# The Icefield Ranges Research Project, 1974

Researchers are braving the Yukon ever earlier in the season for the Icefield Ranges Research Project (IRRP). The first group arrived at the IRRP Kluane Lake base camp (61°N, 138°30'W) on 15 April 1974 and the last group did not leave until 15 October. The winters of 1974 and 1975 mark the first occasion of the base camp being open year-round for two consecutive years. This innovation made possible as a result of the appointment of Mr. and Mrs. A. Williams as a resident camp-management team, is necessary scientifically because certain meteorological projects have to be conducted on a twelve-month basis, as discussed below.

One hundred and four researchers and their assistants, representing nearly twenty universities, government agencies and institutions, made use of the IRRP facilities, and approximately 3,300 man-days of accommodation and subsistence were recorded.

A number of improvements were made to the physical facilities; a new 24 ft x 12 ft (7.3 m x 3.7 m) utility building is now under construction, and two small trailer units have been installed by the group from the University of British Columbia as additional laboratory space for animal behavioural studies. The two ski-wheel-equipped Helio Courier aircraft of the Arctic Institute of North America performed a total of 173 hours of project-support flying, and in addition twenty hours of time of a Jet Ranger and a Hughes 400 helicopter was chartered. One of the Institute's aircraft, which was on lease to Trans North Turbo Air Limited and was engaged in commercial and tourist operations, suffered a minor accident during the field season. The largest aircraft ever to land at the base camp, a Canadian Forces Hercules transport, was used in support of the High Altitude Physiology Studies programme.

*High Altitude Physiology Studies (HAPS)*

The seventh year of these studies was safely completed under the direction of C. S. Houston, M.D., of the University of Vermont College of Medicine. A larger and more comprehensive plan of activities was however attempted than in previous years.

The HAPS programme is designed to investigate systematically the changes in water and electrolyte distribution and in hormone secretion which occur during exposure of human beings to conditions of lack of oxygen at high altitudes. In pursuit of this overall objective a number of different tasks were carried out simultaneously on the experimental subjects, and they are listed below. It is hoped from these studies, and from those of others, to develop better understanding of acute mountain sickness as well as of the basic mechanisms of acclimatization to altitude. There is a possibility that such studies of healthy individuals exposed to an environment abnormally low in oxygen may have important implications for ill persons residing in an environment with normal oxygen content. The long-term objective of HAPS may therefore be described as the formulation of a unified theory of human response to lack of oxygen.

In pursuit of this objective certain specific tasks were established for 1974: (1) to measure levels of aldosterone, renin and cortisols in blood and urine at frequent intervals during the first seventy-two hours at 9,600 ft (2,900 m) and 17,500 ft (5,300 m) respectively in order to acquire data supplementary to that previously obtained for the fourth through tenth days at high altitude; (2) to record the intake and output of sodium, potassium, and water by each individual during his stay at high altitude; (3) to record multiple lead electro-encephalograms at frequent intervals before and after high altitude is reached, and while ambient air and supplementary oxygen is being breathed, and after hyperventilation. Half of the subjects were given Dilantin (which alters or stabilizes cell membranes and thus may become important in the treatment of altitude illness) while the remainder received a placebo identical in appearance; (4) to count circulating blood platelets before and during hypoxia in all subjects, including scientists given Anturan (a medication which prevents agglutination of these formed elements and thus may alter susceptibility to high altitude pulmonary oedema); (5) to measure changes in pulmonary function by the nitrogen-washout method; (6) to calibrate the degree of hypoxia by frequent measurement of arterial blood oxygen, carbon dioxide and pH; (7) to take retinal photographs of all persons at the high altitude laboratory; and (8) to measure the number of formed elements and the amount of protein and ketone bodies in urine during hypoxia. In addition, the researchers observed and attempted to alleviate clinical manifestations of acute altitude illness when these appeared. Six of the eight tasks were completed in seven subjects at both 9,600 ft (2,900 m) and at 17,500 ft (5,300 m) — additional to control studies at 2,600 ft (790 m) either in Edmonton or at Kluane Lake — and in eight further subjects at 9,600 ft only. More than 400 blood and urine samples were brought back for analysis.

The success of a project such as this obviously depends a great deal upon the competence and compatibility of the people involved. In 1974, as a departure from previous practice, the support team were selected more for their interest in medicine and science than for their mountaineering experience, though obviously the latter was an important consideration.

The scientists came from four different medical centres in Canada and the U.S., and the result was a good deal of cross-fertilization of ideas and the introduction of larger perspectives into the research efforts. There were, as well, more physicians present than in the past, and they were therefore able to add to the safety and to the instruction of medical students.

The cooperation of the Canadian Forces was once again excellent and indispensable. From the Defence and Civil Institute of Environmental Medicine (DCIEM) HAPS received several staff members, the loan of expensive and critically-important equipment, and many supplies. The fifteen volunteers from the Canadian Forces who served as subjects were outstanding, being well-motivated and cooperative, and also active participants in all aspects of the programme. In continuation of the previous year's pilot project, an intensive five-day training course in ice and snow craft was given by an Alaskan climbing instructor. This was enthusiastically received by the volunteers.

It is believed that the 1974 data will complete most of the salt, water, and hormone studies (though some more may be done), so that the Project should move on to other less-explored fields. The most promising of these include muscular physiology during acclimatization to high altitude, and changes in, or modification of, the electro-encephalogram which provides at least an approximation of brain activity. Studies of blood platelets and pulmonary function have uncovered new, exciting, and possibly extremely important, evidence concerning the pathologic mechanisms in high altitude pulmonary oedema. These will be continued in 1975.

Under the Project consideration is being given to what may be a major expansion of the programme on the basis of the very favourable experience with medical students obtained in 1974. Because the interest of the support team stimulated the entire party so much, in selecting it in future preference will be given to medical and biological science students so as to develop with them a series of informal seminars, discussions and projects involving man's adjustment to various environments, including high altitude.

*Glacier survey project*

In 1972 the Institute was awarded funds by the Glaciology Division, Department of the Environment, Ottawa, to undertake an inventory of glaciers in the St. Elias Mountains. This work was continued during 1974 by Messrs, S. G. Collins and R. Ragle. Work on the glacier basins of the Donjek River, Alsek River and Tatshenshini River was completed. To date more than 2,000 glacial features have been mapped and recorded. They concern glacier size, location and description. The Project is scheduled for completion in 1976. An extensive bibliography of the St. Elias Mountains is in preparation also and now contains more than 1,100 entries.

*Climatological projects*

Under the direction of the Camp Manager, Mr. A. Williams, and Mr. R. Lenton of AINA, Montreal, and as part of a proposed long-range plan, two pilot climatological projects were initiated in 1974 on behalf of Environment Canada and Parks Canada. Standard and automatic stations were established in the Kluane National Park adjacent to the Slims River and at the 9,000 ft (2,700 m) Divide Station. The year-round meteorological project at Kluane Lake Base was continued in association with the Atmospheric Environment Service, Whitehorse, Y.T.

*AINA projects*

The following additional major projects were supported, in part, by AINA Grants-in-Aid funds:

*Mount Logan Survey* — Dr. G. Holdsworth, Environment Canada

*Surging Glacier Research* — Dr. G. K. C. Clarke and S. Collins, University of British Columbia

*Population Biology of Small Mammals in the Kluane National Park* — Dr. C. J. Krebs, University of British Columbia

*Aspects of Caribou Biology in the Vicinity of Kluane National Park* — Dr. J. B. Theberge and S. Oosenbrug, University of Waterloo, Ontario

*Operation Yukon 1974: Steele Creek* — Dr. W. A. Wood

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## Library Services

The interlibrary loan service of the Institute's library will be resumed with effect from 1 May.

Any inconvenience caused to Members as a result of the unavoidable suspension of the facility is much regretted.

## Charges for *Arctic* Reprints

For eight years, charges made to authors for reprints have changed very little. Considerable increases in costs have now taken place, however. A simple token of these is the fact that what has up to now been the cost to *Arctic* of reprints of 20 pages (the normal maximum length of articles) is now the cost of 8-page reprints.

As a necessary consequence of this, 100 free reprints will henceforward be available only in the case of papers not exceeding eight printed pages in length.

The entitlement to free reprints is, however, now being extended to authors submitting "short papers" (i.e. ones 1250-2500 words in length). As these are not subject to the same exigencies of space planning as are full-length papers and so, in general, can be published more quickly, it is hoped that more of them will be submitted to *Arctic*.

# *Obituary*

## Andrew Thomson, O.B.E. (1893-1974)

The many friends and colleagues of Dr. Thomson, former Director of the Canadian Meteorological Service and a Fellow of the Arctic Institute since 1954, will be saddened to hear of his death on 17 October 1974 in Toronto. He was 81.

Andrew Thomson was born near Owen Sound, Ontario, on 18 May 1893. He graduated from the University of Toronto in 1915 in Honours Physics, and later earned a Master's degree from the same institution. In 1958, he was awarded an honorary doctorate in science by McGill University.

Following a lengthy period abroad, during which time he worked with the Carnegie Institute in the United States, and in the South Pacific as director of the geophysical observatory at Apia in Western Samoa, Dr. Thomson returned to Canada in 1931. In January 1932, he was appointed head of the Physics Division of the Meteorological Service of Canada. Despite a reduced budget during the depression years, he was the prime organizer and promoter of Canadian participation in the second International Polar Year. He was also responsible for the organization of a post-graduate course in meteorology at the University of Toronto, which was given in cooperation with the Meteorological Service of Canada.

Shortly after the outbreak of the war in 1939, the British Commonwealth Air Training Plan was conceived and Dr. Thomson became the main organizer and administrator of the extensive meteorological programme that was required. For his contributions to the war effort, Dr. Thomson was awarded the Order of the British Empire in 1948.

Following the war, Dr. Thomson undertook the reorganization of the Canadian Meteorological Service on to a peace-time basis. He was appointed Controller (later Director) of the Meteorological Service in 1946. In this capacity, he planned and supervised the installation of the Joint (U.S.-Canada) Arctic Weather Stations, and also promoted Canada's active participation in international meteorological affairs. By the time he retired in 1959, Dr. Thomson had presided over a rapid and remarkable period of growth for meteorology in Canada, one during which there were marked advances in climatology, forecasting, research, instrument design, and training methods.

Dr. Thomson was a Fellow of the Royal Society of Canada and of the Institute of Physics of Great Britain. He was also Vice-President of the American Meteorological Society and a member of the Royal Astronomical Society of Canada, of the Royal Canadian Institute and of the Washington Academy of Science.

A pleasant, kindly man, Andrew Thomson was known for his quick mind and keen intelligence. A unique figure in Canadian meteorology for more than forty years, he was in many ways responsible for the stature the Meteorological Service has attained, both in government circles and in the public view.

*R. A. Miller*