Motions from the Hand to the Digital:

An Exploration of Colour through Material Based Print Processes

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2018

Abstract

Textile designers have begun digitally crafting *surface* through exploring materiality, resulting in new ways to connect to the tactile act of making as both digital and craft based through action. This shift concerns an engagement with the potential of *chance* — recognising the unorthodox through texture, colour and 'tensioned' use of digital and craft based technique allows for new stories of surface to be told. In this practise, the hand based technique of dyeing is translated into the digital print medium. Observing subtle shifts of colour through the reactivity of dyestuff regarding temperature and solution invited the designer to expose the movement of colour rather than create it through directive means. This changes the visual language of *colour* to be understood and valued through its *mutability*. Challenging the static colour outcomes that result from standardised action allow for variation and colour sensitivity to play an *emotive* role through surface.

The nuances of textile based practise are also explored through this context — *story boarding* and *colour sampling* illustrate the embedded connection of *tactility* sensitive to the discipline. Exploring tactility allowed for the designer to create variations of process and explore the importance of *spatiality* and *physical labour* in relationship to their own creative *control*.

Figure 1. Concept board of early experimentation. Turbott, R. (2017).

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Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

17/05/2018

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Chapter 1
Introduction

1.1 Positioning the practise: The human as narrative

Surfaces and structure that tell human stories come imbued with irregularity. Dipping your hands into materials to both find and lose constants invokes a turmoil akin to real life. Cultural landscapes look back up at us from surfaces and through these reflections we move and change them in different ways. As a practitioner, looking for the human is a generational act framed in new ways by technology and culture. Looking for chance is a given.

1.2 Introduction

What part does awareness of material play in the perception and use of colour within visual language and aesthetics? Throughout this practise knowledge has been gathered through re-visiting analogue methods of textile technique to understand digitised versions of them. Exploring the visual language of digital textiles through materiality and colour aims to 'ground' surface aesthetics and functions within an increasingly experiential and aware way of making.

The importance of this exploration lies in the understanding that variance can be brought to digital print technologies that facilitate mass production through reflective and explorative development of the textile design process. New knowledge is found through a discussion of alternative methods and tools of practise grounded in process and material. Designing for variance allows for an audience to respond perceptively through creating comparative alternatives, promoting consideration of specific market groups and bespoke textile print outcomes. Variance is a broad term that pertains to all elements of this context: the visual language of colour, the process of design, the materials explored and the voice of the maker.

Figure 2. Digital prints on water induced substrate. Au, M. (2018).

Chapter 2
Context

2.1 Colour as mutable

Colour as mutable is a phrase used throughout the following body of work — it pertains to colour as a visual and material entity that presents itself through movement (chemical, visual, mechanical and digital). The intention of this practise is to change the visual language of textile digital print technology, often associated to static and flat colour outcomes (Treadaway, 2004, p. 12) and create variation of method and aesthetic. These aims discuss why we associate colour to quality, through looking to understand the place of emotion, material and chance alongside function, accuracy and stability. To support the theoretical discussion, the voice of the author is found in grey boxes throughout this text.

2.2 Making connections: Craft practise and the digital

Digital crafting and crafting the digital are terms used to define contemporary practises and attitudes towards the place of craft and material based learning within digital systems of technology. These terms are associated with the formation of connections between process, materials and design through practical, developmental and active prototyping (Oakley, 2014). Crafting is traditionally associated with the altruistic use of hand based processes — however contemporary combinations of technology and craft employ distributive use of tools to create varied interfaces that connect the hand to the digital (von Busch, 2010). Digital and craft hybrid practises within textile print design place emphasis upon the use of the *digital as tool*, where tactical use of software allows for the artist or designer to accessibly include more detail, layer and blend their visual imagery (Treadaway, 2004; 2007). This discussion presents the following points: digital crafting as materials based through prototyping and connected to lateral and experimental use of distributed tools. Throughout my own practise these two points have underpinned my reflective decision-making processes and aims, which explore speculative digital aesthetics and the perception of colour as mutable through the influence of craft based processes such as dyeing and felting.

2.3 Defining the value of craft: Reading chance within digital systems

Risk, chance and the uncouth are prominent cues that guide this work. The mistake is never devalued; quality is not aligned with the action of constant control. Judgement of quality is placed within the eye of the beholder; for example, the quality within natural dyes is the mutability they display (Finlay, 2002) in opposition to their synthetic counterparts which perform through immutability.

Figure 3. Hand dyed silk created through layering dyestuff. Turbott, R. (2017).

Certainty and risk are terms used to discuss quality with regards to workmanship (a term associated to the manual practise of technical skills). In the context of mass production and standardisation, quality is predetermined before the outcome is formed — risk involves the value of quality as placed during the process of creation (Pye, 1968). To expand on this through a contemporary view, craft practise is understood through the term *craftsmanship* which proposes the maker as an individual who uses creative imagination conjunctively with hand based technical and manual skill: "...a process of formalizing material and materializing form that results in the creation of an original craft object" (Risatti & Trapp, 2007, p. 168).

The tension between quality, control, and risk define the value of this project which renegotiates working processes to place surface within an alternative techno-cultural aesthetic space. Craft is negotiated through varying degrees of partiality to the hand (dyeing processes using a hand-held spray bottle are used alongside semi-mechanical felt based processes). In this context, a change of perspective and abstract creative reasoning is facilitated through a loss of accuracy.

> Water moves with the hands, the motion of the spray bottle in conflict with the innate movement of liquid; the aftermath of the water seeping down the surface settling and erasing colour, the conflict of gravity.

On the other hand, the digital is utilised counter-intuitively to balance control and risk. The initial assumption was made that the digital would function as a mechanism to increase productivity through scale and speed, however it was realised progressively as a space that was valued for accuracy — and this accuracy relied on systems specific to the digital print technologies. Acting creatively within these systems involved an acknowledgement of the associated digital based technical skills, rather than a complete devaluation of them when working with crafted imagery and unorthodox production processes. For example, to create a readable colour palette and treat the surfaces as collective a degree of colour management and standardization was essential. In this sense, the digital is *crafted* within its own right, which renegotiates rather than reproduces the initial craft based experimentation. The value of this experimentation is that it initiates creative and abstract thinking processes around material and colour mutability.

2.4 Colour as material

> Materials are vessels of sorts — wombs that supplement the growth of colour from seed to visible presence, allowing it to live and breathe in the eyes of others as fluctuating states of tone and hue, opacity, vibrancy.

Colour allows the audience to read narrative, lodging the work within certain temporalities (historical, cultural, technological). Through negotiating colour as material (dyestuff as applied and created through silk and wool fibres) this practise aims to re-orientate the maker as an individual that uses colour actively, within technological and functional paradigms, to re-negotiate the production of static and stable colour outcomes. Looking for movement and anticipating form and colour as it occurs through materiality frames this approach to action through practise. Ingold (2010) illustrates this concept of active materiality — rather than considering what form should look like from substance, substance begins to act in visible rhythm as the practitioner makes conceptually and physically. Continually, questions are asked throughout practise that anticipate the unpredicted: will an unexpected change present itself if I experiment with the temperature of solution? How does this affect the visual language of the pigment as a material? Will this change also affect the perspective of the user? When designing for materials experience eliciting surprise for the user promotes a positive emotional response, redefining and expanding the associated meaning of the material or product (Karana, Pedgley, & Rognoli, 2014).

Beauty and quality hold different values through the advent of quantitative industrial processes — conversely designing into rather than with materials incurs a loss of spontaneity essential to facilitating imaginative speculation on the part of the designer (Albers & Danilowitz, 2000a). Within industrial systems of production, colour constancy and metamerism refer to the production of chemical colours that appear stable under different light conditions, reducing visual interference and movement (Portillo, 2009). Does colour, in the context of industry lose its appeal as standardization is mistaken for quality? Jongerius and Schouwenberg (2017) address this in their recent publication:

> The testing carried out by contemporary industry is fatal to quality. And I'm convinced it's also inimical to what users really want. I know that the industry has launched countless market research efforts to understand consumer wishes. But how can people express those wishes if they don't know the range of possibilities? The users — and I refer to them as users in preference to consumers — want beautiful colours whose appearance differs with the circumstances (p. 135).

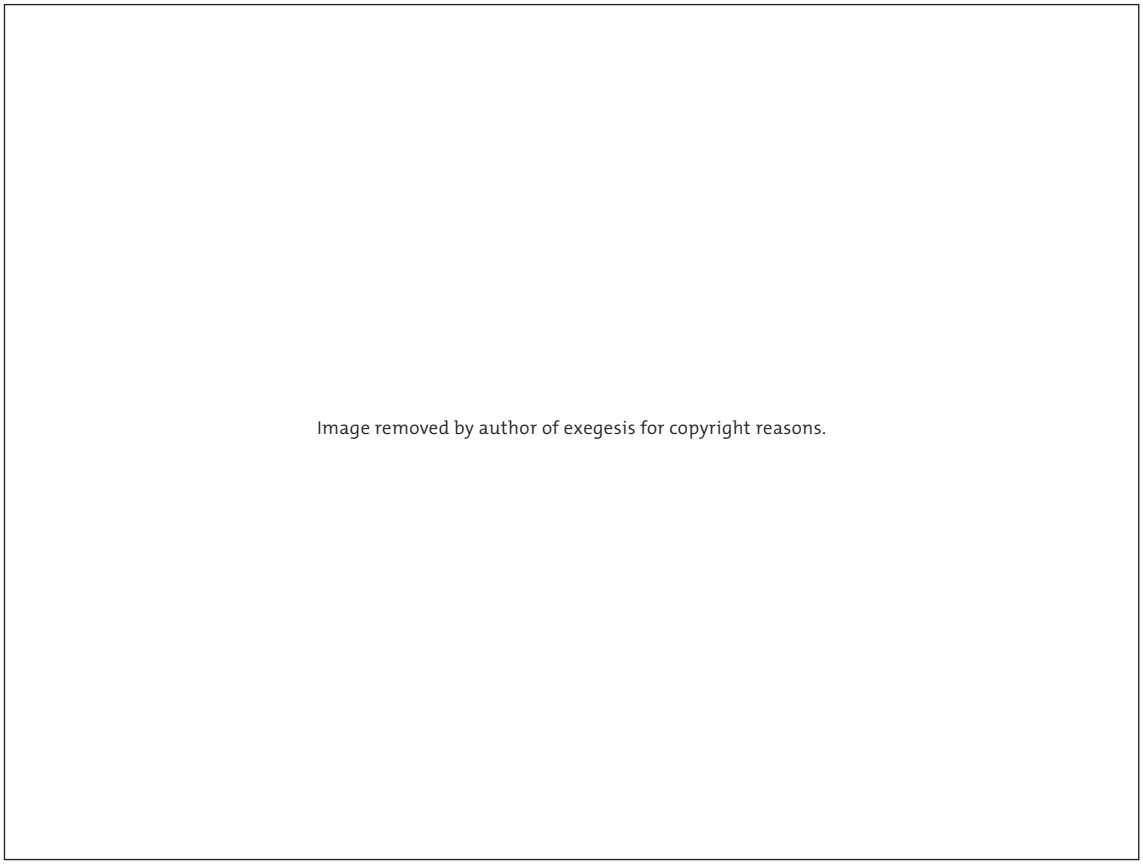

Figure 4. Breathing colour exhibition at the Design Museum London — detail of the evening section. Retrieved from *Jongerius Lab*, by Hella Jongerius, 2017. Retrieved 2018, Apr. 21, from http://www.jongeriuslab.com/work/breathing-colour-exhibition-at-the-design-museum-london. Copyright 2018 by Hella Jongerius.

Above, a strong point is made for colour mutability through pointing to the user — how can the complexity of colour be understood by the user if there is only the given opportunity of the industry standard? This points to some value in the generative working processes and the creation of possibilities when undertaking colour research as a designer. Through framing the user as *open to suggestions*, colour as changeable, perishable and flexible begins to take on new value. Textiles as stable constants and secondary skins don't always hold value through a presumed constancy; their immediacy, limited temporality and sensitivity to change as both functional and aesthetic objects is what allows for interaction, manipulation and intervention on the part of the user and designer (Albers & Danilowitz, 2000b).

Within the specific context of digitally printed textiles colour mutability is lost through the stability of synthetic dyestuff and methods of application. Treadaway, in her exploration of textile based craft practitioners observes that although the digital expands the colour repertoire of the craft practitioner, colour management and digital print technology do not always facilitate sensitive material colour outcomes; this results in the practitioner's association of flat and stable colours to a "lack of hands-on interaction with the cloth and dissatisfaction with the printed colour" (Treadaway, 2004, p. 10). The tension between the accurate portrayal of colours within material (a quantitative need) and the experimental beauty of colours as they appear during the process of designing imagery (digital or analogue) reflect the need for involvement of both systematic modes of making and thinking in collaboration with more creative or unorthodox ones. Negotiated here is the ability to repeat beauty and colour from one medium to the next, through change. Understanding how this works through practise and what tools and methods facilitate a connection between experimental and systematic process is the aim of this project. Furthermore, it seeks to understand to what degree the sensitivities of the craftsperson can be implemented and reformed through the digital textile surface.

2.5 Curious colours: Looking for chance through materials (renegotiating techniques of application)

2.5.1 Inks and substrates: Digital crafting at Custhom

Jemma Ooi discusses the relationship and implications of digital and analogue techniques through her practice at design studio Custhom. The designer finds that digital craft adds value to her practise as digital technologies have many advantages in analogue contexts; an example of this is the adhesive nature of digital inks, utilized to produce foiling effects for Custhom's range of metallic

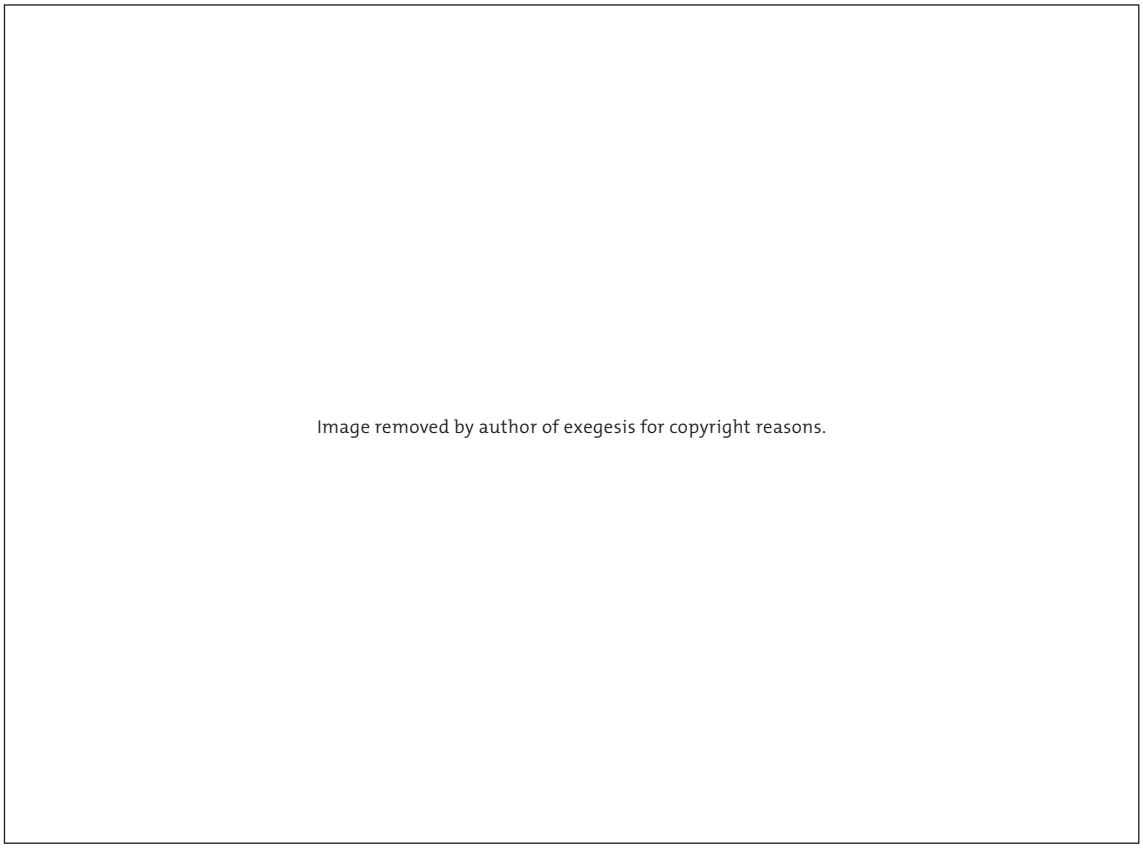

Figure 5. Rye wallpaper, gold. Retrieved from *Digital Crafting at CUSTHOM*, by Philpott, N., cited in J. Ooi, 2016. Retrieved 2018, Apr. 21, from http://researchonline.rca.ac.uk/2196/1/OOIDigitalcraftingatCusthom2016.pdf.

wallpapers (Ooi, 2016). Metallic colours reflect light, induce texture through relief and brighten interiors to encourage visual movement. The technique used does not accentuate uniform applications of metallic — allowing for variation and mutability to occur through application. This approach to materials and colours extends to implicate applied material (dyestuff and pigment) interactively alongside the obvious substrate (wallpaper). It also shows that unorthodox material functions (the adhesive nature of digital ink) inform and incite value as bespoke products through a re-negotiation of the static colour so often associated with industrial processes of production.

In response to the above, the material focus of this practise lies within the subtle nuances of colour as applied to substrate through unorthodox use of process. Some of these interactions are minute in scale; for example, the dampening of the substrate to induce the effect of running dye, accentuating the reflective nature of the silk fibre. Paint, as pigment when applied remains separate and stable in relation to the surface it sits atop of; dyestuff, on the other hand as a soluble and less stable material forms a chemical bond to the surface (substrate) it is applied to — adopting the qualities of the fibre (Clarke & Anliker, 1980). This points to a more organic way of applying, observing and working with colour to reduce static and induce the qualities of the substrate. Surface is not entirely washed away, but remains as a prismatic shadow that reflects, distorts, and changes colour for the observer.

2.5.2 Understanding colour through texture: Motley Rug Collection

Motley Rug Collection and *Fuzzy Logic* are projects created by Adam Blencowe that explore the limit of felt through application. Exploring needle felting as a hand based technique lead to the creative digitalisation of the CNC (Computer Numerical Control) machining process. Digitising the process allows for the wool fibre to be applied to a separate woven substrate with higher accuracy, producing heightened line work and more complex arrangements of colour (Treggiden, 2015).

The use of felt throughout this practise involves the 'meshing' of wool fibre with digitally printed substrates to create texture, which in turn introduces interaction changing the static nature of printed colour. Instead of inciting movement of colour through reflective and translucent mediums such as silk and dye, matte colours and visibly three-dimensional surfaces create shadow and play through relief. Processes such as the FeltLOOM (mechanical technology used in this practise) and Adam Blencowe's digitalised CNC felt hybrid allow for a uniformity to be given to the textile through even and controlled application. However, the presence of the hand still remains close through its active and spatial role in the placement of materials. This proximity allows for subtle variations of colour and texture to occur naturally through accident and chance, suggestive of the vulnerability of materials and maker as advantageous to changing visual definitions of colour seen through material and technique.

2.6 Transforming surface; layering action and material for new narratives

Throughout both of the above examples, we see the transformation of materials and technique occur through active layering. How do actions such as applying affect the way we evolve narratives (such as temporality and change) through surface? Do they conceal or reveal? In his discussion of the line as additive and reductive, Ingold (2016, p. 70) defines the action of making surface "It is through the transformation of threads into traces, I argue, that surfaces are brought into being. And conversely, it is through the transformation of traces into threads that surfaces are dissolved." Much of this practise could be seen as *surface dissolving* through the action of *applying threads* (dyeing silk, felting into wool weaves). However, the additive always considers what grounds it, creating a new narrative from the traditional. This amounts to an intensification — a move forward that takes the old with the new, finding value in the transformation as opposed to merely the *thread* or the *trace*. Recounting the architecture of his upbringing, Smith (2014) reflects upon the meaning of surface intensification

through a metaphorical lens — acknowledging what is already defined and understanding how to grow something from what already exists allows for the individual to operate sensitively.

2.7 Summary: the temporality of colour, craft and the digital

Digital craft provides new perspectives for the designer and craftsperson working within the textile surface. Colour as material performs as a visual cue inciting change to technical action through its mutability and temporality. The accuracy of the digital becomes a contested convention through this practise — craft is invited to perform at speculative level of aesthetic function that embraces a balanced semblance of accepted static uniformity, while the digital renegotiates its conformity through the variance of the hand. Surface finds an alternative visual language through the eyes of the maker, changing the gaze of the observer.

Chapter 3
Methodology

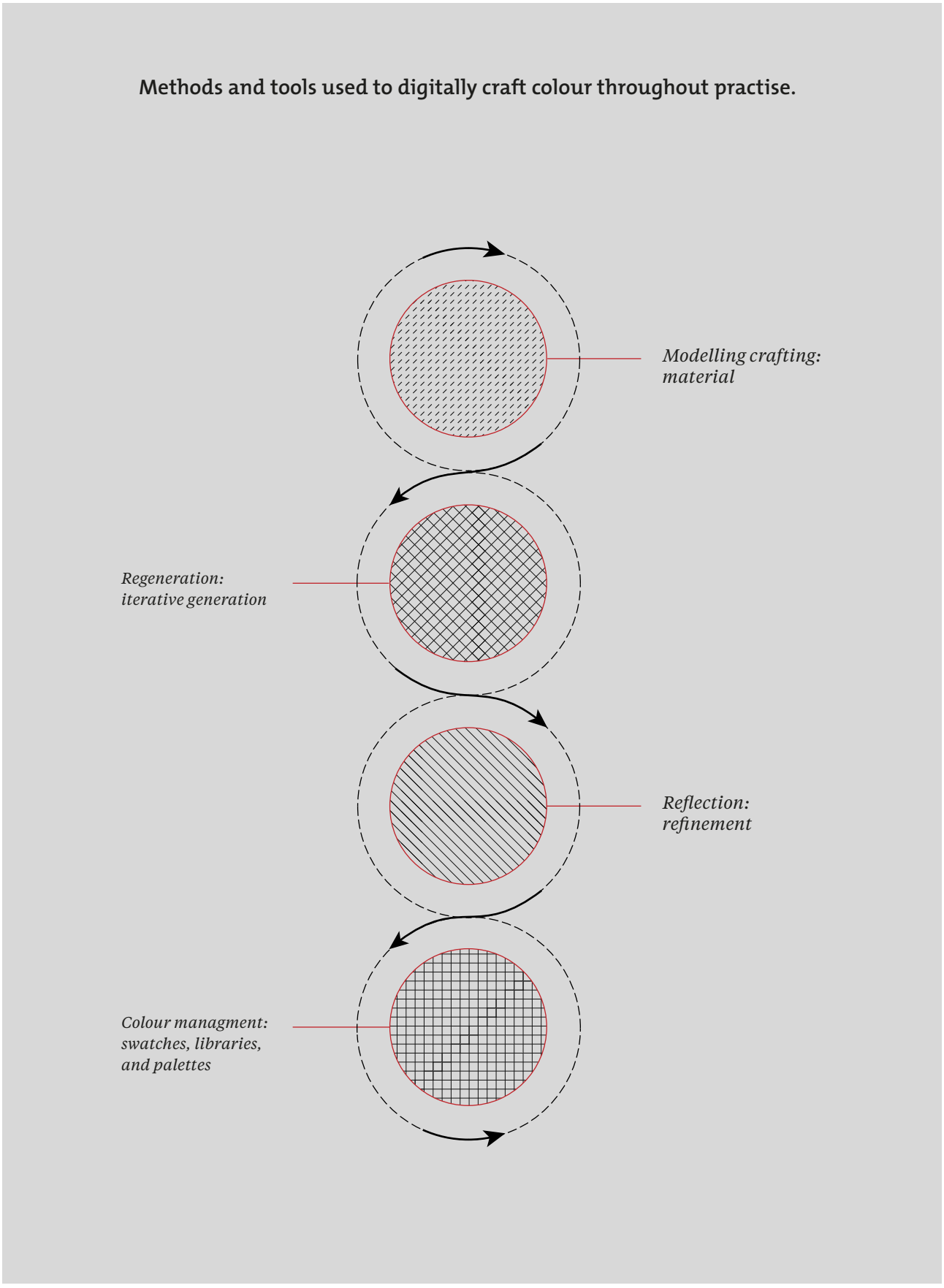

Figure 6. Methods and tools used to digitally draft colour throughout practise. Turbott, R. (2018).

3.1 Methodological approach: Thinking through practise

Design, as situated within action research, relies on iterative thinking and reflection where multiple solutions are generated and evaluated to address the problem (Swann, 2002). Knowledge, in the context of design research is found through the reflective evaluation of process and artefact as interactively engaged with an audience (Cross, 2001). Within practise based research, interactive perception of the artefact relies on positioning the work within a contextual framework (Mäkelä, 2007). Practise-led research is defined by knowledge obtained that is relevant to the practise and process rather than predominantly the artefact (Candy, 2006; 2011). This research practise follows as practise led. New understandings are established with regard to the working processes of a textile designer, which communicate the problem of *immutable* colour as an aesthetic issue of variance associated to culture, technology and materials. Textile design based processes here contribute through their generative and lateral approaches to problem solving and their connection to materiality and tacit knowledge which allow for real world observations to be made and iteratively facilitated. This textile design practise also relies technically and conceptually on strong reflective habits, that act to both create and define solutions. The methods and tools used throughout this practise to generate solutions are outlined in Figure. 6.

3.2 The process of generation: Working with the hands

The place of craft within this research practise is found through the active understanding of materials. Craft research involves the use of both propositional and experiential knowledge when working manually with materials — positioning the value of craft through emotion and imagination, subversion and experimentation, allowing for future speculation on the part of the maker (Niedderer & Townsend, 2010). In the situation of emotion and experience, craft practise is a space where context and expression are formed alongside the physical and tangible elements of material: “Materialness relates a tangible physical material with artistic expression, shaping the total artistic process of craft art in which material and its interaction with the craft artist play the vital role” (Nimkulrat, 2010, p. 65). Craft, through the hand based practise of dyeing, became an important method for inviting experimentation and active observation. Preconceptions were set aside in favour of material revelations— variation was induced through the emotional evaluation of embodied knowledge. As change occurred through the physical manipulation of materials, expression and contextual associations arise and form new perspectives around technique and action.

To begin the process of generation, hand based techniques were used to explore the application of colour. Using the hand became a way to observe material movements at close quarters. In this situation, dyestuff (the granules of material that mix with liquids to form dye) are materials of interest along with more obvious substrates used (silk and merino weaves). Processes created using hand based methods of textile dyeing understood some variables as constant (e.g. fibre reactive dye types and pre-treated silk and merino are materials also specific to the digital printing processes used later in the practise). Hand based processes were considered beneficial to generating aesthetic and process variations for multiple reasons:

↳ Speed and accessibility: Small samples could be generated within short time-frames at hand. Although these are not necessarily replicable or scalable, they facilitate alternative exploration in the absence of controlled variables and costs that are a part of digital production processes. These samples serve as points of ideational inspiration that direct and change the expected outcomes of future analogue and digital sampling.

Figure 7. Collection of hand dyed silks. Turbott, R. (2018).

- ↳ Creative play: Sampling by hand enabled me to create a direct connection to my materials — these are brought within a more manageable space than seen in digital mediums, allowing for observation and reflective action to occur regarding materiality.
- ↳ Achieving depth of colour through layering: By hand, dye can be added through adjusting quantities or changing hues, stripped back and layered to produce depth in the image. This layering is not present within digital print processes of production which allow for accuracy of image through this absence (layering is something that occurs and is limited to the digital workspace).
- ↳ Use of multiple craft/or mechanical processes conjunctively: Felting techniques were explored throughout this period alongside dyeing techniques. This allowed for me to question embedded methods of using material in relation to technique. What happens to the aesthetic and visual language of the practise when these are combined? What structural qualities are given or negated?

3.2.1 Playing with craft: Examples of variation through practise

The variation of forms and colours generated through observing changes as they occurred in relation to fluctuating controls such as temperature, liquid quantities, dyestuff quantities and mixes, and methods of application are discussed in the figures below. In Figure 8, colour was layered through use of a spray bottle. This developed depth of colour through layering additive and subtractive additions of liquid and dye. Changing temperatures and the act of folding material affected the appearance of colour (Figure 9), generating forms that were not anticipated through the condensing of dyestuff at heat and pressure.

Figure 8. Layering dyestuff and water using a spritzer. Geraets, C. (2018).

Figure 9. Forming patterns through applying heat to the process of dyeing. Geraets, C. (2018).

Figure 10. Hand dyed silk felted mechanically into merino fibre. Geraets, C. (2018).

3.2.2 Wool fibre: Introducing a new material

Different substrates such as silk and wool play different roles regarding the application of colour. Silk as a smooth and slippery medium exhibits colour at play with light, with colour reflected. Wool, by contrast, absorbs, light flattening hue and in turn it finds its own beauty through the dimensionality of texture. Dyeing different fibre types helped facilitate the understanding that although a colour may be constant chemically the substrate will, in turn, again affect how it is represented and perceived. Introducing wool fibre was the result of a need to bring more texture based tension to the digital image. Opposing emotive qualities are also associated to this creation of tension and variance — silk, as smooth, soft and refined is juxtaposed alongside wool which is coarse, spongy and strong.

Figure 11. A variety of hand dyed silks felted mechanically into merino fibre. Turbott, R. (2017).

3.3 Regeneration in practise: Translating anew through lateral process based experimentation

Throughout this project, the action of regeneration allowed for the practitioner to bridge the divide between workspaces and technologies of print application. The designer becomes involved with the working processes of both the digital and physical technologies, creating a spatial and physical connection to the process of production throughout. Through reflection, digital tools are developed as observations are made regarding material outcomes. The experience gained from tactile understandings that are made in physical space can then be translated into digital space through digital means.

This way of working can be connected to the visuospatial thinking processes of the textile designer — use of experiential information to construct, develop and change ideational thought occurs through making connections and restructuring knowledge laterally (Eckert & Stacey, 2000). Lateral thinking is a concept discussed by De Bono, which focuses on alternative approaches to problem solving and intuitive approaches to idea generation. Understanding the many ways in which a problem can be viewed involves restructuring and re-arranging information, allowing alternative solutions to occur for evaluation and reflection (De Bono, 1990). Recognising active rhythms in practise became an important way to draw upon this lateral method of generating connections. In his definition of rhythms Lefebvre (2013) constructs a narrative around the place of temporality and movement in the creation of rhythm:

> Without knowing it (which does not mean unconsciously), the human species draws from the heart of the universe movements that correspond to its own movements. The ear, the eyes and the gaze and the hands are in no way passive instruments that merely register and record (pp. 91-92).

Realising rhythms, intent based or natural is one way to disband and expand connectively, without reducing the iterative practise of process to direct intention.

3.3.1 Regenerating repetitive action: Creating thematic content

Identifying repetitive actions of making became a tool to create connections between regenerated content. Translating these actions allowed for commonalities to be observed between workspaces, materials and processes. Establishing connections allowed for the collation of regenerated content and provided a space of entry into new territory where previous knowledge and skills could be tactically

transferred and re-imagined. As a result, materials, workspaces and processes are used differently in the absence of embedded knowledge and technical skill.

3.3.2 Establishing a connection to digital production processes as tactile systems

The attraction of using digital technology to regenerate hand dyed textiles was accessibility. Digital workspaces allowed for the re-creation of patterns due to an extended range of colour and flexibility of scale. The first part of this process involved a period of tactile play with the materiality of dye and silk within the digital process of production. This helped to establish a closer connection to digital production processes and materials. The question asked here was: to what extent are my actions present not only in the image of the surface but the action of making the surface? How does the digital contribute to these actions?

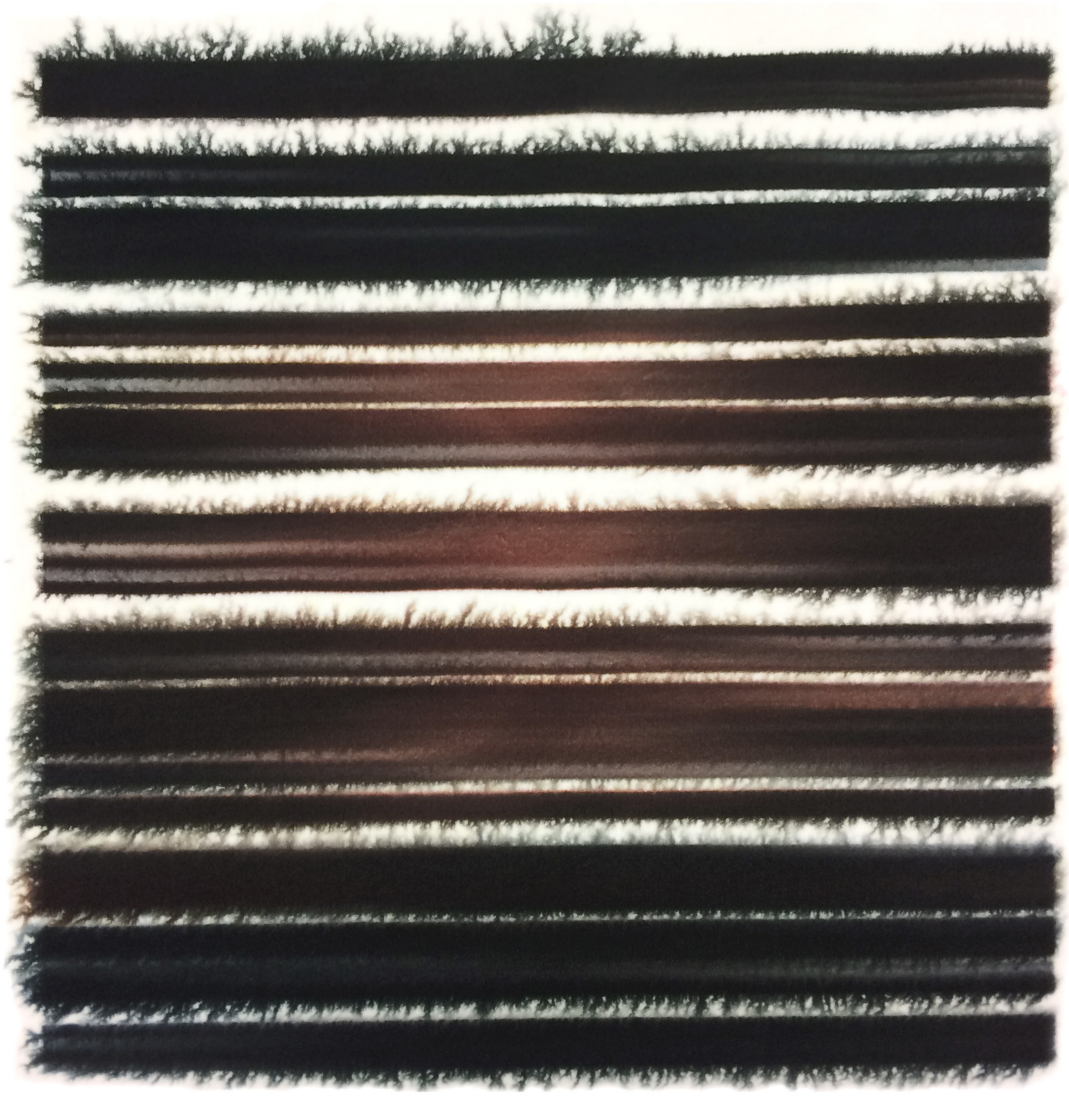

Figure 12. Digital print on water induced silk substrate. Turbott, R. (2018).

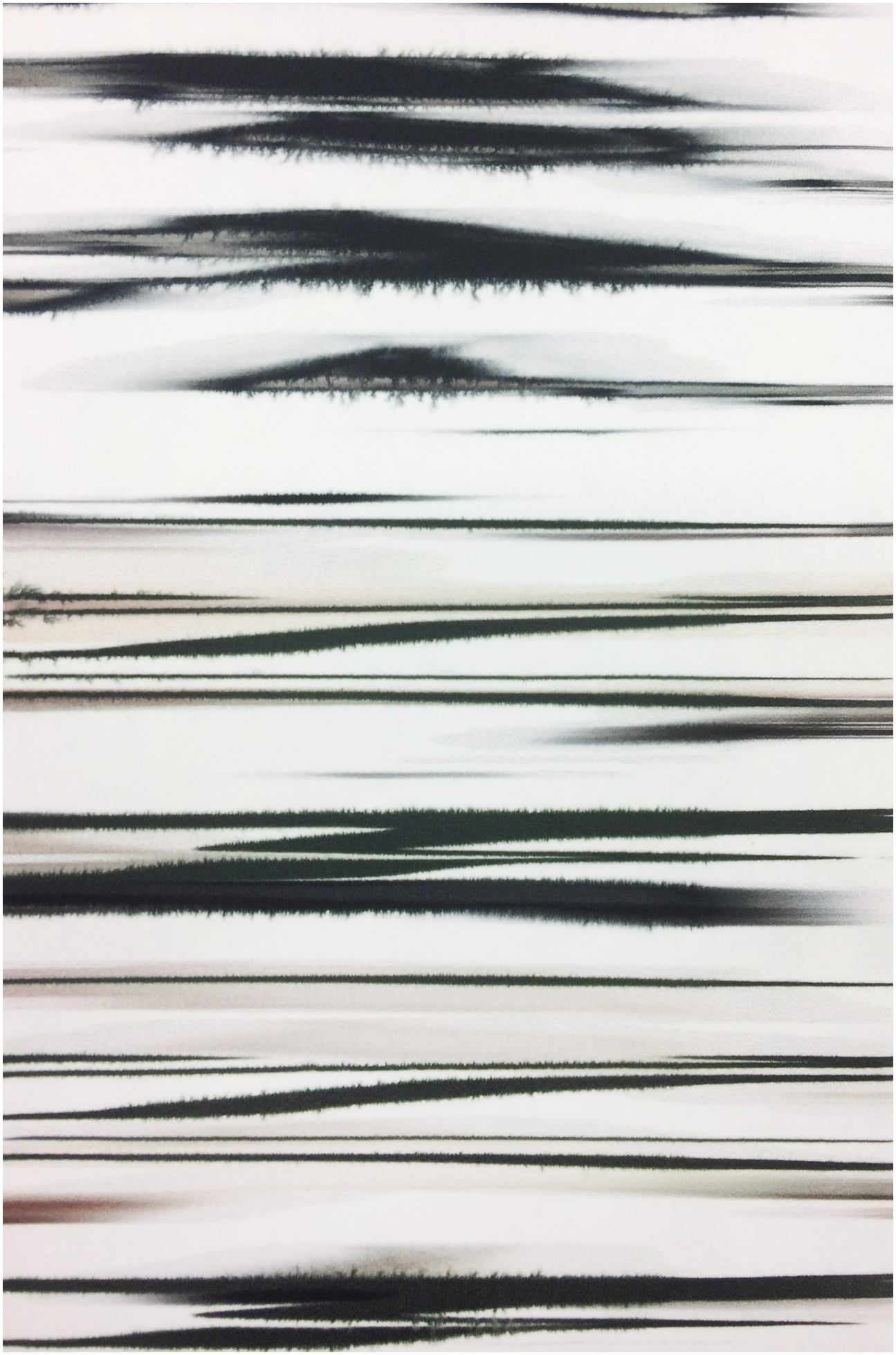

Figure 13. Digital print on water induced silk substrate: minimal use of hue. Turbott, R. (2018).

Playing with the medium of water through the application of dye colourant by hand enabled me to observe material reactions. Changing the quantity of materials and method of application gave different results. Different depths of colour could be achieved and texture could be created by using an uneven drying surface or excess heat which resulted in the settlement of dyestuff. The dampening of the digital silk substrate (and the resulting disfigurement of the pre-treatment) became the predominant craft based action I regenerated, to connect myself to the digital production space. Here, the action took on new form — the dye spread, deepening and mixing darker colours, changing the predetermined digital form of the image. Lighter colours bleed less — as the quantity of dye needed to create the colours is lower. Overall, the resulting colours after post finishing processes appeared deeper, softer and more translucent in comparison to regular digital prints. The action of mixing colour became a multi-layered movement, as the process of applying colour through individual pixels was disrupted and reconfigured. The result was the creation of a new image base or data set. The creation of new data opens new spaces for regeneration, through the duality of action.

3.3.3 The motion of the hand and machine: Drawing lines

The manipulation of colour through hand based processes was facilitated through the repetitive motions of the hand. Mixing colour through layering dye and water onto the textile surface became a semi-conscious act of drawing lines. The form of the line is determined not only by the hand, but the movement of the materials. The application of colour by the digital print head follows similar actions to the hand but in a more linear and controlled manner — the repetitive movement of the print head across the substrate along a predetermined path aligns with the hand based application of layering basic colours to create other hues. The drawing of lines occurs through points and pixels (a more defined rendition of the dispersion of droplets of dye through misting). The linearity of the digital printer in this context gave greater control in the formation of the image, allowing for greater complexity of pattern and colour to be created.

This translation of data was also explored through more static mediums, beyond dye and digital print technology (see Figure 13). Below a felt sample is translated into a variety of new materials such as plaster, through the regeneration of action and form.

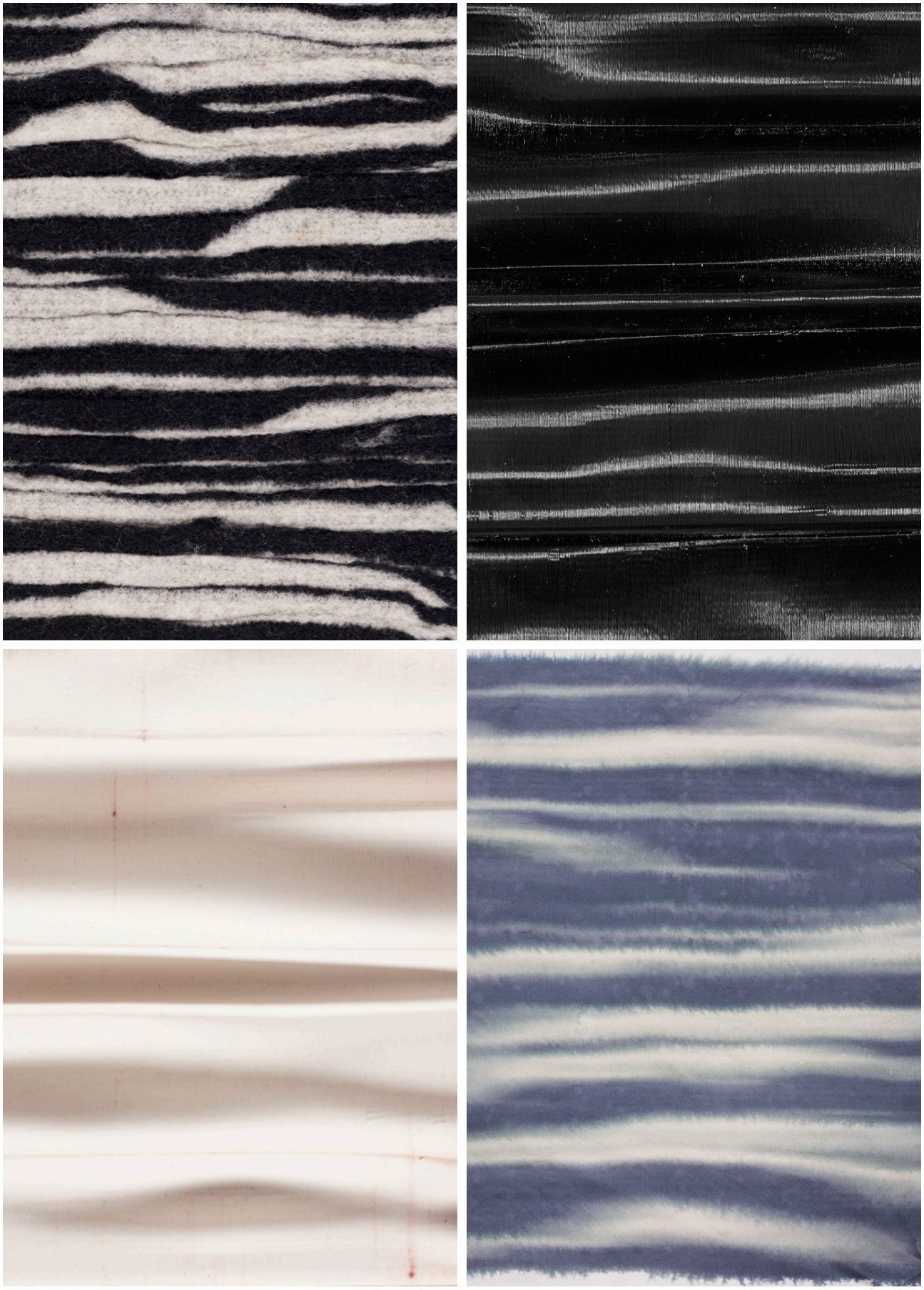

Figure 14. Clockwise, from top left: Original felted sample, 3D printed translation, casted translation in plaster and digitally printed translation. Geraets, C. (2018).

3.3.4 Motion and digital actions: Filters and photographs

Photographic images were used to capture data for regeneration. Most of these images were regenerated photographs of hand dyed and felted textiles (often many samples were included in one composition). Using the blur filter in Adobe Photoshop allowed for the abstraction of the image. This abstraction created another platform for viewing colour and form that was free from the previous image content but still portrayed distinction of colour quantities. Here, the form of the image through digital technology takes a more heterogeneous shape that would not be possible through direct photographic representation. The focus is to regenerate the qualities (layered colour, tonal gradients, soft forms) that were found in material samples. The digital action of the blur filter metaphorically follows the action of the hand and machine through adjusting the shape and direction of the line in the image. The sweeping motion used to dye silk textiles through the physical action of application remains an integral part of the immaterial digital image.

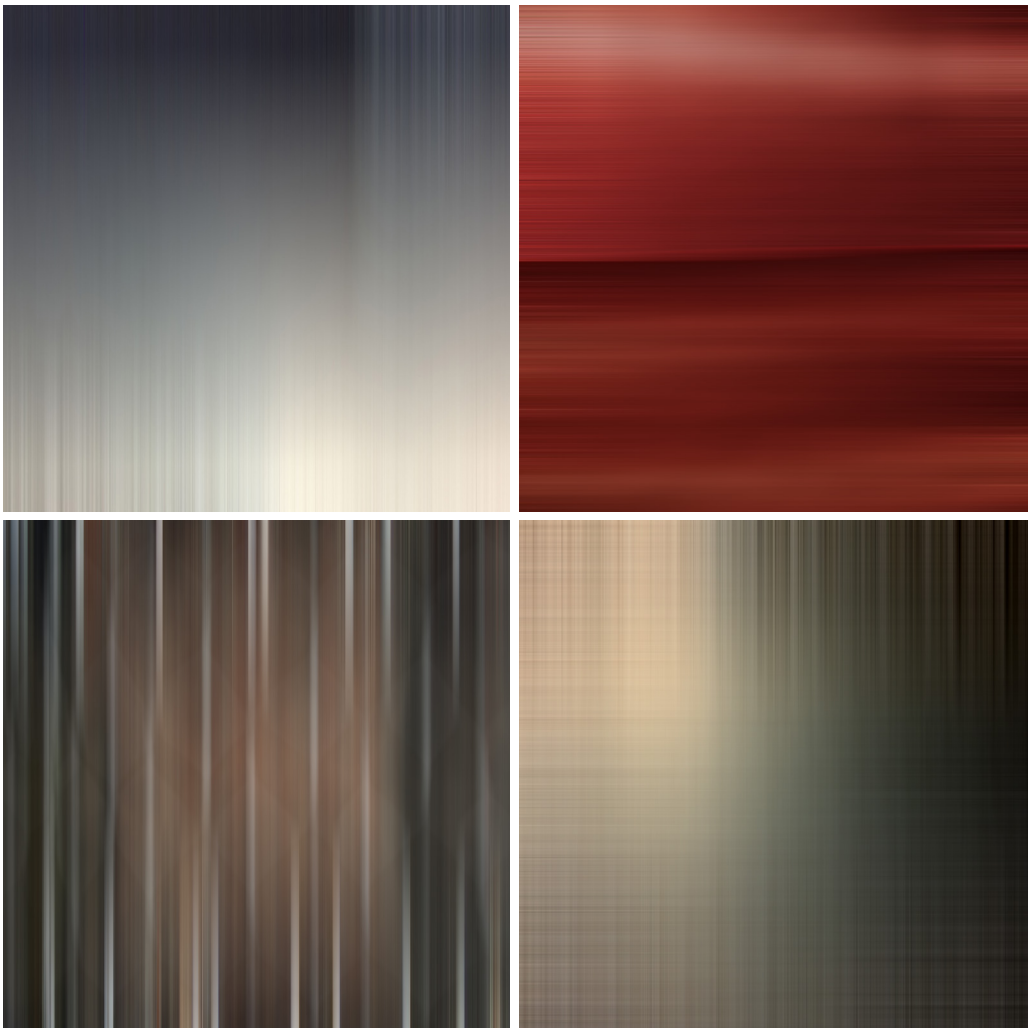

Figure 15. Digital files created using the blur tool in Adobe Photoshop. Turbott, R. (2018).

Figure 16. Digitally printed merino weave mechanically felted into merino fibre. Geraets, C. (2018).

3.3.5 Integrating texture: Regenerated action and the creation of new material definitions

Texture changes the way materials appear, further affecting the appearance of colour. Layering techniques and materials became an important method for introducing texture into the image and creating colour depth. It also became a mechanism for creating new tactile and visual definitions of fibre and material. This is previously discussed (see Chapter 3.2) in the context of the hand crafted. The technique of combining hand dyed silk and merino fibre through mechanical felting processes is developed into the digital context through felting other fibres with woven structures that display digitally printed content. This content is regenerated from photographs of hand dyed explorations. One example is the combination of a digitally printed merino woven felted into merino fibre (see Figure 16). The outcomes were of this development were:

- ↳ A fabric with greater tensile strength and texture (merino weave and wool felt samples).
- ↳ A fabric with greater relief.
- ↳ A fabric displaying imagery that provides additional colour and detail to the material.

The creation of new material definitions helps create a space where exploration is key rather than the dictation of function and aesthetic by known interpretations. It also provides a speculative space for the two-dimensional surface to operate as visibly three dimensional and tactile to the user and designer.

3.4 Action, reflection and experience

Colour mutability is constantly negotiated throughout this practise. The visual language defined, and the physical work created both react and change associatively. Developing these changing associations between practise and context rely upon active technical evaluation and conceptual reflection.

Reflection is the active practise of observation that allows the individual to *learn through experience* (Amulya, 2004). Thinking reflectively can be characterised through *reflection upon action* (where practise outputs inform lateral contextual developments and alternatives) and *reflection in action* (which involves the evaluation of the physical making processes in action through analysing and understanding experiential associations) (Scrivener, 2000). Reflection and experience can be connected to designing for a *sense of fit* — here experiential action and thought is framed through emotive reasoning (Lindgaard & Wesselius, 2017) or as Antle (2017) counters, through reasoned imagination.

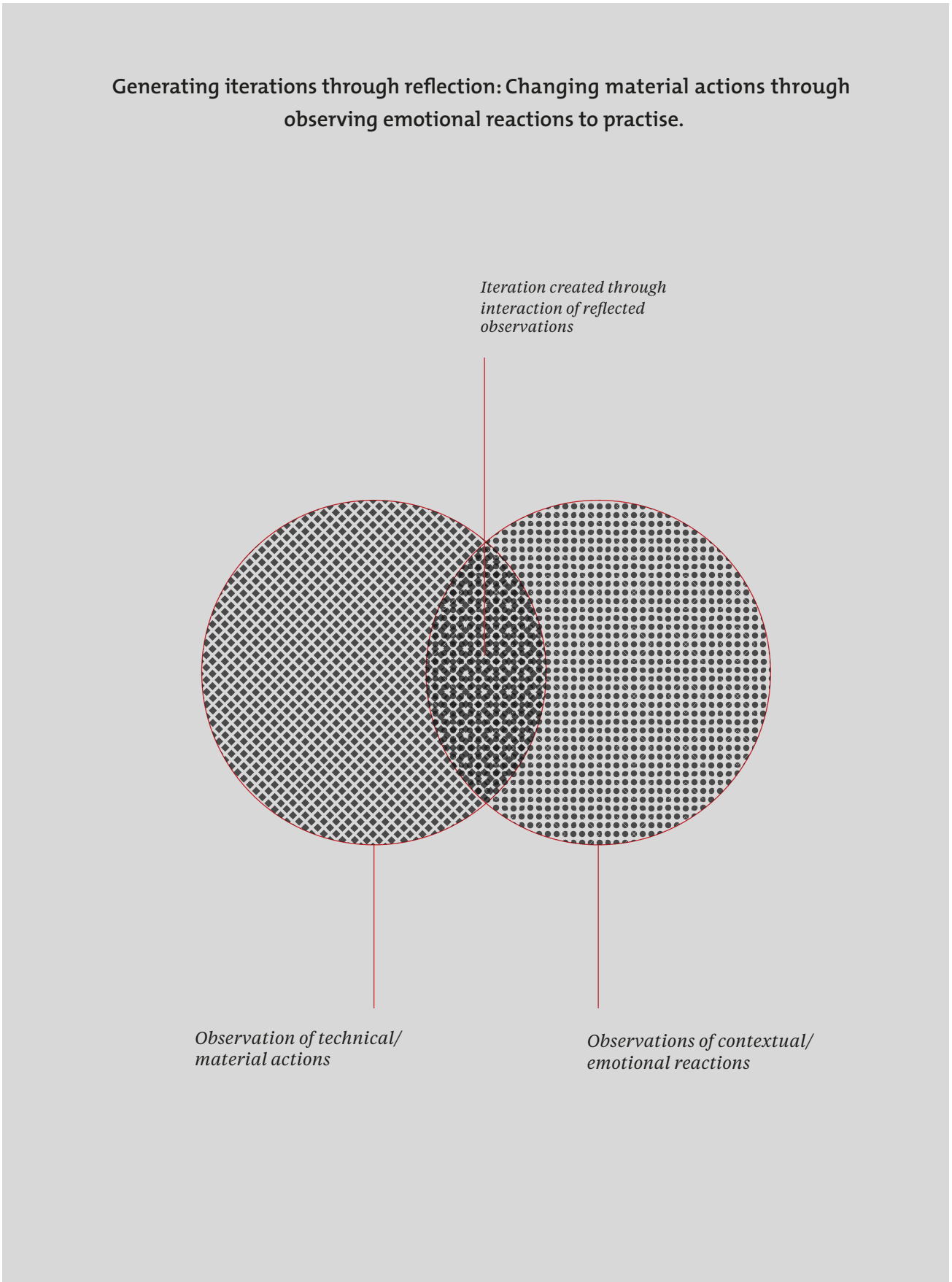

Figure 17. Generating iterations through reflection: changing material actions through observing emotional reactions to practise. Turbott, R. (2018).

3.4.1 Reflective practise and spatial thinking

Learning through experience, reflection and emotional response is best understood in this practise through the *mood board*. Spatial mapping or visual mood boards function as mechanisms for process based design learning through reflection and action — they can simulate, liberate, respond visually and emotionally to a problem or brief when used effectively (Garner & McDonagh-Philp, 2001). In the context of textile design, mood boards can be considered to function as mechanisms for developing inspiration and facilitating communication to a client or individual (Eckert & Stacey, 2000). A more personal approach is taken to the function of the mood board here, where communication becomes a way to generate a reflective conversation between the practitioner and the visual content. A mixture of both found content and personal work is used to map atmosphere and make connections through observation. Generating emotion and evaluating emotion through reaction is a key tool in this process. Do these colours form a relationship? How can I translate the way I use materials and technologies intuitively to facilitate a change in luminosity, value or saturation? Observing these questions and then addressing them through the contextual framework allows for directive approaches to occur amongst practise.

The following diagrams and reflections map progress through drawing connections. This way of mapping was modelled on the working processes displayed in David Nash's 1994 to 2008 artwork *Family Tree* (Ingold et al., 2013). Here, the majority of Nash's different projects are mapped — showing the connections and relationships of different pieces of work to each other through the frame of his lifetime. The passage of time and the act of viewing separate parts in one location make visible themes and commonalities essential to understanding not only the work, but the intentions, actions and growth of the designer. Although my own practise follows a smaller time frame than Nash's and is specific to a particular context, the aim and intentions of spatially mapping progress are similar.

3.4.2 Documentation of the reflective mapping process

Here, a conversation was created regarding the use of technical materials and tools and the outputs they created visually through colour. This conversation was formed halfway through a period of heavy practical development and changed the way I understood both my context and actions.

Individual pieces of work were organised spatially by collating pieces with regards to colour and form. As a result, a linear or pyramid development was observed (see Figure 18):

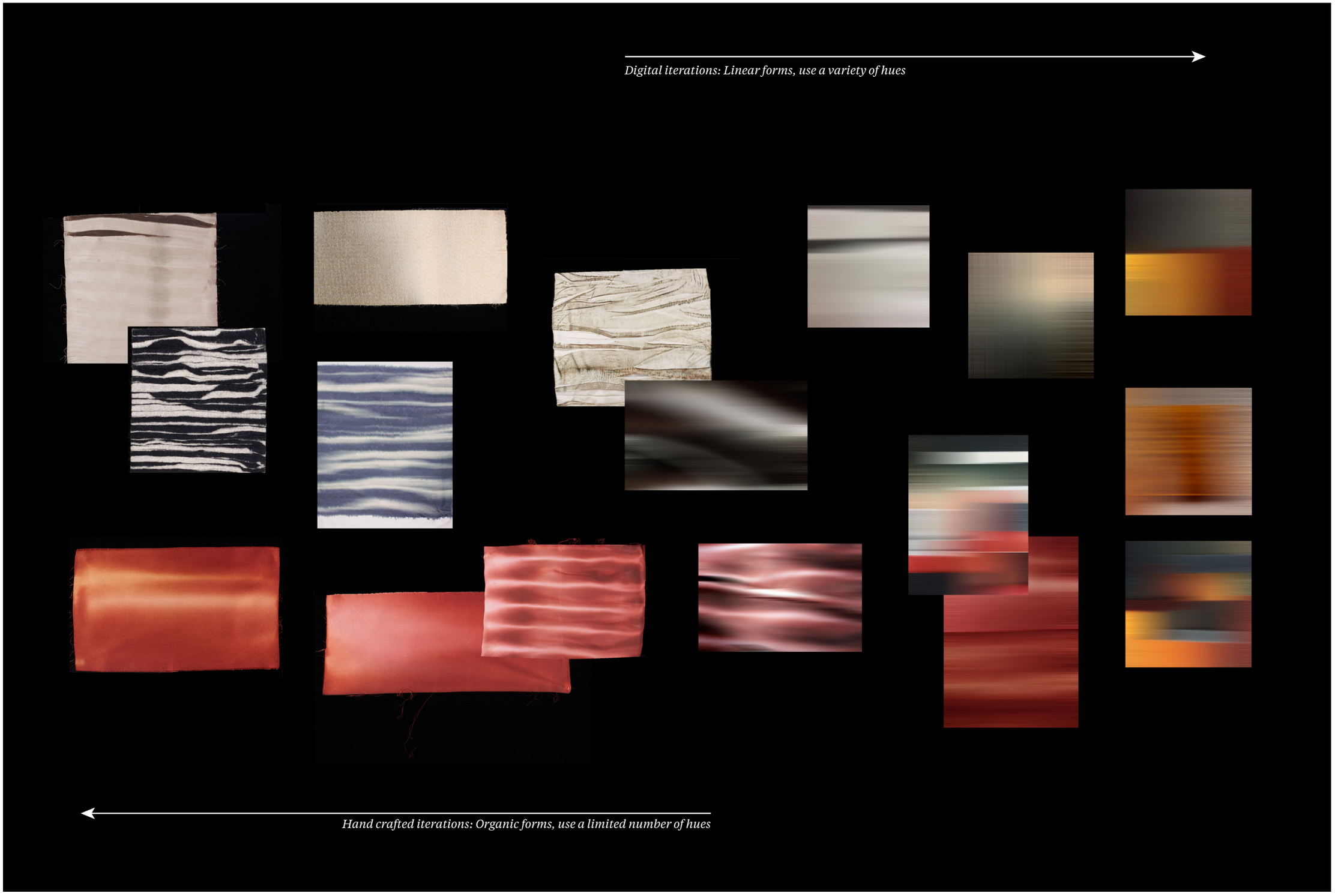

Figure 18. Progression of practise from the hand based to the digital: prior to period of reflection. Turbott, R. (2018).

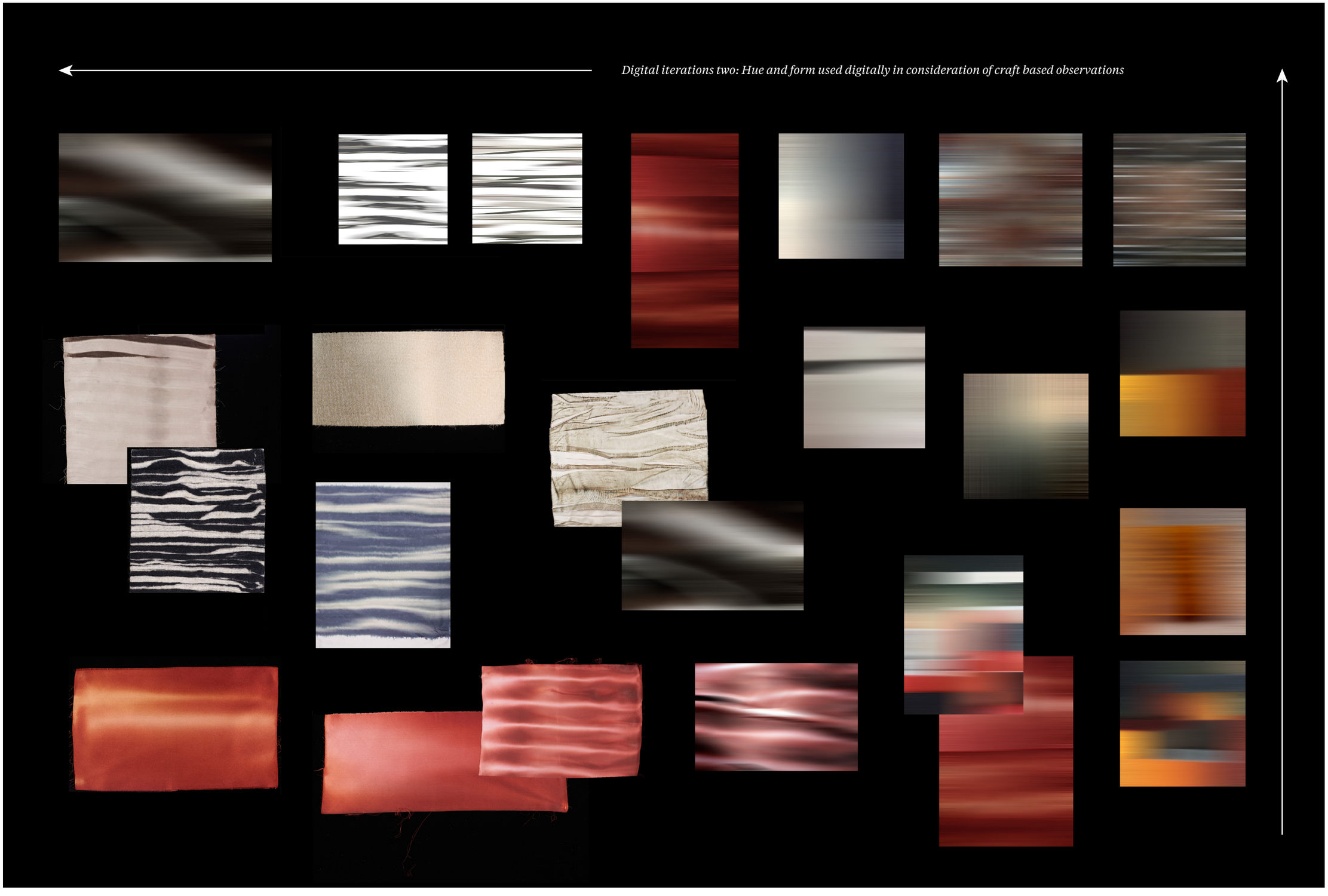

Figure 19. Progression of digital iterations: post reflection. Turbott, R. (2018).

The period of practise mapped in Figure 18 establishes connections between pieces of work through both linear progressions and observations of similarity between samples in terms of colour and form. Using time to measure action as it occurs, we see a shift in the use of hue and saturation. Firstly, the number of hues used increases. Saturation of those hues exhibits variance throughout the progressions — however, with the introduction of more hues this becomes predominantly less apparent and consciously utilised. Occurring parallel to the above, is also a change in the technological workspace of the designer, from the hand and the analogue to the digital. Can a relationship between workspace and the use of colour and form be drawn from this comparison?

On establishment of the above, an evaluation was made that compared the current practise to my original intentions. After this evaluation, it is interesting to note what happens to the practise following (see Figure 19).

The intention of the project is to illustrate the sensitivities of craft practise in companionship to the digital. Colour, as fluid and changeable within the practise of craft repositions the accurate and static outcomes of digital textile print processes. As indicated in Figure 19, the practise returns to the original lowered use of hue prevalent in the earlier craft based sampling but remains within the digital workspace. It appears here that hue and saturation can be modelled or influenced to a degree by the technological workspace of the designer. Here, conscious decision making was crucial in balancing the intentions of the designer (colour mutability), rather than a change in workspace, tools or materials.

The above diagrams and observations indicate a reversal, rotation, or return that moves forward again, bringing with it the favourable knowledge of the linear progression and the core knowledge that intrinsically grounds the project. A less directive approach, as illustrated by this discussion, is perhaps advantageous. In this specific scenario, where colour mutability is negotiated, the concept becomes not only present in the output but extends to process and the actions of the designer. In a broader sense, it allows the designer to pursue multiple pathways, identify alternative directions and methods, in turn developing the original aims and intentions in new ways.

Mind mapping is established as a reflective tool in this practise. In this situation, it is emphasised as a conceptual point of beginning — an ongoing method for developing rhizome like design processes and outputs (as illustrated in this section). It is both present in inward communication and ideation (the personal unpacking of practise and context) and collaborative communication and ideation (which involves communicating to others and synthesizing information).

3.4.3 Scaling, decision-making and collating

Making directive decisions during the final stage of the practise involved the development of concise evaluation methods (see Figure 20). This stage of reflection involves the selection of specific imagery, textures, techniques, materials and colour combinations that best represent the contextual atmosphere of mutability through materiality. Creating a clear representation helps not only to define the physical practise but also the contextual practise in the aim of communication to others. During this process textile samples

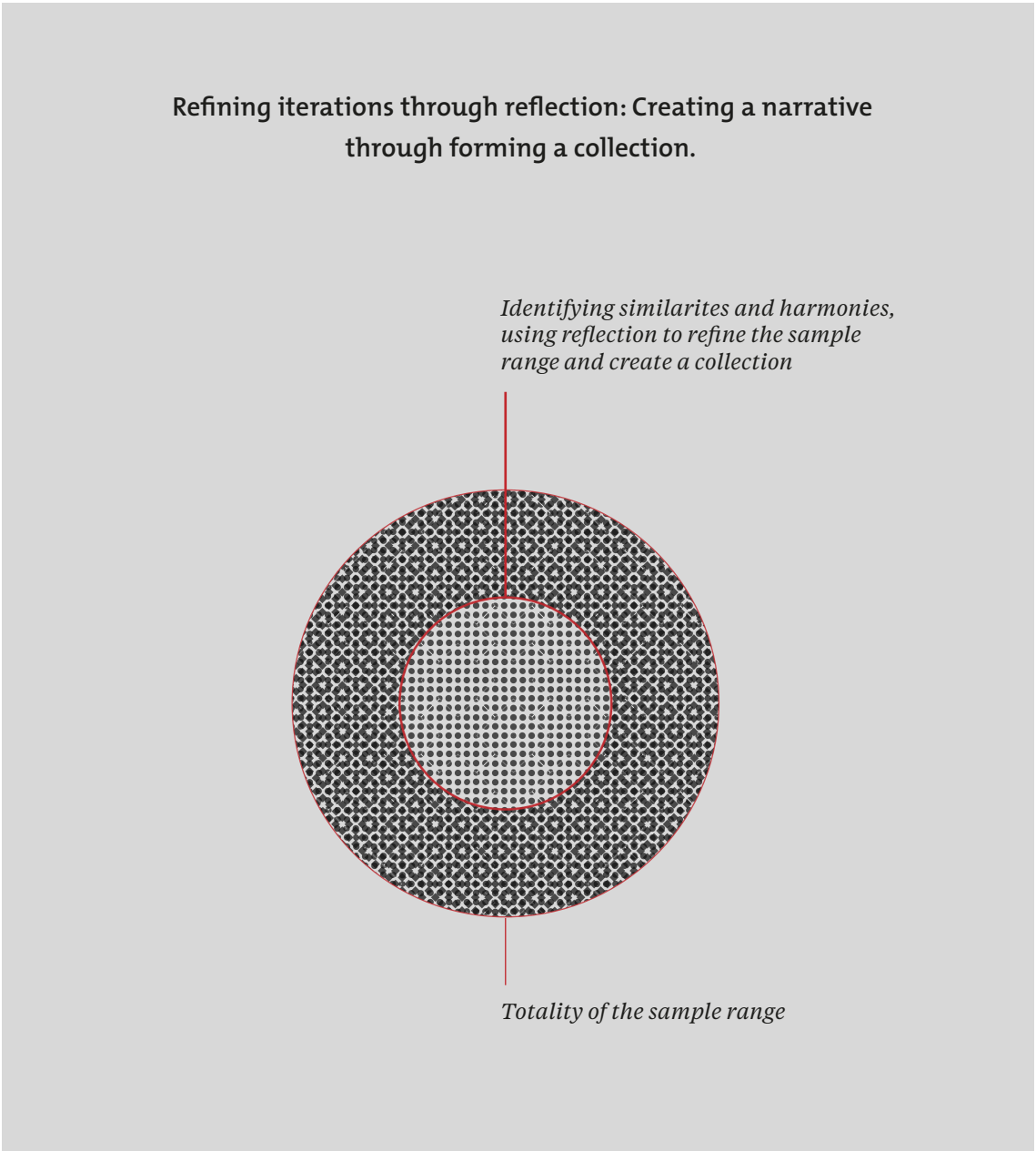

Figure 20. Refining iterations through reflection: creating a narrative through forming a collection. Turbott, R. (2018).

are scaled up and production processes are considered in alignment with this. Executing textile sampling at scale or in quantity changes the nature and vision of the content. This, in align with the capabilities of the production technology and materials can affect expected outcomes — making evaluation and adaptive thinking highly influential in dealing with preconceptions. A considered discussion of what *mutability* pertains to at this stage helps to refine the physical samples as a collective. Mutability grounds not only the visual, but the material and the technicality of process — hence all of these are considered in the presentation of the final work.

> Colour and material mutability occurs through designing materials that allow for sensitivities and variances to be observed. This is presented through visual and tactile cues that portray tonal variation alongside the use of hue, and the presence of texture. The use of line work throughout the print imagery creates a sense of optical play channelling visual mutability. Repeated print work and motifs embrace symmetries, but also look for variance within the repetition.

The second stage of directive reflection collates the practical work to communicate a fluid narrative: the movement of colour through chance and action. Similar colours, textures, scales, harmony and contrast are tactile reference points that promote structural organisation. Below, an initial storyboard is developed using small scale physical material samples; the accent piece is the red / rust silk print (see Figure 21). At scale, this accent sample does not perform as expected — more pinks are revealed, and the silk *habotai* flattens the colour contrast. Reflecting upon the contextual associations of mutability, the dominance of a single hue and the static nature of the print at scale, this approach does not best represent an atmosphere that shows variance through subtle nuances. Instead, the red and rust tones are developed through another print in this selection, where the hue is less dominant.

The next approach (see Figures 22-24), based on the reflection discussed above presents a much cooler palette, with subtle variations in colour. The red remains apparent but harmonizes more successfully in smaller quantities.

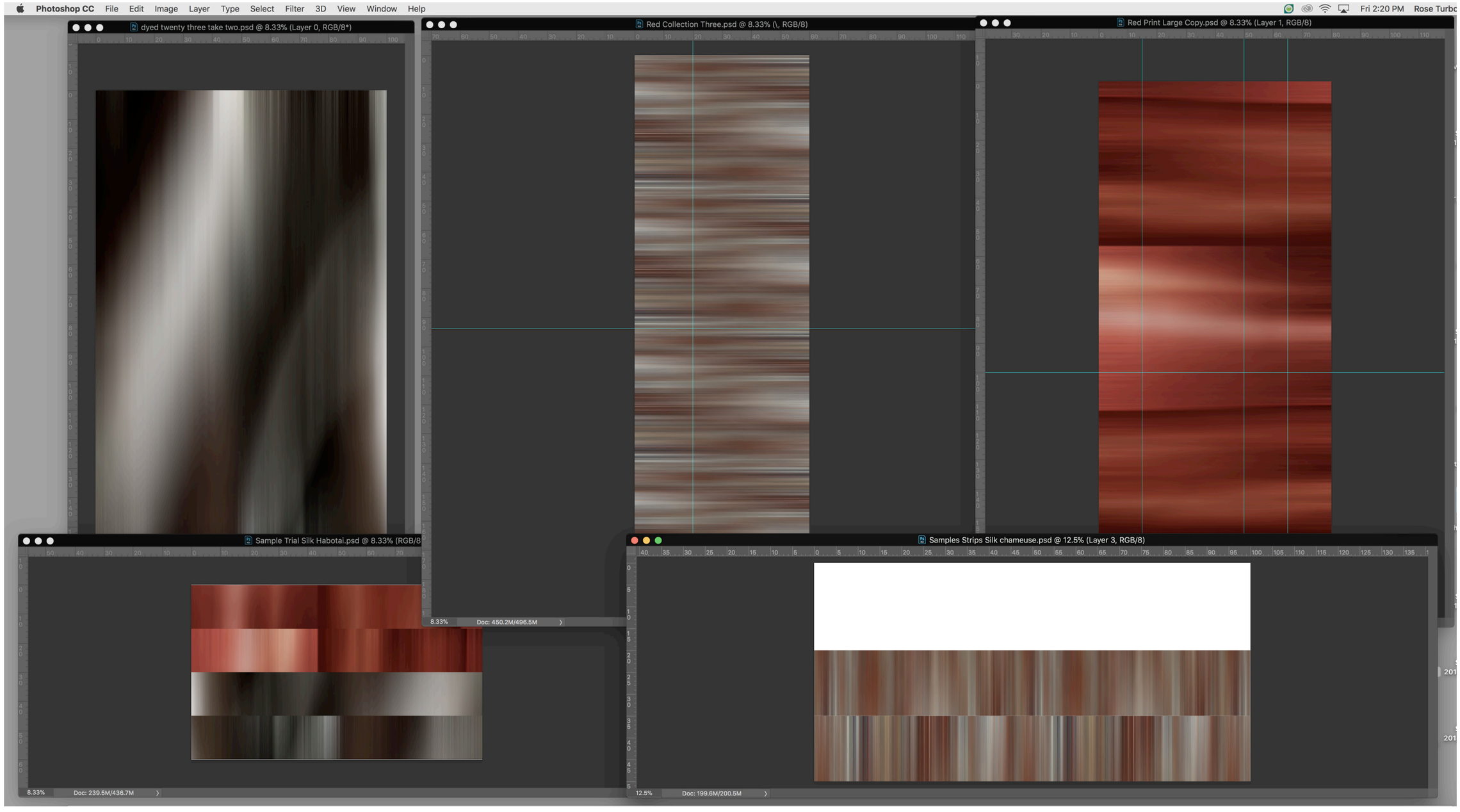

Figure 21. Creating a narrative through directive reflection: digital files for large scale prints. Turbott, R. (2018).

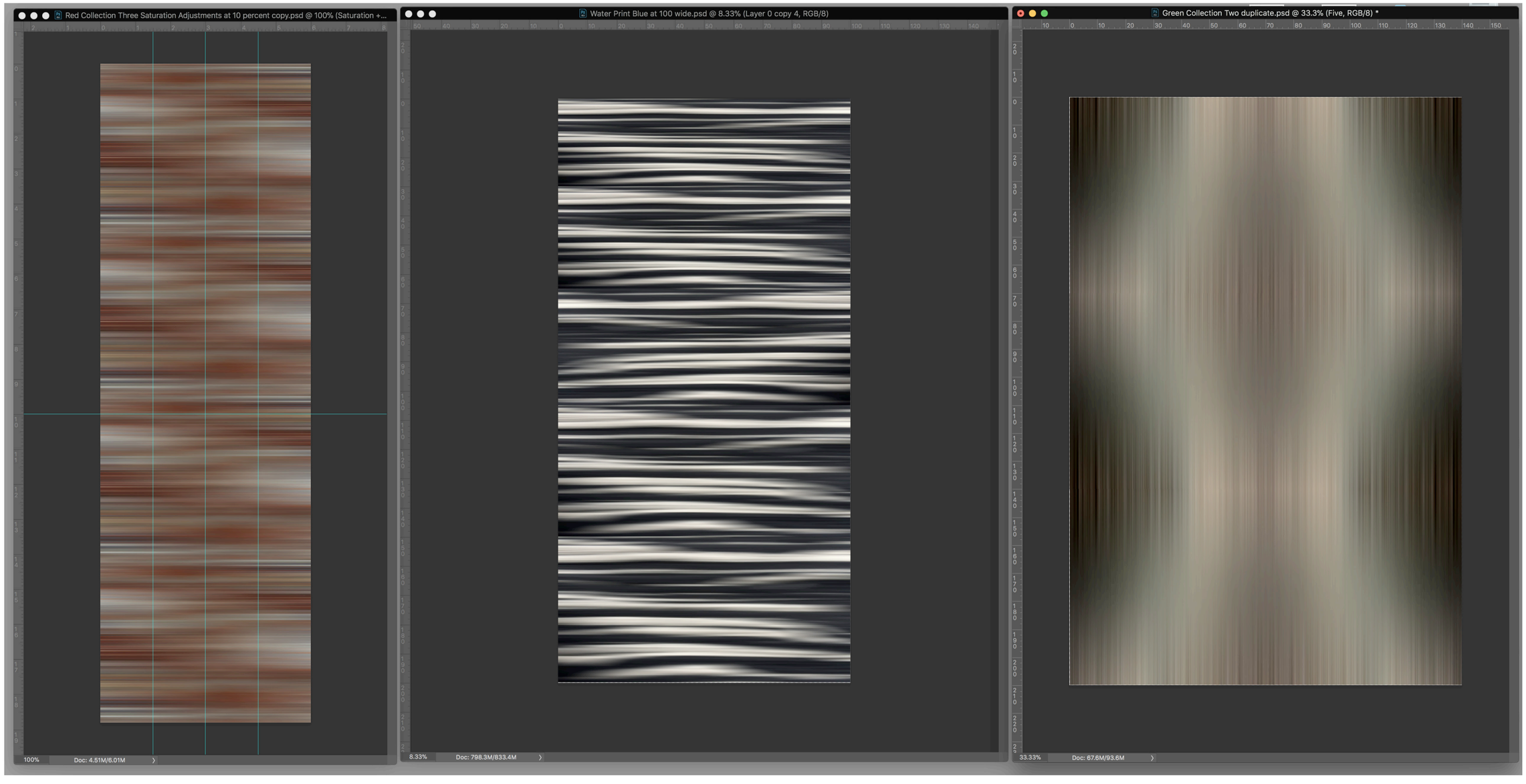

Figure 22. Creating a narrative through directive reflection: refining the colour palette. Turbott, R. (2018).

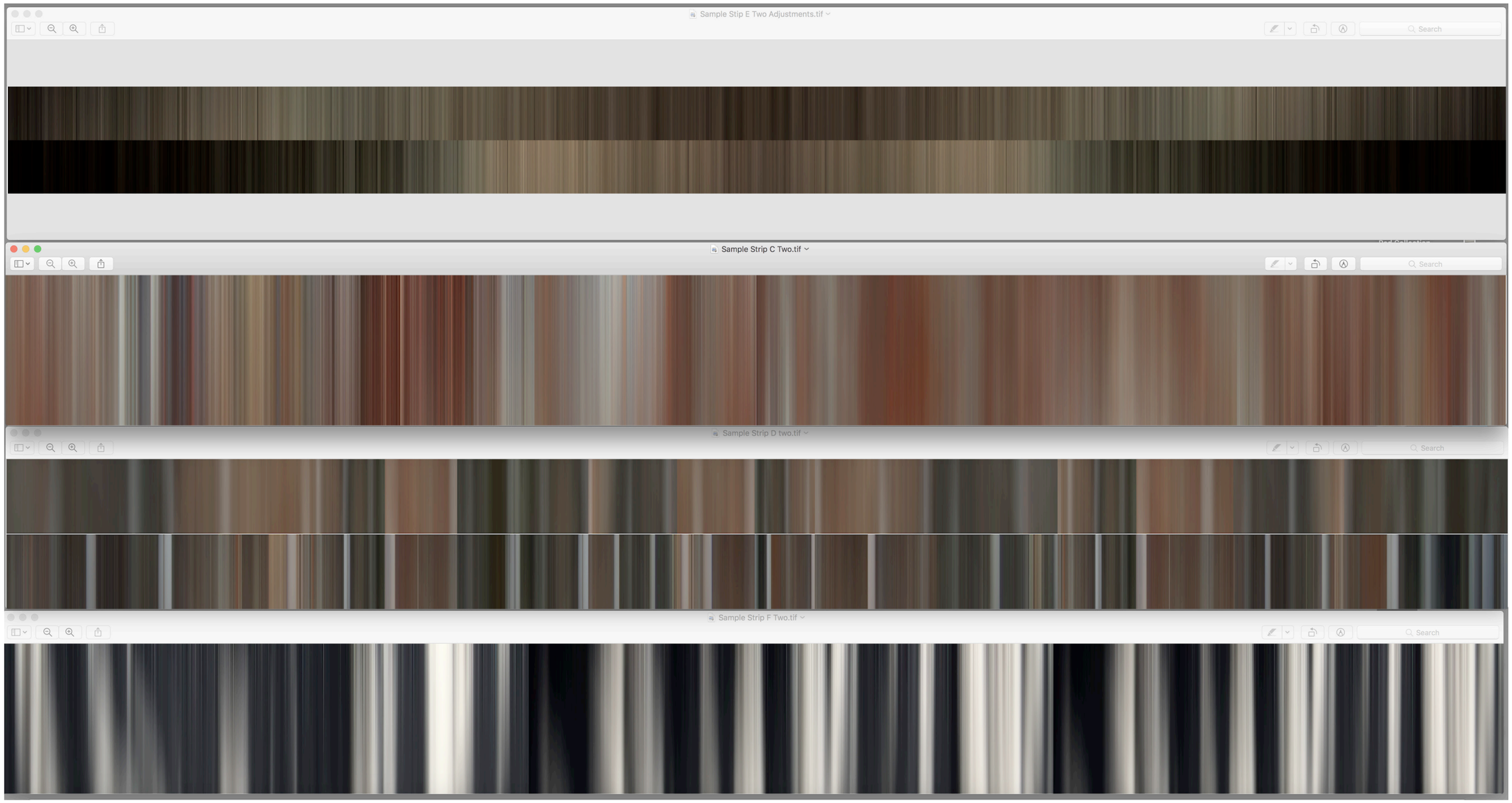

Figure 23. Large scale sampling. Turbott, R. (2018).

Figure 24. Refining the work towards a cohesive collection. Turbott, R. (2018).

3.4.4 Collating and collecting: The place of the strategic and the tactical within digital systems

During this process of scaling and collating, tensions arose around the strategic need to reproduce something at scale and the more unorthodox technical processes used during sampling experimentation. It was assumed that executing the work through mainly digital processes would be much less complex iteratively in opposition to using hand based processes. This assumption was wrongly founded in mistaking a loss of physical labour in connection to a lower level of problem solving involved — the digital brings its own issues regarding technicality of output. Colour sampling is often not accurate on first attempts and may need to be renegotiated over multiple trials and differs between substrates, machines and monitors. An alternative method of sampling was also developed to address the large-scale repeats and photographic imagery used throughout the work. Creating sample lengths (width of fabric / 10-20cm height) was the best way to test the quality of resolution and gather indications of how the image changes at scale on material. This itself brings about an interesting discussion — colour 'mutability' defines an acceptance of variation, however this variation still needs to be collated to tell a story or narrative through the work. Balancing this juxtaposing association was a large part of this secondary process of evaluation. Often the digital follows strategic rather than tactical methods of production — identifying these within the early development of imagery and print work would have helped me to manage this stage more effectively, where the approach of a craft practitioner is perhaps too apparent.

3.4.5 Object in context: Designing for varied applications

Materials are often considered connected to the designer through the process of application (creating a product from material); in some cases, this role crosses into the space of fabrication also, where the designer is involved in processes of production to change the value of the material in accordance with the market (Doordan, 2003). Throughout this process, the role of the practitioner has considered the design of the textile as opposed to the design of a textile for a product. This does not mean it does not consider application — instead it focuses on producing variation for intended applications through atmosphere as opposed to a specific product, interior or garment (Nilsson, 2014). This forms the reasoning behind the approach of an installation based exhibition of the work, where positioning the work outside of a directive form or object allows the viewer to think about the performance of the prints within a variety of contexts. Online platforms and collectives such as *Envisions* provide as example of this approach;

displaying material driven design in this way allows for the process to become the forefront of discussion (Tucker, 2017). The collection created is not orientated towards interior or fashion design in particular — this is discussed below through considering audience, materials and technology employed:

- ↳ Print designs on natural fibres for fashions fabrics (both bespoke and short runs).
- ↳ Print designs for textile installation and bespoke interior applications.
- ↳ Print designs that could be developed to work on more commercial levels within an interior application (this was not followed as it would involve working with outside parties and would change the established concept. It would also involve re-orientating the role of craft within the framework of practise to be less apparent through all stages of the design process).

Some of the digital craft based techniques created for the work (such as the dampened silk substrate for digital print) were considered in terms of an initial attempt to produce extended meterage. This involved transferring the sampling onto a roll to roll printer where meterage is more easily produced. Here, small issues were met in terms of printer gamut, the lessened application of water (changing the rates of bleed) and the printer apparatus that positioned the fabric leaving discharge. I considered continuing down this path, but the value of the aesthetic result perhaps negated further efforts as mass production was not the focus of this exploration.

3.5 Managing colour: Tools and methods

Playing with, emphasising, or re-defining the conventions of tools such as colour palettes and libraries in the context of the digital textile print medium is one method used to encourage mutability within this practise. The development of this method and associated tools is part of an unconscious process of tactile experimentation, that feeds back and between more structured ways of working with digital print palettes and libraries.

Making decisions about colour is an important part of surface design practise. Digital technologies provide new ways to explore the actions of the designer regarding colour selection, use or creation. In the context of a print practitioner or surface designer, digital tools have been observed to increase the ability of the designer to make immediate changes to scale, structure and the quantity of colours used in a pattern or image. The integration of the digital into textile print practise develops the designer's aesthetic; as Treadaway (2004, p.12) suggests "perhaps the most evident manifestation of this development in visual language

Figure 25. Exploring colour palettes. Turbott, R. (2017).

is in the use of colour." Helen Ryall, in her examination of hand based textile relief processes in conjunction with digital printing technology refers to the digital as tool through the concept of *digital dyebath* (Ryall & MacBeth, 2016). Here, the application of colour is deconstructed, producing a new *visual language* for digital print textiles. Application of the colour through the digital textile print head is controlled by dropping ink onto the substrate through piezo-electric pulses — colour is applied as pixels (pixels per inch translating to drops per inch), creating a static photographic image. Ryall subverts this process by using reliefs, to affect the direct and static representation of colour in the image. The importance of the digital within my own practise negotiates colour mutability through an exploration of various visual languages that result from subverting dye technology and materiality. It follows a similar vein to Ryall's explorations — however, the focus is orientated upon subverting the substrate in conjunction with the application of pigment.

3.5.1 Colour systems: Libraries, palettes and wheels

Considering her collaboration with design company Vitra, Jongerius defines and explores the role of colour tools within textile and product design practise. The concept of the colour wheel was introduced by the designer to organise Vitra's colour library. "The colour wheel became very important for the process: it was a form that enabled me to organise the complex library into a system that is both open and organic, it doesn't have to be complete" (Jongerius, 2016, p. 40).

Here, the colour wheel endows a circular organisation of colour (as opposed to traditional linear structures) in the aim of flexibility and design freedom. We see in this example a blending of the boundaries between colour library and palette — an attempt to systemise that leaves room for individuality and fluidity.

The relationship between larger source points of colour (such as a photographic image or a Pantone library) and the development of individual palettes is discussed further on in the text (pg. 45) in relation to colour management. Retaining an organic sense of selection and creating sensitive variation (as emphasised in the colour wheel) relies on presenting tone and shade in relationship to individual hues.

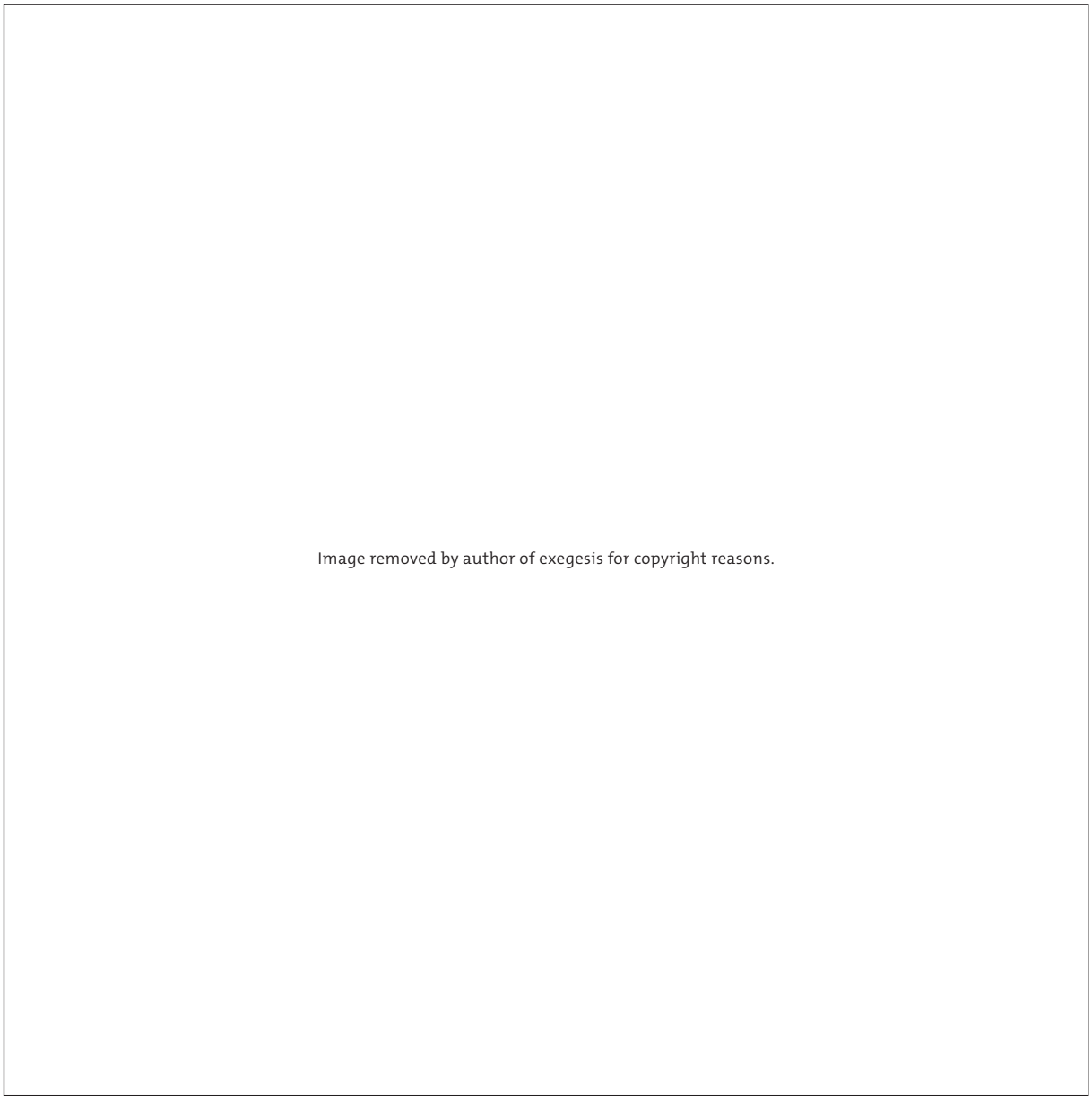

Figure 26. Retrieved from *@hellajongerius*, by Hella Jongerius, 2014 (posted 2017, Dec 2), Retrieved 2018, Apr. 21, from https://www.instagram.com/p/BcKnyXqFYRP/?taken-by=hellajongerius. Copyright 2017, by Hella Jongerius.

3.5.2 Methods of sampling

The photographic image contains large amounts of differentiated colour content in the form of pixels. Colour management of a photographic image is more complex to facilitate as a small palette of singular flat colours is unavailable. Within the context of this practise, the photographic image is used like a 'lotto draw' — expectation is removed from the context allowing for chance to produce a range of results. This method allows for natural colour harmonies to be observed that form within the image. Singular colours that are favourable can then be acted upon / reproduced through direct colour management. Conversely, if the digital image was used as a direct print, colour management could also occur through changing and evaluating printer profiles (see Figure 28).

3.5.3 Creating colour swatches for water induced substrates

As dye changes appearance when introduced to water and heat, regular control swatches were not always applicable. During the process of creating a tactile connection to the digital printer as a production process, ‘colour’ often appeared as multiple ‘colours’ — the damp silk substrate caused bleeding, exposing the basic colours used in the composition of a particular tone or shade. In this situation, the best approach was to create a personal colour swatch or mechanism for understanding how a colour appears on the physical silk substrate post manipulation. From these swatches, single colours could be identified on the silk and then selected within the digital — here, they are used in new samples that feature reduced palettes (see Figure 27). Samples with reduced palettes are formed through manipulating the original digital files into a new pattern and inserting single colours directly. Creating specific sampling methods to address colour management for bespoke outcomes illustrates the need for the designer to develop personal methods for sampling that address the complexities of the process.

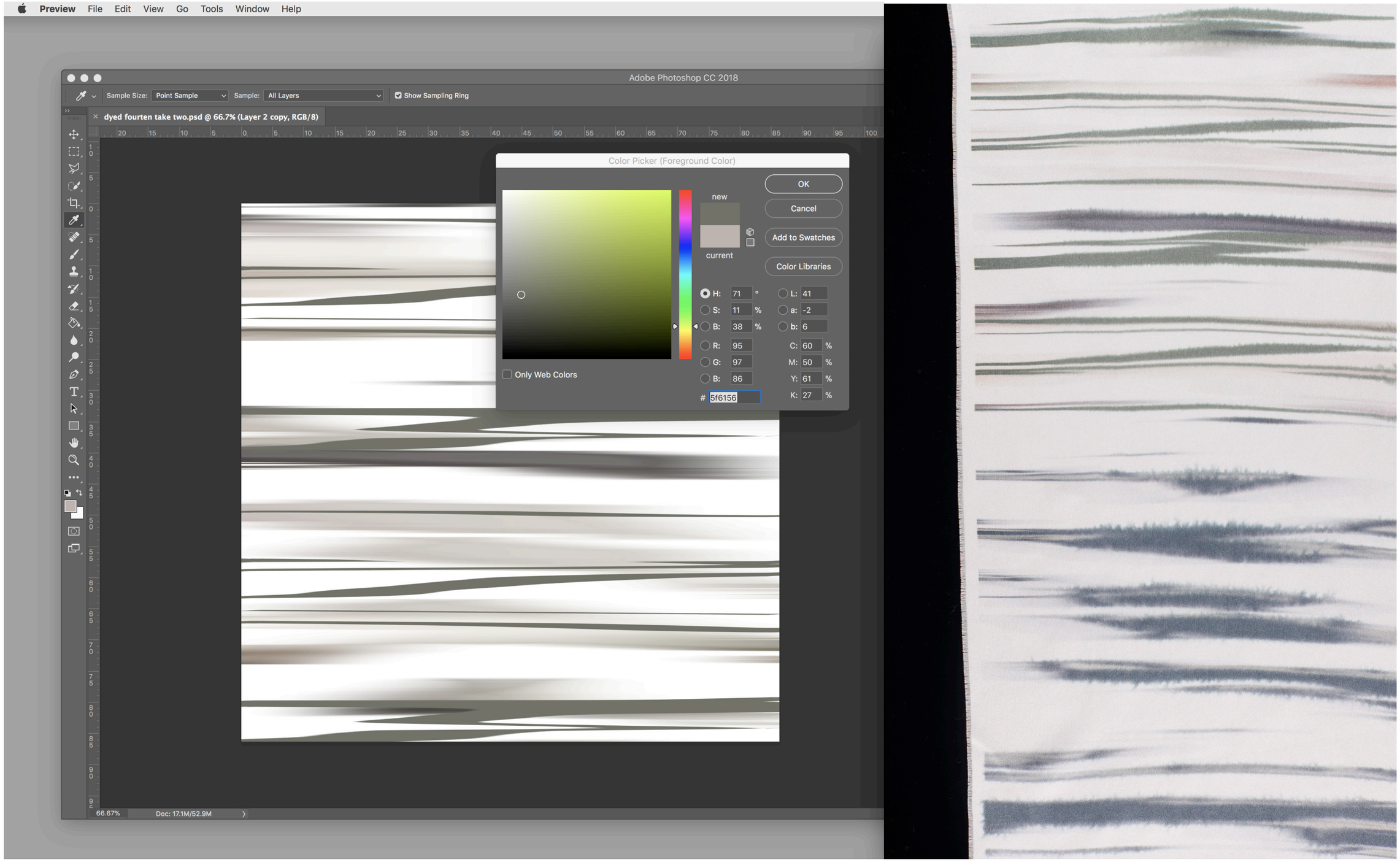

Figure 27. Reducing and selecting colours within the digital file to control the printed outcome. Turbott, R. (2018).

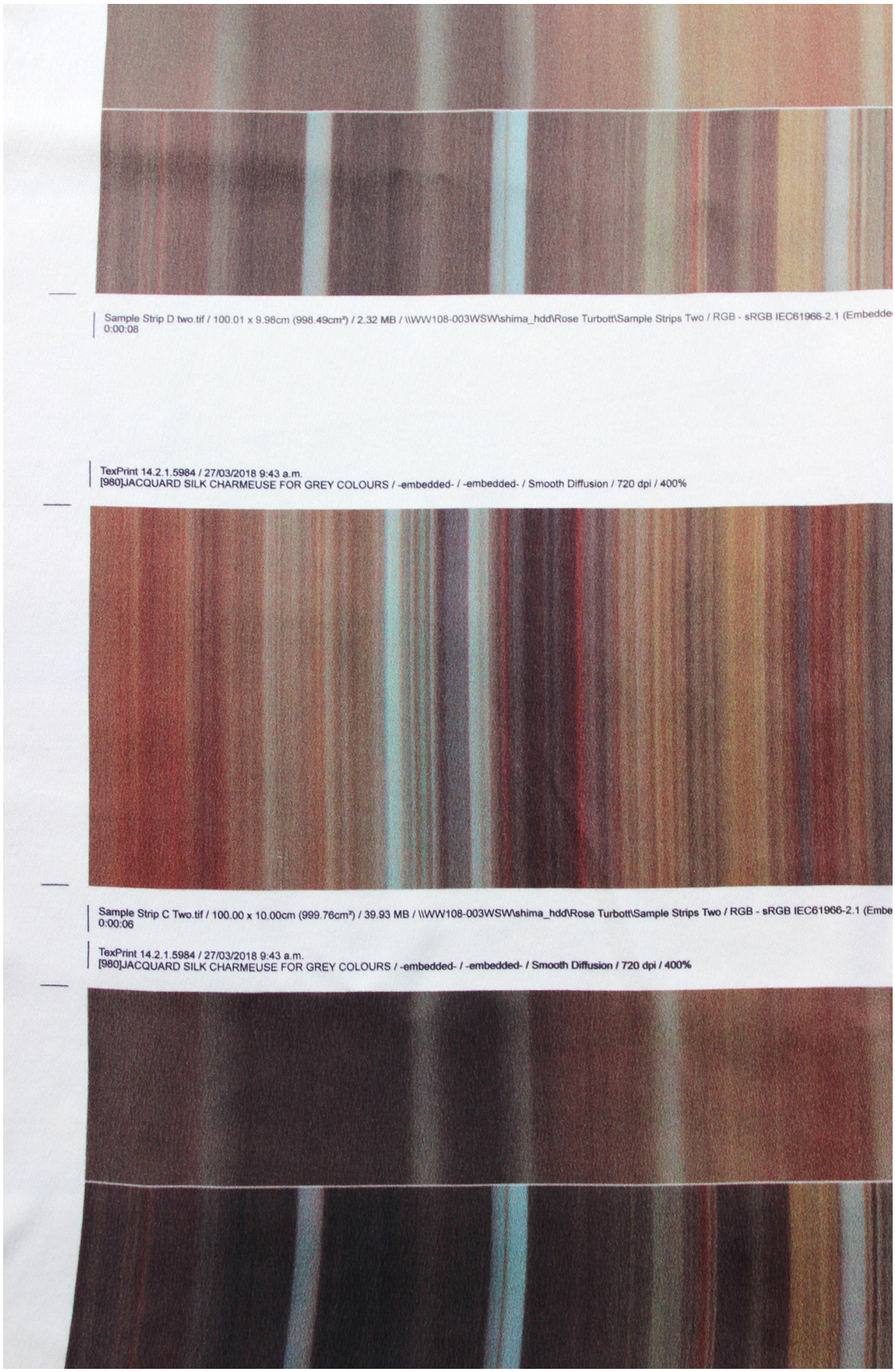

Figure 28. Testing digital prints at scale: trialling different printer profiles to adjust image colours. Turbott, R. (2018).

3.5.4 Making palettes: Facilitating the option for reproduction and accuracy

As the exploration in this project orientates the digital as craft based, certain outcomes such as the water induced silk substrates are not reproducible above the length of two metres. They are also specific to the machine they are printed on with regard to colour gamut — the Shima Seiki Flatbed printer (the availability of this printer in New Zealand in the near future is not certain). Extending this technique to other printers is discussed earlier on in the document (see page 42). To translate the sensitivities of the hand found in the delicate ripples and bleeds of the digitally crafted prints, direct photographic translation and manipulation could be followed. Alternatively, in favour of generating variation over intent based reproduction, the digital files used to create the digitally crafted prints were also directly printed onto the silk substrate to form part of the collection.

3.5.5 Developing colour awareness: Mixing colour

Part of the attraction of understanding colour through the hand was found in the ability to mix and create colour, as opposed to the action of selecting colour. Visual depth and colour intensity can be achieved through the technique of layering and mixing.

The technique of dyeing began as a hand based process prior to the introduction of the digital printer and was used to facilitate an understanding of colour mixing. How colours are mixed in physical practise differ from the equivalent act of playing with hue, saturation and value in Adobe Photoshop — where additive colour systems mix the basic hues red, blue and green to create white through light. Here, adjusting colour involves selecting and editing from pre-determined libraries rather than mixing. Physical action contrary to this begins with basic colorants (dyestuffs) such as red, blue and yellow. Working within a smaller range of colours to start with, the focus becomes upon the variation of the hues initially created through tones and shades. In this practise mixing colour is not just about mixing hues but is also about playing with tonal discrepancies through concentration of water and dyestuff.

Mixing dye colorants by hand became a threefold act: firstly, the mixing of dyestuff with water to create a hue, secondly the mixing of dyes through application to substrate, and thirdly the creation of a tonal range through the addition of using water. It became apparent through these actions that the development of colour sensitivity was facilitated by physical practises, where technical restrictions and the unavailability of pre-determined hues empowered me as a practitioner to fully understand how hue, value and saturation work as colour tools. Increased

Figure 29. Different colours produced through mixing dyestuff by hand. Turbott, R. (2017).

sensitivity to these tools translated into the digital workspace, through the implementation of gentle gradients which created dimensionality and movement within the virtual surface. The colours developed by applying dye through hand application created a preliminary palette — a design source for the first stage of colour regeneration into the digital.

Sensitivity to colour is a learned behaviour — here, conclusions were drawn that individuals with creative experience (and therefore greater colour experience) created a fuller palette of hues through the use of tones and shades, rather than by mixing a variety of hues (Raney, 1992, as cited in Portillo, 2009.) Use of colour schemes that recognise tones and shades within colour stories make a design appear readable, exchangeable or flexible.

3.6 Summary: Methodology and design process

This summary evaluates and discusses the methods developed throughout this practise led design process. *Crafting* by hand allows for the designer to connect to material — here it is the combined sensitivities of the hand and raw material that contribute to the development of colour sensitivity in the digital. *Colour management* is an important method used to design and test the appearance of digital colour — tools such as swatches, libraries and palettes are created to serve unorthodox design processes, adding value through changing generic methods used to control colour outcomes. In retrospect, more attention could have been given to the development of this method. Creating this method as a digital tool in conjunction with, rather than post craft exploration would have allowed me to develop the organisational to retain a greater balance of control.

Regeneration suggests that translating data from one medium to another (craft to digital) finds greater value through indirect translation in opposition to obvious representation. Regenerating action as well as imagery proposes that the designer purposefully adds and changes content in align with their own intentions and material observations when moving between mediums. This adds value to the product through changing the visual language of both the designer and their medium. *Reflection* is a method used to initiate change and support *regeneration*. Reflection can act as a mechanism to laterally develop iterations and facilitate design exploration. It can also conversely provide directive narrative through collating exploration (helpful in the communication of content to an audience).

Chapter 4
Conclusions

4.1 Making conclusions: Summarising intentions and assumptions connected to digitally crafting colour as material

The digital process opens new avenues for the textile maker and designer — allowing for a development of the practitioner's visual language. The intention of this practice was to establish methods that understand textile craft practice within the digital print medium. Colour mutability was established as a visual and material cue that aimed to re-orientate practise based outcomes away from static representations of colour often found in digital print technology.

The assumption was made in the early stages of the practise that digital processes would function fluidly and save time. Placing the digital solely as a method of production that provided accuracy on the basis of a loss of physical labour was unfounded. To operate creatively and accurately within the digital acknowledgement of its methods of operation and partial inclusion of these is advantageous. Acknowledgement of the digital also allows for a new visual language to occur for the practitioner.

4.2 Summarising findings: Material, maker and design methods

Through the hand based practice of dyeing, mutability was presented through acknowledgement of the substrate. Although dyestuff may be perceived and designed to appear as chemically constant, the substrate it is applied to will inform the appearance of the colourant (alongside the environmental conditions it is viewed within). Colour as mutable in this practise associates static and flat colours to the process of applying dye to fibre. Other practitioners also negotiate these subtleties of application with relation to digital print technology — Helen Ryall, for example, in her definition of the 'digital as dyebath' (Ryall & MacBeth, 2016). This practise extends that concept to material — where subversion of the substrate is considered to change the application of the dyestuff.

Conscious and considered decision making is crucial to presenting the intentions of the designer and the contextual positioning within the practise of making. As illustrated within this methodology, reflection concerns both individual samples and techniques alongside the collective body of work. The mood board as a method of communication is extended in this practise to function as a mechanism for reflection that promotes lateral thinking and the placing of emotion within the work. The vulnerability of the designer plays an important role in the embrace of accident and chance. Often vulnerability is found in a degree of incompetence (digital textile printing was new to the practitioner

in this context). Being able to identify similarities between new and familiar technical processes allows for action to occur in the face of vulnerability or lack of skill.

Craft practise, orientated towards experimentation with the hands creates a space for creative abstract reasoning to occur. The accuracy predominant in a directive practise of the digital workspace and the craft of workmanship can be renegotiated to facilitate lateral models of thinking through the instigation of hands based practise. It was established throughout this process that craft was a physical iterative method (such as prototyping, modelling, toiling or mood-boarding) used to connect material to the designer in addition to functioning as a marker of traditional or cultural archetypes. Layering, associated to craft practise in this context is a key metaphorical and physical concept. It can occur through immaterial and material workspaces. Filters can be added in Adobe Photoshop; when dyeing by hand colours can be stripped back or mixed with other hues. Layering as a physical act promotes the addition of action. This invites creative labour and lateral thinking through iteration into the process of designing on both computer and by hand.

Colour as mutable situates change and fluidity in both the position of perspective and action — making and considering colour as material drives both the movement of the visual language and the methods developed by the practitioner.

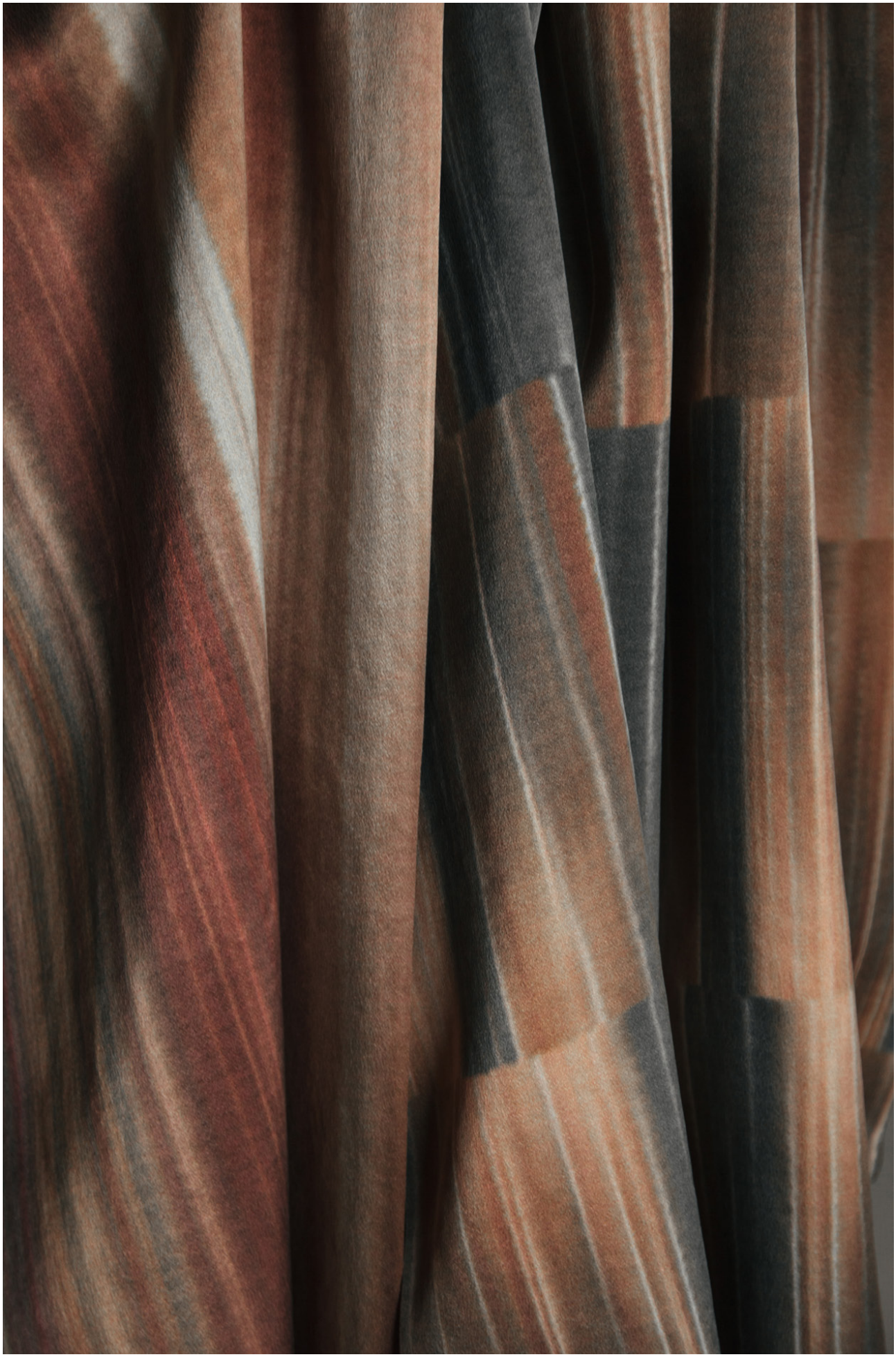

Figure 30. Digital print outcome: water induced silk print – detail. Au, M. (2018).

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Figure 31. Digital print outcome: water induced silk prints. Au, M. (2018).

Motions from the Hand to the Digital

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