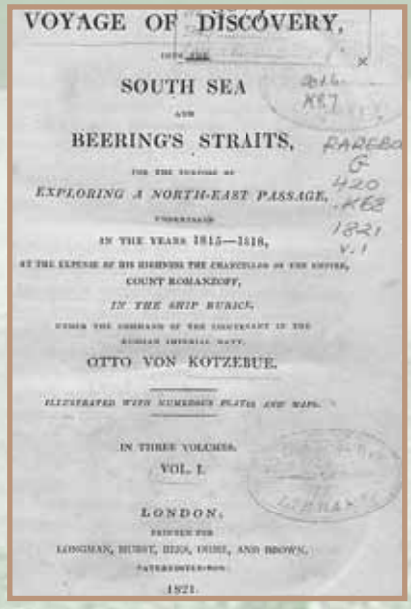
Illustrated history of the Secchi disc

*Marcel Wernand**


VOYAGE OF DISCOVERY,

SOUTH SEA

AND

BEERING'S STRAITS,

EXPLORING A NORTH-EAST PASSAGE,

IN THE YEARS 1815—1818,

IN THE SHIP RURICK,

OTTO VON KOTZEBUE.

IN THREE VOLUMES.

VOL. I.

LONDON,

1821.

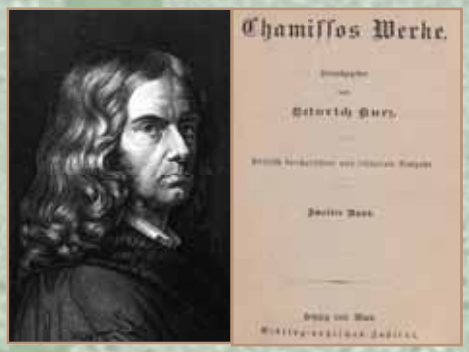
The first records on regular, tabulated, measurements of the water transparency are those by the German naturalist Adelbert von Chamisso during the Russian 'Rurik' Expedition 1815-1818 under the command of Otto von Kotzebue. Otto von Kotzebue explored and named the Sound while searching for a Northeast Passage, in the service of Russia.

A standardized method to determine the water clarity (transparency) was adopted at the end of the nineteenth century. This method (lowering a white painted disc into the water until it disappeared out of sight) was described by Pietro Angelo Secchi in Il Nuovo Cimento and published in 1865.

However, the experiments performed by Secchi and Cialdi in 1864, on such an intensive scale, were never performed before. At the beginning of the twentieth century this method, water transparency observations by means of a 30 centimetres' white disk, was named Secchi-disc method.


Portraits of Inhabitants of Kotzebue Sound

Inhabitants of Kotzebue Sound: The first Plate of Kotzebue's Voyage of discovery Part 1.


Chamissos Werke.

On board the 'Rurik' it was the accompanying German writer and naturalist Adelbert von Chamisso (1781–1838) who used a whitened surface attached to the sounding lead to measure the water transparency.

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Observations of the sea surface and air temperature,(in degrees Fahrenheit) and of the transparency of the water in fathoms, measured with a white disc. The observations were collected during the first part of Kotzebue's Voyage of Discovery during the Atlantic and Pacific crossing.

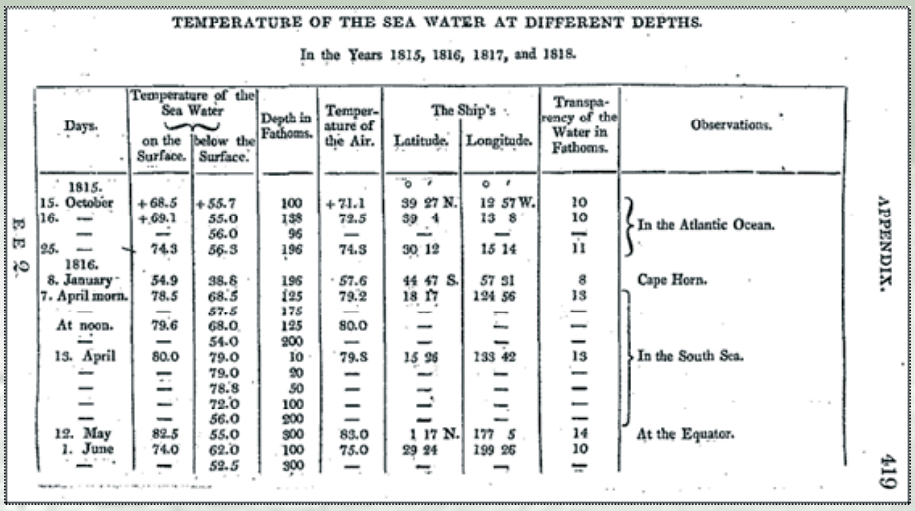
During a French voyage around the world under the command of Louis Isidore Duperrey (1786-1865) on the corvette 'la Coquille' (1822–1825), a white painted plank, with a diameter of two feet and an attached weight, was lowered into the water to measure its transparency.
The Coquille was later renamed l'Astrolabe.

Text as noted, by the commander himself, in a chapter on marine observations published in Annales de chimie et physique (1825).

Notes in Kemper's diary (1834) during his visit to Green Bay (Wisconsin, US) show that he used a white towel to determine the transparency of water.
Transcription: "Much is said of the clearness of these waters — certain subjects can be seen at a great depth say 6 or 7 fathoms — a white towel for instance tied to the line".

Part of a meteorological table filled with data collected during the U.S. Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842 under the command of Charles Wilkes (1798-1877).
"First we tried an iron pot, painted white, next we tried a sphere of hoops, covered with white cotton cloth. Then we tried a mere hope, covered with a canvas. At last we took a common white dinner plate. 'It was good enough'." (25 Aug. 1838 near Madeira)

See under Remarks 'pot visibility'.



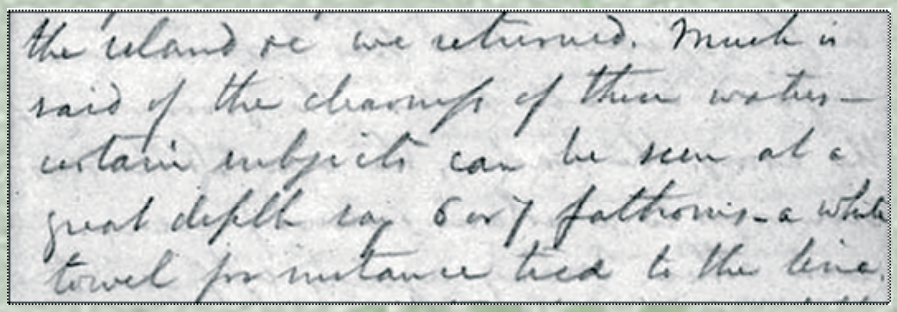
TEMPERATURE OF THE SEA WATER AT DIFFERENT DEPTHS.

In the Years 1815, 1816, 1817, and 1818.

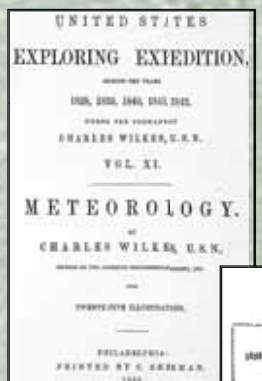
Days.	Temperature of the Sea Water on the Surface.	Temperature of the Sea Water below the Surface.	Depth in Fathoms.	Temperature of the Air.	The Ship's Latitude.	The Ship's Longitude.	Transparency of the Water in Fathoms.	Observations.
1815.					° ′	° ′		
15. October	+68.5	+55.7	100	+71.1	39 27 N.	12 57 W.	10	In the Atlantic Ocean.
16. —	+69.1	55.0	138	72.5	39 4	13 8	10	
—	—	56.0	96	—	—	—	—	
25. —	74.3	56.3	196	74.3	30 12	15 14	11	
1816.								
8. January	54.9	38.8	196	57.6	44 47 S.	57 21	8	Cape Horn.
7. April morn.	78.5	68.5	125	79.2	18 17	124 56	13	In the South Sea.
—	—	57.5	175	—	—	—	—	
At noon.	79.6	68.0	125	80.0	—	—	—	
—	—	54.0	200	—	—	—	—	
13. April	80.0	79.0	10	79.8	15 26	133 42	13	
—	—	79.0	20	—	—	—	—	
—	—	78.8	50	—	—	—	—	
—	—	72.0	100	—	—	—	—	
—	—	56.0	200	—	—	—	—	
12. May	82.5	55.0	300	83.0	1 17 N.	177 5	14	At the Equator.
1. June	74.0	62.0	100	75.0	29 24	199 26	10	
—	—	52.5	300	—	—	—	—	

APPENDIX. 419

dissemblables. A Offak, dans l'île Waigiou, par un temps calme et *couvert*, le 13 septembre, le disque disparut quand il fut descendu de 18 mètres (55 pieds). Le lendemain 14, le ciel étant *serein*, on ne cessa de voir le même disque qu'à la profondeur de 23 mètres (70 pieds).



the island we returned. Much is said of the clearness of these waters — certain subjects can be seen at a great depth say 6 or 7 fathoms — a white towel for instance tied to the line.



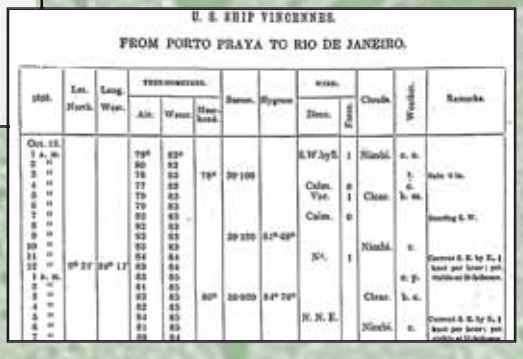
UNITED STATES EXPLORING EXPEDITION.

CHARLES WILKES, U.S.N.

VOL. XI.

METEOROLOGY.

BY CHARLES WILKES, U.S.N.

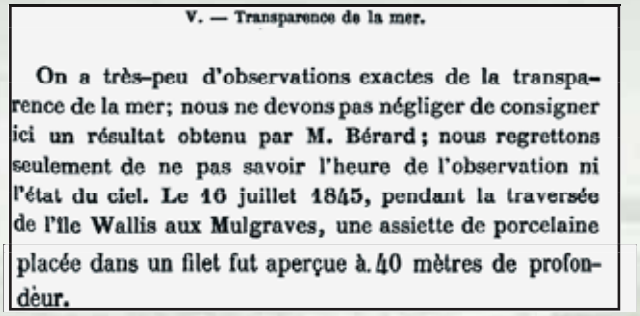


U. S. SHIP VINCENNES.

FROM PORTO PRAYA TO RIO DE JANEIRO.

1838.	Lat. North.	Long. West.	Air.	Water.	Baros.	Hygrom.	Wind. Direct.	Wind. Force.	Clouds.	Weather.	Remarks.
Oct. 12.			79°	82°			S.W.by S.	1	Nimbi.	c. c.	
1 A. M.			80	83						7 c.	
2 "			78	83						b. m.	
3 "			77	82			Calm.	0	Clear.		
4 "			79	83	78°	29·100	Var.	1			
5 "			79	83							
6 "			80	83			Calm.	0			Steering S. W.
7 "			82	83							
8 "			82	83							
9 "			82	83					Nimbi.	c.	
10 "			83	83		29·270	61°-62°				
11 "			83	84			N°.	1			Current S. E. by E. 1 knot per hour; pot visible at 10 fathoms.
12 "			83	84						c. p.	
1 P. M.			83	84					Clear.	b. c.	
2 "			83	85							
3 "			82	85	80°	29·009	64° 70°				
4 "			83	85							
5 "			84	85			N. N. E.		Nimbi.	c.	
6 "			83	85							
7 "			84	84							Current S. E. by E. 1 knot per hour; pot visible at 10 fathoms.
8 "			83	84							


ŒUVRES COMPLÈTES
DE
FRANÇOIS ARAGO


V. — Transparence de la mer.

On a très-peu d'observations exactes de la transparence de la mer; nous ne devons pas négliger de consigner ici un résultat obtenu par M. Bérard; nous regrettons seulement de ne pas savoir l'heure de l'observation ni l'état du ciel. Le 16 juillet 1845, pendant la traversée de l'île Wallis aux Mulgraves, une assiette de porcelaine placée dans un filet fut aperçue à 40 mètres de profondeur.


EXPEDITIONEN S. M. SCHIFF „POLA"

IN DAS

MITTELLÄNDISCHEN, ÄGÄISCHEN UND ROTHEN MEERE

IN DEN JAHREN 1890–1898.

WISSENSCHAFTLICHE ERGEBNISSE

XIX.

UNTERSUCHUNGEN ÜBER DIE TRANSPARENZ UND FARBE DES SEEWASSERS

JOSEF LUKSCH,


Tabelle 19.

Die Sichttiefe und die Bewölkung.

Captain Auguste Bérard (1796-1852) also used a porcelain dinner plate, mounted in a fish net, during the French Arago Expedition in 1845. Passing the South Pacific Wallis Island on July 16 he measured a 'dinner plate' disappearance depth of forty meters.

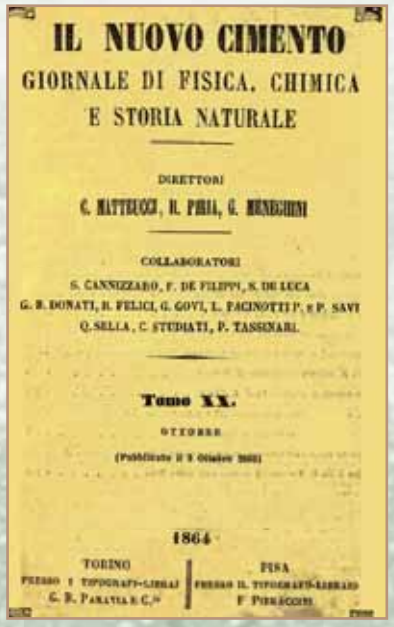
During his 1858 to 1860 investigations in the Gulf of Quarnero (Croatia) Josef Roman Lorenz, later known as Josef Roman Lorenz Ritter von Liburnau, measured the transparency of the sea by lowering a 'batho-thermometer with a white painted lid'. The instrument was used in the Adriatic to establish the sea's visibility, next to the temperature.

During later investigations, for instance in the Halstättersee (Lake in Austria), he used a white painted tin disc of thirty centimetres diameter. The naming of the Secchi-disc was especially questioned by Josef Roman Lorenz von Liburnau at the end of the era who himself called the method 'the disc system'.

Julius Wolf and Josef Luksch on their trip with the yacht 'Hertha', during the summer of 1880, used a large white painted disc during their investigations of the Adriatic and Ionian Sea. A maximum depth of fifty-four meters was found on the 6th of August near the island Zante. Some years later, between 1890 and 1898, Luksch, onboard the steamer "Pola" crossing the eastern Mediterranean and Red Sea, used a small forty-five centimetres disc. West of Beirut at 33º04'7" N and 34º08'E the disc could be seen at sixty meters, in the northern Red Sea until fifty meters and in the south only until thirty-nine meters.

Luksch polished white painted 'Secchi' disc of forty-five centimetres in diameter used onboard the 'Pola'(around 1890).

Looking at forgotten chapters, published in the Italian scientific Journal 'Il Nuovo Cimento' in 1865 and in Cialdi's book 'Sul Ondoso del Mare' of 1866, it definitely clarified the naming of the method to establish the transparency of natural water. In the two identical thirty-two paged chapters all facets of transparency disc measurements are described. The colour of the disc, its diameter and the height of the sun are described in relation to its disappearance depth. Furthermore the positions, such as the bow of the ship, from which measurements were performed, were taken into account. In the Table an example of the height of the sun and the disappearance depths per disc diameter (grande = large, piccolo = small) are shown. At this point it goes too far to mention all of Secchi's results. Reading Secchi's original work it becomes clear why the method finally became known as the Secchi-disc method.



IL NUOVO CIMENTO

GIORNALE DI FISICA, CHIMICA E STORIA NATURALE

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Tomo XX.

1864

TORINO — PISA

ALTEZZA DI SOLE		PROFONDITA' DI VISIBILITA'	
		disco grande	disco piccolo
25°.43'	. . . .	24m.5	. . . .
. . . .	30°. 4'	. . . .	22m.7
45. 24	. . . .	33. 9	. . . .
. . . .	41. 53	. . . .	27. 3
59. 52	. . . .	36. 7	. . . .
. . . .	59. 39	. . . .	32. 2

Padre Pietro Angelo Secchi (1818-1878). It can be concluded that the naming of the disc as Secchi-disc, at the end of the nineteenth century (proposed by François Alphonse Forel and George C. Whipple), was a right decision.