

follows: The very great gain in time, labor and material effected by centrifugal draining and washing during the purification of crystals is demonstrated by quantitative experiments, and simple forms of apparatus are suggested which secure these advantages to the organic chemist or to the worker with small quantities of precious material.

THE WATER OF THE YUKON.

BY F. W. CLARKE.

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ANALYSES of river waters are commonly made with reference to one or another of three distinct purposes, which we may call, respectively, the technical, the geological, and the sanitary. To the geologist, who requires a complete determination of the inorganic contents of a water, the data are interesting in so far as they help to elucidate the problem of "chemical denudation"; that is, to show how much material is removed from the surface of the land, and transported to the sea. On this subject much has been written, but the conclusions have been drawn from incomplete or defective evidence, as I shall show in a future publication. The present note is merely an addition to the list of available analyses, and it relates to a region for which, hitherto, no data existed.

On June 14, 1904, Mr. F. L. Hess, of the U. S. Geological Survey, collected, at my request, a sample of water from the Yukon River. The sample was taken in midstream, above the town of Eagle, a little below north latitude 65° , and nearly on the boundary between Alaska and Canada. It was fairly but not absolutely clear, and contained 0.1565 gram of suspended, inorganic sediment, as weighed after ignition. The soluble, inorganic constituents of the water are given in the subjoined analysis by Mr. George Steiger, and there was also some organic matter undetermined. The CO_3 represents normal carbonates only, in order that the water may be compared with others which are stated in similar terms; the silica and alumina are conventionally reported as present in colloidal form.

THE WATER OF THE YUKON.

	Parts per million.	Percentage of total solids.			
		A. Yukon.	B. St. Lawrence.	C. Rhine.	D. Baikal.
CO ₃	45.1	46.16	44.43	47.06	49.85
SO ₄	10.5	10.75	11.17	12.61	6.93
Cl.....	0.4	0.41	2.41	4.17	2.44
NO ₃.....	.....	.....	.....	.....	0.21
PO ₄.....	.....	.....	.....	0.28	0.72
Ca.....	21.7	22.21	20.67	27.36	23.42
Mg.....	4.6	4.71	6.44	5.57	3.57
Na.....	6.0	6.14	4.87	} 2.69	5.85
K.....	trace	trace	.....		3.44
NH ₄.....	.....	.....	.....	.....	0.08
SiO ₂	7.6	7.78	10.01	0.17	2.03
Al ₂ O ₃	1.8	1.84	.....	} 0.09	1.46
Fe ₂ O ₃.....	.....	.....	.....		.....
	97.7	100.00	100.00	100.00	100.00
Salinity in parts per million		97.7	148.0	178.0	69.0

The CO₂ "half combined" in the Yukon water is 20.5 parts per million.

The columns which give the percentage composition of the mineral matter dissolved in the river water, are peculiarly useful. They enable us to compare different waters with one another independently of the great variations which they exhibit in respect to dilution. Out of a large number of analyses of river and lake waters, which I have reduced to uniform standards, the following approximate most nearly to the Yukon.

B.—The Saint Lawrence, opposite Montreal. Analysis by Norman Tate. The high silica is due in part to the influence of the Ottawa, and the chlorine may represent pollution.

C.—The Rhine, at Cologne. Average of four analyses by Vohl. The high chlorine is again noticeable.

D.—Lake Baikal, Siberia. Analysis by Schmidt.

The Yukon, then, at least where the sample was taken, is a fairly typical calcium carbonate water, with a remarkably low proportion of chlorides. It belongs to a large and well-defined group of natural waters, and it is desirable that other rivers of the far north should be examined for comparison with it. Such rivers probably represent the minimum of contamination through human agency, and their composition is therefore particularly significant for geological discussion. Rivers, however, vary in composition from time to time and place to place, and a single analysis does

not give all the information that is needed. I hope that later samples from other points on the Yukon may be available for analysis, in order that its possible variations may be discovered and recorded.

U. S. GEOLOGICAL SURVEY, WASHINGTON,
December 5, 1904.

THE WATER OF UTAH LAKE.¹

By F. K. CAMERON.

Received November 29, 1904.

IN looking over the analyses of waters from several lakes and streams with Professor F. W. Clarke, the writer's attention was called to the great discrepancy between an unpublished analysis of water from Utah Lake made in the laboratory of the Bureau of Soils in 1903 and one made by Clarke twenty years earlier.² Further, neither of these analyses agree with one of a sample of water taken from the Jordan River at the outlet of the lake, made by the writer in 1899.³ The results of these analyses are given below:

ANALYSES OF UTAH LAKE WATER.

Results stated in parts per million of solution.

	U. S. Geol.	Bureau of soils.	
	Survey. Clarke. 1883.	Cameron. 1899.	Brown. 1903.
Ca	55.8	67.6	80.0
Mg.....	18.6	13.8	92.0
Na.....	17.7	233.7	247.0
K.....	? }			? }	30.0
SO ₄	130.6	236.7	365.0
Cl.....	12.4	316.5	336.0
HCO ₃.....	.....	.....	266.0
CO ₃	60.9	23.7	.....
SiO ₂	10.0	.....	.....
	<u>306.0</u>	<u>892.0</u>	<u>1416.0</u>

These figures show that the total salt content has increased very markedly since 1883, the greatest increase being in the sodium and the chlorine. In order to confirm this interesting observation, the Bureau has had a number of other samples collected at different points in the lake and analyzed. These samples were collected by

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² U. S. Geological Survey, Bull. No. 9, p. 99 (1884).

³ Field Operations of the Division of Soils, 1899, p. 108.