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The Role of Student Mountaineering Clubs in the Development of Geological Sciences –The Example of the Academic Alpine Club of Hokkaido*

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Abstract

The Academic Alpine Club of Hokkaido, a group of active and graduate members of the university mountaineering club, has been sending mountaineering expeditions mostly to the Nepal Himalaya. These expeditions subsidiarily have conducted field studies of natural sciences including geology, glaciology, botany, etc, which were taken care of by young scientists, including graduate students. The youngsters further evolved their studies after they got jobs in universities, institutions, etc, where they recruited their students, juniors, colleagues, and even friends from outside Japan to work with them.

Their activities are worth noting, particularly in geology and glaciology,. Their geological studies in Antarctica since 1957, in the Himalayas since 1962, in Patagonia since 1965, and in the Gondwanan terrains since 1985 have produced a wealth of scientific publications, some of which have become classic or very citable literatures. Their glaciological studies in the Himalayas since 1963 and in Antarctica since 1968 have also formed a valuable database of information including 30 years of glaciological observations of a central Himalayan glacier, the mass balance of an integral part of Antarctic ice sheet, and 3000 m depth/720000 years-length of ice coring in Antarctica.

The student mountaineering club is thus valuable in developing positive energy and attitudes for conducting pioneering work in field sciences, including earth sciences

1. INTRODUCTION

The Academic Alpine Club of Hokkaido (AACH), a group of students and graduates of Hokkaido University is a good example that attests to the way in which the spirit and behavior of exploration formed during youth and born through the activity of a mountaineering club have played an important role in developing geological sciences.

The AACH has sometimes sent expedition teams with the major objective of climbing the high peaks of the world, for example the first ascent to Mt. Chamlang (7317m) in the eastern Nepal Himalaya in 1962, and the first winter ascents to Baruntse (7220m) in

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1980 and Dhaulagiri (8167m) in 1982 (Academic Alpine Club of Hokkaido, 1985); and the ascent to Dhaulagiri formed the first formal world record of winter ascent to the 8000 m peak.

In addition to mountaineering, the young scientists of AACH were interested in natural science research including geology, glaciology, biology, etc., and since the early 1960s, they have conducted several field research projects as a part of mountaineering expeditions or as an independent scientific expedition (Table 1, e.g., Hokkaido University Himalayan Committee, 1971; Hokkaido University Patagonia Committee, 1974). The scientific work was mostly done by the young members mostly graduate students of the club. The field activity during the expedition encouraged the youngsters to further develop their field science studies after they got jobs in universities, research institutes, or enterprises.

Year	*Area of survey*	*No of AACH**	*Field of science*
1962	Chamlang Expedition	7/7	Geology
1963	Western Nepal Expedition	5/6	Geology and glaciology
1965	Central Nepal Himalaya Expedition	6/8	Geology and glaciology
1965	1st Scientific Expedition of Patagonia	6/9	Botany and geology
1966	Eastern Nepal geological survey	1/1	Geology
1967	Tethys Scientific Research	2/2	Geology and ethnics
1967-68	Central Nepal Survey	2/2	Glaciology and Zoology
1967-68	2nd Scientific Expedition of Patagonia	3/6	Botany, geology, and glaciology
1968	Central Nepal Biological Research	3/7	Animals and vegetation
1968	3rd Scientific Expedition of Patagonia	1/4	Geology
1969	Karakoram geological survey	1/1	Geology
1969-70	4th Scientific Expedition of Patagonia	1/7	Geology and botany
1969-70-	Scientific Expedition in Central Nepal Himalaya	3/7	Botany, geology and ethnics
1969-70	Japan Everest Ski Expedition	6/33	Geology, zoology, glaciology

* Number of AACH members/Number of total expedition members

Table 1. Scientific expeditions of the AACH or related bodies during the 1960s, either not associated with mountaineering.

They continued their field studies individually or forming a group including young students from their universities/institutes or their own friends, who were generally

AACH colleagues, but sometimes colleagues from outside the AACH, and even from overseas. Their studies have thus expanded throughout Japan as well as world-wide, and the fruits of some of their studies have now come to form important parts of related fields of science. Some examples of these related to geological and glaciological sciences are given in the following sections..

2. GEOLOGICAL ACTIVITIES IN THE NEPAL HIMALAYA

In 1955, an AACH geologist was included in the Japanese Manaslu expedition and conducted a geological survey along the expedition route (Hashimoto, 1959); since then, young AACH researchers and students have been encouraged to visit, and have become accustomed to visiting the Nepal Himalaya and have conducted fieldwork for various fields of sciences. Among these activities, geological field studies have covered extensive areas in the Nepal Himalaya (Figs. 1, 2). The remarkable fruits of these activities appeared as a large volume titled *"Geology of the Nepal Himalaya"* (Ohta and Akiba, 1973), contributed to by 17 scientists including 10 AACH members. This book formed one of the classic and important literatures in Himalayan geology. Geologists from the AACH have further developed Himalayan studies, in collaboration with their successors and colleagues inside and outside of Japan, and have made considerable contributions, including international publications (Nepal Geological Society, 1982, 1984) and books for the public (Kizaki, 1994; Yoshida et al., 2008, 2011). A record of AACH activities in the 1960s related to the Nepal Himalaya was recently assembled into one book (Tethys Travel Editorial Committee, 2010), which is expected to attract Japanese youngsters to start field science studies.

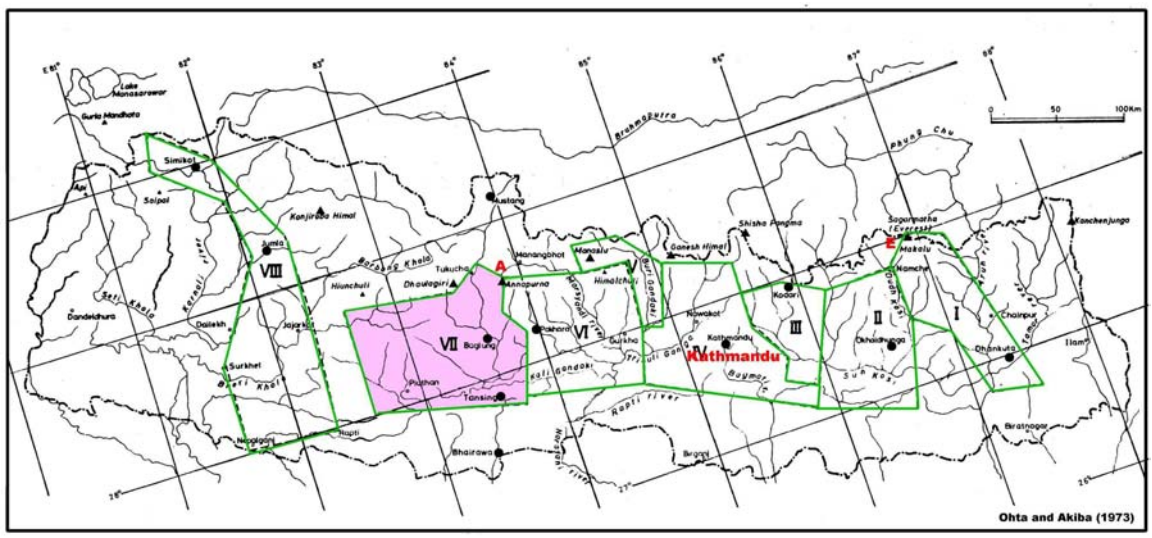

Fig.1. Field survey areas covered by geological field teams mostly organized by AACH.

I: Arun River-Mt Chamlang region surveyed by S. Anma in 1962. II: Ramechhap-Okaldhunga region surveyed by T. Ishida in 1966. III: Chautara region

surveyed by T. Ishida in 1966 and U. Maruo, C. Akiba and Y. Ohta in 1970. IV: Kathmandu region surveyed by K. Arita, C. Akiba, Y. Ohta, T. Soma and T. Kano in 1970. V: Buri Gandaki – Mt. Manaslu region surveyed by S. Hashimoto in 1955. VI: Pokhara – Gurkha region surveyed by K. Arita in 1967 and Y. Ohta, C. Akiba, K. Arita and Y. Maruo in 1969. VII: Dhaulagiri region surveyed by S. Sako, T. Ishida, M. Masuda, H. Tanaka and O. Watanabe in 1965. VIII: Karnali region surveyed by H. Ando, T. Endo and O. Watanabe in 1963.The gray highlighted area is shown in detail in Fig. 2.

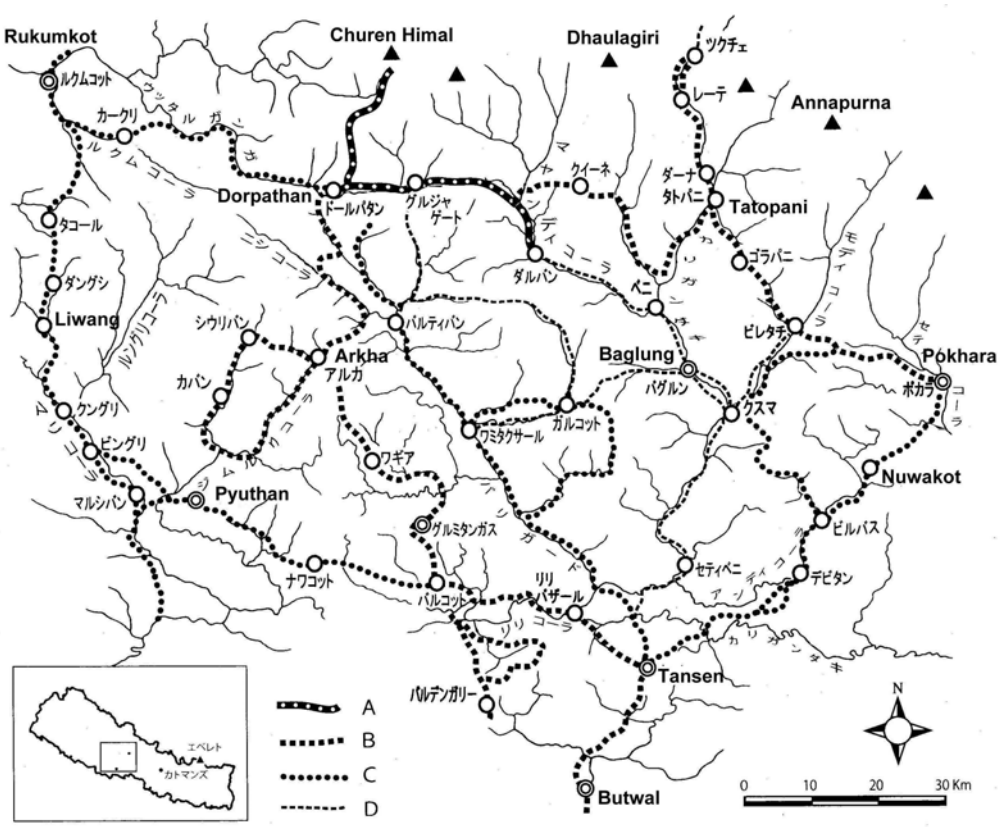

Fig.2. Example of field survey routes in Central Nepal Himalaya (Dhaulagiri region) during the 1965 expedition.

The Dhaulagiri region (VII) is highlighted in Fig. 1. A - D routes are those traced by different members of the expedition. A circle with letters DF shows the location of Dome Fuji.

3. GEOLOGICAL ACTIVITIES IN ANTARCTICA

Geologists from the AACH have also conducted active research in Antarctica. Since 1957, eight AACH geologists have joined the Japanese Antarctic Research Expedition. They all conducted extensive field surveys in Antarctica, mostly surrounding Syowa Station and the coastal and inland mountains in Eastern Drawning Maud Land, and many geological reports including the Antarctic Geological Map Series (Table 2, National Institute of Polar Research, 1974-2004) have been dispatched, forming a

valuable data-base for the study of Antarctic geology. Thirty-one of thirty nine sheets so far were co-authored by AACH members.

Sheet No.	Areas	Scale	Pub Yr	AACH Nos.	Sheet No.	Areas	Scale	Pub Yr	AACH Nos.
1	East Ongul Island	1/5,000	1974	1/3	22	Oku-iwa Rock	1/25,000	1981	1/3
2	West Ongul Island	1/5,000	1974	2/4	23	Honnor Oku-iwa Rock	1/25,000	1987	0/3
3	Te･a	1/5,000	1975	1/3	24	Rundvagskollane and Rundvagshetta	1/25,000	1986	0/5
4	Ongulkalven Island	1/5,000	1975	1/3	25	Botnneset	1/25,000	1987	2/2
5	Langhovde	1/25,000	1976	4/9	26	Strandnibba	1/25,000	1985	0/6
6,7	Skarvsnes	1/25,000	1977	3/8	27(1)	Mt. Fukushima, Northern Yamato Mountains	1/25,000	1978	3/4
8	Kjuka and Telen	1/25,000	1979	1/5	27(2)	Mt. Torimai, Northern Yamato Mountains	1/25,000	1995	1/3
9	Skallen	1/25,000	1976	2/5	28	Central Yamato Mountains, Massif B and Massif C	1/25,000	1982	2/8
10	Padda Island	1/25,000	1977	0/2	29	Belgica Mountains	1/25,000	1982	0/3
11	Cape Hinode	1/25,000	1978	0/1	30	Southern Yamato Mts. (Massif A and JARE-IV Nunataks)	1/25,000	1988	3/9
12	Lutzow-Holm Bay	1/250,000	1989	1/3	31	Balchenfjella	1/100,000	1991	1/8
13	Prince Olav Coast	1/250,000	1989	1/3	32	Wider･fjellet	1/100,000	1992	1/8
14	Sinnan Rocks	1/25,000	1983	1/3	33	Bergersenfjella	1/100,000	1993	1/14
15	Cape Ryugu	1/25,000	1980	1/3	34	Brattnipene	1/100,000	1996	1/11
16	Akebono Rock	1/25,000	1986	1/3	35	Sor Rondane Mountains	1/250,000	1997	1/5
17	Niban Rock	1/25,000	1983	1/3	36	Ongul Islands	1/10,000	1994	1/6
18	Kasumi Rock	1/25,000	1984	0/5	37	Mount Riiser-Larsen	1/12,500	2000	0/7
19	Tenmondai Rock	1/25,000	1985	1/5	38	Tonagh Island	1/10,000	2001	0/12
20	Akarui Point and Naga-iwa Rock	1/25,000	1984	2/5	39	Skallen (Revised Edition)	1/10,000	2004	1/13
	Cape Omega	1/25,000	1979	0/2					

AACH Nos.: Number of AACH members versus number of authors

Table 2. Antarctic Geological Map Series 1974-2004 in which AACH members were involved

4. DISCOVERY OF THE FIRST YAMATO METEORITES AND SUCCEEDING COLLECTIONS IN ANTARCTICA

While conducting geological and glaciological activities in Antarctica, an interesting

and very important finding suddenly happened. This occurred in December 1969, when an inland survey team from the 10th Japanese Antarctic Research Expedition was ending their 250 km triangulation survey under the first-year program of the Enderby Land Glaciological Project (cf. Section 7). At the southwestern margin of the Yamato Mountains, the team led by AACH geologist Hisao Ando found and collected 9 meteorites on the ice field (Yoshida et al., 1971, Yoshida, 2010). This discovery was followed by the succeeding discoveries of another inland survey team led by Kazuyuki Shiraishi, who was also an AACH geologist, of 14 meteorites on the same ice field (Shiraishi et al, 1973). These discoveries triggered the start of the Japanese Antarctic Research Expedition's meteorite collection program, as well as of collection programs done by other countries, and as a result, more than 44000 meteorites had been collected from Antarctica as of March 2011. By 1969, only 6 meteorites had been found from Antarctica and only 2000 or so from all over the world. The discovery of meteorites in Antarctica thus resulted in the drastic increase of the world's meteorite collection, and prompted dramatic developments in planetary sciences.

5. GEOLOGICAL ACTIVITIES IN GONDWANALAND TERRAINS

Four AACH geologists who had worked mostly in Antarctica extended their field work to Sri Lanka, India, and Africa, which were once juxtaposed with Antarctica in the Gondwanaland supercontinent. They, together with Japanese and Indian students and colleagues, formed a small but international academic society the "Gondwana Research Group (GRG)", in 1992, and they further developed the group, inaugurated the "International Association for Gondwana Research (IAGR)", started to publish an international scientific journal titled *Gondwana Research*; furthermore, they published dozens of memoir volumes/special publications on the geology of Gondwanaland (e.g., Yoshida and Santosh, 1995a, b). They conducted several international conferences, mostly in Gondwanan countries, such as India, Sri Lanka, South China, Madagascar, etc., and escorted several Japanese geologists to the projects and conferences to encourage them to extend their work to Gondwanaland, and/or to do geological field studies in foreign countries.

In 1995, they formed a UNESCO-IUGS Research Project IGCP-368 (Proterozoic Events in East Gondwana) which over 300 scientists from 36 countries joined. The project produced numerous important publications (e.g., Yoshida et al., 2003) and accelerated the study of supercontinents, which is one of the most attractive topics in earth sciences today. The *Gondwana Research* journal has gradually evolved, and is competing for the top impact factor among the world's earth science journals.

6. GLACIOLOGICAL ACTIVITIES IN THE NEPAL HIMALAYA

The activities of AACH members on the glaciology of the Himalayas, as well as on Antarctica, are worth noting further. In the Himalayas the AACH members started

glaciological studies at the time of the Central Nepal Himalayan Geological and gGaciological Expedition in 1965 (cf. Table 1). They formed a long-term glaciological project (Yamada et al. 1992), that included scientists outside the AACH, accumulating valuable data up to the present, including the world's first ice coring of a Himalayan glacier, the Yala glacier near the Yala peak (Fig. 3, Watanabe et al., 1984), and prompting young scientists to join and continue the project. Their most successful work has been the long-term glaciological observations in the Langtang Valley of the Central Nepal Himalaya, in which several able young Japanese glaciologists were included and improved their research. They have dispatched numerous reports, which have formed a valuable database of the long-term measurements of glaciological phenomena in the Nepal Himalaya (e.g., Higuchi, 1993; Fujita et al., 2006).

Fig. 3. The world's first ice-coring in the Himalayas at the Yala Glacier west of the Yala peak in 1982.

7. GLACIOLOGICAL ACTIVITIES IN ANTARCTICA

In Antarctica around 1968, a group of geologists and glaciologists who mostly belonged to the AACH (Tb. 3) initiated and worked on a glaciological research project (Enderby Land Glaciological Project) in the tributaries of the Shirase Glacier (Fig. 4), and in 1982 further extended the study area, covering all of the Mizuho Plateau (ca 500000km^2, the Eastern Drawing Maud Land Glaciological Project) south of Japanese Syowa Station (Fig. 5). These projects continued successfully, with their results showing the characterization and budget of the ice sheets in the Mizuho Plateau (e.g., Naruse, 1978; Watanabe et al., 1988), which formed integral database used to consider the ice sheet conditions in Antarctica as a whole.

Year	*AACH members joined*
Enderby Land Glaciological Project	
1969-1970	H. Anto, M. Yoshida
1970-1971	O. Watanabe, K. Ishimoto

1971-1972	T. Kimura, T. Yamada
1975-1976	O. Watanabe
Eastern Drawning Maud Land Glaciological Project	
1986-1987	O Watanabe
Dome Fuji Ice-coring Project	
1992-1997	O. Watanabe, N. Higashi, A. Takahashi, T. Yamada

Table 3. AACH members worked on glaciological projects in Antarctica

Fig. 4. The triangulation survey in Mizuho Plateau in 1969 under the Enderby Land Glaciological Project

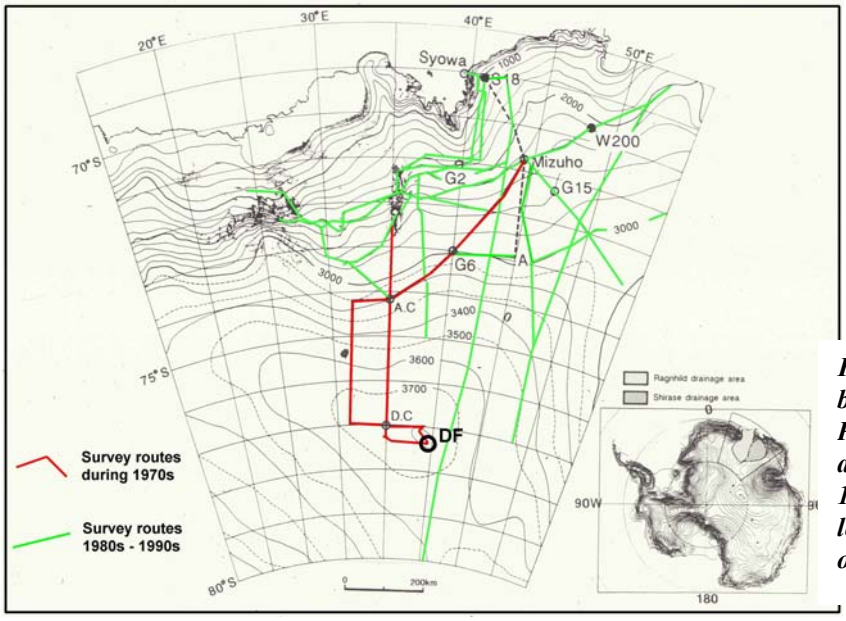

Fig. 5. Survey routes covered by expeditions in Mizuho Plateau and surrounding areas during the 1970s' (green) and 1980s' (red). A circle with the letters DF shows the location of Dome Fuji.

In 1992, a similar group of glaciologists mostly belonging to the AACH (cf. Tb. 3)

started the Dome Fuji Ice-coring Project at about 1000 km south of Syowa Station (cf. Fig. 5). The project succeeded in going deep into the ice sheet, forming a new record for Japanese deep ice drilling, and attained up to 3035 m depth in 2007, resulting in the second oldest time record (720000 years) collected from all world ice cores. Various analytical data from the ice cores have been contributing much to the globe community, especially in terms of past environmental studies of the earth (e.g., Watanabe et al., 1999; Motoyama, 2007).

8. CONCLUDING REMARKS

Since the late 1950's, field studies in both geology and glaciology by AACH members have developed and grown, and their results have contributed importantly to related scientific fields. Studies of AACH members, their successors, and their colleagues have formed major international references about the Himalayas and Antarctica, as dispatched from Japan. The student mountaineering club is thus considered useful to help youth to develop such spirit and behavior, as shown in Table 4, which are fundamental to conduct pioneering work in the field science studies..

1. Yearning for unknown land
2. Pioneering spirit: bravely creating new field
3. Positivism
4. Autonomy and responsibility
5. Synthetic judgment
6. Synthetic creativity
7 Ability of action
8. Cooperativeness and leadership

Table 4 Positive spirit and behavior that can be grown through the student mountaineering club activity

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