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ii



Indexing Water

Kunsthalle Lissabon (Lisbon, Portugal)
December 2017 – February 2018

iv



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i



iii



ii





Indexing Water

More than a year ago, when I was invited by Luis Silva and João Mourão to develop a site-specific work for the Kunsthalle Lissabon, I thought it would be the right moment and context to start the process of following the thread of an idea I had considered for a long time: working with the colors of water.

The journey began when I had my first conversation with Marcel Wernand in his office at the Royal Netherlands Institute for Sea Research (NIOZ). I had come across his name while I was working on different projects involving landscapes in which one color was strongly dominant; greens in the forest in Malaysia, blacks in Hawaiian lava flows. Would the color of a seascape be blue? Probably not...

A few centuries ago, art and science were not the differentiated, separate fields such as we know them to be today; they had many points of correlation and coexistence.

As a practitioner in the field of art, I was aware of color studies in the history of art, yet color dictionaries were also developed in the field of natural sciences as a means of describing and communicating observations within nature. It was Marcel who introduced me to this knowledge, and to the sources from which I could learn more.

It is unnecessary to discuss Marcel's background and expertise in this context, but nonetheless, I would like to mention that the particular combination of approaches in his studies, together with his personality, made the dialogue extremely interesting and enriching from the beginning.

It turned out that Marcel was not only a very knowledgeable researcher, but also a great storyteller. His research has taken him all around the globe, during which he has seen many waters and encountered many people. His interest in the history of color studies is what made it all come alive for me.

The interviews with Marcel became the very core of this project. I would continuously read the papers he has written, or others he would offer me, and look through books, getting more involved in the topic. The amount of information started to become overwhelming, and I realized that it had started being more constricting than inspiring.

I realized then that the most interesting thing I had in my hands was the series of conversations with Marcel—his stories, as well as the mental space that our dialogues were creating for me.

I decided that I pursue this further by continuing to talk to him, recording the interviews, letting the information sink in, and taking notes of the images that would materialize from these conversations.

The narrative of our conversations became the script of the exhibition, as well as the artist's book.

As the conversations were too broad, I proposed to Marcel that we take the color scale he uses in his studies as a guideline: the Forel-Ule scale. The scale has twenty-one colors. I suggested that Marcel and I should discuss one color at a time. He proposed grouping them. One day about blues, another about greens, yellows, and browns. Dissecting the scale by color groups helped me to understand the factors that affect the color of water.

A large volume of writing emerged from these conversations, including ideas for photographs, objects, and references that had exhibition space.

The color scale provides a pillar for the exhibition, as well as the publication, while objects, images, and text flesh out the story, offering the viewer various points of entry.

i

Enlarged version of Forel-Ule Scale

acetate sheets and acrylic

147 × 420 cm



ii

Water column – scale 1:10

longer visibility record taken with the Secchi Disk

glass, gel and pigments

790 cm × 3 cm diameter



ii
details



iii

Water column – scale 1:10

shortest visibility record taken with the Secchi Disk

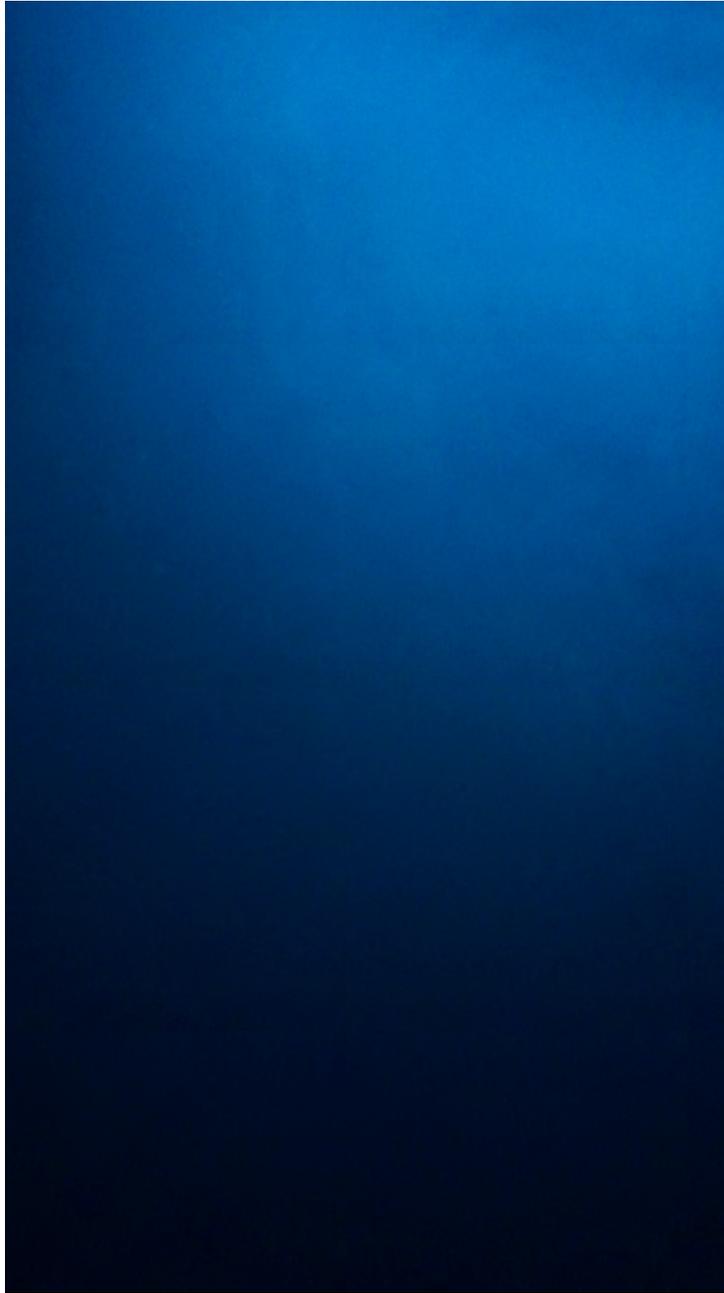
solid glass

1 cm × 3 cm diameter



iv
Snap of Blue Grotto
photograph
50 × 28 cm





v

Phytoplankton drawings

watercolor on paper

3 drawings, 30 × 30 cm each (framed)

shelf: 160 cm length, 5 cm depth



vi

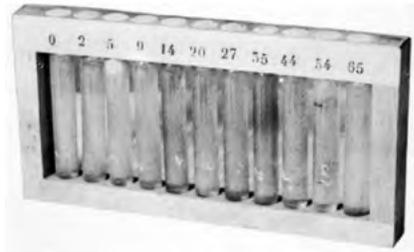
*Stones mentioned by Lorenz von Liburnau
in his 'mineral' sea color scale (1898)*

vitrine: 110×41×25 cm

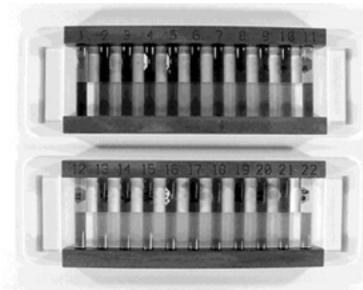
Clear-blue [Azurite, Chalcanthite, Sapphire, Halite,
Beryl], Diffuse-blue [Indigo, Ultramarine, Lapis
Lazuli, Turquoise], Blue-green [Diopside], Apple-
green [Heliotrope, Actinolite, Emerald, Malachite,
Chrysoprase], Yellow-green [Serpentine, Epidote,
Olivine, Nephrite]



i. Enlarged version of Forel-Ule Scale



Forel scale design around 1900. The glass tubes are filled with a mixture of copper-sulphate and potassium chromate. The numbers above the tubes present the percentage yellow. [Historical reference based on Marcel Wernand's archive]



The 21 tubes, contain colored solutions from blue, blue-green to cola-brown, are mounted in a frame and together form the Forel/Ule scale. Tube 22 (left) contains mQ water and does not belong to the scale. François-Alphonse Forel (1841-1912) / Wilhelm (Willie) Ule (1861-1940) [Historical reference based on Marcel Wernand's archive]



Forel-Ule Scale by Marcel Wernand



The color comparator scale after Forel-Ule by Marcel Wernand



Process of re-making Forel-Ule scale by Hans Simons – referenced on Marcel Wernand's research

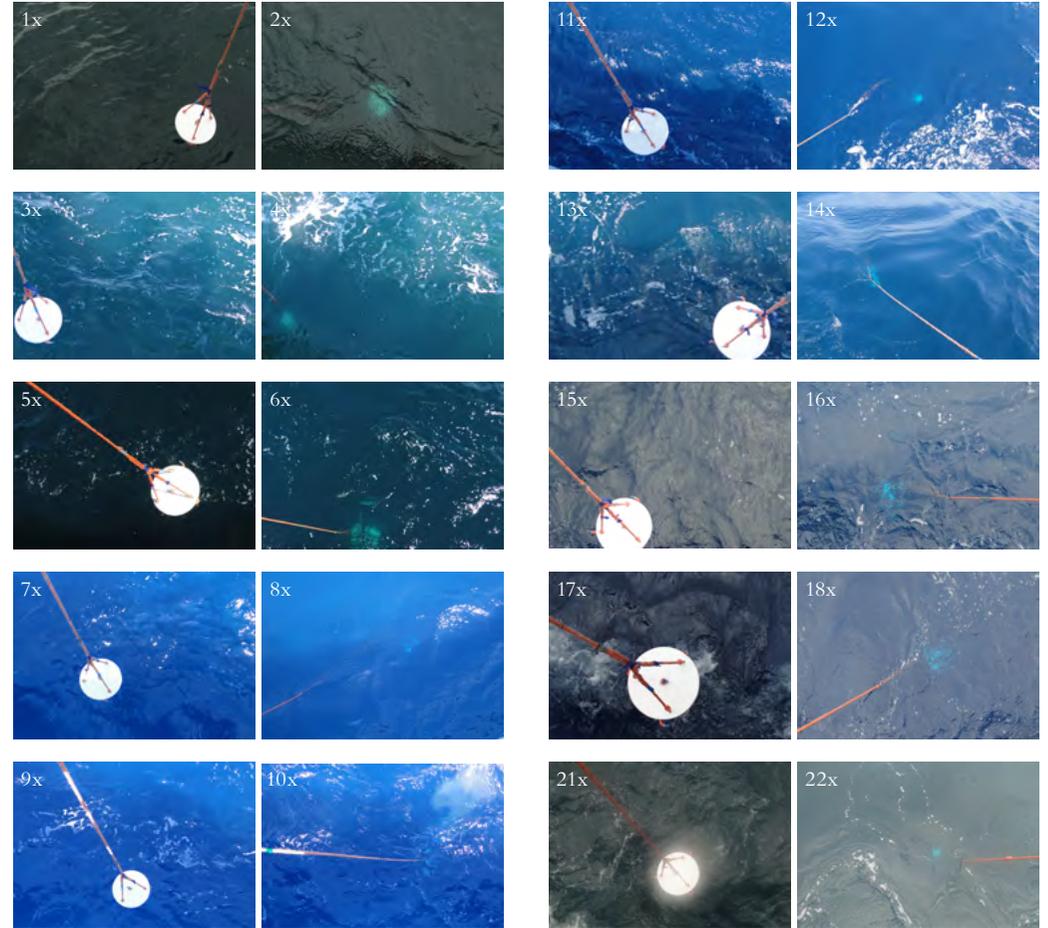
Research & Process

ii-iii. Water column – scale 1:10

Water column – scale 1:10 longest visibility... (ii) is based on the deepest recorded Secchi depth of 79 meters on October 13 1986 in the Weddell Sea. Water column – scale 1:10 shortest visibility... (iii) is based on one of the shortest recorded Secchi depth of 0.1 in 1984, Strait of Madura.



The Secchi Disk, as created in 1865 by Angelo Secchi, is a plain white, circular disk 30 cm in diameter used to measure water transparency or turbidity in bodies of water. The disc is mounted on a pole or line, and lowered slowly down in the water. The depth at which the disk is no longer visible is taken as a measure of the transparency of the water. This measure is known as the Secchi depth. [from Marcel Wernand's archive]



Measurements made on the voyage from Gorinchem to Port Harcourt in the period June 2015 by Damen captain Jaap de Jong

foto name1	foto name2	Date UTC	Local Time	UTC	Lat degrees	Lat minutes	Lat Decimal degrees	Lon degrees	Lon minutes	Lat Decimal degrees	SD in m	FU	Position name	Remarks	Seastate	Foto name 3
1x	2x	12 june 2015	12:00	10:00	50	15	50.2500	-1	-44	-1.7333	11.0	7.5	English Channel	S good, FU good	good	N/A
3x	4x	13 june 2015	12:00	10:00	47	26	47.4333	-7	-8	-7.1333	10.0	8.0	Bay of Biscay	S good, FU good	moderate	N/A
5x	6x	14 june 2015	12:00	10:00	43	20	43.3333	-10	-21	-10.3500	12.0	6.5	Atlantic, Finisterre	S good, FU good	moderate	N/A
7x	8x	15 june 2015	12:00	11:00	38	49	38.8167	-13	-1	-13.0167	25.0	3.5	Atlantic, Lissabon	S mod, FU mod	rather rough	N/A
9x	10x	16 june 2015	12:00	11:00	33	50	33.8333	-15	-46	-15.7667	31.0	2.0	Atlantic	S poor, FU poor	rather rough	N/A
11x	12x	18 june 2015	12:00	11:00	28	18	28.3000	-17	-4	-17.0667	32.0	3.0	Atlantic, Canary Isl.	S poor, FU poor	rather rough	N/A
13x	14x	21 june 2015	12:00	11:00	12	57	12.9500	-17	-39	-17.6500	25.0	4.0	Atlantic	S good, FU good	moderate	N/A
15x	16x	22 june 2015	12:00	11:00	8	30	8.5000	-14	-47	-14.7833	21.0	4.5	Atlantic	S mod, FU good	moderate	N/A
17x	18x	24 june 2015	12:00	11:00	4	2	4.0333	-5	-41	-5.6833	26.0	3.5	Gulf of Guinee	S good, FU good	moderate	19x
21x	22x	25 june 2015	12:00	11:00	4	10	4.1667	0	-29	-0.4833	13.0	8.0	Gulf van Guinee/Bight of Benin	S good, FU good	moderate	22x
23x	24x	26 june 2015	12:00	11:00	4	0	4.0000	3	34	3.5667	22.0	4.5	Bight of Benin	S good, FU good	moderate	25x

[from Marcel Wernand's archive]

iv. *Snap of Blue Grotto*



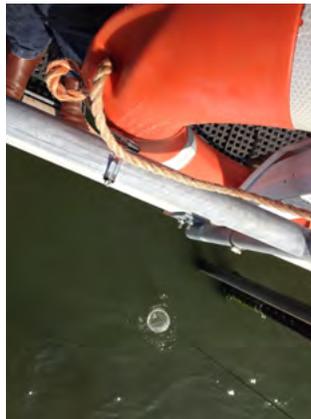
painting *The Blue Grotto at Capri*, 1835, by Heinrich Jakob Fried (1802–1870) [Historical reference based on Marcel Wernand's archive]



Revisiting the Blue Grotto, inside the Grotto
photo: Irene Kopelman, November 2017



v. *Phytoplankton drawings*



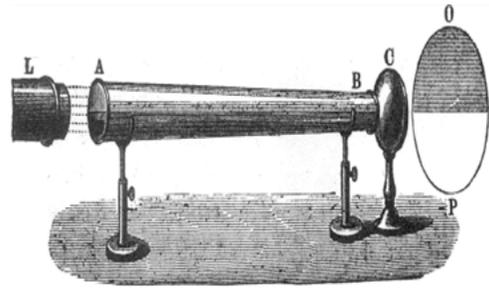
Collecting plankton samples at the Jetty at the Royal Netherlands Institute for Sea Research (NIOZ)



Drawing set up in the Lab at the Royal Netherlands Institute for Sea Research (NIOZ)

Research
& Process

– Kayser tube (1873)

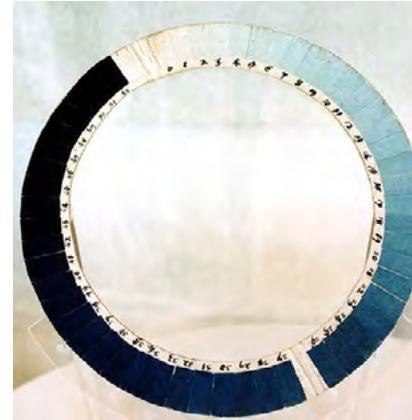


A simple design, using the eye to determine the colour of pure water, was proposed by the German researcher J. Kayser. A 4.5 meters long metal tube, A-B, was half-filled with distilled water. Colorless glass windows closed the tube at both sides. White light of an electric lamp L is transmitted through the tube. The lens C mirrors the image on screen O-P. The white of the lamp can be seen in the bottom half and the blue as resulting color of the by water filtered rays can be seen at the top half of the screen



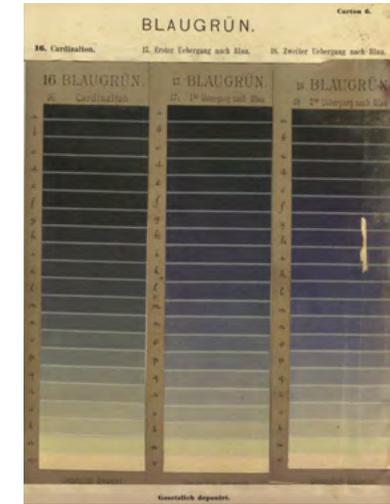
Reconstruction at NIOZ's LAB of Kayser's tube.
"Seawater is transparent and can be discriminated into two colors; a reflected and a transmitted color. Blue is the color of pure water."
(Kayser, Physik des Merres, 1873) [Wernand at Royal NIOZ Lab. 2003]

– Saussure's Cyanometer



In 1791 Horace-Bénédict de Saussure proposed the cyanometer with 53 nuances (grades) of blue. The circular paper scale to establish the sky's color was also used to establish the ocean's color. [Historical reference based on Marcel Wernand's archive]

– Otto Radde's internationale
Farbenskala (1898)



– *Werner's Nomenclature of Colors. Adapted to Zoology, Botany, Chemistry, Mineralogy, Anatomy, And the Arts*, P. Syme



[Historical reference based on Marcel Wernand's archive]

Irene Kopelman
Indexing Water

Project by Irene Kopelman
inspired by a cooperation with Marcel Wernand,
scientist of the Royal Netherlands Institute for
Sea Research and Coastal Ocean Darkening
research project

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João Mourão and Luís Silva

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