

THE INTRA-ACTION OF PAPER AND HEDGEROW CHEMISTRY

Rachel Marsh

A chorus of living wood sings to the woman: If your mind were only a slightly greener thing, we'd drown you in meaning.

(Powers, 2018, p.4)

Over 220 artists from around the world responded to the 2025 World Book Night prompt 'Tell it to the trees' after reading Richard Powers' 2018 novel *The Overstory*. The annual World Book Night is organized by Sarah Bodman and Linda Parr, at UWE, Bristol. Artists sent in paintings, collages, prints and artists books for an exhibition in Bower Ashton library in summer 2025. The works were then swapped and sent back to participants in August – and my job was to produce a keepsake of the project to go with them.

Having read the book twice by this stage – and so not able to look at a tree in quite the same way as I had before – I was reluctant to use paper made from wood-pulp for the keepsake. Conversations with artists involved in the project revealed that others had felt similarly conflicted. I know some might find this ridiculous. The novel is printed on paper made from tree pulp – albeit FSC certified. The most extreme end of the debate is articulated by Jonathan Bate (2003, p92) who writes, 'the price of art is the destruction of a living tree' but then goes even further: 'You create culture by enslaving nature.' I don't agree that this statement needs to be true and was curious to explore a non-extractive method of responding to *The Overstory*, while at the same time acknowledging the agency of the other intelligences referenced in the novel.

The tree is saying things, in words before words.

(Powers, 2018, p.3)

I am structuring this article using quotes from Powers' wonderful introduction to the 'Roots' section of *The Overstory*. Powers emphasizes the communicative power of trees 'in words before words' (p3). His (human) characters respond to these messages, and although they can't understand what the trees are saying, the nine

characters' lives are changed forever by their relationships to trees. Some of these responses are revelatory with life-changing effects, some are peripheral and only understood by characters much later.

Is it ever possible to 'speak for' the more-than-human world? Ursula K. Le Guin, in the foreword to her last poetry collection writes: 'Poetry is the human language that can try to say what a tree or a rock or a river is, that is, to speak humanly for it, in both senses of the word "for".' (2016, p.viii)

I am a letterpress artist and do not consider myself an eco-poet. But perhaps that doesn't matter. Kate Rigby (2004) writes that eco-poetry's importance

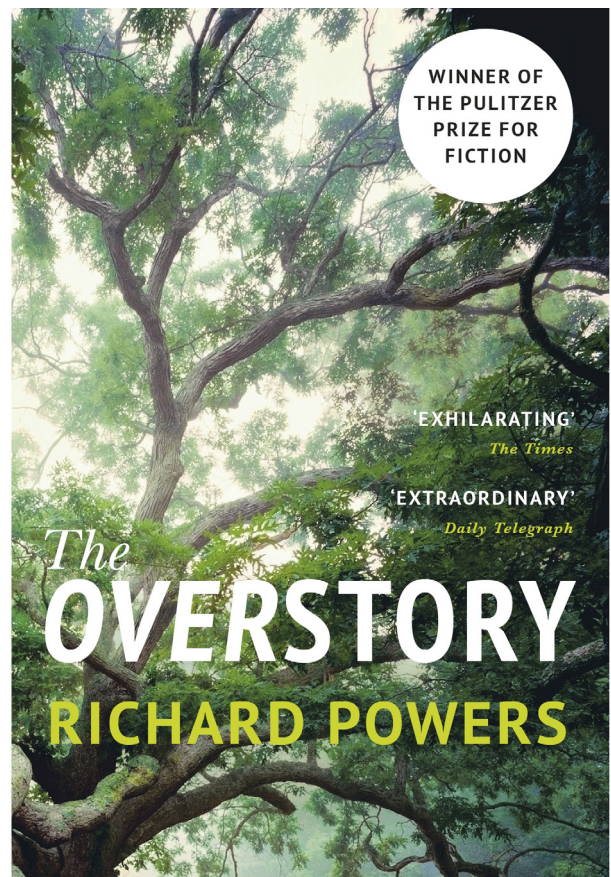


Figure 1

Figure Titles and Information

Fig 1. Cover of *The Overstory*, by Richard Powers, first published in 2018.

comes from showing 'the nonequation of word and thing, poem and place' (p.437). She continues:

Only to the extent that the work of art is self-cancelling, acknowledging in some ways its inevitable failure to adequately mediate the voice of nature, can it point us to that which lies beyond its own enframing. (Rigby, 2004, p.437)

She calls this 'negative ecopoetics' (p.437). This idea contains many possibilities for a letterpress artist. Texts can be self-cancelled through over-printing, for example. However, the name seems a little... negative?

What if Powers' 'words before words' aren't words at all? Karen Barad (2003) rails against 'the linguistic turn', demanding 'How did language come to be more trustworthy than matter?' (2003, p.801). Rather, Barad advocates for a 'material-discursive' that focusses on the relations – or intra-actions – between material phenomena. Therefore 'matter is substance in its intra-active becoming – not a thing, but a doing' (2003, p.822).

I was reminded of their words when I started making dye from oak galls and iron sulphate – then watching them intra-act on various paper samples. It gave me the starting point for a material ecopoetry that gives voice to, rather than 'speaking for' the non-human world – but with language remaining a key component. Or as Donna Haraway (2016, p.66) puts it 'Material semiotics is exuberantly chemical; the roots of language across taxa, with all its understandings and misunderstandings, lie in such attachments.'

It says: Sun and water are questions endlessly worth answering.
(Powers, 2018, p.3)

I wanted to explore the interconnections between trees created by the mycelial network of fungal hyphae. This is explored in the novel through the character of Patricia Westerford – whose research brings Suzanne Simard to mind. The first question was whether I could find a suitable tree-free paper. All the options were white or off-white, but this gave me the opportunity to combine homemade oak gall dye with letterpress print for the first time. There followed a lot of experimentation with paper samples to find a tree-free paper that could be soaked multiple times – and still be suitable for letterpress print.

My paper options were:

- Tree Free paper made from 75% bamboo and 25% short-fibred cotton linters (surface sized with starch) 250gsm
- Khadi paper made from long-fibred cotton rag (sized with gelatine) 210gsm/310gsm
- PaperWise paper made from agricultural waste (surface sized with starch) 295gsm.

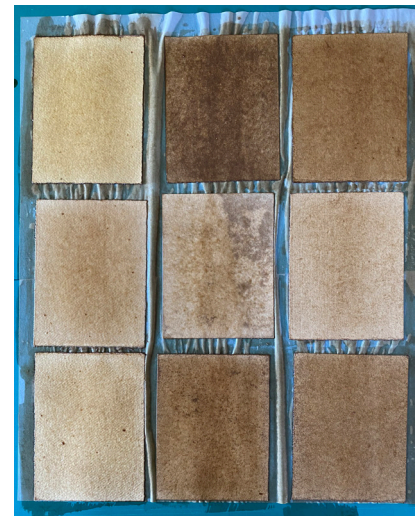


Figure 2

Fig 2. Paper samples while being dyed (still wet). Top row: Alum mordant. Middle row: Soya milk. Bottom row: water. First column: Khadi. Second column: Paper Free. Third column: PaperWise

I also tried three paper pre-dye treatments:

- soaking in water
- soaking in homemade soya milk
- soaking in an alum (aluminium sulphate) mordant bath

Soya milk provides a protein coating that bonds physically with the cellulose fibres – which can often improve the brightness of the colour in the dyeing process. An alum mordant bonds chemically with the cellulose fibres fixing the colour and making it more lightfast. All three baths wetted and relaxed the fibres before the dye process.

<p>Khadi paper/alum</p> <p>Beautiful even dye, the alum modified the colour to make it brighter. Dried unevenly.</p>	<p>Tree free/alum</p> <p>Initially gave a quick deep and even dye, but dried in a mottled manner.</p>	<p>PaperWise/alum</p> <p>Gave a pleasing mid-tone, dried evenly. Paper kept its 'snap' and still felt like card.</p>
<p>Khadi paper/soya milk</p> <p>Didn't seem to want to bind to the paper. Left ripple marks on drying like low-tide beach sand.</p>	<p>Tree free/soya milk</p> <p>Very uneven dyeing. Dried looking like faux leather, not unpleasant, but not suitable.</p>	<p>PaperWise/soya milk</p> <p>Slow to take the dye, but once dry was deep, crisp and even. Kept its snap.</p>
<p>Khadi paper/water</p> <p>Dyed slowly but evenly, however it dried unevenly</p>	<p>Tree free/water</p> <p>Gave a quick deep and even dye, and almost dried evenly, but had weird foxing effect</p>	<p>PaperWise/water</p> <p>Beautiful quick, deep, even dye. Dried evenly, and kept its snap.</p>

Pre-soaking the samples in the baths convinced me that dye baths were not suitable for multiple sheets of large paper. Even the small samples stuck together, and although it was possible to move them around there were quantities of scale to consider. I needed to make 250 keepsakes, so I was going to have to dye a lot of paper... I decided to brush coat the dye onto paper instead. This made the dye take-up less even, but I liked the uneven results. A subsequent experiment with a dye bath and small paper samples produced deeper and more even results but used a horrifying amount of dye. Brush coating the dye was quicker, allowed the card's back to stay (more or less) neutral for



Figure 3

Fig 3. Dyed paper samples after four coats of brushed dye (dry): Top row: Alum mordant. Middle row: Soya milk. Bottom row: water. First column: Khadi. Second column: Paper Free. Third column: PaperWise

later printing, and meant that I could colour the paper using less dye solution.

PaperWise was the outright winner after these experiments. Regardless of pre-treatment, it took the dye well and dried evenly. It kept its stiffness and felt most like a postcard, which was the feel I was aiming for. The Tree Free paper seemed to take the dye unevenly, and the repeated wetting weakened the paper. The Khadi with its longer fibres had no trouble with repeated wetting – its heavy sizing needed the soaking before the dye could sink into the fibres. Ironically, it's the sizing that makes it such a good watercolour and ink paper.

It became clear that the soya was completely unnecessary for the oak gall dye, and the alum had only a marginal effect. This is due to the high level of tannin in the oak galls which acts as a mordant in itself. Plants produce tannins in response to damage from insects (Lee, 2007, p205) as the oaks grow the tannin-rich gall around the gall wasp larvae. It was satisfying to dye paper that was not made from trees, using tannins created by trees.

My oak gall dye recipe

Ingredients

- Two handfuls of oak galls
- Distilled / rainwater
- Iron (ferrous) sulphate solution (vitriol / copperas): 1% solution in distilled water
- Sodium carbonate (soda ash / wood ash): 1% solution in distilled water

Method

Only collect oak galls with a hole in the side to make sure that the wasp larvae have moved on.

Crush the oak galls in a brass pestle and mortar, then grind them in a coffee grinder.

Place in a stainless-steel pan with distilled/rainwater just covering the crushed galls. Cover with a lid.

Steep on a low heat for over an hour. For better results leave for a week or two in a warm place before heating, then leave for another week.

Test by dipping strips of paper into the solution – they should turn a mid-brown.

Strain through a filter paper.

Make a second batch of dye with the oak gall grounds.

Notes and variations

To turn it black: modify it with a little iron sulphate. Lightfast.

To turn it red-brown: modify with a little soda ash. May not be lightfast.

To use as a drawing ink: add a little gum arabic solution to help the ink flow more easily, and to help it bind to the surface of the paper.

Iron gall ink is oak gall ink with an added splash of iron sulphate.

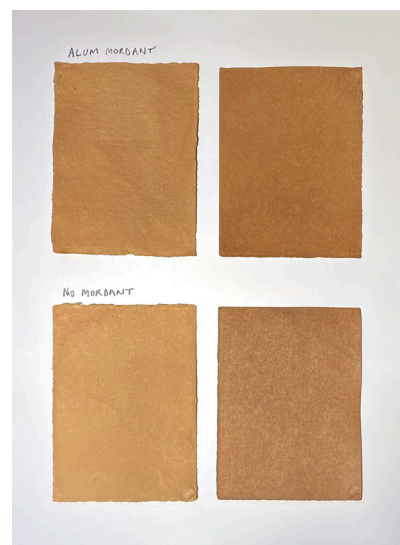


Figure 4



Figure 5

Fig 4. Dip dyed samples (dry): Top row: alum mordant. Bottom row: unmordanted. Left column: Khadi. Right column: PaperWise.

Fig 5. Oakgalls

It says: A good answer must be reinvented many times, from scratch.
 (Powers, 2018, p.3)

Joshua Calhoun's 2020 book *The Nature of the Page* advocates for an 'ecology of texts' (pp.1–16) that reads not just the words on the page, but the page itself for meaning. 'Paper' he writes '... is a marvelous but flawed protagonist, the product of nature and culture, of non-human and human agencies' (p.ix). The paper itself is much easier to (ecologically) read in renaissance books, as it was handmade in moulds from linen rags. Readers could spot small piece of fabric, hairs and occasionally feathers embedded in the page. They could even read the season of the paper's making from its colour; paper mills need to be close to running water, and spring floods turned the rivers and then the paper muddy brown. Rags were always scarce – especially in the UK where flax and linen rags had to be imported to meet demand. It was only a matter of time before papermakers turned to other sources of cellulose fibre.

PaperWise is not the first paper to be made from agricultural waste. In 1800 Matthias Koops published a book on the history of all the substances used to make paper – from papyrus to animal skins to cotton and flax to... agricultural waste. His book was printed on what Calhoun describes as 'coarse yellow paper' that is 'heavily flecked with organic matter', which under archive lighting 'can take on a shimmering quality' (2020, p.30). Koops' book was printed on paper made from 100% agricultural waste – including 'straw, hay, thistles, waste, and refuse of hemp and flax' (2020, p.37). His paper wasn't the first as he himself acknowledged, but Koops was the first to make usable paper from agricultural waste with no rags added. The final appendix was printed on a noticeably different, finer and paler, paper. This was another of Koops' experiments – being made entirely from wood pulp. Calhoun enjoys the rightness of Koops' use of paper: 'Negotiation among humans and nonhumans is at the heart of Koops's story; the plant sources never drop from view or fade into the background.' (2020, p.34). Unfortunately, Koops' new venture did not last. His papermill at Millbank, Westminster, making paper from straw, went out of business in 1804. Papermaking industrialized within the decade, but raw materials remained scarce. It wasn't until the late nineteenth century that the breakthrough discovery that sulphides could extract the cellulose from wood meant that paper made from wood-pulp could take over.

PaperWise has an interesting story to tell. By making paper using renewable energy from a plentiful agricultural waste product, PaperWise claims to achieve a 20% saving on the carbon footprint of FSC certified paper, and a 45% saving on recycled paper (<https://paperwise.eu/en>). It's a lovely paper and is worth investigating further.

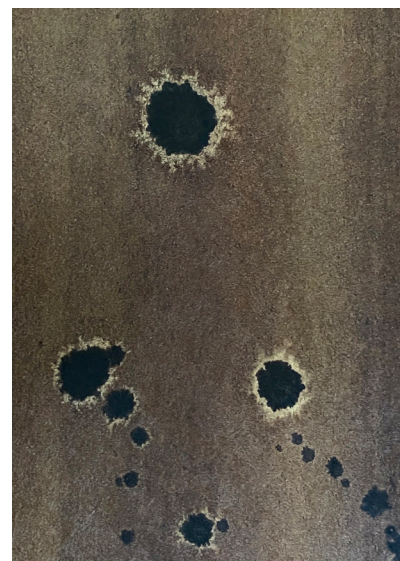


Figure 6

Fig 6. Iron sulphate solution applied with a dropper bottle created strange blots like a malevolent virus

It says: Every piece of earth needs a new way to grip it. There are more ways to branch than any cedar pencil will ever find. A thing can travel everywhere, just by holding still.

(Powers, 2018, p.3)

My first instinct was to make the dyed paper as even as possible – then realised that I was wasting an opportunity. So I slopped on the dye and let it pool on the paper, or added the iron sulphate with a dropper bottle to make black blots that drove the oak gall dye out before it – giving the impression of a malevolent virus. I used a brush loaded with modifiers in huge arcs to make expressive stroke marks across the page. It was great fun. The oak gall dye on its own makes the paper light brown and needs several coats to deepen the colour. Sloshing over the smallest amount of iron sulphate creates instant blacks as gallic acid in the gall ink reacts with the iron salts on the page. This is described as ‘gallotannin’ by Lucy Mayes (2025, p129) and ‘an iron-tannin complex’ by Anisha Gupta (2021). Meanwhile the soda ash increases the pH which reacts with the gallic acid to turn the paper chestnut-red. It feels like a kind of witchcraft although, as all the ingredients can be foraged on a Devon walk, perhaps hedgerow chemistry would be a better description. However, Radha Pandey (2022) more accurately describes paper dyeing as ‘alchemy’, being a combination of ‘botany, cooking, biology, medicine, physics, and chemistry – fields that today are divided into separate sciences’ (2022, p.114).

My first impression of the PaperWise card was not particularly favourable. It reminded me of greyboard, and, like Koops’ paper, contained visible flecks of organic matter. However, my early letterpress print trials showed it could take an impression very nicely with minimal pressure. After I dyed the paper and added the modifiers the paper felt different. It seemed smoother on the dyed surface, almost leathery. Tanned leather was traditionally softened using oak tannins so I wondered whether a kind of tanning process had taken place. Another possibility is that the iron sulphate was reacting with the gallic acid to produce a weak sulphuric acid that was affecting the paper. Where historic ink was made with too much iron, the sulphuric acid produced over time oxidises on the page, breaking down the cellulose fibres. Eventually this creates a halo effect around the letterforms of written text on old manuscripts, before parts of the paper fall away (Gupta, 2021). It might be a headache for an archivist, but for an artist it is an exciting added dimension. If parts of the keepsakes disintegrate over the coming years, then I would be delighted. But the process usually takes decades or centuries, and I’d used a very weak solution of iron sulphate.

Your kind never sees us whole. You miss the half of it, and more. There’s always as much below ground as above.

(Powers, 2018, p.4)

Finally, I was ready for the letterpress print stage – listening to the



Figure 7



Figure 8

Fig 7. Finished dyed sheet of PaperWise, showing oak gall dyed paper, modified with iron sulphate and sodium carbonate.

Fig 8. Letterpress print experiments. Left: print on undyed PaperWise, using homemade letterpress ink with laked red onion skin dye. Right: print on dyed Khadi, using opaque white letterpress ink from the tin.

whispers of the mycelial network connecting the trees under the ground. I used recycled pine floorboards as jigs to hold the type in place – cutting the curves with a jigsaw. In the past I have set type on a curve using letterpress furniture alone, but I wanted to over-print the type accurately – going in both directions – and the jigs (and the trees they came from) enabled that to happen. I wrote the texts direct on the press bed, using numbers instead of word spaces. In one direction the trees are talking about me walking through the woods with my dogs, noticing that the dogs are more in tune to material qualities of the forest floor than I am. In the other direction the mycelial network sends messages about discovered sources of minerals and water and possible threat. I chose 36pt Centaur italic (also known as Arrighi) as I had plenty of it and I enjoyed the way the letterforms interacted with one another as they over-printed on the page. The descenders seemed like tiny hyphal hairs growing out from the mycelium. I used white ink direct from the tin, as I have not yet successfully made my own opaque white letterpress ink.

That's the trouble with people, their root problem. Life runs alongside them, unseen. Right here, right next.

(Powers, 2018, p.4)

Tim Ingold writes 'In short, materials are what they do.' (2015 p.63). The keepsake project was an opportunity to develop a methodology to work in symposium (Haraway, 2016) with the non-human, by allowing matter to speak for itself. The non-human and human elements create meaning together in a material ecopoetry. This is closely related to Calhoun's 'ecology of texts' (2020) where both the non-human and the human components need to be interpreted as a whole by the reader. I had to decide to let go control – or at least to make decisions based on a different kind of aesthetic. Lawrence Buell, 1995, calls this the 'aesthetics of relinquishment', which 'calls into question the authority of the superintending consciousness ...' that suggests '... the possibility of a more ecocentric state of being than most of us have dreamed of.' (1995, p144-145). These moments of uncertainty – watching as materials intra-acted with the paper – were for me the most surprising and exciting in this project.

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Fig 9. Finished full size print, before being cut into four keepsakes.

Fig 10. *Mycelial Whispers* (2025) by Rachel Marsh. Letterpress print, 157 x 122 mm. Copyright: the artist.

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Rachel Marsh is PGR at UWE, Bristol, exploring Mary Stella Edwards' poetry and relationship with the more-than-human world through the lens of Lichenism. Her PhD is taking a multidisciplinary approach: with research at the Ackland and Edwards archive at The Burton at Bideford, alongside practice as research, ecocriticism and lichenology. She is a

letterpress book artist, writer and graphic designer, and joint editor of the Eco-poetry section in Resurgence & Ecologist magazine. She was awarded Clifford Moss Memorial Prize at UWE in 2022, and the Peter Reddick Bursary at Spike Print Studio for the year 2022-23.

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IMAGE GALLERY

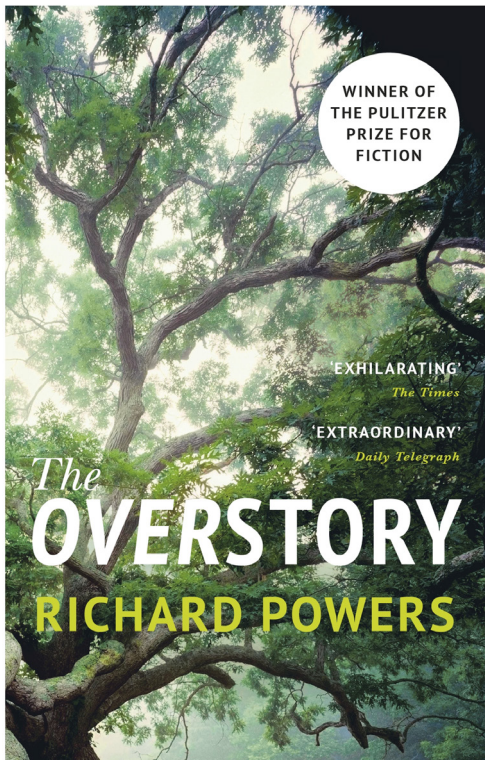


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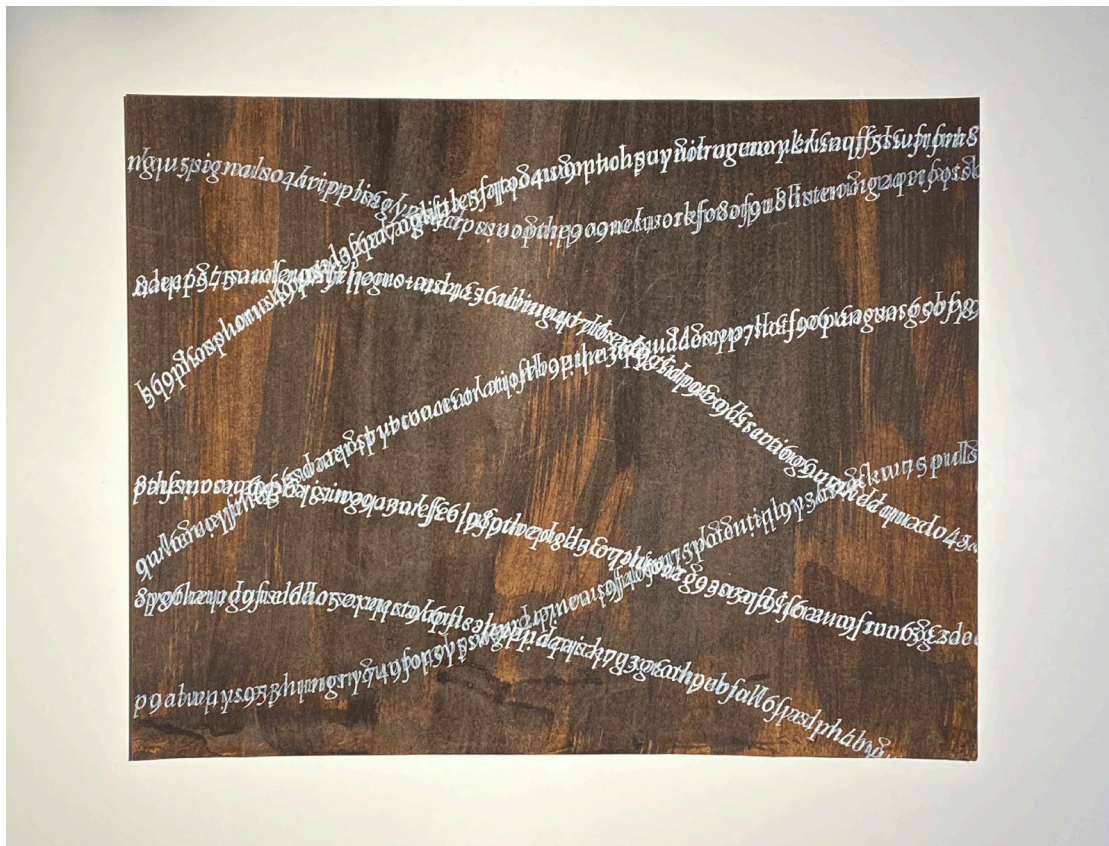


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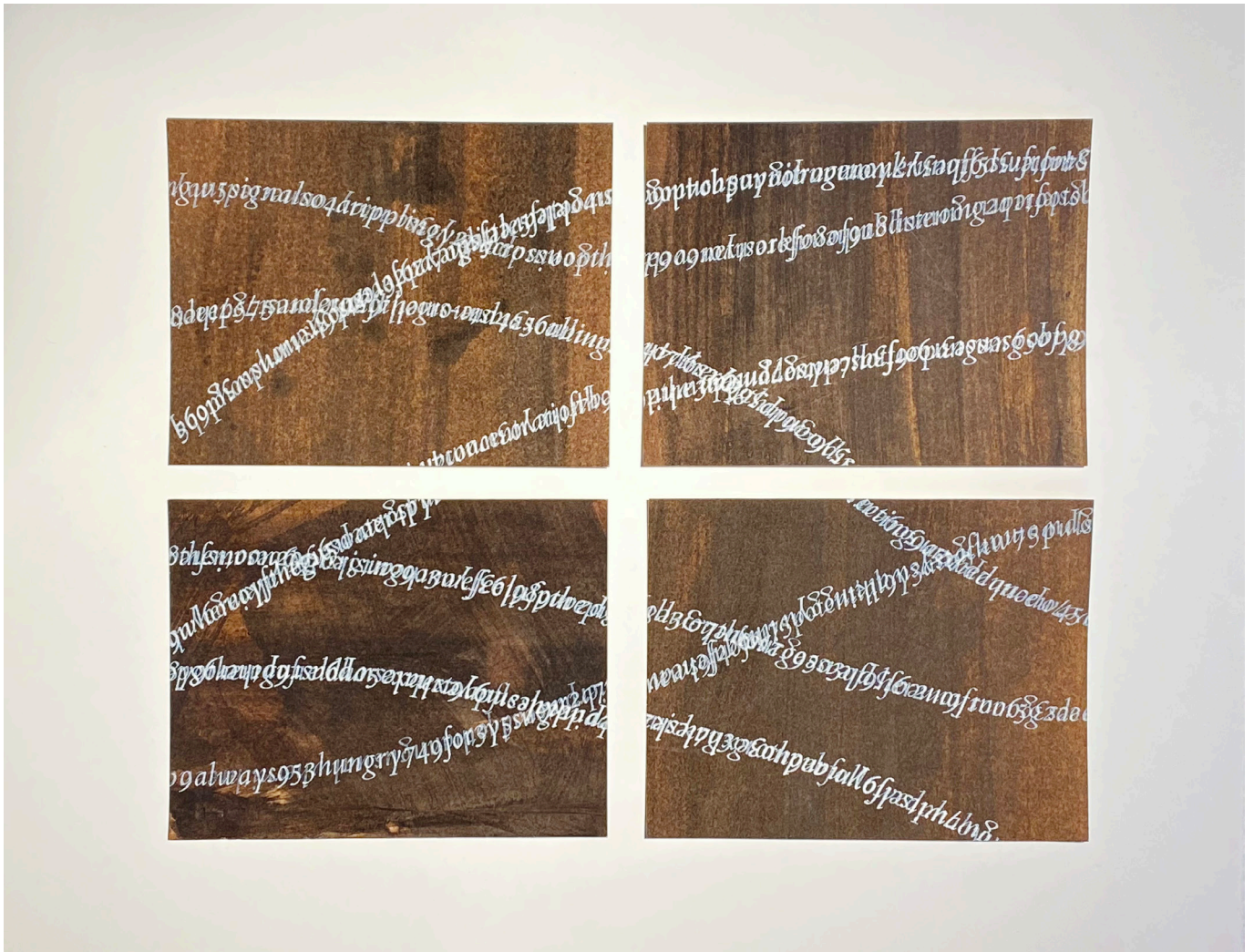


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