Designing in-between: Innovation from field to fabric

Professor Lynn-Sayers McHattie* and Lindsey Stewart Sherrod
The Glasgow School of Art
*Corresponding Author l.mchattie@gsa.ac.uk

Abstract
In this article we present the reflective and reflexive accounts of two research and textile practitioners designing in-between—whereby encounters between human and the more-than-human—shape textile design practice as an ongoing and relational connection with soil, land and landscape. From selectively breeding a flock of Shetland sheep for fleece to designing for decomposition to support soil health; both accounts articulate the lived and felt experience through: place and the stewardship of land; the importance of terrain; transparency and traceability; the pursuit of [re]generative material cycles; and innovation from field to fabric. As practitioners, we frame a [re]positioning of dominant discourses through the lens of environmental sustainability and ecological renewal. We locate more-than-human as an interconnected matrix of inter- and intra-dependencies, which includes the wisdom of nature within the wider ecology. This extends to local and vernacular materials including the ritualistic and performative qualities of decomposition and specifically to the recuperation of perceptions around the value of wool both economically and environmentally. We go on to advocate for the radical [re]imagining of production cycles within the textile industry broadly conceived and conclude with a call to designers to consider alternative starting points—innovation from field to fabric—embodied within the more-than-human rubric. In so doing, we [re]consider how a full set of contributors—from sheep to soil microorganisms—can [re]position, [re]define and [re]imagine existing textile production cycles.

Keywords: Regenerative Design; Ecological Stewardship; Sheep; Wool; Design for Decomposition.

Introduction

This article explores the concept of designing in-between where encounters with the more-than-human shape textile design practice as an ongoing and relational connection with human and ecological interspecies. It examines how human and more-than-human entities can co-exist in a mutually comprehensible etymology that fulfils a double function to conserve and to sustainably develop through a sort of kinship of creation. We foreground questions around what does it mean to grow, process and craft textiles—honed by the hand—informed by approaches that are directly related to the qualities and sensibilities of nurture rather than depleting natural systems. We begin by presenting the reflective and reflexive accounts of two research and design practitioners, which are narrated in the first-person, and together explore the selective breeding of a flock of Shetland sheep in South West Scotland and designing for decomposition through a renewed connection to soil, land and landscape. Both accounts articulate the lived and felt experience of vernacular materials, textile design and production and responsible advocacy through: place and the stewardship of land; the importance of terrain; transparency and traceability; the pursuit of [re]generative material cycles; and innovation from field to fabric. These reflective and reflexive research accounts frame textile practice as modalities that enfold breeding Shetland sheep, textile design and practice and project-based communities bound by paradigm. We go on to introduce cycles of regeneration and how a more-than-human approach can be observed as an interconnected matrix of inter- and intra-dependencies. We discuss how the current fragmentation and entanglement of textile processes require significant shifts towards ecological, environmental and ethical production cycles. We then provide the methodological orientation and research approach and its connection to broader theoretical constructs. We call for a radical reimagining of relations as a mode of regenerative design, which not only challenges dominant discourses, but calls to action designers' responsibilities as they embrace textile design and practice from an environmental and ecological perspective. In so doing, we consider how a full set of contributors—from field to fabric—can [re]position, [re]define and [re]imagine existing textile production cycles.

Practitioner Accounts

We begin by presenting the reflective and reflexive accounts of two research and design practitioners. We are driven in part by the *lack* of value ascribed to wool—which is not just particular to Scotland—but shared geographically between countries and farming communities (Irish Farmers Journal, 2023; Fibres2Fashion, 2022; BBC News, 2020; Burgess, 2019; Zheljazkov, 2005). Sheep and wool are important environmentally, economically and culturally. Traditionally, sheep were bred for wool, which had significant economic value, however with a focus on wool now as a by-product of the meat industry (Agriland, 2023) and exacerbated by Covid-19 this has resulted in wool having relatively little economic value with rates reported of less than 10p per kilo (BBC News, 2021). Farmers have responded by burning their fleece rather than selling to British Wool at a loss after they have paid for shearing (BBC News, 2020b). Collectively, these challenges call for a repositioning and reframing of the narratives that surround wool.

Narratives of Wool

The indigenous and unique properties of wool and the aesthetics of the natural Shetland fleece palette offer a lens to advance understanding of both the historical context and intangible cultural heritage of native breeds that speak to the consideration of local cultures and practices. At a fundamental level textile and craft practices co-exist with new developments and innovation towards establishing a broader more mutually comprehensible etymology, which fulfils a double function to conserve and to sustainably develop. Similarly, small scale farming, shepherding and textile techniques, tools and practices, which may risk obsolescence might be documented, to inform new environmentally responsible processes in new contexts. These practices are located in specific geographic and cultural contexts, yet are universal in their capacity to connect across spatial and temporal communities. My [Lynn's] research and practice aims to uncover the regenerative and situated complexities involved in sustaining and developing craft, fibre and textile practice towards supporting ongoing multi-agency and transdisciplinary discourses and connections, ensuring that these play a central role in forming and advancing the agenda for the development of community-based regenerative indigenous textile production.

Indigenous Textile Production
Community-based indigenous textile production can be viewed as a body of knowledges that reside in the lived and felt experience of practitioners including the intimate knowledge of materials, local traditions and geographic context. This includes the relations between landscape, mythology and iconography, including vernacular traditions and materials, such as fibres and yarn derived from in this case Shetland sheep. These communal or shared bodies of knowledge revolve around connectivity (social, cultural and familial), community, space, place, care, health and wellbeing as well as economics. This is tied to cultural reception and the importance of interdependencies within creative practice and craft work as a web or "meshwork" (Ingold, 2023) of cultural wisdom. Cultural wisdom or situated knowledges are located in specific geographical contexts and confer to Manzini's (2022) notion of project-based communities to form a more expansive view of craft that encompasses the relationship practitioners and textile makers have to land through the growing, nurturing and harvesting of raw materials and how craft intertwines with the material world. It could be argued that these practices broadly reside at the intersection between agriculture and craft and are given shape and form through my practice as a mode of relations that connect indigenous practices and communities to the land. Recently the interconnections with rural communities and indigenous practices have become within the purview of design discourses in-part related to the decolonisation of design debate. Together these become component parts of the "political economy of craft" and extend to advocacy around preservation and the cultivation of indigenous, native and vernacular materials, the appreciation of deep process wisdom and embodied knowledge and collectively influencing narrative to support social and cultural change. This expanded view of craft acts as a fulcrum that connects making to infrastructure, education and skills envisaging new sustainable and alternative models, which give space to legitimising geographically located and hyperlocal skills that are intimately connected to the landscape and, as such, may not be framed within conventional research approaches.

Progressive Approaches and Practices

Foregrounding questions around what does it mean to grow, process and craft textiles through holistic and adaptive approaches scaffold my research and in so doing are directly related to the qualities and sensibilities of nurture rather than depleting natural systems. These approaches are rooted in local and hyper-local tacit wisdom as a foundational concept (McHattie & Champion, 2021). Through asking these questions in my practice I contend that through this lens contemporary practices of textiles should strive to be circular in nature and connect farmers and makers to the broader local ecology. In many ways, these contemporary practices of craft resonate with progressive approaches, such as reigning in systemic growth and a move towards connecting the tactility of vernacular materials to their origins—through a sort of kinship of creation—cultivating animals and crops within an ethical and moral framework to give material form. A more equitable approach whereby ethical production is connected to a deeper understanding of the rhythms of nature, seasonality and, of course, animal welfare.

Layers of Biography
Located in the South West of Scotland my practice revolves around creative practice broadly considered and textiles as a "body of knowledges" that relate to local landscapes, vernacular materials, skills, expertise and process wisdom acquired over time. Trained as a textile designer I keep a flock of Shetland sheep. Shetland sheep are a hardy and native breed—they are versatile foragers, grazers and browsers—and the terrain affects the quality of the fleece. In this way Shetland fleece contains layers of biography the touch, crimp and fineness of fibres made visible through the connection with the soil. I selectively breed the sheep for the unique properties and intrinsic characteristics of Shetland wool including: light, lustrous, fine, soft, breathable, and durable also known as "kindly wool". I have the fleece micron tested, which tests the fineness of the fibre, and informs my breeding strategy to ensure consistency and quality and for particular Shetland colours. There are 11 main Shetland colours, mine range from white, musket – a light grey/brown, fawn, moorit – a red/brown to Shetland black. In addition to the colours there are over 30 markings described in the Shetland dialect as: bersugget; katmoget and snaelit. I then convert the fleece and blend the natural palette of colours into yarn.

Image 1: 'Norman' of Barclay Shetland Sheep GrimesterTup Image Credit: Lynn-Sayers McHattie.

Transparency, traceability and Scottish provenance are central tenets of this approach, for example, I can identify exactly what sheep the fleece and wool comes from. As a textile designer and weaver, I use the wool to create fabrics; my fabrics incorporate organic forms often using one structure such as honeycomb across different scales. This approach foregrounds collaboration and community-based bio-regional textile models that are in tune with the capacities and/or limitations of particular ecosystems, I also work in collaboration with new and emerging designers who use my wool. I'm particularly interested in the potential of circular textile economies and re-generative models. This includes the potential of new and different starting points, such as, designing with and for nature, designing for decomposition and reimaging supply chains through building inter- and intra-dependencies, which are underpinned by a plurality of values that encompass making, meaning and living well.

Designing for Decomposition

Notions surrounding decomposition are largely hidden from the everyday aspects of textile practice; the entanglements that surround textile sourcing such as supply chain complexity, unknown material origins, and communicating provenance to consumers obscure the built-in obsolescence. In designing for decomposition, the value of "endings" shift into sharp focus. In order to support regenerative modes of design through designing for decomposition we believe it is fundamental to understand how wool returns to the soil and its potential to nurture the field. Decomposition is thus foregrounded as a mode of organic relations from field-to-flock-to-fleece-to-fabric-to-field. Whilst decomposition can conjure associations of decay, deterioration, corrosion and death there are studies that reveal how embracing the idea of decomposition within material

objects can provide new design insights and open pathways to regeneration (Song and Paulos, 2021; Liu, Bardzell, & Bardzell, 2019; DeSilvey, 2006). Transformative applications of decomposition in domains such as microbiology, physiology and zoology (Swift, 1979), as well as statistics (Kitagawa, 1955) and computer science (DeMarco, 1979) suggest decomposition can open up insightful activity rather than views of a stagnant and unavoidable path to decline. Through working with wool in the soil, alternative starting points, raw material decisions and textile design choices could enhance designers' connection to the land. In this manner, decomposition is not viewed as the "end" but rather a narrative pathway that evokes regeneration and renewal.

Soil within a Wider Lexicon
Working with wool decomposition focused the language between research and practice from larger conceptual ideas around sustainable design towards specific connections to place-based design and designing for decomposition. Rather than "soil" serving as a term for dirt or mud; soil fertility embodied a concept or relationship to land within a wider lexicon. These encounters enacted through the lived and felt experience enmeshed in nature contributed to shaping and reshaping designers' decision-making particularly with respect to raw and vernacular materials, such as wool. The lived and felt experience resonated through the use of Shetland "waste" wool and "scraps", in this case, procured from shepherds and small-scale farmers for the purpose of composting and decomposition. These wool "scraps", referred to in the Shetland dialect as "hentilagets", are small tufts of wool left behind in fields or caught between fence wires and historically gathered for textile use. However, "hentilagets" have now become remnants of rural life rather than utilised for textile purposes. In so doing, they serve as identified bindings between networks of human activity and a more-than-human world where the nuance and subtle shifts of the terrain and inter-dependencies hold potential meaning towards reimagining textile systems.

Narratives of Project-Based Communities
In my work [Lindsey], decomposing wool allowed for a project-based community exploration to wool decomposition without an attached outcome—such as a product or strategy—but through connectedness. Reflexively, within my research into wool decomposition the "ending" of materiality cannot be removed from the relations between human and more-than-human. Seven participants working and making with wool as designers in Scotland were recruited to take part in the research. Although designers in urban and rural geographies we presented with the opportunity to participate, the group's collective geography was primarily rural. Over several weeks each of the designers received Shetland wool from the same fleece that I was utilising in my own work. The fleece was buried in locations selected by the participants. During a series of interviews in the middle and end of the project, participants spoke about their experiences with the Shetland fleece, they often referred to their surroundings and vocalised interpretations from their local environments. Oftentimes, this was observed in the vocabulary used to describe the area in which they buried their fleece. These references moved from general: wooded; acre; plot; land; mountain to the detailed: my tomato plant; the slugs in our garden; a bin that we use for compost. Embedded within their design approach was an intention to intimately engage with their surroundings—for one participant it was working within the ecosystem and textile heritage on an island—where a childhood was spent. For another participant, it was a move from an urban to a rural environment, which included a shift towards prioritising what she described as 'natural

fabrics' in her work. A further participant who studied forestry developed a local infrastructure to source wool for yarn through local farmers that she met through the organisation that supplied her weekly veg box. A further participant, cultivating her own natural dye garden led to constructing a composting system that could regenerate the material waste from the dyeing process into mulch for her green beds.

Binding Place and Participants
As each participant described their embeddedness of place this directly related to their approach to decomposition. However, the placement or "burying" of the fleece demonstrated specific knowledge in relation to their expertise and connection to land. For example, the participant with forestry and ecological training buried the fleece samples in two different locations; one with less moisture and more sunlight and the other in the shade where the ground retained water because she thought to have two soil samples would be helpful for the research, as well as her own experimentation surrounding growing vegetation on her land. She commented on how burying the fleece affirmed the ability to influence her environment *"you can work on your soil fertility with fairly gentle natural methods"*. The island participant who is a knitwear designer, described the fleece's burial location in the context of the archipelago's landscape *"There's the sea and more hills [...] it sort of felt quite… I don't know, a very typical [Shetland] environment"*. This relationship —a connection binding place and participants—were held together through the act of decomposition that enhanced the relationship to land and landscape through both design and decomposition practices that demonstrated that designers could directly benefit the soil fertility in their communities.

A Cycle of Regeneration
Working within a cycle of regeneration, specifically composting wool in soil, fed into other aspects of participants' lives such as the effect of their practice on their own land and landscape. All of the participants had outdoor compost sites that integrated their materials of practice into the composting ecosystems through different methods. When one participant described the tension between translating the philosophy behind her natural dye garden compost and the pristine nature of social media, she acknowledged that even though composting is "not the prettiest" part of her design process, it was deeply meaningful to her. *"Actually, the idea of using something and creating waste and putting it down the drain for somebody else to deal with or putting it in the bins so it's somebody else's responsibility, even if you're using natural material, I just find that just completely odd and so disconnecting from the reason for choosing those things in the first place […] I'm very lucky to be able to do that and to actually fulfil all parts of that philosophy."* This tension to conceal what is acceptable or desirable in contemporary culture was addressed by another participant through the iterative cycles of mending. The process of mending a pattern on a jumper appealed to her and she described how she observed experienced knitters employing this technique over the course of several wear and use cycles, to the point where the majority of the garment consisted of mended pieces and only fragments of the originals. However, she stated that she did not like the idea of garments remaining in landfill for decades like plastic. Once the garment had completed its purpose, she found the idea of the wool returning to nature agreeable and referenced the cultural significance of sheep to her community. In her mind, the decomposition of her practice felt "very full circle".

Context: Reshaping the Field

We contend that textile production, historically, has prioritised human need. Today, the interconnectedness of textile production systems and the attendant supply chain require radical shifts towards ecological, environmental and ethical production cycles. The required adjustments to existing systems are predicated on the points of integration between humans and the environment. Thus, encouraging ecological residents to interplay in a system in which their presence may have been considered secondary or submissive in traditional textile processes. In this manner designers are distanced and dislocated from raw and vernacular materials, such as wool, which reside locally within communities. We seek to integrate these local project-based communities (Manzini & Fassi, 2022) beyond the historic, human-based need for textiles and clothing. In so doing, we consider how a full set of contributors—from sheep to soil microorganisms—can [re]position, [re]define and [re]imagine existing textile production cycles. This deconstructed approach entails actively questioning where the design process begins and ends and how "handling" or being-in-the-world with ecological participants can shift understandings and develop regenerative responses within the textile system and supply chain. Intentionally existing within such interstices between design, textiles and agriculture are where innovation, augmented processes and alternative models can emerge. For example, carbon capture can be "designed-in" at the onset to aid the reduction of carbon emissions, (which are significant within industrial farming models) rather than isolating carbon as a post-use challenge. A recent cradle-to-grave assessment of wool garments revealed that intensive farming for wool production had the highest contribution of greenhouse gas emissions (Wiedemann, S., Biggs, L., Nebel, B. et al., 2020). However, this relates more significantly to the meat industry and that these emissions could be reduced through improved land management and changing sheep diets (Min et al., 2021). Alternative approaches include the introduction of vegetation such as seaweed, a practice historically and currently engaged on the northernmost island of Orkney, North Ronaldsay, in Scotland. This type of innovation reflects "cycles within cycles" that are renewed through direct contact with sheep flocks and agricultural producers who maintain the connection to the terrain through co-existence with the ecological environment and soil potentially reimagining the role fleece can play, for example, in reinvigorating crops (Farmers Guide UK, 2023). Positioning the wider planetary needs of animals, plants and crops through the lens of textile production and decomposition aligned to a deeper understanding of more-than-human communities opens up the possibility for reimagining "where design begins"

More-than-human

More-than-human, a term proposed by philosopher and ecologist David Abram (1996) has come to describe the interconnected matrix of relationships beyond isolated human understanding, which includes the wisdom of nature and its relations to the natural environment. It has served as the focus of a number of research studies ranging from Participatory Design (PD) to Ethics (Noorani & Bridgestocke, 2018; de La Bellacasa, 2017). Yet, how such approaches inform and shape designer practice and textile production remain an open question. Recognition of the matrix of relationships experienced through sensation and perception beyond isolated human understanding—including the wisdom of nature—offers an opportunity to reimagine textile systems and reshape designer practice and its origins. Immersion in the field creates the

conditions whereby new knowledge of the more-than-human emerges by a direct, relational connection through "handling" (Bolt, 2006) rather than theoretical reasoning. Humans are specifically tuned for this type of relationship "…our bodily rhythms, our moods, our cycles of creativity and stillness, and even our thoughts are readily engaged and influenced by shifting patterns in the land" (Abrams, 1996: 267). Working alongside sheep, wool producers, and the microorganisms that thrive within this ecosystem invites equitable relationships rather than a focus on material outcomes. To do so, requires working in the soil and its host of benefactors rather than theorising what may come from it. This process requisites an embeddedness of complexity and unpredictability that occurs when seeking to develop a regenerative system binded to biocultural conditions of place (Wahl, 2016). For us, this requires understanding of wool textiles and their relations to soil health. Our reflections are tethered to this reality that from the more-than-human networks in the soil, creation emerges in the forms of vegetation for the sheep, which if nutritious benefits the keratin fibres, which produce a finer, crisper wool for textile work. This in turn, also works to return a benefit to the same community of actors within the soil who benefit from the decomposition of aretfacts comprised of wool.

Soil-to-Soil Residency

Wool can make positive nutrient deposits into soil through decomposition. Ninety-five percent of a wool fibre (95%) comprises of keratin (Quartinello et al., 2018, Cardamone et al., 2009) a range of fibrous proteins (Plowman, 2003) that can be digested by insects (Noval and Nickerson, 1959). Additionally, while wool keratins can initially resist enzyme attack, keratin-rich materials like wool do not accumulate in nature excessively (Zoccola et al., 2015) and strains of Bacillus and Streptomyces genera are reported to act as natural decomposers (Daroit, Corría, & Brandel- li, 2009). The elements of raw wool—carbon (50%), nitrogen (16-17%), and sulphur (3-4%) (Von Bergen, 1963)—are also rich in nutrients and research studies have examined wool waste and wool residues as potential soil fertilisers to act as nitrogen sources (see Abdallah et al., 2019; Hustvedt, Meier, & Waliczek, 2016; Zoccola et al., 2015; Zheljazkov, 1995). In considering the more-than-human as players within textile systems, this evidence cannot be ignored. In contrast to the build-up of discarded garments in landfill, wool-to-soil maintains a different value-based relationship where the human need is deprioritised and instead additional co-players in the system, such as microorganisms, are considered.

Soil Alternatives to Industrial Cycles

Despite technological advances such as Fibresort (Innovations in Textiles, 2020), currently less than one percent of post-use garments are recycled into new clothes and only 13 percent of garments are recycled into other products (Ellen MacArthur Foundation, 2017). Some studies assert that the industrial processing of post-use textiles feeds into a new era of material use based upon principles of the Circular Economy (CE) where all materials loop within continual cycles of use. It has been argued that this is an Age of Recovery in which designers are actively preparing for the end of a material life cycle as a consistent mode of "recovery and regeneration" (Goldsworthy, 2021 p. 140). Whilst this acknowledges that designers need to address the continual need to "close the loop" in order that all materials and design components feed into systems of renewal (Braungart and McDonough, 2002) the technology to implement industrial solutions for textile recycling and biodegrading at scale remain emergent (Payne, 2015;

Innovations in Textiles, 2020). Paradoxically, the majority of textile design education in UK Higher Education Institutes do not have a clear and informed focus on sustainability as it confers to Industry 4.0, which are aligned to material and production cycles, and designing for recovery and regeneration. We contend that adopting a more holistic approach aligned to benefitting soil systems presents the opportunity to re-imagine local community relationships to nature, craft and bioregional cultures. This requires a radical reimagining of relations and infrastructures, which in turn will alter the traditional relationship that designers hold with raw materials. Commensurate with this is a focus on vernacular materials that inform the lived and felt experience whereby innovation and multiple forms of value including alternative creative, economic and environmental economies may emerge, including those related to the disposal of garments.

The Undoing of Design
This approach contrasts significantly with design's historical engagement to nature which attempts to "bridge" and "compromise" only to fulfil the needs of production and economics (Fletcher, St. Pierre, Tham, 2019). Working in this historical manner, shuts down new relationships, languages and commensurate practices that arise slowly out of and through engagement and new ways of being present to, and interacting with the [natural] world (Jickling *et al*, 2018). For example, in wool decomposition the undoing of design is found and embedded into a new community in the soil, which maintains its usage of the materials in the form of nutrients and sustenance, through the symbiotic relationship between sheep, pastures and grazing from grass that grows within the soil. In the system of human-constructed fibres, textiles often become a barrier to this connection within the more-than-human matrix. We contend that the more-than-human has maintained an almost invisible presence within the textile supply chain whereby the dysfunctional relations have become fractured and tenuous resulting in the climate-adverse indicators assigned to current industry practices.

Hyper-local to Global
The fractured dispersion of textile communities is evident throughout the global supply chain of textile production. This can be tangibly illustrated through examples where textile disposal has occurred in natural environments. One such example demonstrating the documented effects of displaced second-hand textiles in the town of Accra Ghana (OR Foundation, 2016). While seemingly distant and separate from the research origins of wool in Scotland, the export of second-hand textiles from the Global North to communities within the Global South such as Accra are found to produce residual negative effects to the culture and environment. This socially constructed phenomenon of accumulated textiles specifically in Accra reflects the more extensive and interconnected human-produced tensions of the global textile industry. In 2015 alone, more than $700 million of discarded clothing was compressed into 1000-pound bales for export from the United States to sell in second-hand markets, like those in Accra. The clothing not sold likely shifted into waste cycles, materially working its way into rivers, greenways and landfill (Elmer, 2017). Additionally, with up to 75 percent of discarded and donated clothing globally comprising of synthetic fibres that are resistant to soil decomposition (Stanes, 2021) revisiting the phenomenon of wool [in Scotland] reinforces design practices and outcomes where origin and decomposition are not detached from "handling" (Bolt, 2006) but explored materially within communities based upon tacit and cultural wisdom.

Approach: Methodology

Our [re]constructed approach entails actively questioning where the design process begins and how "handling" (ibid) or being-in-the-world can shift understandings and develop regenerative responses within the textile system and supply chain. For Lynn, the provenance of the fibre begins within the ecosystem where a flock of Shetland sheep reside that is constructed from her practice as textile designer and researcher, and her experience working with the land. For Lindsey, questioning the responsibility of designer to the soil informed a year-long, practice-based research project involving a network of designers who work and make with wool in Scotland. Following practice-based approaches give antecedence to perceptions from individual perspectives to discover the deeper meaning of the lived and felt experience (Goulding, 2005). Thus, our roles as researchers and practitioners are contextualised to practice-based frames of reference whereby the researcher is an integral part of the situation (Corbin and Strauss, 2008). In practice-based research, a range of methods are used whereby divergent approaches are identified in order to research complex socio-cultural situations. The role of the practice-based researcher is thus material to qualitative understanding. Through repositioning the researcher as an instrument integral to the inquiry we contend that traditional conventions between the researcher and the researched require to be repositioned. Bridging disciplinary concerns and methodological stances, the practice-based approach is centred on the relationships formed between researchers, practitioners and communities both human and more-than-human to offer an approach towards conceptualising both new knowledge and insights for innovation within such research contexts. For example, in the work of decomposition the process of decomposing fibres in soil was not only pursued by research participants, but researcher. Working within the same timeframe and reflexively documenting the process through the method of life writing (Fletcher, 2021) the researcher (Lindsey) designed an artefact to be reintroduced to the land and microorganisms within the soil. This process was documented through ongoing monitoring, both above and below ground utilising tools and techniques from root imaging science. From the human perspective (above ground) a trail camera, which is often used by professional wildlife photographers and observers, provided digital images to observe how the artefact might affect ground level. From the soil level, a minirhizotron integrated with digital software was used to document the artefact decomposition. A minirhizotron is a non-destructive observation tool used in qualitative and quantitative research to study fine root production. Dr. Marie Arnaud, a research fellow investigating the below ground carbon dynamics of wetlands in response to global changes, designed EnRoot as a collaborative, open-source device that would remove economical barriers to underground imaging research in a wide range of ecosystems (Arnaud, M., Baird, A.J., Morris, P.J. *et al*, 2019). The use of the EnRoot challenged notions of imagery of the decomposition process only from human perspective, but instead engaged practice-based research to extend within the community found in the soil.

Image 2: Implementation of a wool burial site with above- and below-ground monitoring utilising the construction of a 3D-printed minirhizotron, a field tool typically used for root imaging Image Credit Lindsey Stewart Sherrod.

Design-led Innovation

Acknowledging the tensions that methodologies and methods present within interdisciplinary enquiry presents the opportunity to consider in what ways traditional methodologies do not address non-human forces and to seek out approaches for practice-based research that recognise a more-than-human context within design processes and practice. In utilising post textile disciplinary perspectives throughout our work, there is value prescribed to a host of contributors throughout the textile systems including researchers and participants. In building this community, the textile outputs become reflection of the stewardship of the land, the importance of terrain, transparency and traceability in the pursuit of [re]generative material cycles. Such context-specific methods will necessitate, "a need for designers and researchers to immerse and embed themselves within the geographical setting in which their projects are situated, allowing them to develop rich and authentic understandings of the social, cultural, political and economic conditions that characterize each unique design context" (McHattie, Champion, & Broadley, 2018). Within the more-than-human rubric, we also extend this principle to include the under-recognized inhabitants within human constructed textile infrastructures, which include the microorganisms in the soil. However, this encompassing regeneration may contend upon the expansion of textile design as practice, rendering new understandings that rely upon wisdom of disciplines once considered "inferior" from industrial fashion standards due to their low use of

technology and rejection of mass production, such as craft (McHattie and Champion, 2021; Jakob & Thomas, 2017). This also extends design-led textile processes to acknowledge and honour the earth's seasons, rhythms, and current capacities as interpreted by science and agriculture.

Reimagining Relational Practices
This reimagining of relations in both of our narratives can be viewed as a mode of regenerative design, which not only challenges dominant discourses, but maintains benefits for designers as they embrace textile design and practice from an environmental and ecological perspective. In doing so, these approaches can contribute to decreasing climate anxiety and increasing the wellness and health of surrounding ecosystems, as well as producing positive outcomes for communities. With design and textile practitioners (Fletcher, 2020; McQuillan & Rissanen, 2016) striving to ecologically enhance their research and practice, directly engaging with the environment beyond the studio is vital in this work. We argue that as design shifts from the studio to working in the field and/or with communities the articulation and visualisation of design processes as they relate, for example, to textile design practice and composting (See Figure 1) is pivotal to this transformation.

3. INDUSTRIAL COMPOSTING

2. UPCYCLING

1. RECYCLING

PERMEABLE
GROUND LEVEL

SOIL-TO-SOIL COMPOSTING
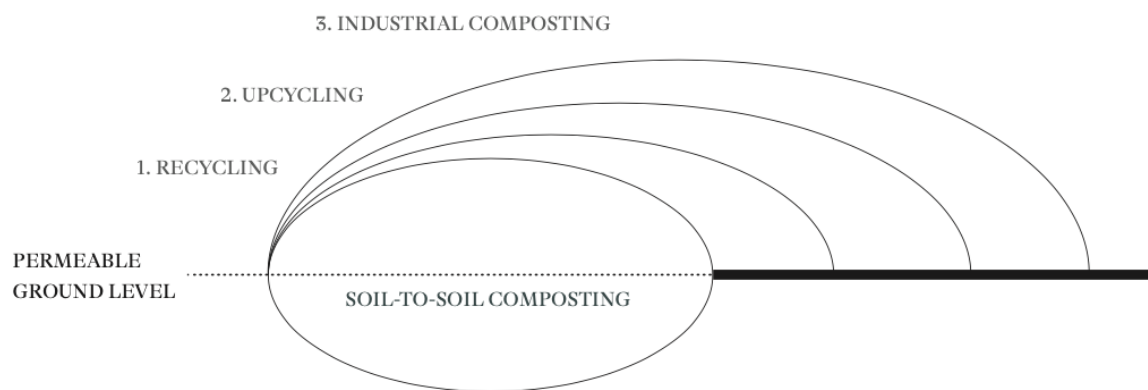
Figure 1: Illustration of soil-to-soil textile composting that both emerges from the health of the soil and likewise returns nutrients back to the soil.

Decomposition and soil are not end points likewise—fleece is not a stagnate product—both are ongoing communities of change, renewal, and co-existence. Seasonally, and from year to year, varying weather systems as with agricultural crops, may produce variations of colour, crimp and fineness that can be observed through a refracting lens of shared value and aliveness rather than inconsistency. This approach is in contrast to current supply chain decisions associated with wool, where the designer is largely "specifier" and "buyer", economic implications and imperatives are given priority over transparency and accountability to environmental considerations and sustainability. These decisions, for example, including elastane or synthetic fibres in a blend have

significant environmental consequences. Whilst wool prices fall, the value of wool to soil is markedly different. Additionally, understanding the complexity and resilience of ecosystems underpins the ongoing shifts that support regeneration.

Repositioning the dominant capitalistic and economic discourses to relational practices, which foreground environmental, regenerative and responsible approaches have the capacity to reposition designer's processes and also evoke a sense of openness and sensibilities to what may come from the "direct handling" of vernacular materials. Working through the lens of an agricultural practice in stewardship *with* the land, terrain and its vegetation incorporated within the textile system harbingers alternative meanings into what is found in "waste" and "productivity". Whilst this may be challenging, particularly in urban and metropolitan geographies, if communities and educators were connected to co-exist seasonally within the ecological reality through growing, harvesting and direct handling new and different relations could emerge. If viewed as a potential pathway to design; the land, terrain and its vegetation becomes nutrition for sheep— connecting cycles of innovation—related to creating optimal conditions for nutrients to thrive and grow and, for example, produce healthy keratin fibre in the fleece.
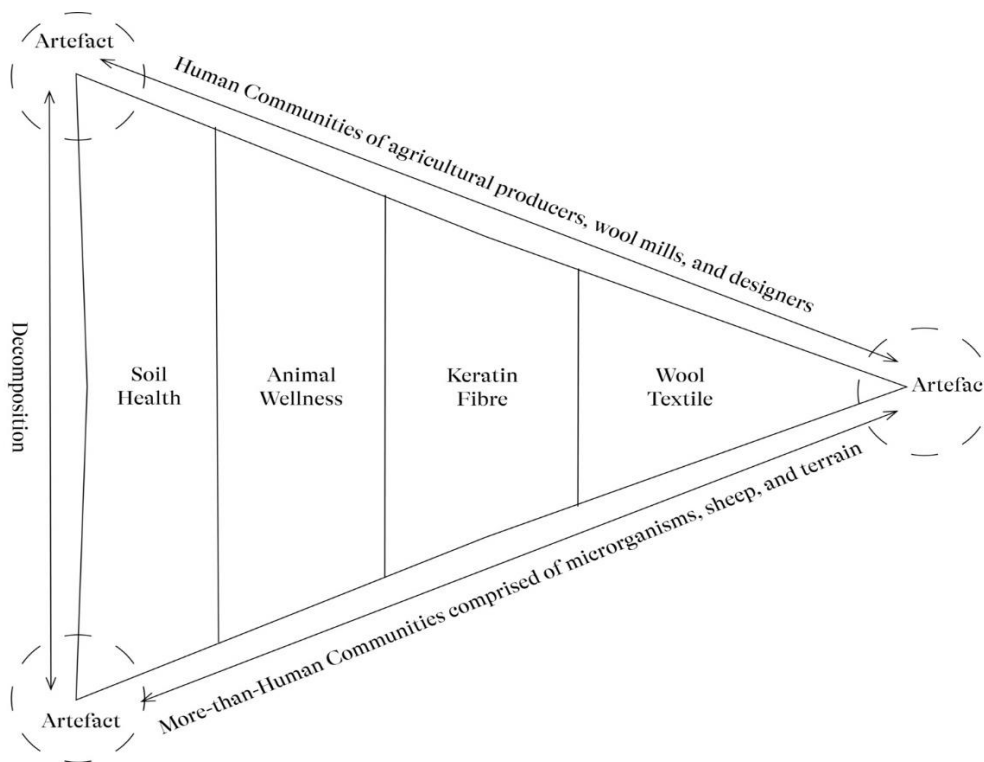

Figure 2: Reimagined wool textile production where human and more-than-human communities support the process of artefact creation by building one layer upon another for mutual benefit.

Conclusion: Innovation from field to fabric
Understanding textiles as agricultural products through handling, from the field to the soil, opens up possibilities for reimagining how they might return to the land. This full life cycle approach— from field to fabric—raises questions of transience: Will what you wear outlive you? What responsibility do humans have to the land to ensure materials are returned safely? And, how does a more holistic understanding of craft and handling of materials further develop this? We contend that the answers reside in the handling, knowing and working with soil through designing in-between whereby encounters between human and the more-than-human—shape textile design practice as an ongoing and relational connection with soil, land and landscape. Within both accounts the opportunity for direct immersion through "handling" was profound and allowed for an organic extension of textile and research practice rather than limited by dominant disciplinary dogmas. Rather, opportunity abounded to further connect textile practice to a system of co-existence alongside nature and a deeper understanding of ecosystem alignment. Future research will revolve around the implications and insights that removing the walls of the studio as barriers —akin to the performative notion of the third wall—and working in the landscape *with* multispecies communities in consideration and wider acknowledgement of a regenerative design practice that decentralises the human and repositions textile making as a mode of polysemic understanding. Innovation from field to fabric seeks to harness the collective wisdom that resides in encounters the more-than-human, specifically to vernacular materials, such as wool and decomposition, as an ongoing and relational connection that supports renewal and regeneration. In so doing, we offer the opportunity that through engaging with and embracing a full set of contributors—from sheep to soil microorganisms—together as a community of practice we can [re]position, [re]define and [re]imagine textile design and production cycles.

References

Abdallah, A.M., Ugolini, F., Baronti, S., Maienza, A., Ungaro, F. and Camilli, F. (2019) 'Assessment of two sheep wool residues from textile industry as organic fertilizer in sunflower and maize cultivation', *Journal of Soil Science and Plant Nutrition*, 19(4), pp. 793-807.

Abram, D. (1996) The Spell of the Sensuous: Perception and Language in a More-than-Human World. New York: Pantheon Books, 1996.

Agriland (2023) 'Disappointing' prices for British Wool members' 18 May. Available online at: https://www.agriland.co.uk/farming-news/disappointing-prices-for-british-wool-members/ (Accessed: 24 May 2023).

Arnaud, M., Baird, A.J., Morris, P.J. et al. EnRoot: a narrow-diameter, inexpensive and partially 3D-printable minirhizotron for imaging fine root production (2019) *Plant Methods 15*, 101 https://doi.org/10.1186/s13007-019-0489-6.

BBC News (2020) 'Coronavirus: Sheep wool "barely worth selling any more"', 16 July. Available online at: https://www.bbc.com/news/business-53421546 (Accessed: 17 August 2021).

BBC News (2020b) 'Shepherd scraps wool harvest due to price slump' 22 July. Available online at: https://www.bbc.co.uk/news/uk-england-sussex-53501671 (Accessed: 24 May 2020).

BBC News (2021) 'Prices for wool "have gone through the floor"', 13 August. Available online at: https:// www.bbc.com/news/uk-scotland-highlands-islands-58162610 (Accessed: 17 August 2021).

Bolt, B. (2006) *'Materializing pedagogies', Working Papers in Art and Design*, (4) Retrieved <31 August 2021> from URL http://sitem.herts.ac.uk/artdes_research/ papers/wpades/vol4/bbfull. html. ISSN 1466-4917.

Braungart, M., McDonough, W. (2002) Cradle to Cradle: Remaking the Way We Make Things. New York: North Point Press.

Burgess, R. (2019) Fibershed: Growing a Movement of Farmers, Fashion Activists, and Makers for a New Textile Economy. Vermont. Chelsea Green Publishing.

Cardamone, J.M., Nuñez, A., Garcia, R.A. and Aldema-Ramos, M. (2009) 'Characterizing wool keratin', *Research Letters in Materials Science*, Vol 2009, pp. 1-5.

Corbin, J. and Strauss, A. (2008) Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory, 3rd Edition. London: Sage Publications.

Daroit, D.J., Correa, A.P.F. and Brandelli, A. (2009) 'Keratinolytic potential of a novel Bacillus sp. P45 isolated from the Amazon basin fish Piaractus mesopotamicus', International Biodeterioration & Biodegradation, 63(3), pp. 358-363.

de La Bellacasa, M.P. (2017) Matters of care: Speculative ethics in more than human worlds (Vol. 41). Minneapolis: University of Minnesota Press.

DeMarco, T. (1979) 'Structure Analysis and System Specification', In: Broy, M., Denert, E. (eds) Pioneers and Their Contributions to Software Engineering, Berlin: Springer, pp. 255-288.

DeSilvey, C. (2006) 'Observed decay: Telling stories with mutable things', *Journal of Material Culture*, 11(3), pp. 318-338.

Ellen MacArthur Foundation (2017) A New Textiles Economy: Redesigning fashion's future. Available online at: https://www.ellenmacarthurfoundation.org/publications/a-new-textiles-economy-re- designing-fashions-future (Accessed: 17 August 2021).

Elmer, V. Fashion Industry: U.S. Exports of Used Clothing Increase. (2017) Available from: http://busiinessreseearcher.sagepub.com/sbr-1863-101702-2767082/20170116/u.s.-exports-of-used-clothing-increase.

Farmers Guide UK (2023) 'Vineyard using sheep fleece as mulch could make shearing worthwhile' 1 March. Available online at: https://www.farmersguide.co.uk/vineyard-using-sheep-fleece-as-mulch-could-make-shearing-worthwhile/ (Accessed: 24 May 2023).

Fibre2Fashion (2022) 'Declining price trend continues at Australian wool auctions this week' 23 Sept. Available online at: https://www.fibre2fashion.com/news/textile-news/declining-price-trend-continues-at-australian-wool-auctions-this-week-283250-newsdetails.htm (Accessed: 24 May 2023).

Fletcher, K, Pierre, L.S., and Tham, M. (2020) Design and Nature: A Partnership. London: Routledge & CRC Press.

Fletcher, K. (2021) 'Life Writing as an Ecological Research Method', *Fashion Practice*, Vol. 13 (1). pp. 1-13.

Fletcher, K, Pierre, L.S., and Tham, M. (2020) Design and Nature: A Partnership. London: Routledge.

Goldsworthy, K. (2021) 'Material Ages' Viewpoint Colour, (9), pp. 140-147.

Goulding, C. (2005) "Grounded theory, ethnography and phenomenology: A comparative analysis of three qualitative strategies for marketing research", *European Journal of Marketing*, Vol. 39 No. 3/4, pp. 294-308. https://doi.org/10.1108/03090560510581782.

Hustvedt, G., Meier, E. and Waliczek, T. (2016) 'The feasibility of large-scale composting of waste wool', in Muthu, S.S. and Gardetti, M.A. (ed. 1) Green Fashion. Singapore: Springer, pp. 95-107.

Ingold, T. (2013). Making. London: Routledge.

Innovations in Textiles (2020) 'Fibersort launches to revolutionize recycling of post-consumer textiles'. Available online at: https://www.innovationintextiles.com/fibersort-launch- es-to-revolutionise-recycling-of-postconsumer-textiles/ (Accessed:11 March 2020).

Irish Farmers Journal (2023) 'Sheep farmers need higher wool prices to sustain consistent supplies' 8 April. Available online at: https://www.farmersjournal.ie/sheep-farmers-need-higher-wool-prices-to-sustain-consistent-supplies-757664 (Accessed: 24 May 2023).

Jakob, Doreen & Thomas, Nicola (2017), 'Firing up craft capital: the renaissance of craft and craft policy in the United Kingdom', *International Journal of Cultural Policy*, Vol. 23 No. 4, pp. 495-511 DOI: 10.1080/10286632.2015.1068765.

Jickling, B., Blenkinsop, S., Timmerman, N. & Sitka-Sage, M.D.D. (Eds.) (2018) Wild Pedagogies: Touchstones for Re-Negotiating Education and the Environment in the Anthropocene (1st ed.). London: Palgrave Macmillan.

Kitagawa, E.M. (1955) 'Components of a difference between two rates', Journal of the American Statistical Association, 50(272), pp. 1168-1194.

Liu, S.Y., Bardzell, J. and Bardzell, S. (2019) Decomposition as design: Co-creating (with) natureculture. In Proceedings of the Thirteenth International Conference on Tangible, Embedded, and Embodied Interaction, pp. 605-614.

Manzini, E & Fassi, D. (2022) Project-based communities *CoDesign: Designing for Reimagined Communities,* Volume 18:1 pp. 4-15.

McHattie, LS. & Champion, K. (2021) Steek-Aboot: The role of 'women's work' in the recuperation of craft practice in Scotland. *MAI: Feminism & Visual Culture*, 8. ISSN 2003-167x. Available online at https://maifeminism.com/steek-aboot-the-role-of-women-work-in-the-recuperation-of-craft-practice-in-scotland/ (Accessed: 30th June 2023).

McHattie, LS., Champion, K. & Broadly, C. (2018) Craft, textiles, and cultural assets in the Northern Isles: innovation from tradition in the Shetland Islands. Island Studies Journal, 13 (2). pp. 39-54. ISSN 1715-2593.

McQuillan, H. and Rissanen, T. (2016) *Zero Waste Fashion Design*. London: Fairchild Books, Bloomsbury.

Min, B.R., Parker, D., Brauer, D., Waldrip, H., Lockard, C., Hales, K., Akbay, A. and Augyte, S. (2021) 'The role of seaweed as a potential dietary supplementation for enteric methane mitigation in ruminants: Challenges and opportunities', Animal Nutrition, 7(4), pp. 1371-1387.

Noorani, T. and Brigstocke, J. (2018) 'More-Than-Human participatory research' in Facer, K. and Dunleavy, K. (eds.) Connected Communities Foundation Series. Bristol: University of Bristol/AHRC Connected Communities Programme.

Noval, J.J. and Nickerson, W.J. (1959) 'Decomposition of native keratin by Streptomyces fradiae', Journal of Bacteriology, 77(3), pp. 251-263.

Payne, A. (2015) 'Open and closed-loop recycling of textile and apparel products', in Muthu, S.S. (ed.) Handbook of Life Cycle Assessment (LCA) of Textiles and Clothing. Cambridge: Woodhead Publishing (Woodhead Publishing Series in Textiles), pp. 103–123.

Plowman, J.E. (2003) 'Proteomic database of wool components', Journal of Chromatography B, 787(1), pp. 63-76.

Quartinello, F., Vecchiato, S., Weinberger, S., Kremenser, K., Skopek, L., Pellis, A. and Guebitz, G.M. (2018) 'Highly selective enzymatic recovery of building blocks from wool-cotton-polyester textile waste blends', Polymers, 10 (10), pp. 1107.

Song, K.W. and Paulos, E., (2021) May. Unmaking: Enabling and Celebrating the Creative Material of Failure, Destruction, Decay, and Deformation. In Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems, pp. 1-12.

Stanes, E. (2021) 'Dressed in Plastic: The Persistence of Polyester Clothes', in: Shaw, I., Taffel, S., Farrelly, T., (eds) Plastic Legacies: Pollution, Persistence, and Politics. Canada: Athabasca University Press.

Strauss, A.L. (1987) *Qualitative analysis for social scientists.* Cambridge: Cambridge University Press.

Swift, M.J., Heal, O.W., Anderson, J.M. and Anderson, J.M. (1979) Decomposition in Terrestrial Ecosystems (Vol. 5). Oakland: University of California Press.

The OR Foundation (2016) Dead White Man's Clothes. Available online at: https://deadwhitemans- clothes.org/intro (Accessed: 31 August 2021).

Von Bergen, W. (1963) Wool Handbook Vol. 1, 3rd Ed., New York-London: John Wiley & Sons.

Wahl, Daniel C. (2016) Designing Regenerative Cultures. Axminster: Triarchy Press.

Wiedemann, S.G., Biggs, L., Nebel, B., Bauch, K., Laitala, K., Klepp, I.G., Swan, P.G. and Zheljazkov, V.D. (2005) 'Assessment of wool waste and hair waste as soil amendment and nutrient source', Journal of Environmental Quality, 34(6), pp. 2310-2317.

Zheljazkov, V.D. (2005) 'Assessment of wool waste and hair waste as soil amendment and nutrient source', *Journal of Environmental Quality*, 34(6), pp. 2310-2317.

Zoccola, M., Montarsolo, A., Mossotti, R., Patrucco, A. and Tonin, C. (2015) 'Green hydrolysis as an emerging technology to turn wool waste into organic nitrogen fertilizer', Waste and Biomass Valorisation, 6(5), pp. 891-897.

Biographies

Bio: Professor Lynn-Sayers McHattie PhD, MBA, BA, PG Cert, FRSA

ORCID ID 0000-0003-2790-5187

Lynn-Sayers McHattie is Professor of Design Innovation at The Glasgow School of Art. Lynn's cross-cultural research explores craft and textile practices as "cultural assets", which connect to the landscape and culture of geographically distributed communities, and the role design-led innovation can play in socio-cultural renewal and transformation of rural economies. In addition to her academic work, she is a textile designer with a small flock of Shetland sheep "*of* Barclay", which she selectively breeds for fine, luxuriously soft fleece known as "kindly wool"; in pursuit of returning to the 1927 Shetland breed standard. The flock includes prize winning tups - Norman, a Grimester white and XSherlock a moorit – who are both Shetland Sheep Society Approved rams; two of only 59 in the UK. Trained as a weaver, Lynn specialises in the natural palette of Shetland colours in organic constructions and structures and also works in collaboration with young emerging designers.

Bio: Lindsey Stewart Sherrod MRes, BA

ORCID ID **0000-0002-8913-6566**

Lindsey Stewart Sherrod is a graduate of the Master of Research Programme at The Glasgow School of Art where her research focused on textile afterlife and its relation to soil regeneration. Additionally, she is a designer working with agricultural producers to support alternate cycles of textile production that maintain development from field to finished product within a 300-mile radius. Previously, her work has been recognized by Forbes Magazine, along with guest lectures and speaker presentations within design and academic communities. Her research and practice contribute to design-led economic development within rural ecosystems and ongoing investment in textile production that sustains and contributes to geographically located communities, including those in the Highlands & Islands of Scotland.