scope
Contemporary Research Topics

art & design 24:
August 2023

Artist's Page

https://doi.org/10.34074/scop.1024011

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Published by Otago Polytechnic Press.
Otago Polytechnic Ltd is a subsidiary of Te Pūkenga,
New Zealand Institute of Skills and Technology.

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Sand and iron-rich ochre have been used for thousands of years in pottery, both in the clay itself and as glaze materials. My work for the 2022 Dunedin Art+Science exhibition utilised paleomagnetic core samples unearthed and studied by Dr Faye Nelson.[1] I fired the samples in both glaze and clay body to create a representation of time and the physical forces our Earth undergoes.

The project started with two tubes full of material that had already been examined thoroughly by Nelson and her team. In addition, I received a large bag full of dozens of small beach samples, each identified by a string of numbers and letters. I had little knowledge of the scientific specificities that this collection held for geologists, but as a ceramicist I had an inkling of what to expect. The samples were iron-rich and contained a mixture of sand as well as shell shards. Before I could use them fully for their aesthetic properties, I would have to fire them to get a better understanding of their chemical properties.

First, the samples were fired in small dishes to 1200° Celsius to test their melt quality. Based on the nature of the samples, I knew that they would be high in silica and that some of them would have a significant iron content as well. Some would also have calcium, and potentially calcium phosphate, if there was enough shell and bone material. Silica and phosphorous are glass-forming elements in ceramic glaze, but their melting temperature is too high on their own to melt in the kilns used for ceramics. As ceramicists, we rely on fluxes like sodium, potassium, lithium, calcium and magnesium to lower their melting points. This is called a eutectic system, wherein two materials together have a lower melting point than either of the materials separately.[2]

The resulting sample dishes provided an array of colours, textures and melt qualities. Those that melted more proved to have more flux content within their grains and made for more promising ceramic applications. I wanted additives that would be able to melt on their own at the two main temperatures we fire ceramics: 1220° Celsius and 1285° Celsius. If the additives didn't melt, they might compromise the integrity of the clay body or stick out like shards from the glaze.

Figure 1. One of the fired beach samples.

From this batch of tests, I chose six to use as glaze materials. Three of the samples I chose to fire in a commercially bought clear glaze to 1285° Celsius in a reduction (low oxygen) atmosphere. The chosen glaze was Ferro 6935, a lead-free glaze that I knew could perform equally well at either of the two temperatures planned and remain clear. The other three were fired in the same clear glaze to 1200° Celsius in an oxidation (high oxygen) atmosphere. The temperatures for each sample were chosen based on the quality of the melt of the material at 1200°C.

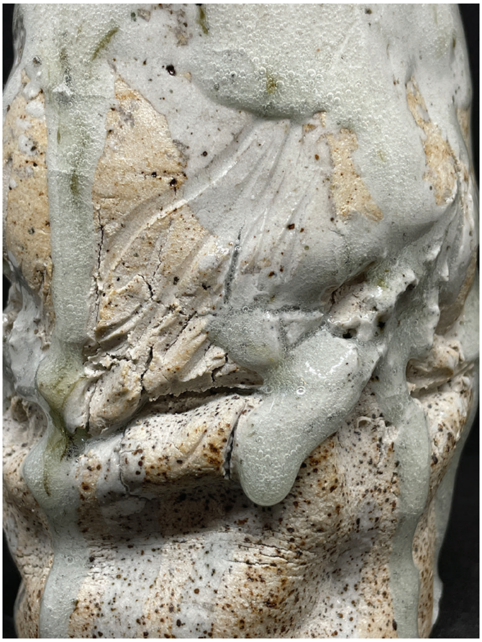

Figure 2 & 3. Locke Jean-Luc Unhold, *Finale* (detail), ceramics, 2022, 200x80x80mm.

Using the samples from the tubes, I wedged the sand into white clay, chosen as it would give more room for the additives and the glaze to speak. The downside to this method is that most white clays in New Zealand require exported additives to be plastic enough for a potter to use, making the end piece not fully a product of Aotearoa. This is a compromise that sometimes must be made to achieve a desired outcome.

After bisque firing these tests to 980° Celsius, the 6935 glaze was applied and they were fired to 1200° Celsius to see the results and determine whether the sand would contribute to the appearance of the glaze and clay. As intended, both of the tube samples gave a subtle iron speckle to the clay body without interfering with the glaze much. I could now move on to combining the two elements of the tests into a singular piece.

For the piece shown in Figure 2, I created a representation of the push and pull of the tectonic plates of the Earth's crust by making two imperfect cylinders, each with one of the tube samples added to the clay. Using tools and hands, I pushed the two cylinders together, attaching them roughly. I then pulled at either end to open the joins and twisted loosely. The result is a landscape of rough crags and smooth curves, seams ripped open and re-attached.

I combined all the tested glazes in one bucket, yet only loosely stirred them together. Although the sand samples came to me in neatly ordered baggies with specific delineations, materials in situ are not so clean-cut. Seams of minerals meander through the crust and shells are deposited on shores in asymmetrical ways, so it seemed apt for the glaze to be poured across the surface of the piece, with different elements streaked through it seemingly at random. I layered the glaze on thickly, allowing for large globs to melt and pull down across the surfaces, acquiring bubbles of air trapped within.

The piece was fired to the top temperature of 1285° Celsius in a reduction atmosphere. This allowed for the iron in the glaze to create subtle yellow, green and blue tones. It also created a slight blush across the raised areas of the clay body.

Figure 4. Locke Jean-Luc Unhold, *Finale*, ceramics, 2022, 200x80x80mm.

The finished work, *Finale,* is more subtle than I anticipated. The consequences of the ebb and flow of tides on rock are too slow for a human eye to see as it occurs. Analogously, the small changes and shifts in the tide of the glaze on the surface of this piece require careful consideration. The tectonic shifts and tears of the clay are a dramatic sight, but they too have longer-lasting implications throughout the surface of the piece, dictating where the glaze pools and runs.

Undertaking these tests and creating a work from them has reinvigorated my interest in utilising found material in my work. There is a growing movement in New Zealand and around the world to return to making pottery from local materials – hand-dug clays and rocks ground to make a glaze. It roots the piece to where it is made. It is also a grounding, community-driven practice, as potters share their knowledge of locations of geological and cultural interest.

There are beautiful materials all around us, even those that at first glance may seem like just dirt or sand. But that dirt and sand has its own long history and beauty that we can highlight through both art and science together.

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1 "Life's a Gas: Art+Air" was the ninth theme in the Dunedin Art+Science project. Dr Faye Nelson is a geologist who runs the Otago Paleomagnetic Research Facility. Her research area is paleomagnetism and environmental magnetism of piston cores from the south-western coast of New Zealand. See https://issuu.com/dunedinschoolofart/docs/art_air_catalogue_2022.

2 Frank Hamer, *The Potter's Dictionary of Materials and Techniques* (London: Adam and Charles Black, 1975).