

## Making Kin With Plastic Through Aesthetic Experimentation

Louisa Penfold and Nina Odegard

Louisa Penfold is a postdoctoral fellow in early childhood education at the Harvard Graduate School of Education. Her doctoral research (2015–2019), which was run as a partnership between the University of Nottingham, Tate Gallery, and the Whitworth Art Gallery (UK), looked at the design of young children's learning environments in modern art museums. Louisa's writing on children's art education has been published in MIT's *Journal of Design and Science* and *The Australian*. She also runs the blog Art Play Children Learning. Email: [louisa\\_penfold@gse.harvard.edu](mailto:louisa_penfold@gse.harvard.edu)

Nina Odegard is an associate professor at the Faculty of Teacher Education and International Studies at Oslo Metropolitan University. Her doctoral research explored the phenomenon and concept of aesthetic exploration in young children's encounters with recycled materials in a Remida centre. Prior to this, Nina worked as a project leader at a creative recycle centre and as a pedagogical supervisor across early childhood centres in Norway. Her work is inspired by the Reggio Emilia approach. She is also the author of the Norwegian book *Reuse as a Creative Force: When Matter Comes to Matter*. Email: [odegaa@oslomet.no](mailto:odegaa@oslomet.no)

*Recent scholarship in childhood studies has raised concerns about humancentric, singular discourses regarding human-plastic relations. As a result, questions of how to develop new forms of learning with materials in environmental education are now an important issue for researchers, educators, and policymakers. This paper activates a feminist new materialist ontology to position plastic as an active participant in the formation of knowledge. Drawing on visual imagery of children's and artists' aesthetic experimentations, we explore the intra-related and complex relationship between plastic, children, and the planet. Haraway's concept of making kin is operationalized to highlight plastic's multidimensional complexities as both a destructive and creative force, producing a novel framework for understanding and learning with plastic in early childhood education.*

**Key words:** *feminist new materialisms; aesthetics; plastic; early childhood education; Anthropocene*

### Plastic on a damaged planet

Social scientists have argued that we live in the Anthropocene, an era in which all planetary action is shaped by human activity (Crutzen, 2006). Beginning with the industrial revolution, this geological age has produced widespread environmental damage to ecological systems through drought, heavy rain, and rising global temperatures.

Within Anthropocene debates, plastic has been critiqued for its destructive effect on the environment (Zalasiewicz et al., 2016). Humans' overuse and misuse of the material is evidenced by the introduction of plastic to the ocean's multispecies food chains (Silverman, 2007). A recent assessment of waterways predicts that there will be more plastic in the ocean than fish by the year 2050 (United Nations, 2017). At present, there are around 80,000 tons of plastic in the Great Pacific Garbage Patch (Lebreton et al., 2018), most existing as microplastics embedded as sediment on the seafloor (Marshall, 2019). Such discarded plastic can be understood as a monument of what society once valued and has thrown away (Hird, 2013). As a consequence of this environmental destruction,

public consciousness has positioned plastic as a common enemy of living things, producing a singular discourse regarding human-plastic relations. However, as living bodies merge with plastic, the relationship between the material, living things and the planet is becoming increasingly intra-related, blurred, and complex (Gasperi et al., 2018; Kraftl, 2020; Reinertsen, 2018).

Reggio Emilia educators spearheaded the connection between discarded materials, environmental sustainability, and early childhood education through the generation of Remida centres, or creative reuse centres, around the world (Fondazione Reggio Children, n.d.; Gandini & Kaminsky, 2005). This pedagogy emphasizes the importance

of aesthetics, inquiry-based learning, and atelierista culture in early childhood education (Carlsen, 2015, 2018; Girak, 2015; Iorio et al., 2017). Research undertaken by Odegard (2012, 2019a, 2019b, 2019c) and Odegard and Ross-holt (2016) has investigated waste discourses and recycled materials in Remida centres through an intra-active ontology. From this perspective, intra-activity is understood as the coming together of people and the world in which meaning and matter are inextricably bound (Barad, 2003, 2007). Scholarship merging Reggio Emilia philosophy with new materialist theories (Kind, 2014; Murriss et al., 2018; Pacini-Ketchabaw et al., 2017) has contemplated the significance of materials in early childhood education and theorized the encounters and explorations that emerge from Reggio practice (Odegard, 2021). This research has been extended by Molloy-Murphy (2018, 2020), whose doctoral study reiterated the need to move away from humancentric discourses by acknowledging plastic's agentic force in early childhood settings. She calls for a reformed "pedagogy of hope" that reconsiders what it means to live sustainably on an ecologically challenged planet. This article builds on the aesthetic aspects of Remida practices and combines them with a feminist new materialist ontology to open up a novel framework for understanding and learning with plastic in early childhood education.

Beyond Remida centres, human-plastic-waste relations have gained increasing attention in childhood studies over recent years (Kraftl, 2020; Pacini-Ketchabaw, 2013, 2020; Pacini-Ketchabaw & Kummen, 2016; Taylor, 2013). This work has raised important questions around how children's lives are being affected by plastic within the Anthropocene. Hodgins et al. (2020) argue that early childhood educators' need to present innovative and "shiny" learning environments constructs a tension when recycled materials are used as educational resources:

Our actions to reduce, reuse, and recycle (being good citizens) sit alongside our actions to buy/bring into the classroom stuff to enrich children's experiences in an inquiry (being good teachers), and both sets of actions are buoyed by neoliberal colonial individualist logic. (p. 13)

Studies undertaken in Canadian preschools (Pacini-Ketchabaw, 2019, 2020) have mobilized a materialist pedagogy to position the material at the forefront of classroom practices, helping to reframe understandings of waste in early education. Children's play with recycled "junk" materials has also been studied by MacRae (2008, 2011), who argues for the need to resist reducing children's interactions with materials as simple representations of ideas and feelings. Human-waste-material relations have also been foregrounded by Osgood and Robinson (2019) and Osgood (2019a, 2019b), who critically examine the coming together of young children, LEGO, and glitter in early childhood settings, drawing attention to environmental questions relating to aesthetics, materiality, and waste.

While previous childhood research has acknowledged the complexity of plastic in early childhood education, a multidimensional discourse surrounding the material has yet to significantly permeate teaching practices, particularly concerning the selection of learning environment materials. As a result, questions of how to develop new forms of learning with plastic that acknowledges its multidimensional potentialities are now an important issue for researchers, educators, and policymakers.

### **Activating a feminist new materialist ontology**

Feminist new materialism, described as an ontology of relational learning with material, place, human, and non-human actors (Molloy-Murphy, 2020), has gained increasing popularity over the past 20 years as a mode of cultural, social, and political inquiry across disciplines, including quantum physics (Barad, 2001, 2003, 2007, 2014), critical cultural theory (Bennett, 2010; Coole & Frost, 2010; van der Tuin, 2011), biology (Haraway, 2016; Paulson, 2019), gender studies (Fox & Alldred, 2015), and posthumanist theory (Braidotti, 2013). The ontology acknowledges the active, participatory, and unpredictable role of matter in the formation of knowledge. By producing a new understanding and renewed emphasis on materiality, feminist new materialism flattens the ontological divide between people and the physical world so that they are in a state of mutual transformation with one another (Lenz Taguchi, 2018).

Exploring plastic-waste-matter relations is situated within broader discourses of environmental education. Research exploring the intra-relationship between children and materials has a decade-long history in childhood studies (Hultman & Lenz Taguchi, 2010) with more recent scholarship exploring the posthumanist nature/culture

divide and material agency in early childhood education (Hohti, 2016; Rautio 2013; Taylor et al., 2013; Tesar & Arndt, 2016). Further studies have explored the implementation of feminist new materialist methods in childhood studies (Common Worlds Research Collective, 2020; Hodgins, 2019, Kind, 2014; Malone, 2020; Murriss, 2020; Nxumalo, 2020; Ringrose et al., 2018; Somerville, 2016). This work has drawn attention toward the inextricable relationship between children and more-than-human entities such as materials, technology, weather, and ecological systems. Materials have been drawn on to produce new ways of thinking with and through the world (Pacini-Ketchabaw et al., 2016; Pacini-Ketchabaw & Boucher, 2019). As Osgood and Robinson (2019) articulate, this ontology draws attention toward children's bodily positions in early childhood contexts, inviting

researchers to immerse themselves in the material-discursive entanglements that shape practice and to be attuned to the means by which children resist, challenge, indulge, and transgress gendered ways of becoming through their inter- and intra-actions with humans (e.g., peers, parents, educators), non-humans (e.g., material, animal), and the more-than-humans (e.g., computers). (p. 37)

In line with this research, we understand materials, including plastic, as active and vibrant forces that intra-act with children to produce new ways of thinking and being in early childhood education (Barad, 2003, 2007, 2014; Bennett, 2010; Braidotti, 2013).

### **Making kin with plastic**

This paper mobilizes Haraway's (2016) concept of making kin to construct a multidimensional framework for understanding and learning with plastic in early childhood education. We understand making kin as a way of thinking about humans' relationship with the more-than-human world that acknowledges all living beings as sharing a common "flesh" (Haraway, 2016). Haraway articulates this as a process in which "we relate, think, world, and tell stories through and with other stories, worlds, knowledges, thinkings, yearnings" (p. 97). By drawing on the material of plastic and children's aesthetic experimentation with it, we explore the intra-related, complex, and blurred relationship among plastic, children, and the planet. From this perspective, kin making is used to blur human and nonhuman entities and so we can coexist and cocreate each other through our coexistence (Malone et al., 2020.)

In this paper, we operationalize a feminist new materialist ontology and "making kin" through data generated from two separate doctoral research projects undertaken in Norway and the United Kingdom. The first was an action research study looking at how the material practices of contemporary artists can be used to support young children's learning in modern art museums (Penfold, 2019a, 2019b, 2020; Penfold & Turner, 2020). The second study explored the concept of aesthetic explorations and the complex intra-actions among children, recycled materials, tools, and the physical environment in a Remida centre (Odegard, 2021). Between 2017 and 2019, the authors copresented three conference presentations exploring children's aesthetic experimentation with plastic (Penfold et al., 2017; Penfold & Odegard, 2018, 2019; Figures 1 and 2 illustrate plastic materials shared in these sessions). These presentations generated new connections and insights on plastic, aesthetics, and early childhood education across the two studies. Visual images of plastic and children's play from the projects with it are reread and reexplored collaboratively in this article. These images are not positioned as representations of children's experiences but as provocations to push our thinking further. We argue for a new framework for understanding and learning with plastic in early childhood education that acknowledges the material's multidimensional and complex potentials that emerge from paying careful attention to its physical properties and their intra-actions with children.



Figure 1. Plastic materials presented as part of a workshop at the 2018 Reconceptualizing Early Childhood Education conference in Copenhagen, Denmark. Image credit: Louisa Penfold.



Figure 2. Plastic materials presented as part of the “Children’s Learning with New, Found, and Recycled Stuff” symposium at the 2017 Australian Association for Research in Education conference. Image credit: Nina Odegard.

## Exploring plastic's potentiality through aesthetic experimentation

Aesthetics is a complex concept that is difficult to define, articulate, or classify (Knight, 2018). Articulated by Vecchi (2010) as a polysensorial approach to forming relationships with oneself, other people, and the world around them, aesthetics can include the lighting, texture, colour, materials, space, furnishings, equipment, and layout of a learning environment (MacNaughton & Williams, 2009). While what is considered beautiful varies significantly across cultures, aesthetics can be understood as the process of giving attention and care to the arrangement and layout of physical spaces (Dissanayake, 2000). Aesthetics become experimental when different components of an environment actively extend thinking and become a multisensory, beautiful, valuable, and provocative experience (Odegard, 2021). Building on Grosz's (2008) work, Odegard (2021) conceptualizes aesthetic explorations as a process that produces effects, sensations, and intensities. Subsequently, aesthetics can be understood as a multifaceted concept that enables objects to be more than they are (Grosz, 2008).

Aesthetic experimentation opens up new pathways for thinking and becoming with plastic's physical properties. Plastic is made from natural and organic materials like gas, cellulose, coal, and oil. These components are processed in intricate ways, beginning with the distillation of crude oil that is then separated into chemical compounds (Geyer et al., 2017). These are then heated and moulded into objects like buckets, containers, and buttons (see Figure 3). Plastic's ability to change form allows it takes on diverse functions, giving it great potential for aesthetic experimentation.



Figure 3. Recycled plastic cups and coffee capsules at a Remida centre in Norway. Image credit: Nina Odegard, from the book *Reuse as a Creative Force* (2015).

## Plastic as a material for artists' experimentation

Artists, whether adult or child, transform materials into artistic mediums through exercising careful aesthetic control over a material (Eisner, 1971). This watchful attention to materials distinguishes the activity from other acts of experience. Eisner (1971) writes:

For a material to become a medium, appropriate transformation must take place. Such transformation

requires intelligent decision-making in the selection of the material to begin with, as well as during the process of creation. (p. 5)

Artists' experimentation and decision making with materials can be drawn on to produce an alternate face of plastic that challenges singular discourses on the material. Aesthetic experimentation with plastic can be traced to the beginning of the 20<sup>th</sup> century, when the material was first produced (Davis & Turpin, 2015). Since this time, artists and designers have turned their attention toward developing sustainable practices with plastic (Davis, 2015; Kane, 2015; Moholy-Nagy, 1947; Solanki & Corbin, 2018; Williams, 2009), leading to further ecological thinking and environmental awareness in contemporary art (Boetzkes, 2009).

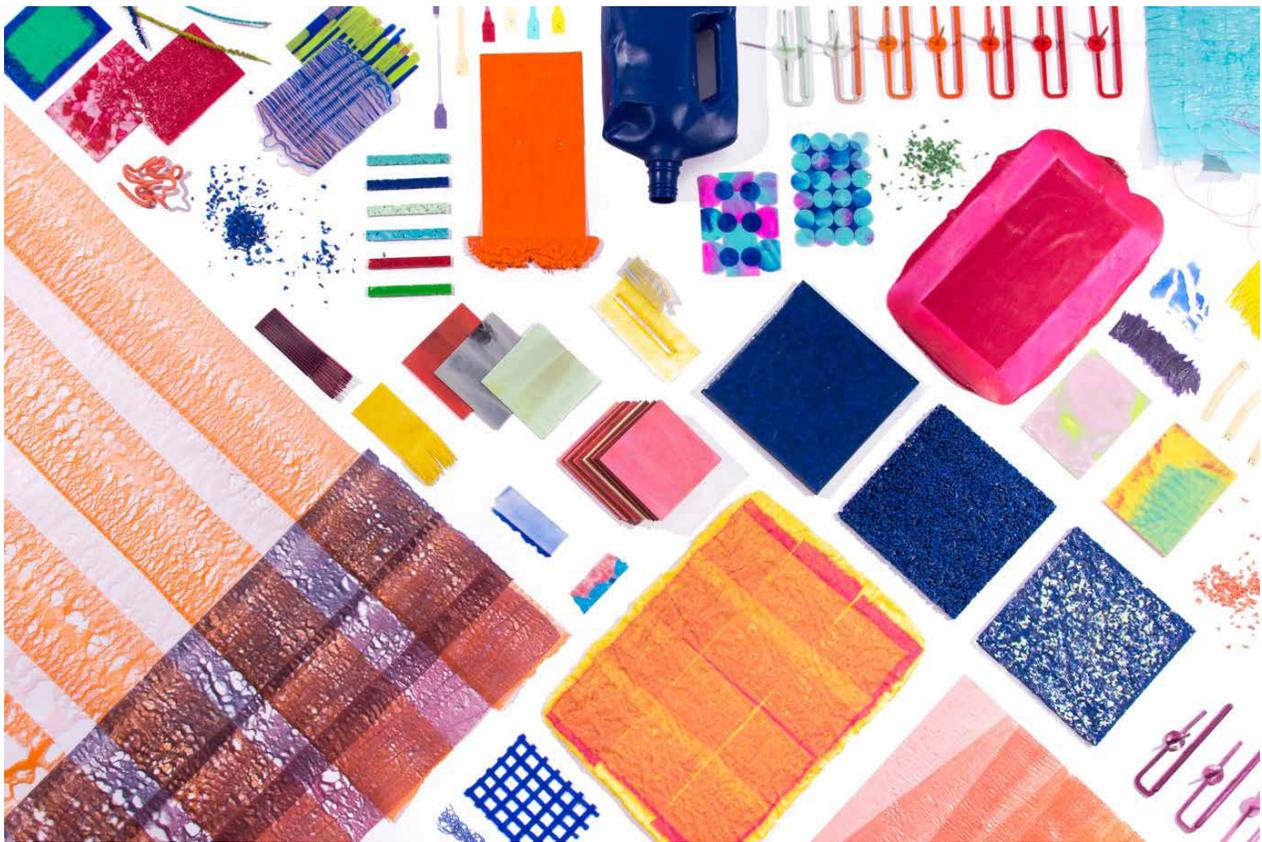


Figure 4. Jessica den Hartog, "Recolored: A New Way of Recycling" (2018). Image credit: Jessica den Hartog.

For example, Dutch designer Jessica den Hartog (2020) experiments with recycled plastic to produce colourful 2-D and 3-D objects. She produces new ways of working with the material by melting, fusing, and reconfiguring the plastic, as illustrated in Figure 4. As she does this, the plastic produces unique configuring of meanings, feelings, and matter and opens up new thought processes. Haraway (2016) talks about fabric weavers as a "cosmological performance" in which the artist constructs relationality and connectedness into the material through the process of making. Like fabric weavers, den Hartog and the plastic she works with create, entwine, and construct stories through their transformations. By doing so, her experimentation opens up new discourses and potentialities for plastic in creative learning.

### Children and plastic's playful intra-actions

Plastic and children intra-act in unpredictable ways to reconfigure one another over time. While aesthetics has been highlighted as critical in constructing pluralistic, collective, and expressive ways of being (Delors, 1996), the arts have been marginalized from school curricula around the globe (Thomson et al., 2019). As a result, opportunities for children to engage in the world in aesthetic and sensory-driven ways have become increasingly limited. At

the same time, play-based learning has been trivialized as not being sufficiently focused on academic skills (Moss, 2012), limiting children's ability to experiment with the material world. While opportunities for children's playful aesthetic experiences in schools have reduced, many modern art museums are developing exciting material play offerings for young audiences.

Plastic has the ability to be transformed by children while also provoking new thought processes in return. To explore these intra-actions, the Whitworth Art Gallery in Manchester (UK) curated a children's "atelier" (art studio) activity inspired by David Batchelor's sculpture "Plato's Disco" (2015). The atelier environment presented plastic as a material that children could use to explore the concept of colour mixing. During the activity, 3-year-old Claire (a pseudonym) experimented with sticking cellophane shapes to a window with a water spray bottle (Figure 5). The cellophane invited aesthetic experimentation relating to phenomena including colour mixing, transparency, opacity, and texture.



Figures 5 & 6. A plastic/colour-mixing art studio activity at the Whitworth Art Gallery, UK. Image credit: Louisa Penfold.

Claire then moved to another window with a long strip of cellophane hanging off it. She sprayed the water onto it until the material's properties transformed, from hanging in front of the window to adhering to the glass (Figure 6). The water simultaneously ran down the cellophane until the dye from the plastic began to form a pool of purple on the floor. The plastic, water, and Claire's thinking intra-acted as these transformations occurred to produce new starting points for aesthetic experimentation. This vignette illustrates children's need for playful intra-actions with plastic's aesthetic qualities. Doing so allows them to understand the messy, situated, and complex possibilities of the material in their lives. These intra-actions also challenge previous human-centered approaches to play-based learning that position children as innocent beings who exist in a protected space from more-than-human forces such as plastic.

## Plastic as a provocation for children's aesthetic exploration

In Remida centres, surplus recycled plastic is donated by local industries for children's creative experimentation (as illustrated in Figures 7 and 8). The origins of Remida centres can be attributed to the Italian town of Reggio Emilia that set up the first space of its kind in 1996. As a result, Remida centres share the philosophical underpinnings and practices of the Reggio Emilia early childhood approach. For example, Remida centres are based on cultural and pedagogical projects that encourage environmental sustainability (Fondazione Reggio Children, n.d.; Vecchi, 2010, 2012). Remida centres collect, store, and exhibit a wide variety of recycled materials, including industry offcuts, surplus supplies from commercial productions, and faulty goods that would otherwise be regarded as junk. Consequentially, the material content of each Remida centre is based on the stock of local industries and businesses. These materials, including recycled plastic, have a second life as a creative force at the centre (Odegard, 2015). These second lives make it possible for humans to encounter big amounts and varieties of materials in many different ways, which allows for thinking through ideas of making kin through getting to know the materials.

The plastic in the Remida centre comes in many different sizes, colours, surfaces, and shapes. These various physical forms invite unique opportunities for children's aesthetic experimentation. Aesthetic experimentation with recycled materials, similar to aesthetic explorations, can be defined as the hands-bodies-materials-light-shadow-darkness-colour intra-actions that are produced by the coming together of complex phenomena in an aesthetic environment (Odegard, 2015). In these aesthetic explorations, plastic invites children to narrate, imagine, and play in divergent and experimental ways. Children's aesthetic explorations with materials, such as plastic, are significant because they allow the children to think, do, and experiment in different ways, including through their senses. These materials open up new ways for children to build relationships with the world and vice versa. Getting to know plastic, and making kin with plastic's properties and possibilities and their destructive sides, cultivates thinking-and doing-with the material, opening up children's capacities to respond. From this perspective, aesthetics is integral in constructing a conceptualization of how children encounter the world beyond a focus on cognition.



Figure 7 (left). Materials are laid out at a Remida centre in Norway. Image credit: Nina Odegard.

Figure 8 (right). A child plays with plastic materials at the centre. Image credit: Nina Odegard.

## Plastic as a material for setting children's thinking in motion

Vecchi (2012, as cited in Carlsen, 2015) stresses that experimentation with materials should be based on an ecological mindset that emphasizes connections between children, materials, and the environment. Vecchi's ideas echo Haraway's invitations to kin making (Haraway, 2016, p. 145). Figure 9 shares visual documentation of the intra-actions between recycled plastic and a young child inside the Remida's darkened room. The plastic sheet is transparent, which makes this material especially interesting to layer, to look through, to use against a screen, and to explore light and colour.

The child explores the large plastic sheet's properties and potentials, its transparency, and how light and colour change. This image, taken during the second author's research (Odegard 2019a, 2019b), illustrates children's aesthetic explorations with unique recycled materials. By layering the sheet with other transparent sheets, the colour of each transparent plastic material, including stage light filters, transforms into new colours that both the child and the researcher find intriguing. These intra-actions and transformations are then moved on to the children's bodies, clothes, and spaces. By looking through the plexiglass, the material entities change into something new. Through kin-making and letting themselves be affected by these relationships, new forms of companionship arise between the materials and the children.

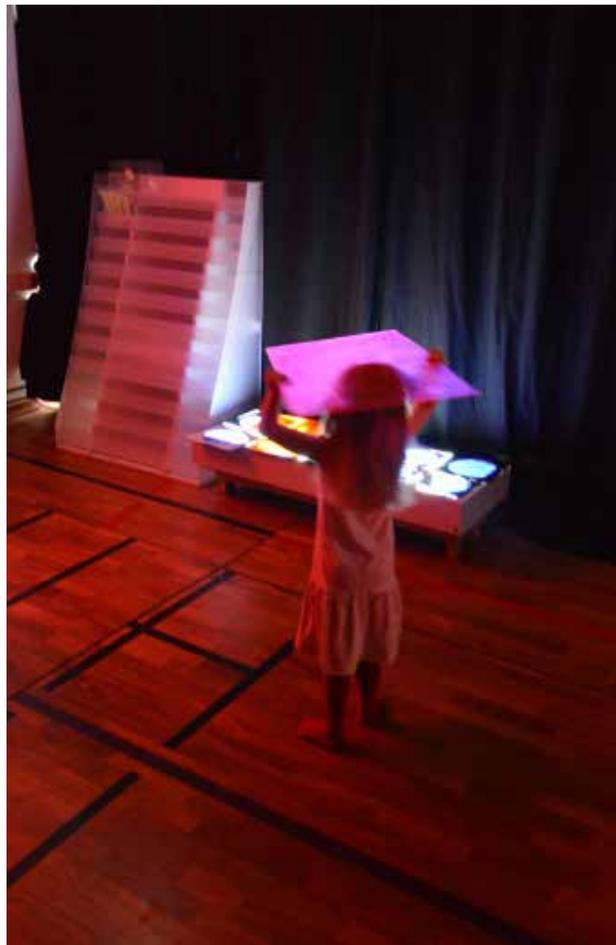


Figure 9. Child playing with recycled objects at a Remida centre. Image credit: Nina Odegard.

Plastic objects seem to set children's thinking in motion (Odegard, 2021). For example, children's play with plastic provokes storytelling, invites creative actions, shapes new ideas, and evokes memories. The plastic's properties engage children in aesthetic explorations with the phenomena of transparency, translucency, mobility, shadow, light,

and colour. Kin making ties relationships through material play. The aesthetics and phenomena of light, colour, and shadow become companions (Odegard, 2019c). By engaging in play with materials, which Haraway (2016) understands as arts for living and dying on a damaged planet, we tie threads between human and nonhuman entities by making kin with plastics. A child's response to the plastic material's vibrant matter could generate responses that make a difference, raising awareness about consumption and sustainability as an important and possible side effect.

### **Constructing child-plastic kinship through aesthetic experimentation**

While previous research has looked at the role of aesthetics (Dissanayake, 2000; Vecchi, 2010; MacNaughton & Williams, 2009) and environmental sustainability in childhood studies (Girak, 2015; Iorio et al., 2017; Molloy-Murphy, 2018, 2020 Pacini-Ketchabaw, 2013, 2019, 2020), this paper merges these debates to produce a multifaceted framework for learning with plastic in contemporary childhood research.

If kinship involves caring and being kind, caring for plastics is to acknowledge the material's complex and often contradictory constituents. This paper has explored:

- plastic as a provocation for children's aesthetic exploration
- plastic as a material for artists' experimentation
- children and plastic's playful transformations
- plastic as a material for setting children's thinking in motion.

Questions of when, how, and if we should use plastic at all are at the forefront of plastic's use in early childhood education. While government recommendations encourage educators to reduce the use of single-use plastics in classrooms (Sparrow, 2018), it is also essential to acknowledge that the material is already here on our planet and therefore already an immediate threat to the earth. Simultaneously, if plastic is cared for and recycled, it can be reused for years to come, making it a valuable and sustainable resource.

Examining plastic through the lens of making kin cultivated the capacity for us to respond to these tensions. Kin making is the process of coming to *know* plastic in all of its complexities and contradictions. This awareness then becomes a form of activism (Alaimo, 2016). By sitting with the messy uncertainty of what is produced from the intra-actions between children and plastics, we acknowledge the complexity of forming ethical response-ability with the material within the Anthropocene. These often contradictory facets of plastic are webs like those that Haraway (2016) describes as being "necessary for learning to stay with the trouble" (p. 216). In this paper, we have not sought to solve the problems plastic has generated but rather engage with the complex and often contradictory relations among the material, children, and the planet.

Making kin and aesthetic experimentation are integral in recognizing and productively working within plastic's paradox in early childhood education. By operationalizing making kin as an analytical framework, we have produced a way of responding to the challenge of plastic's existence in childhood and environmental studies. We have drawn attention to the many ways in which plastic travels around, into, through, and out of children's everyday lives. Making kin produces a mode of inquiring into how sustainable, ethical, and response-able practices can be developed with plastic in a particular time, place, and context. This paradigm opens up possibilities for new relations in-between human and nonhuman entities such as plastic. By doing so, it also questions relationships with the material that are simultaneously playful, aesthetic, ethical, political, and hopeful. However, if this framework is to be implemented in early years practices, there is a need for educators to work with complexity, uncertainty, and risk in their everyday practices.

### **Looking toward a destructive and creative future with plastics**

This paper illustrates what a new and creative form of learning with plastic might look like in action. By engag-

ing with plastic's multiple facets through the two separate research projects, our thinking has become entangled with plastic's ethical complexities. By attending to the material, its properties, and its potentials, new perspectives have emerged that dissolve dichotomous thinking about people/matter, standardization/creativity, and destructive/constructive thought. These intra-actions with the material are significant because "each one reconfigures the world in its becoming—and yet they never leave us; they are sedimented into our becoming, they become us" (Barad, 2007, p. 394).

We have attended to plastic and its unique properties to construct a framework that acknowledges plastic as both a destructive and a creative force. However, we need to continue to generate deeper knowledge of the material to further explore its aesthetic potential, stories, histories, and properties. With this framework, we will continue to explore the multiplicity of what plastic means and offers to the future of early childhood education on our environmentally challenged planet.

By thinking with plastic and exploring its numerous destructive and productive potentials, we have destabilized a singular discourse on the material to produce new ways of thinking with plastic that acknowledge its multiple potentials for learning in early childhood education. We therefore propose a paradigm shift in pedagogy toward one that values creativity of thought and collective aesthetic processes that pave the way for new ways of living on a damaged planet.

## References

- Alaimo, S. (2016). *Exposed: Environmental politics and pleasures in posthuman times*. University of Minnesota Press.
- Barad, K. (2001). Re(con)figuring space, time, and matter. In M. DeKoven (Ed.), *Feminist locations: Global and local, theory and practice* (pp. 75–109). Rutgers University Press.
- Barad, K. (2003). Posthumanist performativity: Toward an understanding of how matter comes to matter. *Signs*, 28(3), 801–831. <https://doi.org/10.1086/345321>
- Barad, K. (2007). *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning*. Duke University Press. <https://doi.org/10.1215/9780822388128>
- Barad, K. (2014). Diffracting diffraction: Cutting together-apart. *Parallax*, 20(3), 168–187. <https://doi.org/10.1080/13534645.2014.927623>
- Batchelor, D. (2015). Plato's disco [Sculpture]. <https://www.davidbatchelor.co.uk/works/commissions/platos-disco/>
- Bennett, J. (2010). *Vibrant matter: A political ecology of things*. Duke University Press. <https://doi.org/10.1215/9780822391623>
- Boetzkes, A. (2009). *Plastic capitalism: Contemporary art and the drive to waste*. The MIT Press.
- Braidotti, R. (2013). *The post-human*. Polity Press.
- Carlsen, K. (2015). *Forming i barnehagen i lys av Reggio Emilias atelierkultur* [Arts and crafts in the light of Reggio Emilia's studio culture]. Åbo Akademi.
- Carlsen, K. (2018). Visual ethnography as a tool in exploring children's embodied making processes in pre-primary education. *Form Akademisk: Forskningstidsskrift for Design Og Designdidaktikk*, 11(1), 1–14. <https://doi.org/10.7577/formakademisk.1909>
- Common Worlds Research Collective. (2020). *Learning to become with the world: Education for future survival*. <https://unesdoc.unesco.org/ark:/48223/pf0000374032>
- Coole, D., & Frost, S. (2010). *New materialism: Ontology, agency, and politics*. Duke University Press. <https://doi.org/10.1215/9780822392996>
- Crutzen, P. (2006) The "Anthropocene." In E. Ehlers & T. Krafft (Eds.), *Earth system science in the Anthropocene*. Springer. [https://doi.org/10.1007/3-540-26590-2\\_3](https://doi.org/10.1007/3-540-26590-2_3)
- Davis, H. (2015). Life and death in the Anthropocene: A short history of plastic. In H. Davis (Ed.), *Art in the Anthropocene: Encounters among aesthetics, politics, environments, and epistemologies* (pp. 347–358). Open Humanities Press. <https://library.oapen.org/handle/20.500.12657/33191>
- Davis, H., & Turpin, E. (2015). Art and death: Lives between the fifth assessment and the sixth extinction. In H. Davis (Ed.), *Art in the Anthropocene: Encounters among aesthetics, politics, environments, and epistemologies* (pp. 3–30). Open Humanities Press. <https://library.oapen.org/handle/20.500.12657/33191>
- Delors, J. (1996). *Learning: The treasure within*. UNESCO. <https://unesdoc.unesco.org/ark:/48223/pf0000109590>
- den Hartog, J. (2020). About. <https://jessicadenhartog.nl/about/>
- Dissanayake, E (2000). *Art and intimacy: How the arts began*. University of Washington Press.
- Eisner, E. (1971). Media, expression, and the arts. *Studies in Art Education*, 13(1), 4–12.
- Fondazione Reggio Children. (n.d.). Remida: The creative recycling centre. <https://www.frchildren.org/en/research/projects/remida>
- Fox, N., & Alldred, P. (2015). Inside the research-assemblage: New materialism and the micropolitics of social inquiry. *Sociological Research Online*, 20(2), 122–140. <https://doi.org/10.5153/sro.3578>
- Gandini, L., & Kaminsky, J. (2005). Remida, the creative recycling center in Reggio Emilia: An interview with Elena Giacomini, Graziella Brighenti, Arturo Bertoldi, and Alba Ferrari. *Innovations in Early Education*, 12(3), 1–13.
- Gasperi, J., Wright, S., Dris, R., Collard, F., Mandin, C., Guerrouache, M., & Tassin, B. (2018). Microplastics in air: Are we breathing it in? *Environmental Science & Health*, 1, 1–5. <https://doi.org/10.1016/j.coesh.2017.10.002>
- Geyer, R., Jambeck, J., & Law, K. (2017). Production, use, and fate of all plastics ever made. *Science Advances*, 3(7), e1700782. <https://doi.org/10.1126/sciadv.1700782>
- Girak, S. (2015). *forget me not: An exhibition –and– creative reuse: How rescued materials transformed my a/r/tographic practice: An exegesis* (Doctoral thesis, Edith Cowan University). <https://ro.ecu.edu.au/theses/1618>
- Grosz, E. (2008). Sensation: The earth, a people, art. In E. W. Holland, D. W. Smith, & C. J. Stivale (Eds.), *Gilles Deleuze: Image and text* (pp. 81–103). Continuum.
- Haraway, D. (2016) *Staying with the trouble. Making kin in the Chthulucene*. Duke University Press. <https://doi.org/10.23987/sts.63108>
- Hird, M. J. (2013). Waste, landfills, and an environmental ethic of vulnerability. *Ethics & the Environment*, 18(1), 105–124. <https://doi.org/10.2979/ethicsenviro.18.1.105>
- Hodgins, B. D. (2019). Common worlding research: An introduction. In B. D. Hodgins (Ed.), *Feminist research for 21<sup>st</sup>-century childhoods: Common worlds methods* (pp. 1–21). Bloomsbury Academic. <http://dx.doi.org/10.5040/9781350056602>
- Hodgins, B. D., Narda, N., Sherri-Lynn, Y., Xiaofeng, K., & Rosalind, T. (2020). Living speculative pedagogies as boundary-crossing dialogues. *Canadian Children*, 45(4), 5. <https://doi.org/10.18357/jcs00019126>

- Hohti, R. (2016). Time, things, teacher, pupil: Engaging with what matters. *International Journal of Qualitative Studies in Education*, 29(9), 1148–1160. <https://doi.org/10.1080/09518398.2016.1201610>
- Hultman, K., & Lenz Taguchi, H. (2010). Challenging anthropocentric analysis of visual data: A relational materialist methodological approach to educational research. *International Journal of Qualitative Studies in Education*, 23(5), 525–542. <https://doi.org/10.1080/09518398.2010.500628>
- Iorio, J. M., Hamm, C., Parnell, W., & Quintero, E. (2017). Place, matters of concern, and pedagogy: Making impactful connections with our planet. *Journal of Early Childhood Teacher Education*, 38(2), 121–135. <https://doi.org/10.1080/10901027.2017.1306600>
- Kane, C. L. (2015, July 17). Plastic shrine: From prosaic miracle to retrograde sublime. *e-flux*. <http://supercommunity.e-flux.com/texts/plastic-shine-from-prosaic-miracle-to-retrograde-sublime/>
- Kind, S. (2014). Material encounters. *International Journal of Child, Youth, and Family Studies*, 5(4.2), 865–877. <https://doi.org/10.18357/ijcyfs.kinds.5422014>
- Knight, L. (2018). Digital aesthetics and multidimensional play in early childhood. In C. M. Schulte & C. Marmé Thompson (Eds.), *Communities of practice: Art, play, and aesthetics in early childhood* (pp. 133–151). Springer Nature.
- Kraftl, P. (2020). *After childhood: Re-thinking environment, materiality and media in children's lives*. Taylor & Francis. <https://doi.org/10.4324/9781315110011>
- Lebreton, L., Slat, B., Ferrari, F., Sainte-Rose, B., Aitken, J., Marthouse, R., Hajbane, S., Cunsolo, S., Schwarz, A., Levivier, A., Noble, K., Debeljak, P., Maral, H., Schoeneich-Argent, R., Brambini, R. & Reisser, J. (2018). Evidence that the great Pacific garbage patch is rapidly accumulating plastic. *Scientific Reports*, 8, 4666. <https://doi.org/10.1038/s41598-018-22939-w>
- Lenz Taguchi, H. (2018). The fabrication of a new materialisms researcher subjectivity. In C. Åsberg & R. Braidotti (Eds.), *A feminist companion to the posthumanities* (pp. 211–221). Springer International. <https://doi.org/10.1007/978-3-319-62140-1>
- MacNaughton, G., & Williams, G. (2009). *Teaching young children: Choices in theory and practice* (2<sup>nd</sup> ed.). Open University Press.
- MacRae, C. (2008). *Making space: Organizing, representing, and producing space in the early years classroom* (Doctoral thesis, Manchester Metropolitan University).
- MacRae, C. (2011). Making Payton's rocket: Heterotopia and lines of flight. *International Journal of Art & Design Education*, 30(1), 102–112.
- Malone, K. (2020). Re-turning childhoodnature: A diffractive account of the past tracings of childhoodnature as a series of theoretical turns. In A. Cutter-Mackenzie-Knowles, K. Malone, & E. Barratt Hacking (Eds.), *Research handbook on childhoodnature: Assemblages of childhood and nature research* (pp. 57–86). Springer International.
- Malone, K., Tesar, M., & Arndt, S. (2020). Glossary key posthuman Childhood studies concepts. In *Theorising posthuman childhood studies* (pp. 237–251). Springer Singapore.
- Marshall, M. (2019). Enter the Anthropocene: We are now living in Earth's plastic age. *The Telegraph*, April 17. <https://www.telegraph.co.uk/business/reducing-plastic-waste/anthropocene-age-of-plastic/>
- Moholy-Nagy, L. (1947). *Vision in motion*. Paul Theobald & Co.
- Molloy-Murphy, A. (2018). *Where does the ribbon want to take us? Rethinking the role of materials in sustainability education*. Paper presented at the Childhood and Materiality conference, Jyväskylä, Finland, May 7–9.
- Molloy-Murphy, A. (2020). Plastic city: A small-scale experiment for living in the Anthropocene. Paper presented at the Comparative and International Education Society conference, online, March 15–April 30.
- Moss, P. (2012). Readiness, partnership, a meeting place? Some thoughts on the possible relationship between early childhood and compulsory school education. *Forum*, 54(3), 355–368. <https://doi.org/10.2304/forum.2012.54.3.355>
- Murris, K. (2020). Post-human child and the diffractive teacher: Decolonizing the nature/culture binary. In A. Cutter-Mackenzie-Knowles, K. Malone, & E. Barratt Hacking (Eds.), *Research handbook on childhoodnature: Assemblages of childhood and nature research* (pp. 31–55). Springer International.
- Murris, K., Reynolds, R., & Peers, J. (2018). Reggio Emilia inspired philosophical teacher education in the Anthropocene: Posthuman child and the family (tree). *Journal of Childhood Studies*, 43(1), 15–29. <http://dx.doi.org/10.18357/jcs.v43i1.18262>
- Nxumalo, F. (2020). Situating Indigenous and Black childhoods in the Anthropocene. In A. Cutter-Mackenzie-Knowles, K. Malone, & E. Barratt Hacking (Eds.), *Research handbook on childhoodnature: Assemblages of childhood and nature research* (pp. 535–556). Springer International.
- Odegard, N. (2012). When matter comes to matter: Working pedagogically with junk materials. *Education Inquiry*, 3(3), 387–400. <https://doi.org/10.3402/edui.v3i3.22042>
- Odegard, N. (2015). *Gjenbruk som kreativ kraft. Når (materi)AL(ite)T henger sammen med alt* [Reuse as a creative force. When matter comes to matter]. Pedagogisk Forum.
- Odegard, N. (2019a). Crows: Young Nordic children's aesthetic explorations of crows. In P. Rautio & E. Stenvall (Eds.), *Social, material, and political constructs of Arctic childhoods: An everyday life perspective* (pp. 119–137). Springer. [https://doi.org/10.1007/978-981-13-3161-9\\_8](https://doi.org/10.1007/978-981-13-3161-9_8)
- Odegard, N. (2019b). Imagine sustainable futures. Experimental encounters between young children and vibrant recycled matter. In J.

- Kroeger, C. Y. Myers, & K. Morgan (Eds.), *Nurturing nature and the environment with young children: Children, elders, earth* (pp. 124–138). Routledge. <https://doi.org/10.4324/9780429264672-11>
- Odegard, N. (2019c). Making a bricolage: An immanent process of experimentation. *Contemporary Issues in Early Childhood*, 0(0), 1463949119859370. <https://doi.org/10.1177/1463949119859370>
- Odegard, N. (2021). *Aesthetic explorations with recycled materials. Ideas, concepts, and phenomena that matter* (Doctoral dissertation, Oslo Metropolitan University).
- Odegard, N., & Rossholt, N. (2016). “In-betweens spaces”: Tales from a Remida. In A. B. Reinertsen (Ed.), *Becoming Earth: A post human turn in educational discourse collapsing nature/culture divides* (pp. 53–63). Sense. [https://doi.org/10.1007/978-94-6300-429-9\\_6](https://doi.org/10.1007/978-94-6300-429-9_6)
- Osgood, J. (2019a). You can't separate it from anything: Glitter's doings as materialized figurations of childhood (and) art. In J. Osgood & M. Sakr (Eds.), *Post developmental approaches to childhood art* (pp. 111–136). Bloomsbury.
- Osgood, J. (2019b). Materialized reconfigurations of gender in early childhood: Playing Seriously with LEGO. In J. Osgood & K. H. Robinson (Eds.), *Feminists researching gendered childhoods: Generative entanglements* (pp. 85–108). Bloomsbury Academic.
- Osgood, J., & Robinson, K. H. (2019). Re-returns and dis/continuities of feminist thought in childhood research: indebtedness and entanglements. In J. Osgood & K. H. Robinson (Eds.), *Feminists researching gendered childhoods: Generative entanglements* (pp. 17–40). Bloomsbury Academic.
- Pacini-Ketchabaw, V. (2013). Frictions in forest pedagogies: Common worlds in settler colonial spaces. *Global Studies of Childhood*, 3(4), 355–365.
- Pacini-Ketchabaw, V. (2019). *Reconfiguring the plastic scenes young children live with*. Paper presented at “Young People, Well-Being, Resilience, and Enterprise: Critical Perspectives for the Anthropocene,” Bizkaia Aretoa, Bilbao, Spain, September 5–7.
- Pacini-Ketchabaw, V. (2020). *Inevitable queer futurities for the Chthulucene*. Paper presented at Comparative and International Education Society conference, online, March 15–April 30. <https://cies2020.org/update/common-worlding/>
- Pacini-Ketchabaw, V., & Boucher, K. (2019). Claying: Attending to Earth's caring relations. In B. D. Hodgins (Ed.), *Feminist research for 21<sup>st</sup>-century childhoods: Common worlds methods* (pp. 25–34). Bloomsbury Academic.
- Pacini-Ketchabaw, V., Kind, S., & Kocher, L. (2017). *Encounters with materials in early childhood education*. Routledge. <https://doi.org/10.4324/9781315743257>
- Pacini-Ketchabaw, V., & Kummen, K. (2016). Shifting temporal frames in children's common worlds in the Anthropocene. *Contemporary Issues in Early Childhood*, 17(4), 431–441. <https://doi.org/10.1177/1463949116677930>
- Paulson, S. (2019, December 6). Making kin: An interview with Donna Haraway. *Los Angeles Review of Books*. <https://lareviewofbooks.org/article/making-kin-an-interview-with-donna-haraway/>
- Penfold, L. (2019a). Material matters in children's creative learning. *Journal of Design and Science*, 5. <https://jods.mitpress.mit.edu/pub/bwp6cysy/release/1>
- Penfold, L. (2019b). *Pedagogical curation: Connecting young children's learning with art museum curatorial practices* (Doctoral thesis, University of Nottingham). <http://eprints.nottingham.ac.uk/59443/>
- Penfold, L. (2020). Connecting young children's learning processes with art museum practices. In S. Shaffer (Ed.), *International perspectives on children in museums: Weaving theory and practice* (pp. 41–55). Routledge.
- Penfold, L., & Odegard, N. (2018). *The performativity of visual imagery in early childhood education*. Paper presented at Reconceptualizing Early Childhood Education conference, Copenhagen, Denmark, October 14–18.
- Penfold, L., & Odegard, N. (2019). *Making kin with plastic in children's art education*. Paper presented at Art in Education conference, Oslo Metropolitan University, Oslo, Norway, August 28–30.
- Penfold, L., Odegard, N., & Thomson, P. (2017). *Imagine immanent didactics [Odegard] and Young children's thinking with natural materials in art museums [Penfold]*. Papers presented at “Material Play: Children's Learning with New, Found, and Recycled Stuff” symposium, Australian Association for Research in Education, Canberra, Australia, November 26.
- Penfold, L., & Turner, L. (2020). Reflecting on children's play at the Whitworth Art Gallery. In A. Hackett, C. MacRae, & R. Holmes (Eds.), *Working with young children in museums: Weaving theory and practice* (pp. 179–186). Routledge.
- Rautio, P. (2013). Children who carry stones in their pockets: On autotelic material practices in everyday life. *Children's Geographies*, 11(4), 394–408. <https://doi.org/10.1080/14733285.2013.812278>
- Reinertsen, A. (2018). Unconscious activism and the subject as critic: A slam articlepoem. In A. Cutter-Mackenzie-Knowles, K. Malone, & E. Barratt Hacking (Eds.), *Research handbook on childhoodnature: Assemblages of childhood and nature research* (pp. 1–16). Springer International. [https://doi.org/10.1007/978-3-319-51949-4\\_22-1](https://doi.org/10.1007/978-3-319-51949-4_22-1)
- Ringrose, J., Warfield, K., & Zarabadi, S. (2018). *Feminist posthumanisms, new materialisms, and education*. Routledge.
- Silverman, J. (2007). Why is the world's biggest landfill in the Pacific Ocean? [Blog post]. *How Stuff Works*. <https://science.howstuffworks.com/environmental/earth/oceanography/great-pacific-garbage-patch.htm>
- Solanki, S., & Corbin, L. (2018). *Why materials matter: Responsible design for a better world*. Prestel.
- Somerville, M. (2016). The post-human I: Encountering “data” in new materialism. *International Journal of Qualitative Studies in Education*, 29(9), 1161–1172. <https://doi.org/10.1080/09518398.2016.1201611>

- Sparrow, A. (2018). Schools urged to eliminate single-use plastics by 2022. *The Guardian*, December 27. <https://www.theguardian.com/environment/2018/dec/27/schools-urged-to-eliminate-single-use-plastics-by-2022>
- Taylor, A. (2013). *Reconfiguring the natures of childhood*. Routledge.
- Taylor, A., Blaise, M., & Giugni, M. (2013). Haraway's "bag lady story-telling": Relocating childhood and learning within a "post-human landscape." *Discourse: Studies in the Cultural Politics of Education*, 34(1), 48–62. <https://doi.org/10.1080/01596306.2012.698863>
- Tesar, M., & Arndt, S. (2016). Vibrancy of childhood: Things, power, philosophy, and political ecology of matter. *Cultural Studies ↔ Critical Methodologies*, 16(2), 193–200.
- Thomson, P., Hall, C., Earl, A., & Geppert, C. (2019). Towards an arts education for cultural citizenship. In S. Riddle, & M. Apple (Eds.), *Reimagining education for democracy*. Routledge. <https://doi.org/10.4324/9780429242748>
- United Nations. (2017). UN's mission to keep plastics out of oceans and marine life. <https://www.un.org/sustainabledevelopment/blog/2017/04/feature-uns-mission-to-keep-plastics-out-of-oceans-and-marine-life/>
- van der Tuin, I. (2011). A different starting point, a different metaphysics: Reading Bergson and Barad diffractively. *Hypatia*, 26, 22–42. <https://doi.org/10.1111/j.1527-2001.2010.01114.x>
- Vecchi, V. (2010) *Art and creativity in Reggio Emilia: Exploring the role and potential of ateliers in early childhood education*. Routledge.
- Vecchi, V. (2012). *Blå blomster, bitre blader* [Blue flowers, bitter leaves]. Fagbokforlaget Vigmostad & Bjørke AS.
- Williams, G. (2009). From industrial waste to objects of beauty. *New York Times*, February 5. <https://www.nytimes.com/2019/02/05/t-magazine/recycling-waste-into-objects.html>
- Zalasiewicz, J., Waters, C., Ivar do Sul, J., Corcoran, P., Barnosky, A., Cearreta, A., Edgeworth, M., Gałuszka, A., Jeandel, C., Leinfelder, E., McNeill, J., Steffen, W., Summerhayes, C., Waple, M., Williams, M., Wolfe, A. & Yonan, Y. (2016). The geological cycle of plastics and their use as a stratigraphic indicator of the Anthropocene. *Anthropocene*, 13, 4–17. <https://doi.org/10.1016/j.an-cene.2016.01.002>