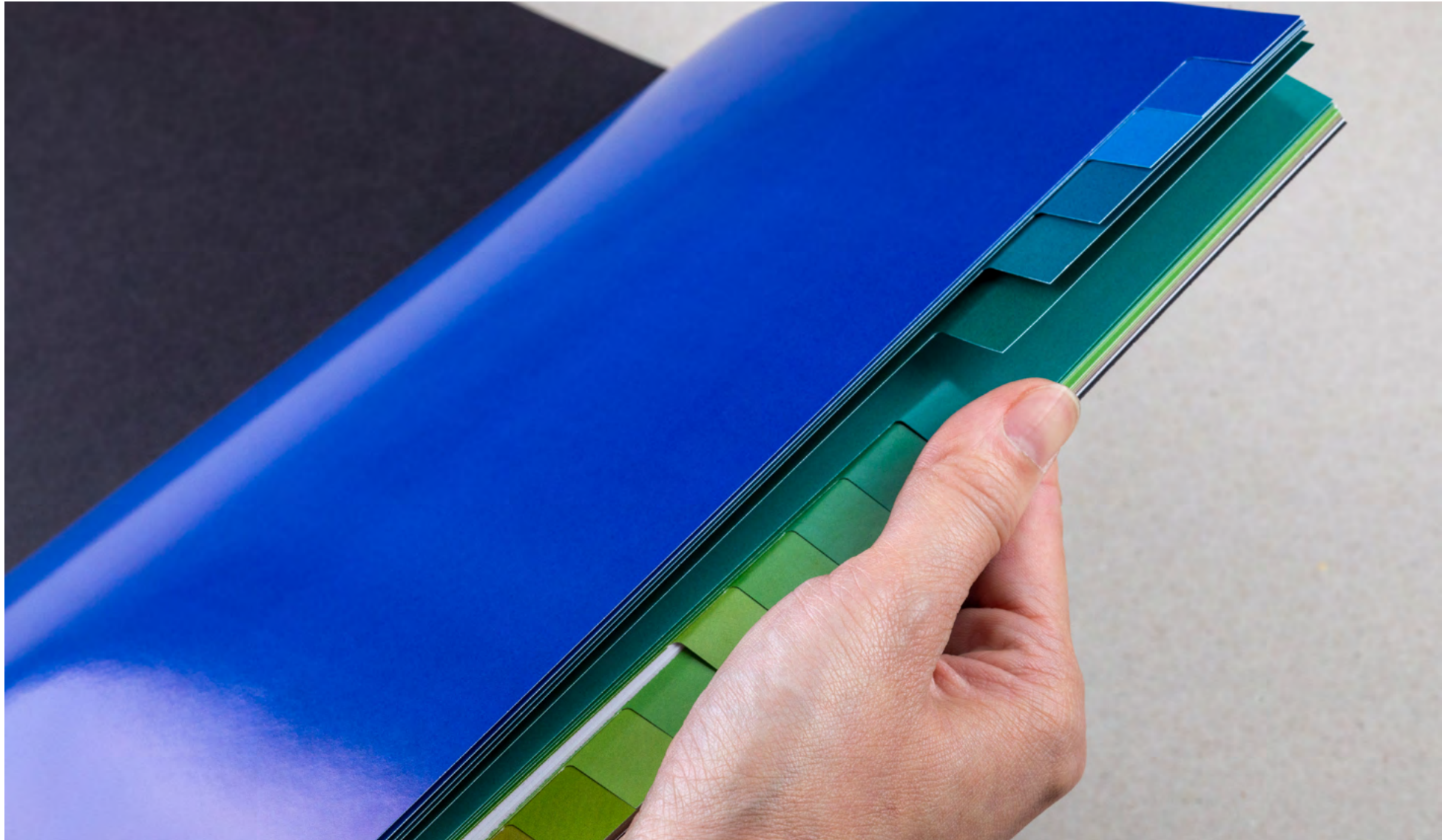


Indexing Water

Notes on Representation – Vol. 9
28×21 cm, 68 pages, 2018



This 9th volume in Kopelman's series *Notes on Representation*, is dedicated to Dr. Marcel Wernand, a physical oceanographer who engaged in the research of Forel-Ule scale—a hand-held index to estimate the colour of natural waters since the nineteenth century. This book functions as the Forel-Ule scale itself, reproduced as

printed matter in solid, opaque colours. It also brings together fragments, both of Wernand's writings and of recorded conversations, which took place at different moments in 2017.

But Liburnau came after Forel. So now we arrive at the history of the Forel-Ule scale. Francois Alphonse Forel was a Swiss professor of Medicine. When you think of oceanographers and limnologists, university professors may not be the first to come to mind. But before the establishment of the field, the first oceanographers were often chemists, geologists—they could even be medical doctors, wondering about particular water or colour-related phenomena 'on the side'. As they were studying natural phenomena in their own respective fields, related issues came up, such as the appearance of the colour of the sea and the sky, the way light influenced colour, etcetera. And they would pursue researching these phenomena out of curiosity, or because it would support other physical or phenomenal theories they were developing. Well, Forel did lots of research at Lac Léman (Lake Geneva). He wanted to see if the colours of the lake changed during the seasons. So he came up with a colour scale to establish the colour of the water. This is called the Forel scale, with blue tones ranging from indigo blue to, let's say, greenish-blue: eleven classifications in total. And this scale would work for Lake Geneva because its water wouldn't change beyond these colours. But there was someone else, a German geographer named Willi Ule, who studied the waters of the German Bight, which is brownish-green. And so he needed a wider range of colours to determine the colour of the water. He extended Forel's scale, using the same procedure—mixing chemical liquids and chemical powders to produce coloured liquids—adding another ten colours to the scale, tones between greenish-blue and cola-brown. That is the last colour on the scale, number twenty-one, cola-brown. And from that time on—we are now in the 1890s—researchers have used this scale, the Forel-Ule scale, to classify the colour of sea, lake and river.



Francois Alphonse Forel (1841–1912) pioneered the study of lakes, and as such is considered the founder of limnology. He wrote about his research in his three-volume monograph *Le Léman*. During a session of La Société Vaudoise des Sciences Naturelles, held in Lausanne in 1887, Forel proposed an eleven-colour scale for a quick identification of the colour of the sea, lake, or river water. The scale, composed of a mix of solutions of copper-sulphate and potassium-chromate, covers the blue-to-green spectrum of water colours.

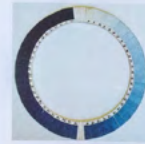


Wilhelm or Willi Ule (1861–1940) was a German geographer and limnologist. He wrote his dissertation on the lakes of Mansfeld, *Die Mansfelder Seen*. In 1892, Ule extended the existing Forel scale with the colours necessary to index the green-to-brown waters of the sea, adding another chemical, cobalt-sulphate, to the mix. The resulting colour comparator scale, from then on named the Forel-Ule scale, is the most common and well-known colour comparator, used in limnology and oceanography, to determine the colour of natural waters. (MW)

IK: And what about the cyanometer?

MW: I just... You read my mind. Horace-Bénédict de Saussure, also from Switzerland—he looked for a method to classify the colour of the

sky. And he invented the cyanometer: that was a circular scale with colours ranging from white to dark-blue.



A cyanometer is an instrument for measuring 'blueness', specifically the colour intensity of blue sky. It consists of squares of paper dyed in graduated shades of blue and arranged in a colour circle or square that can be held up and compared to the colour of the sky. Horace-Bénédict de Saussure (1740–1799), often called the founder of modern meteorology, is credited with inventing the cyanometer in 1789. De Saussure's cyanometer had 53 sections, ranging from white to varying shades of blue (dyed with Prussian blue) and then to black, arranged in a circle; he used the device to measure the colour of the sky at Geneva, Chamoniex, and Mont Blanc. (Source: Wikipedia)

IK: And that was before Forel?

MW: Yes, long before, 1700-something [1789, ed.]. Alexander von Humboldt and Aimé Bonpland—Bonpland was a botanist who joined Von Humboldt on his explorations—used his scale when they sailed to South America.

From 1773 to 1858, on their way to the 'new continent', Alexander von Humboldt (1769–1859) and Aimé Bonpland (1773–1858) investigated equinoctial waters, where they compared the grade of blueness with Saussure's paper-scale cyanometer. (MW)

IK: The cyanometer?

MW: The cyanometer. But to measure the waters, not the sky. In the middle of the ocean, the water is deep blue, but once you come closer to the coast the water will be within the green and brown range, so altogether the cyanometer was not very useful for this. They did measurements but... they were limited to the blues.

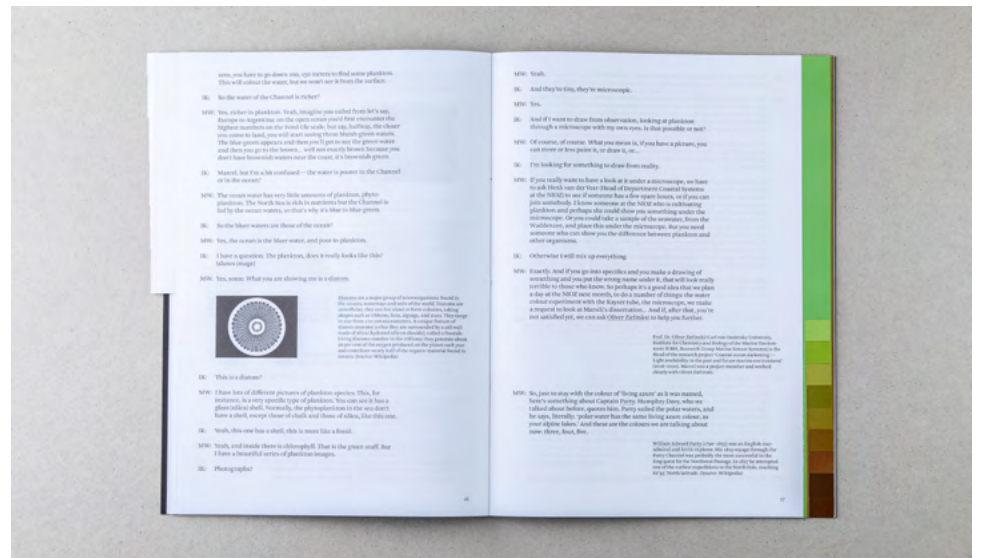
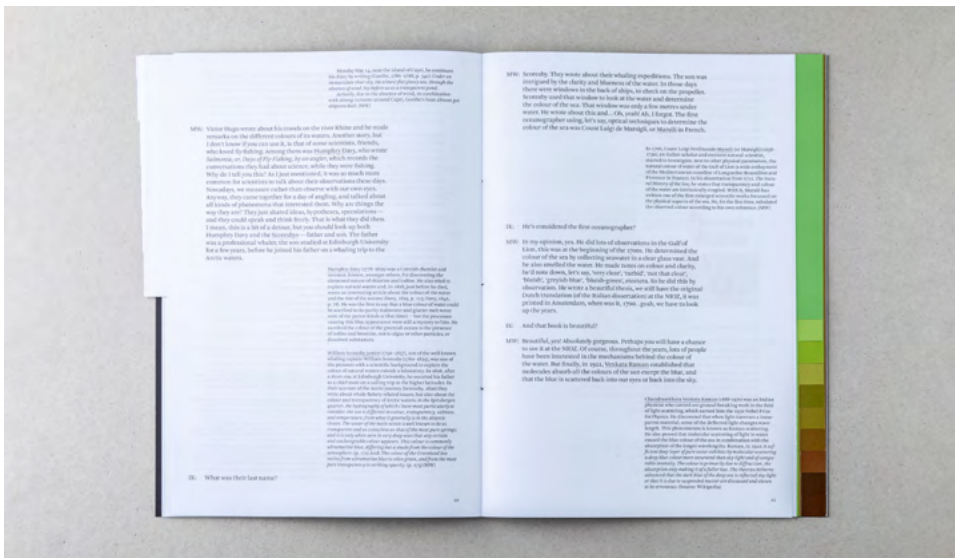
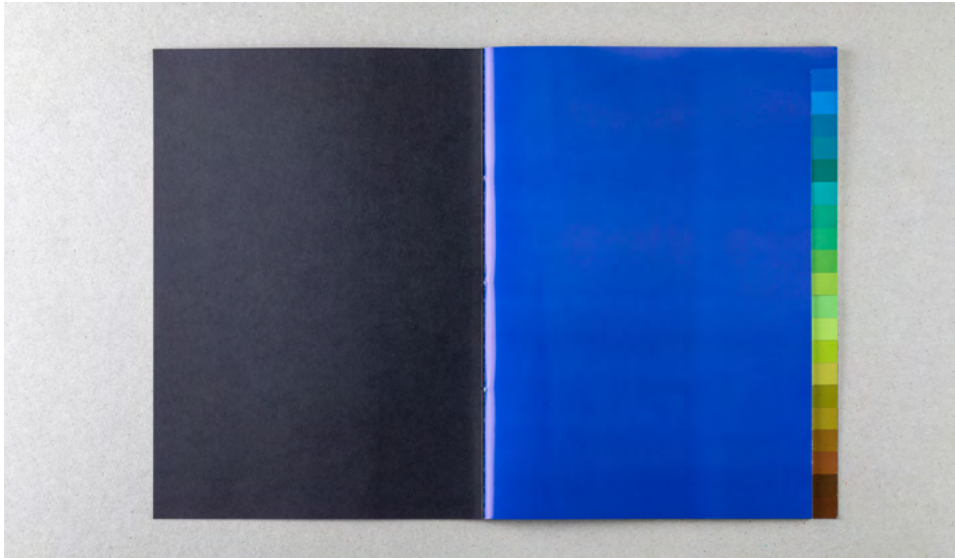
IK: The first Forel-Ule scales are made with liquids in transparent tubes, right?

MW: Yeah, chemical solutions. That is also in my thesis (*Posidon's Paintbox*, 2011), in which I explained how the make of it was done.



The recipe for reproducing the coloured liquids of the scale can be found in Marcel's thesis, *Posidon's Paintbox*, Chapter 4. 'Spectral analysis of the Forel-Ule Ocean colour comparator scale'. A mixture of three standard solutions is used to obtain the colour palette of the scale. The standard solutions are made with distilled water, ammonia, copper-sulphate, potassium-chromate and cobalt-sulphate.

IK: And do any of these original instruments still exist?



Photography (documentation of the book): Ayako Nishibori