I completely agree with Haugen that "A mere look at Resen's, Sigurdsson's and all other maps drawn from Icelandic sources shows that these were not based on first-hand experience, but on learned construction and the reading of the sagas" (p. 290). But there is one thing that distinguishes Clavus from the other Northern sources and that is the fact that he calls Greenland an Island: "Gronlandie Insule chersonesus dependet a terra inaccessibili a parte septentionis uel ignota propter glaciem" (Codex Vindobonensis latinus 5277 and Codex Vindobonensis latinus 3227) and this means that Clavus cannot be excluded as a source because Greenland appears as an island on the VM.

It is perhaps possible, as Haugen assumes (p. 294), that the one who drew the VM had his knowledge from the Pope's archives. But of course this does not exclude Clavus as a source either, because Clavus' information about Greenland, etc. would very likely have reached these archives; if the opposite was the case it would be strange, because no doubt the Pope must have been interested in Clavus' information about a widening of the world picture of seven latitudes; Clavus lived in Rome in the 1440's.

At least let me say that I do not consider it impossible that in time another source will appear from which the VM can be derived. But in the same breath I want to stress that Clavus cannot be excluded — as Haugen has tried to do — on the basis of: "the differences between Clavus' Greenland and that of the VM . . ." It is not only *an unconvincing attempt* to exclude Clavus as a source, but it is an attempt which cannot be put into practice at all.

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Obsidian Samples from Archaeological Sites in Northwestern Alaska: A Preliminary Report

One hundred and two obsidian specimens from a series of archaeological sites in northwestern Alaska were submitted to the Museum of Anthropology, the University of Michigan, by Mrs. Ruth W. Giddings, Curator, and Douglas D. Anderson, Haffenreffer Museum of Anthropology, Brown University, for analysis by neutron activation. The major portion of the samples (84) derive from the deeply stratified site of Onion Portage on the Kobuk River. This site had been investigated by J. L. Giddings[1] and is still under excavation by Anderson[2]. In the Brown University collections, seven other locations were also represented by one or more specimens. A final sample was received from R. L. Humphrey, George Washington University, from the Utukok River Driftwood Creek Site 1[3].

The neutron activation analysis technique has been discussed in detail elsewhere[4,5] and will not be reviewed here. The Na and Mn contents and the Na/Mn ratio of each sample have been determined (Table 1). The result was four Na-Mn groups. Preliminary Na-Mn groups of this type have proven useful in the Near East[6,7] and in North America[8,9] for the initial separation of geologic sources and for archaeological specimens where source data are not yet complete. The latter is the case for northwestern Alaska.

Group A is defined by a Mn content of 7.3 to 8.3 $\times 10^{-2}$ per cent and a Na/Mn ratio of 45 to 51. There are 5 samples in this group (Tables 1 and 2). All Group A Samples (860, 870, 918, 922, and 925) are from Onion Portage. Samples 918, 922 and 925 are from Band 3, and sample 860 is from Band 5, Level 2, where it is in association with 6 Group B specimens. Sample 870 is from the Onion Portage Hillside and the Flank of Gully No. 1, bottom of the sod layer.

Group B comprises 89 of the 103 specimens. This group has a Mn content of 5.8 to 7.0 $\times 10^{-2}$ per cent and a Na/Mn ratio of 53 to 60. Seventy-four of the samples came from

TABLE 1. Na and Mn Contents of Obsidian Samples from Onion Portage and Related Northwestern Alaska Archaeological Sites.

Sample No.	*Opos. No.*	*%Na*	*%Mn x10²*	*Na/Mn*	*Na-Mn Group*	*Provenience (Onion Portage Unless Otherwise Designated)*
850	1	3.57	6.44	55.4	B	B-5, L-3
851	2	3.86	6.90	55.9	B	"
852	3	3.87	7.00	55.3	B	"
853	4	3.70	6.39	57.9	B	"
854	5	3.57	6.51	54.8	B	B-5, L-2
855	6	3.76	6.85	54.9	B	"
856	7	3.91	6.86	57.0	B	"
857	8	3.57	6.36	56.1	B	" (Hearth Area)
858	9	3.69	6.39	57.7	B	"
859	10	3.45	6.38	54.1	B	"
860	11	3.78	8.32	45.4	A	" "Bubbly Obsidian"
861	12	3.56	6.63	53.7	B	B-5, L-1
862	13	3.78	6.83	55.3	B	"
863	14	3.94	6.96	56.6	B	B-5, L-1 Proto-Denbigh House
864	15	3.73	6.73	55.4	B	B-5, L-1 (Hearth Area)
865	16	3.63	4.57	79.4	C	Onion Portage Hillside and Flank of Gully No. 1, Bottom of Sod Layer
866	17	3.62	6.26	57.8	B	"
867	18	3.54	5.05	70.1	C	"
868	19	3.73	6.68	55.8	B	"
869	20	3.61	6.25	57.8	B	"
870	21	4.06	8.04	50.5	A	"
871	22	3.59	6.55	54.8	B	"
872	23	3.67	6.66	55.1	B	"
873	24	3.45	6.00	57.5	B	Soil Horizon Beyond SW Corner of Early Eskimo House on Bluff West of Gully No. 1
874	25	3.58	6.35	56.4	B	B-7, L-1
875	26	3.63	6.77	53.6	B	B-6, L-4
876	27	3.89	6.81	57.1	B	"
877	28	3.77	6.84	55.1	B	Palisades II
878	29	3.71	6.48	57.2	B	KOR-4
879	30	3.46	6.05	57.2	B	Noatak River, Site N-5
880	31	3.70	6.20	59.7	B	B-2, Bottom, L-10-12
881	32	3.65	6.28	58.1	B	"
882	33	3.85	6.92	55.6	B	"
883	34	3.75	6.47	58.1	B	B-2, L-10-12
884	35	3.60	6.05	59.5	B	" (House Area)
885	36	3.60	6.35	56.9	B	" "
886	37	3.73	6.40	58.3	B	" "
887	38	3.77	6.28	59.0	B	" "
888	39	3.39	5.89	57.7	B	" "
889	40	3.59	6.53	54.9	B	B-2, L-11
890	41	3.83	6.61	58.0	B	B-2, L-9-10
891	42	3.52	6.05	58.2	B	"
892	43	3.73	6.41	58.2	B	B-2, L-10 (Hearth Area)
893	44	3.73	6.42	58.2	B	B-2, L-8 or 9
894	45	3.66	6.29	58.1	B	"
895	46	3.67	6.13	59.8	B	B-2, L-6
896	47	3.57	6.00	59.4	B	B-2, L-5
897	48	3.76	6.57	57.2	B	"
898	49	3.89	6.62	58.8	B	B-2, L-7
899	50	4.42	4.87	90.8	D	B-2, L-2
900	51	4.46	4.71	92.6	D	"
901	52	3.68	6.36	57.8	B	"
902	53	3.64	6.33	57.6	B	B-1, L-2
903	54	3.38	5.85	57.8	B	"
904	55	4.42	4.78	92.4	D	B-1, Top Layer
905	56	4.21	4.63	91.9	D	B-1, Lower Levels (L-2)
906	57	3.70	6.50	57.0	B	B-1, L-1
907	58	3.54	5.94	59.0	B	B-1, Top 2 Levels

B=Band
L=Level

Sample No.	*Opos. No.*	*%Na*	*%Mn x10²*	*Na/Mn*	*Na-Mn Group*	*Provenience (Onion Portage Unless Otherwise Designated)*
908	59	4.36	4.87	89.3	D	B-1, Upper Levels
909	60	3.89	6.65	58.4	B	B-1
910	61	3.71	6.40	57.9	B	B-1, L-1 or 2
911	62	3.68	6.32	58.2	B	B-1
912	63	3.71	6.58	56.5	B	Lower B-1
913	64	3.34	5.69	58.8	B	Lower B-1
914	65	3.97	6.92	57.3	B	B-3, L-3
915	66	3.61	6.08	59.2	B	B-3, L-1 and 2
916	67	3.81	6.67	56.3	B	"
917	68	3.49	6.24	56.0	B	B-3, L-1
918	69	3.63	7.43	48.9	A	B-3, L-2 and 3
919	70	3.55	5.99	59.3	B	B-3, Lower Levels
920	71	3.31	6.15	54.1	B	B-3, Upper Levels (Hearth)
921	72	3.52	5.92	59.4	B	" "
922	73	3.70	7.32	50.5	A	B-3, L-2
923	74	3.67	6.64	55.3	B	B-3, House 1
924	75	3.51	6.46	54.3	B	"
925	76	3.70	7.32	50.5	A	B-3, Top Surface
926	77	3.42	6.30	54.3	B	B-2/3
927	78	3.46	6.40	54.4	B	"
928	79	3.69	6.80	54.0	B	"
929	80	3.29	5.89	56.1	B	" (Top Level)
930	81	3.57	6.29	57.5	B	Choris, H-5
931	82	3.56	6.44	54.4	B	Kelly River (Noatak Area), NKR-2
932	83	3.51	6.44	54.7	B	B-4, L-10 (Hearth)
933	84	3.63	4.69	77.4	C	Second Gray Level, Denbigh House
934	85	3.54	6.32	56.0	B	B-4, L-1
935	86	3.51	6.44	54.7	B	B-4, L-3 (Hearths)
936	87	3.34	5.93	56.3	B	"
937	88	3.77	6.63	56.8	B	Denbigh House
938	89	3.44	6.12	56.5	B	B-4, House 14
939	90	3.52	6.43	55.2	B	Denbigh House, Below Gray Level
940	91	3.60	6.34	56.7	B	B-4, L-2
941	92	3.51	6.28	57.4	B	"
942	93	3.65	6.32	57.7	B	"
943	94	3.65	6.47	56.4	B	B-4, L-1 or 0
944	95	3.93	6.80	57.2	B	Denbigh House
945	96	3.56	6.46	55.3	B	B-4, L-1
946	97	3.30	6.06	54.5	B	"
947	98	3.88	6.67	58.1	B	B-4, L-1
948	99	3.20	5.93	54.0	B	Denbigh House, Second Gray Level
949	100	3.99	6.94	57.5	B	Nim 12 No. 3, Nimiuktuk River
950	101	3.35	4.49	74.8	C	NKR-2, Kelly River, NW Alaska
951	102	3.91	6.90	56.7	B	Little Noatak Site, NW Alaska
952	103	3.73	6.65	56.1	B	"
1730	—	3.78	6.78	55.8	B	Site No. 1, Driftwood Creek

TABLE 2. Distribution of Na/Mn Groups by Sites.

Site	*A*	*B*	*C*	*D*	*Totals*
Onion Portage: Major Stratified Area	4	74	1	5	84
Onion Portage Hillside	1	5	2	0	8
House Spoil Area, Onion Portage	0	1	0	0	1
Kobuk River KOR-4	0	1	0	0	1
Palisades II	0	1	0	0	1
Choris, H-5	0	1	0	0	1
Kelly River NKR-2	0	1	1	0	2
Nimiuktuk River 12 No. 3	0	1	0	0	1
Noatak River N-5	0	1	0	0	1
Little Noatak River	0	2	0	0	2
Driftwood Creek	0	1	0	0	1
Totals	5	89	4	5	103

the major Onion Portage stratified deposit (see Table 2). The remaining 15 were found at the Onion Portage Hillside and House Spoil areas; the Little Noatak River site, seven miles from Hotham Inlet[1]; Palisades II; Choris H-5; site NKR-2, Kelly River, eight miles upstream from the mouth; site Nim 12 No. 3, located four miles from the mouth of the Nimiuktuk River; site N-5 on the Noatak River, near the middle canyons; at Driftwood Creek, Site 1; and site KOR-4 on the middle Kobuk River.

Group C is defined by a Mn content of 4.5 to 5.1 $\times 10^{-2}$ per cent and a Na/Mn ratio of 70 to 80. There are 4 samples in this group. One specimen (933) is from the Second Gray Level, Denbigh House, at Onion Portage, where it is associated with five Group B samples. Two Group C specimens (865, 867) are from the Onion Portage Hillside. The final sample is from Kelly River NKR-2.

Group D consists of 5 samples, all from Onion Portage. It shows a Na content of more than 4.2 per cent, a Mn content of 4.6 to 4.9 $\times 10^{-2}$ per cent, and a Na/Mn ratio of 89 to 93. Two Group D specimens (899, 900) are from Band 2, Level 2, and were found in association with one Group B sample. The final 3 (904, 905, 908) are from Band 1, Top Layer, Lower Levels, and Upper Levels respectively.

Unfortunately, at this writing, only 2 certain geologic flows have been tested for Alaska. One (773) is located on Mount Drum, Nizina District. This sample was received from the Field Museum (Cat. No. Li 2475). The Na/Mn data for this specimen (Table 3) are in line for Group B. However, examination of additional element contents in comparison with these elements for an Onion Portage Group B sample (855) shows that the Mount Drum source has seven times the Fe, and considerably less La, Rb, and Sm. Thus, it can not be the Group B source.

Three specimens from an obsidian flow located on Umnak Island were received from William B. Workman, University of Wisconsin. They show a Na range of 3.3 to 4.0 per cent, a Mn range of 7.4 to 8.2 $\times 10^{-2}$ per cent, and a Na/Mn range of 44.6 to 45.5. These values are close to the determination for Group A. Data on the additional elements are now being computed.

Two specimens (1359, 1360) were received from H. Banks, Division of Petrology, Smithsonian Institution (Smith. Cat. No. 6384), from a beach near the Norwitikata River. (We have been unable to locate this river in an Atlas). With Mn contents of 5.15 and 5.67 $\times 10^{-2}$ per cent and Na/Mn ratios of 61.0 and 61.6 respectively; neither was this location the source, or so it appears. Furthermore, the La content seems to be too low (Table 3).

A Group D specimen has also been tested for these elements (Table 3). With a Sc content of 12.8 $\times 10^{-4}$ per cent, it will be easy to recognize this source. This Sc value is by far the highest yet recorded by us after a study of about 60 natural obsidian flows.

In time depth, Group B appears first at Onion Portage in Band 7 in the Palisades II Complex, which dates around 4000-3900 B.C.[2]. It is also known from the site of Palisades II. There is a possible Paleo-Indian occurrence of Group B at the Driftwood Creek Site 1. Utilization of Group B continues at Onion Portage into Band 1, the Arctic Woodland Eskimo Complex, which dates from A.D. 1000 to A.D. 1700[2].

The earliest occurrence of Group A (860) is in Band 5, the Portage Complex of the Northern Arctic Tradition, which dates from 2600 to 2200 B.C. There are two Group A samples in Band 3, the Choris Complex, dating from 1500 to 500 B.C.[2].

Group C occurs as early as the Denbigh occupation at Onion Portage: 2200 to 1800 B.C. All Group D samples are from Bands 1 and 2. Thus, Group D dates at this site from A.D. 400 to A.D. 1700[2].

In conclusion, there are *at least* four obsidian sources represented on these sites. From present data, the geographic locations of these sources have not yet been identified.

TABLE 3. Element Content of Alaskan Obsidians.

Sample No.	*Origin*	*%Na*	*%Mn x10²*	*%La x10²*	*%Fe*	*%Rb x10²*	*%Sc x10⁴*	*%Sm x10³*	*Na/Mu*
*773	Mt. Drum	3.66	6.38	0.29	3.5	0.94	9.8	0.50	57.4
*1360	Norwitikata	3.14	5.15	0.53	0.71	1.7	3.3	0.89	61.6
855	Onion Portage	3.76	6.85	0.92	0.47	1.8	3.0	1.3	56.1
900	Onion Portage	4.46	4.71	0.56	2.3	1.4	12.8	0.96	92.6

* *Geologic Source*

While a start has been made in outlining the distribution of obsidian groups on archaeological sites in northwestern Alaska, considerable work needs to be done. One major direction to be taken is an intensive field examination and collection of obsidian samples for analysis. Secondly, we will continue to analyse specimens in our Michigan laboratory, with the express purpose of defining obsidian groups more exactly on the basis of the 12 elements currently being examined. The Na Mn groups have been corroborated by the study of these other elements both in the Near East and North America. In a sense, then, this is a plea for cooperation from both archaeologists and geologists whose research interests lie in this area. Both may benefit from these types of analyses.

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Rocher River, Northwest Territories

INTRODUCTION

Small towns in the United States and Southern Canada have witnessed a significant decline in recent years. People have been attracted to larger centres for a variety of reasons, e.g. employment, increased number of services. In technical terms, the small settlements are undergoing a negative balance in the accrual of economic and human resources; to wit: they are not viable.

Small settlements in northern Canada are also meeting difficulty in surviving. An example of the problems facing one small northern settlement, Rocher River, Northwest Territories, will be described here.

THE REGION

During the past year, I investigated the economic potentialities of the settlements of the Great Slave Lake region, particularly the "South Mackenzie" area, which includes the settlements of Hay River, Fort Smith, Pine Point, Fort Resolution, Fort Providence, and Rocher River.

The settlements are highly varied economically. Hay River (1966 population: 2002) has a diversified economic base: transportation-communication hub, centre for the lake's fishing industry, and an active centre for the construction industry. Fort Smith (population: 2120) is a government dominated town; it is the north's centre for the Department of Indian Affairs and Northern Development (D.I.A.N.D.), and a regional centre for the Government of The Northwest Territories. Pine Point (population: 459) is the centre for a recently developed lead-zinc mine; it is at present the prime producer of mineral wealth in N.W.T. Fort Resolution (population: 677) and Fort Providence (population: 378) are Indian settlements whose primary sources of income derive from trapping, government employment, and social assistance. Rocher River (population *c.* 38) is a small trapping