inhabiting and co-constituting worlds *well*” (p. 1). This “species turn” in anthropology has spilled over into other social

sciences such as education, especially early years education (see for example The Common Worlds Project, n.d.; Taylor & Pacini-Ketchabaw, 2018) and has a much longer history in the (environmental) humanities and arts, and it is also beginning to influence scientific practice. While science, mathematics and technology education have at times drawn the multispecies world into its frame through scholarship in culturally responsive and other critical approaches, to our knowledge it has nowhere made our more-than-human kin *central* to its theorizing or curriculum innovations (an exception would be within indigenous led science, mathematics and technology education). This is the area for growth and reflection to which we are pointing.

According to van Dooren et al (2016),

a multispecies approach focuses on the multitudes of lively agents that bring one another into being through entangled relations...these larger contexts are not mere environments...[r]ather, they are *complex “ecologies of selves,”* (Kohn, 2013, p.134) *dynamic milieus that are continually shaped and reshaped, actively...crafted through the sharing of “meanings, interests and affects,”* (Lestak et al., 2014, p.155) *as well as flesh, minerals, fluids, genetic materials, and much more...*this multiplicity, this multiplying of perspectives and influences, is key to what multispecies studies is all about (pp. 3-4, italics added).

Tsing (2019) notes that one has to move beyond language to the study of temporalities, infrastructure, and landscapes in order to begin to appreciate that multiple ways of being encounter each other in world-making. This is quite literally slow work. In short, multispecies work is a study in complexity of living, learning, and becoming with, alongside, and through other planetary beings and cosmological phenomena. Khan (2020) begins to develop the first aspects of the framework of a mathematics for Multispecies' Flourishing.

Speculatively, Khan (2020) offers that a mathematics education for Multispecies' Flourishing might find a first analogy in enactivism's focus on structural coupling among individuals and their environment; this can then be extended to include indigenous wisdom sensibilities/spiritualities, which do not view the multispecies world through logics and economics of replacement, extraction, exploitation and extinction or as 'resources' to be exploited and profited from, but rather as 'kin' and 'nations' to be partnered with in teaching, learning, living, and dying well. We offer that Science, Mathematics and Technology Education (SMTE) for Multispecies' Flourishing acknowledges and seeks to address the needs of some specific member(s) of the multispecies world for survival, transcendence, belonging, dignity and challenge and whose places of learning (Ellsworth, 2004) include the land, languages spoken on and by the land, the stories told by living beings and the ways of living that involve a variety of selectively advantageous logics from which learning emerges across a variety of different embodied complex systems.

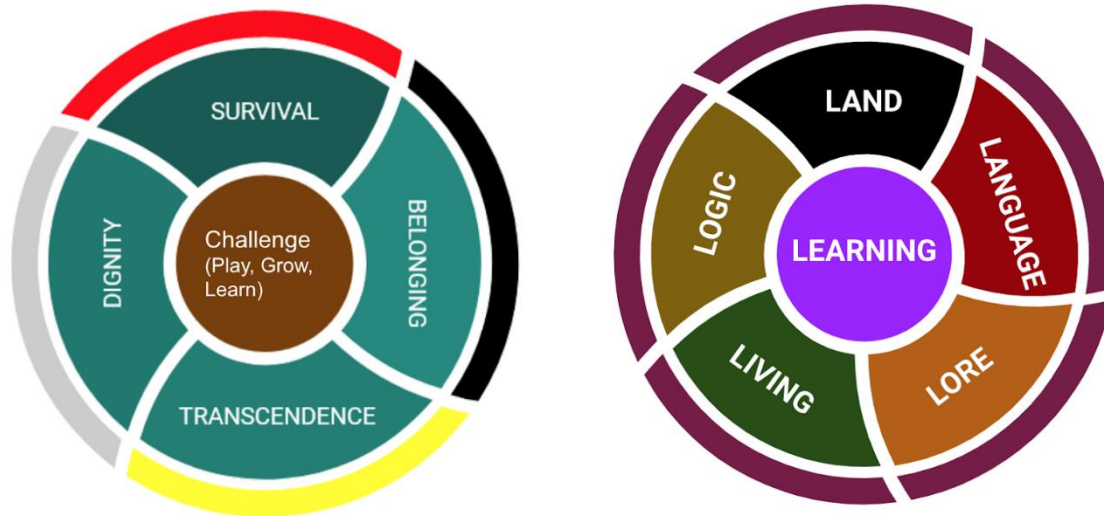


Figure 1: An initial frame for Multispecies' Flourishing.

Multispecies' Flourishing is not another/an Other 'plot' (i.e., it is not merely another academic subfield seeking a toehold, nor is it someone else's or some subaltern's concern - Multispecies' Flourishing is a proper concern for all beings on this planet). It is an ethics that sits in relation to the multiple interlaced economic systems that span the globe today, the spaces from which survival, culture, and resistance emerge, and the places of oppression. It is an ethics that is in opposition to frameworks that seek to relegate any aspect or member of the multispecies world as 'property.' It points to the absurdities and contradictions in notions like sustainable development goals and ESE (Environmental and Sustainability Education) that seek to maintain and work within the existing economic frameworks and philosophies of oppression and domination. Multispecies' Flourishing is the next step in a long emancipation (Walcott, 2021) not just of oppressed peoples everywhere on this planet, but oppressed species understood very broadly

– the longer/deeper inter-generational goal is still multispecies' freedoms and justice.

Challenges

Remaining open to these gifts of the nonhuman natural world might provide a key into how we must be if we are to live in a more radically equitable planet. A planet that decenters the human. What can we make possible when we make room for the unexpected in the midst of ruin?...How much ruddier might we be against the multiheaded hydra of white supremacy as "a world of mutually-flourishing companions" instead of "a single species" forcibly homogenized and easily destroyed?" (D' Oleo, 2019, p.163).

"i wanted to bring us back to the green of blackness, ease on down into the groove of the bottomsoil, slip inside the underground brilliance of mycelium, pull a lush feeling out from deep inside the earth, think about how people (now) come together outside the digital assistance of intermediary social media apparatuses. i was preoccupied with intimacy, relations between people, relations between all that exists. i began to ruminate on the possibility in coming together, to make friends (not followers) outside the strictures of surveillance." (Ife, 2021)

The Multispecies Flourishing framework that we have presented (see Figure 1) is posed as a challenge. It is foremost an ethical challenge, i.e. a challenge to our normative and, at times, oppressive ways of working, knowing, and being and our sometimes disconnectedness from our objects and subjects of study. Multispecies work offers opportunities to do traditional/rigorous work in mathematics and science and technology education, without having to abandon our romantic or mythopoetic sensibilities, by acknowledging and honouring the fact that our ability to do this work is enabled by a multitude of others. Work that is oriented towards being for Multispecies' Flourishing is work that is oriented towards expanding the sphere and increasing the density of freedoms for all species. This is justice work writ large in our (cosmologically) small lives.

The incorporation of an approach that we have called Multispecies' Flourishing will entail a much closer collaboration between practitioners in source

disciplines and those in education. This is a renewed and differently inflected call for inter, multi and transdisciplinary collaborations or more accurately partnerships across areas of study, and communities, including non-human ones (Mitchell & Willets, 2009). The challenge is a new narrative purpose for education with the goals of inspiring reflection and action. What might this look like for readers' work? The challenge is to begin by asking - what might we choose to do differently (or do more of) if we were to take the flourishing of the multispecies world as a right and as a rightful starting place for our work? For example, in mathematics education, this has meant making certain intentions, inclusions and exclusions explicit and learning more about physical location (land/territory), natural history, and cultural anthropological perspectives on phenomena and practices such as communal buffalo hunting (Brink, 2008), differential rates of diabetes in indigenous and non-indigenous populations (DyckFehderau, 2017) hacking insulin pumps and DIY insulin, as well as discussing the effects of elevated carbon-dioxide level on micro-nutrient de-densification in human food staples (Loladze, 2014) and decalcification resulting in shell fragility of pteropods in acidifying oceans (Kennedy, 2014).

Multispecies Flourishing is both an end and a starting point.

Mohawk mathematician Edward Doolittle, speaking in a context of Indigenous language loss and revitalization, notes that learning his Mohawk language was transforming in developing understanding of the critical importance of relationships. He says,

When I learned Mohawk, an elder came to visit my class and said to us, 'The birds thank you. The trees thank you. The animals thank you for learning the language.' At the time, it seemed an odd thing to say, but now I understand. (Doolittle, 2015).

This idea is at the heart of this editorial: that relationships matter; that relationships with our more-than-human kin matter; and that learning mathematics, science and technology for survival, transcendence, dignity, belonging and to meet challenges through studying the networks among land, language, lore (story), living, logics and (emergent) learning is a necessary first step in repairing relationships damaged

through the various forms of colonialism (settler, extractive, plantation), ongoing colonialities and its attendants—racial capitalism and multispecies exploitation. We mindfully and carefully substitute 'SMTE' or 'Teach SMTE' for Mohawk in the Doolittle quote above as a hopeful intention for our students that they might one day say,

When I learned SMTE / to teach SMTE, an elder came to visit my class and said to us, 'The birds thank you. The trees thank you. The animals thank you for learning the language.' At the time, it seemed an odd thing to say, but now I understand.

References

- Asdal, K., Druglitrø, T. & Hinchliffe, S. (Eds.) (2016). *Humans, animals and biopolitics: The more-than-human condition*. Routledge.
- Birch, S. P. (Ed.). (2018). *Multispecies archaeology*. Routledge.
- Brink J. W. (2008). *Imagining Head Smashed In: Aboriginal buffalo hunting on the northern plains*. Edmonton, Alberta: Athabasca University. (EBook). Retrieved from <http://www.aupress.ca/index.php/books/120137>.
- Bull, J., Holmberg, T. & Åsberg, C (2019). *Animal places: Lively cartographies of human-animal relations*. Routledge.
- Cherkowski, S. & Walker, K. (2018). *Teacher wellbeing: Noticing, nurturing and sustaining flourishing in schools*. Ontario, Canada: Word & Deed.
- decolonizing light (website). <https://decolonizinglight.com/>
- D' Oleo, D. R. (2019). Mushrooms and mischief: On questions of Blackness. *Small Axe*, 59, 152-163. DOI 10.1215/07990537-7703392
- Doolittle, E. (2007). Mathematics as Medicine – Plenary lecture. In P. Liljedahl (Ed.) *Proceedings of the 2006 CMESG Annual Meeting (17-25)*, Burnaby, BC, Canada.

- Doolittle, E. (2015). *Residential schools robbed Edward Doolittle of the Mohawk language. Then he reclaimed it.* <https://www.cbc.ca/radio/asithappens/as-it-happens-thursday-edition-1.3100783/residential-schools-robbed-edward-doolittle-of-the-mohawk-language-then-he-reclaimed-it-1.3101027>
- DyckFehderau, R. A. (Writer) (2017). *The sweet bloods of Eeyou Istchee: Stories of diabetes and the James Bay Cree*. Mistissini: QC, Cree Board of Health and Social Services of James Bay.
- Ellsworth, E. (2004). *Places of learning. Media, architecture, pedagogy*. Routledge.
- Gallas, K. (1995). *Talking their way into science: Hearing children's questions and theories, responding with curricula*. Teachers College Press.
- Gillespie, K. & Collard, R-C (Eds.). (2015). *Critical animal geographies. Politics, intersections and hierarchies in a multispecies world*. Routledge.
- Gorski, P. (2017). Human flourishing and human morphogenesis: A critical realist interpretation and critique. In *Morphogenesis and human flourishing* (pp. 29-43). Cham, Switzerland: Springer International Publishing AG.
- Hannon, V. & Peterson, A. (2021). *Thrive: The purpose of schools in a changing world*. Cambridge University Press. <https://doi.org/10.1017/9781108877152>
- Haraway, D. (2015). Anthropocene, Capitalocene, Plantationocene, Chthulucene: Making kin. *Environmental Humanities*, 6(1), 159-165. <http://environmentalhumanities.org/arch/vol6/6.7.pdf>
- Ife, F. (2021). *Maroon choreography*. Duke University Press.
- Jenkins, S., Montford, K. S. & Taylor, C. (Eds.) (2020). *Disability and animality: Crip perspectives in Critical Animal Studies*. Routledge.
- Johnson, J. (1988). Mixing humans and nonhumans together: The sociology of a door-closer. *Social Problems*, 35(3), 298-310.
- Keller, E. F. (1984). *A feeling for the organism: The life and work of Barbara McClintock*. Macmillan
- Kennedy, C. (2014). *Ocean acidity dissolving tiny snails' protective shell*. May 8. <https://www.climate.gov/news-features/featured-images/ocean-acidity-dissolving-tiny-snails%E2%80%99-protective-shell>
- Khan, S. K. (2020). After the M in STEM: Towards Multispecies' Flourishing. *Canadian Journal of Science, Mathematics and Technology Education*, 20, 230-245. <https://doi.org/10.1007/s42330-020-00089-4>
- Kimmerer, R. W. (2003). *Gathering moss: A natural and cultural history of mosses*. Oregon State University Press.
- Kimmerer, R. W. (2015). *Braiding sweetgrass: Indigenous wisdom, scientific knowledge and the teachings of plants*. Milkweed Editions.

- Kirksey, E. (Ed.) (2014). *The multispecies salon*. Duke University Press.
- Kirksey, S. E., & Helmreich, S. (2010). The emergence of multispecies ethnography. *Cultural Anthropology*, 25(4), 545-576. <https://doi.org/10.1111/j.1548-1360.2010.01069.x>
- Kohn, E. (2013). *How forests think: Toward an anthropology beyond the human*. University of California Press.
- Kutsyuruba, B., Cherkowski, S. & Walker, K. D. (2021). *Leadership for flourishing in educational contexts*. Canadian Scholars Press.
- Loladze, I. (2014). Hidden shift of the ionome of plants exposed to elevated CO₂ depletes minerals at the base of human nutrition. *eLife*, 3:e02245 doi: [10.7554/eLife.02245](https://doi.org/10.7554/eLife.02245)
- MacCormack, P. (2020). *The ahuman manifesto: Activism for the end of the Anthropocene*. Bloomsbury Academic Press.
- Mace, G. M., Possingham, H. P., & Leader-Williams, N. (2006). Prioritizing choices in conservation, (pp. 17-34). In Macdonald, D. & Service, K. (Eds.), *Key topics in conservation biology*, Wiley.
- Miller, T. L. (2019). *A multispecies ethnography in Indigenous Brazil*. University of Texas Press.
- Mitchell, C. A., & Willets, J. R. (2009). *Quality criteria for inter- and trans-disciplinary doctoral research outcomes*. Prepared for the ALTC Fellowship: Zen and the Art of Transdisciplinary Postgraduate Studies. Sydney, Australia: Institute for Sustainable Futures, University of Technology. Retrieved from <http://www.altc.edu.au/system/files/resources/Mitchell%20UTS%20Fellowship%20report%202009.pdf>
- Mittman, G. (2019). *Reflections on the Plantationocene. A conversation with Donna Haraway and Anna Tsing*. <https://edgeeffects.net/haraway-tsing-plantationocene/>.
- Monami, S. & Adamson, J. (Eds.) (2017). *Ecocriticism and Indigenous studies: Conversations from earth to cosmos*. Routledge.
- Nagarajan, V. (2018). *Feeding a thousand souls: Women, ritual, and ecology in India - An exploration of the kolam*. Oxford University Press.
- Nishi, J.S. (2017). *Status of the American Bison (Bison bison) in Alberta. Update 2017. Alberta wildlife status report No. 38*. Report prepared for Alberta Environment and Parks (AEP) & Alberta Conservation Association (ACA), Edmonton, AB. (134 pp.). Retrieved from <https://open.alberta.ca/dataset/7a095312-6f90-4fca-a992-591d3f4c7780/resource/cab47b51-bf70-4ce4-8aa6-b098aeafec3c/download/sar-statusamericanbisonalberta-2017update-feb2017.pdf> on January, 19, 2019.
- Omura, K., Otsuki, G. J., Satsuka, S. & Morita, A. (Eds.) (2019). *The world multiple: The quotidian politics of knowing and generating entangled worlds*. Routledge.
- Reinert, H. (2016). About a stone. Some notes on geologic conviviality. *Environmental Humanities*, 8(1), 95–117. doi: <https://doi.org/10.1215/22011919-3527740>

- Rupprecht, C., Cleland, D., Tamura, N., Chaudhuri, R. & Ulibarri, S. (Eds.) (2021). *Multispecies cities*. World Weaver Press.
- Schaberg, C. (2020). *Searching for the Anthropocene: A journey into the Environmental Humanities*. Bloomsbury Academic.
- Seligman, M. E. P. (2011). *Flourish: A visionary new understanding of happiness and well-being*. New York, NY: Simon & Schuster.
- Sheldrake, M. (2020). *Entangled Life: How fungi make our worlds, change our minds & shape our futures*. Random House.
- Simard, S. (2021). *Finding the mother tree: Discovering the wisdom of the forest*. Allen Lane.
- Singh, J. (2018). *Unthinking Mastery: Dehumanism and decolonial entanglements*. Duke University Press.
- Su, F. (2020). *Mathematics for human flourishing*. New Haven, CT: Yale University Press.
- Taylor, A. & Pacini-Ketchabaw, V. (Eds.). (2018). *The common worlds of children and animals: Relational ethics for entangled lives*. Abington, UK: Routledge.
- The common worlds project (n.d.). <https://commonworlds.net>
- Tran, T. T., Khan, S. K., & LaFrance, S. (2020). Mathematics for multispecies' flourishing: Make kin with Vietnamese Bánh Chung. *Journal of the Philosophy of Mathematics*.
- Tsing, A. (2019). A multispecies ontological turn. In n K. Omura, G. J. Otsuki, S. Satsuka & A. Morita (Eds.) *The world multiple: The quotidian politics of knowing and generating entangled worlds* (pp. 233-246). Routledge.
- Tunstall, L., & Ferkany, M. (2017). The role of mathematics education in promoting flourishing. *For the Learning of Mathematics*, 37(1), 25-28.
- van Dooren, T., Kirksey, E. & Münster, U. (2016). Multispecies studies: Cultivating arts of attentiveness. *Environmental Humanities*, 8(1), 1–23. <https://doi.org/10.1215/22011919-3527695>
- Walcott, R. (2021). *The long emancipation. Moving toward Black freedom*. Duke University Press.
- Walther, S. (2021). *Multispecies modernity: Disorderly life in postcolonial literature*. Wilfred Laurier University Press