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RADIUM CONTENT OF SOME INSHORE BOTTOM SAMPLES IN THE PACIFIC NORTHWEST

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The radium content of ordinary rock formations is quite well established and has been summarized by Jefferys (*3*). However, a comparatively few radium determinations have been made on samples taken from the ocean bottom. Joly (*4*) has reported twelve radium determinations of surface samples collected from the Atlantic and Pacific Oceans. Pettersson (*5*) has reported on determinations made on twenty-eight samples, most of them taken from the Atlantic Ocean, while Piggott (*6*) has reported on twenty-eight samples taken largely from the Pacific Ocean. Evans (*1*) has reported on one sample taken from off the Coast of California.

For several years the authors have been conducting a rather extensive survey of the radium content of both surface bottom and core samples taken along the Pacific Coast of Alaska, Canada, and the northern part of the United States. Considerable work has also been done on samples from the Bering Sea, Bering Strait, and off the Arctic Coast of Alaska. This report is a preliminary one on surface bottom samples involving the region of the San Juan Archipelago and Vancouver Island.

The method and apparatus used for the determination of the radium content is essentially that developed by Evans (*2*). For the sake of completeness a brief description of the method is given. A schematic diagram of the apparatus is shown in Figure 72.

The radium content of a sample is determined by removing the radon which is in equilibrium with the radium in a sample and then measuring the ionization produced by the radon in a double ionization chamber by means

of a string electrometer. The sample is dried and ground to pass through a sixty mesh screen. It is then sampled, weighed, and baked in a furnace for one hour at 900° to 1000° C. to remove carbonates, organic matter, or water of crystallization, after which it is sealed in a glass tube and allowed to stand for twenty-eight days or more to insure equilibrium between the radium and the radon.

When a determination is to be made, the free radon from the previously heated sample is temporarily stored in the reservoir (B). The sample is placed in the graphite crucible vacuum electric furnace (A). The system (A, C, E) is then evacuated. After evacuation of the system, the crucible

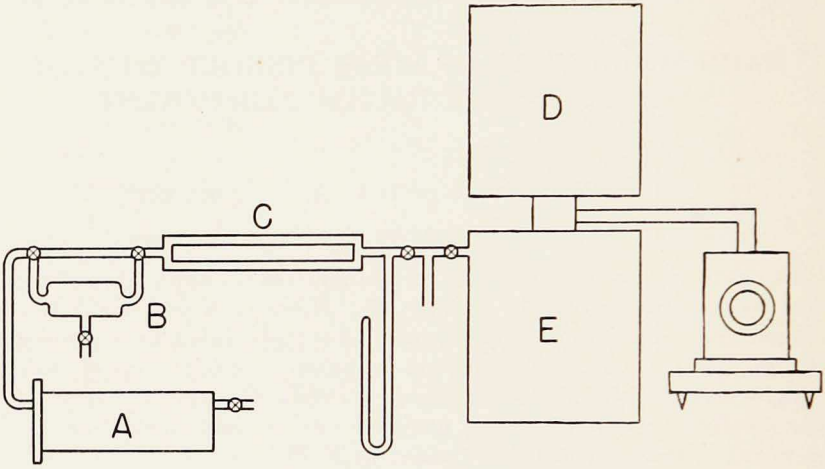

Figure 72. Schematic diagram of the apparatus.

is heated to approximately 2000° C. which completely removes the radon. This, together with the radon in the reservoir (B), is swept through the ion trap (C) into the ionization chamber (E) by means of radon-free nitrogen. The potentials of the two chambers are such that the electrometer measures only the difference in ionization in the chambers. Since one of the chambers (E) contains nitrogen and radon while the other chamber (D) contains only nitrogen, the deflection of the string electrometer will depend only upon the ionization current due to the radon. The ionization current was photographically recorded, thus giving a continuous record for a period of twenty-four hours duration. In order to correct for the ionization due to radioactive contamination of the chambers, cosmic rays, etc., each radon measurement was bracketed by background determinations. The apparatus was calibrated with a standard radium solution which was supplied through the kindness of R. D. Evans.

The location of the samples and their radium content, in grams of Ra per gram of dry material, is tabulated in Table I and indicated in the accompanying chart, Figure 73. The diameters of the circles are proportional to the radium content.

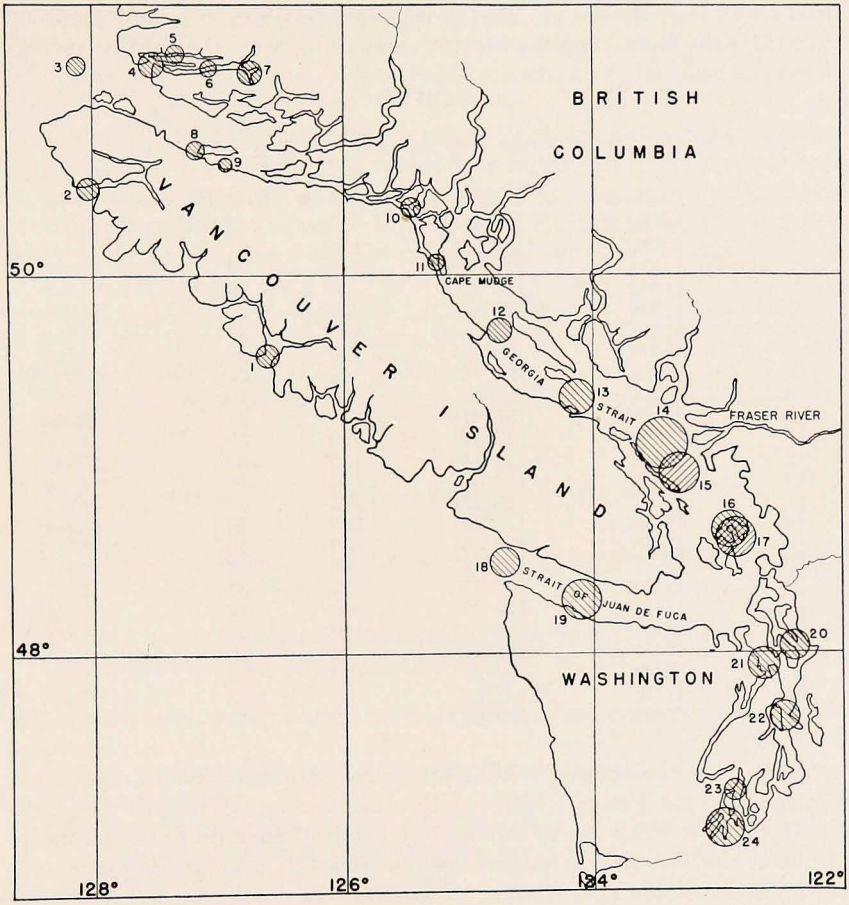

Figure 73. Chart of the San Juan Archipelago and Vancouver Island region. The diameter of the circles is proportional to the radium content.

Stations one to eleven are situated around the northern part of Vancouver Island. The samples from these stations are made up of the sediment from Vancouver Island and from the coast of British Columbia. This territory is composed largely of schist and quartzite with a small amount of diorite.

The average radium content of the eleven stations is 0.24 x 10^{-12} g. Ra per g. which is in agreement with the radium content of the rock formations of the surrounding territory.

The same may be said to apply to the stations from the Puget Sound area. Samples twenty to twenty-four, inclusive, have an average radium content of 0.37 x 10^{-12} g. Ra per g. The surrounding territory is largely made up of glacial drift with a radium content comparable with that of the average of the stations.

TABLE I

Location of Stations and Radium Content of Samples

Station	*Latitude*	*Longitude*	*Depth (meters)*	*G. of Ra per g.*	*Description*
1	49°35′ N	126°35′ W	30	.28 × 10^{-12}	Clay
2	50°29′	128°04′	110	.27	Clay
3	51°05′	128°07′	180	.23	Sand
4	51°02′	127°32′	20	.29	Clay
5	51°08′	127°18′	270	.23	Clay
6	51°03′	127°12′	130	.20	Clay
7	51°04′	126°40′	100	.30	Clay
8	50°38′	127°12′	40	.22	Sand
9	50°34′	126°57′	10	.16	Sand
10	50°19′	125°27′	235	.24	Sand
11	50°05′	125°17′	20	.20	Sand
12	49°43′	124°45′	175	.30	Clay
13	49°21′	124°08′	147	.43	Clay
14	49°07′	123°27′	275	.64	Clay
15	48°58′	123°20′	130	.50	Clay
16	48°40′	122°55′	30	.46	Clay
17	48°37′	122°51′	40	.49	Clay
18	48°30′	124°43′	75	.37	Clay
19	48°17′	124°05′	200	.49	Sand
20	48°03′	122°23′	150	.36	Clay
21	47°57′	122°38′	90	.40	Sand
22	47°38′	122°27′	150	.36	Clay
23	47°18′	122°51′	30	.26	Sand
24	47°07′	122°55′	12	.48	Clay

The sediment composing the samples from stations twelve to nineteen is furnished by the Fraser River and the surrounding territory. The flood tide in Georgia Strait enters through the Strait of Juan de Fuca and meets the flood tide entering through Johnston Strait at a point approximately ten miles south of Cape Mudge. Therefore, the stations near the mouth of the Fraser River are composed largely of the sediment from the Fraser River while the stations farther away are composed to a greater extent of the sediment from the surrounding territory.

It is of interest to note that the radium content is relatively high near the mouth of the Fraser River and decreases with some uniformity in Georgia Strait to the north, and also into the Strait of Juan de Fuca to the south and west. The drainage basin of the Fraser River is predominately granitic,