

Participation in the U.S. Ellsworth Mountains Operation of the 1979–1980 Austral Summer, Antarctica

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米国隊 1979–1980 年のエルスワース山地オペレーション参加報告

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要旨: 著者は変成岩岩石学的研究を目的として、1979–1980 年夏期の米国隊のエルスワース山地野外研究活動（主任研究者はミネソタ州マカレスター大学の G. F. ウェーバーズ教授）に参加した。調査期間は 38 日間、調査地域はヘリテージ山脈の南部および北西部、調査精度は 1:2500 で、特に構造要素を詳しく記録した。採集標本（多くの定方位標本を含む）は約 400 kg であった。

野外調査の拠点は、山地中央部に設置されたエルスワース山地キャンプで、約 40 人の科学者が、ヘリコプター、スノートボガンにより調査活動を行ったものである。

Abstract: Field activities in the Ellsworth Mountains in the 1979–1980 austral summer were supported from a temporary U.S. base camp. To study metamorphic petrology, the author mainly surveyed Marble Hills, Liberty Hills, Edison Hills, High Nunatak, and Wilson Nunataks of the southern part of the Heritage Range, and the northwestern part of the same range. The duration of the actual field survey was 38 days and rock specimens collected amounted to some 400 kg. Outlines are given on the logistics of the camp and the scientific teams during the season.

1. Introduction

After negotiations between the National Institute of Polar Research, Japan and the Division of Polar Programs of the National Science Foundation, U.S.A., the author participated in the geological survey of the Ellsworth Mountains in the 1979–1980 field season (NAGATA, 1981). The author joined the research group of Gerald F. WEBERS of Macalester College who was also the representative of scientists and the camp director. The Ellsworth Mountains camp was open for scientific activity from November 2, 1979 to January 18, 1980, and the author was present throughout this period. This report outlines the field studies of the author and the activities of the Ellsworth Mountains camp.

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2. Ellsworth Mountains Camp

The Ellsworth Mountains camp was built at the southern bank of the Minnesota Glacier, which flows from west to east between the Sentinel Range to the north and the Heritage Range to the south (SPLETTSTOESSER and WEBERS, 1981) (Figs. 1–3). The camp was composed of five Jamesways (semicircular hut of 60–100 m² in area), one plywood generator shack, and two large fuel bladders (95 k^l and 38 k^l each). One caterpillar (9 tons), 12 Skii-Doos, and 3 helicopters (UH–1N) were the main logistic support means: the helicopters and Skii-Doos were also very useful for traveling to the various fields of study. The camp satisfactorily housed about 20 logistic personnel and 25–40 scientists. Further details of the camp are given by WALDRIP (1980, private communication) and YOSHIDA (1981a).



Fig. 1. Surveyed areas in the Ellsworth Mountains.

Dotted and solid areas indicate mountainous rises including bared rock areas (adopted from CRADDOCK *et al.*, 1964), among which the solid areas were surveyed by the author. The star indicates the location of the Ellsworth Mountains camp. PP: Polarstar Peak. NWH with a square of chain: Northwestern part of the Heritage Range. WP: Webers Peaks. SP: Soholt Peaks. EH: Edison Hills. LH: Liberty Hills. HNT: High Nunatak. WNT: Wilson Nunataks. MH: Marble Hills. The inset map shows the location of the Ellsworth Mountains.



Fig. 2. Ellsworth Mountains camp area. The northern part of the Heritage Range is to right at the foot of the Sentinel Range. (Two Hercules aircraft have just arrived



Fig. 3. Scientists of the Ellsworth Mountains camp.

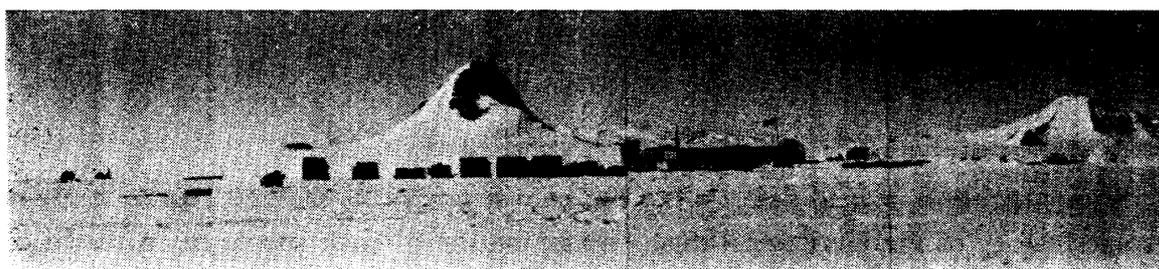
Front row from the left; P. GOULD, M. YOSHIDA, V. SAMSONOV. Back row from the left; C. CRADDOCK, J. CRADDOCK, I. DALZIEL, E. L. YOCHELSON, W. BUGGISCH, J. F. SPLETTSTOESSER, G. F. WEBERS, M. TURNER, B. SPORLI, C. L. MATSCH, R. OJAKANGAS, A. BRAMALL, C. M. HUDAK, D. WATTS.

3. Scientific Activities

In the 1979–80 season, 9 scientific projects were conducted in the Ellsworth Mountains (Table 1). Some details of the Ellsworth Mountains projects are given elsewhere (YOSHIDA, 1981b). The geology group under G. WEBERS stayed at the camp for the whole period of the scientific activity, but other groups stayed less.

The geology group, which was the largest, was composed of 21 scientists and field assistants, with additional 5 members coming from other groups in the field operation. The 26 personnel were subgrouped according to their specialities (Table 2). Some details of the operation of the field survey are given by SPLETTSTOESSER and WEBERS (1981).

The author was the only metamorphic petrologist in the geology group and worked on tectonic petrology and tectonic geology, surveying mainly in the northwestern and southern parts of the Heritage Range (Table 3 and Fig. 1). The actual duration of the



the right and the Sentinel Range is far left. The Minnesota Glacier flows from left to evacuate the camp.)

Table 1. Scientific projects conducted in the Ellsworth Mountains during the 1979–1980 austral summer.

Principal investigator (Institute)	Subject	Number of investigators who stayed at the camp
G. F. WEBERS (Macalester College)	Geological investigation of the Ellsworth Mountains	21
G. H. DENTON (University of Maine)	Late Cenozoic glacial history	6
E. J. ZELLER (University of Kansas)	Resource and radioactivity survey by airborne gamma-ray spectrometry	4
J. W. COLLINSON (Ohio State University)	Stratigraphy and sedimentary petrology of the Polarstar Formation	3
W. J. KOSCO (U.S. Geological Survey, Virginia)	Ellsworth Mountains geodetic control	3
I. CAMPBELL ^a (Soil Bureau, D.S.I.R., New Zealand)	Salt and chemical weathering of soils of the Ellsworth Mountains	2
I. W. DALZIEL (Columbia University)	Evolution of the West Antarctic-Andean Cordillera in the Scotia Arc	2
L. BAACK (University of Nebraska)	The United States and the Antarctic since World War II	1
W. A. CASSIDY (University of Pittsburgh, Pennsylvania)	Search for meteorites	1

^a This project was sponsored by the New Zealand Antarctic Research Program.

field survey was 38 days during which 400 kg of rock specimens were collected. Routes of the field surveys were recorded in 1 : 2500 maps.

Almost all the main rocks of the Lower Paleozoic or older formations of the mountains, *i. e.* the Minaret Group, the Heritage Group, and the Crashsite Quartzite reported by CRADDOCK (1969) were surveyed. It is a pity, however, that the author could spend only one day surveying the Polarstar Formation of the Sentinel Range, and could not survey on the Whiteout Conglomerate because the operation of the Ellsworth Mountains camp was shortened.

4. Future Laboratory Works

Summarization of field data on the geologic structures is the first step to study the tectonic history of the Heritage Range. Examination of rock specimens with various petrographic methods is the second step to study the nature of metamorphism and its relation to the geologic structures. Rock specimens from throughout the Ellsworth

Table 2. Scientists of the geology group of the Ellsworth Mountains camp.

Grouping by specialities	Name	Nationality	Office
Paleontology and stratigraphy of lower Paleozoic and older rocks	G. F. WEBERS	U. S. A.	Macalester College, Minnesota
	J. CRADDOCK ^c	U. S. A.	Macalester College, Minnesota
	L. C. ROSEN ^c	U. S. A.	Macalester College, Minnesota
	C. M. HUDAK ^c	U. S. A.	Macalester College, Minnesota
	P. GOULD ^c	U. S. A.	Macalester College, Minnesota
	J. ANDERSON ^c	N. Z.	Victoria Univ. Wellington
	R. OJAKANGAS	U. S. A.	Univ. Minnesota
	J. POJETA, Jr.	U. S. A.	USGS, Washington, D. C.
	W. BUGGISH ^b	W. Germany	Geol. Inst. Darms., W. Germany
	E. L. YOCHELSON	U. S. A.	USGS, Washington, D. C.
Structural geology	B. SPORLI	Switzerland	Univ. Auckland, N. Z.
	C. CRADDOCK	U. S. A.	Univ. Wisconsin, Madison
	I. DALZIEL ^a	U. S. A.	Columbia University, New York
	M.R.A. THOMSON ^a	U. K.	British Antarctic Survey
Sedimentology of upper Paleozoic formations	J. W. COLLINSON ^a	U. S. A.	Ohio State Univ.
	C. L. VAVRA ^{a,c}	U. S. A.	Ohio State Univ.
	J. M. ZAWISKIE ^{a,c}	U. S. A.	Ohio State Univ.
Geomagnetism of lower Paleozoics	D. WATTS	U. S. A.	Univ. Leeds, Great Britain
	A. BRAMALL ^c	U. K.	Univ. Leeds, Great Britain
Glacial geology	R. RUTFORD	U. S. A.	Univ. Nebraska
	C. L. MATSCH	U. S. A.	Univ. Minnesota
Igneous petrology	P. GIZYCKI ^b	W. Germany	Univ. Munster, W. Germany
	V. SAMSONOV ^b	U. S. S. R.	NPO, SEVMORGEO, Leningrad
	W. R. VENNUM	U. S. A.	Sonoma St. Univ., California
Metamorphic petrology	M. YOSHIDA ^b	Japan	Osaka City Univ., Japan
Science coordinator/ geomorphology	J.F. SPLETTSTOESSER	U. S. A.	Minnesota Geol. Survey

^a Scientists with their own projects and budgets different from those of WEBERS.

^b Official participants from the other nations than the United States; they are sponsored by their own countries.

^c Graduate or undergraduate students.

Mountains having been stocked in the United States since the 1961 survey have a key importance in studying metamorphism of the mountains. This study will hopefully be done as a later step. These studies will be done in collaboration with some scientists of the WEBERS' group.

Table 3. Areas surveyed by the author in the Ellsworth Mountains during the 1979–1980 austral summer.

Survey areas	Period	Accompanying scientists	Weight of specimens (kg)
Marble Hills	Dec. 13-Dec. 23, 1979	J. M. ANDERSON L. C. ROSEN	60
Liberty Hills, Edison Hills, Wilson Nunataks, High Nunatak	Dec. 26, 1979-Jan. 10, 1980	V. SAMSONOV P. GIZYCKI W. R. VENNUM	200
Soholt Peaks	Dec. 6, 1979 and Jan. 11, 1980	G. F. WEBERS and others	40
Webers Peaks	Dec. 3 and Dec. 5, 1979	G. F. WEBERS and others	40
Northwestern part of the Heritage Range	6 days between Dec. 4-Dec. 24, 1979	V. SAMSONOV J. M. ANDERSON L. C. ROSEN C. M. HUDAK C. L. VAVRA E. L. YOCHELSON	50
Sentinel Range	Jan. 12, 1980	M. D. TURNER M.R.A. THOMSON J. SPLETTSTOESSER	10

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