WHERE WISE MEN DARE NOT TREAD

Belgium in Antarctica (1957 – 1970)

Tony Van Autenboer

Prof. Dr. Tony Van Autenboer was geologist and later expedition leader of several of the Belgian Antarctic expeditions in the period 1957-1970. He also participated in Norwegian, Danish and American research in the Arctic.

This paper is "his story" and does not pretend to be "history".

The way one experiences Antarctica is very personal and any story is bound to be biased, especially when it tries to evaluate. In this account, e.g. no appreciation is included for the work of the cook, who in the author's opinion did the hardest work at the station. Nor is the medical officer mentioned who had the least to do but probably had the hardest time…

For reasons such as these, the account tries to minimize personalisation.

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Abstract

The Belgian research in Antarctica between 1957 and 1970 is reviewed. The efforts to convince the authorities to participate in the "International Geophysical Year" with an Antarctic programme started much earlier. These efforts were crowned with success when Gaston de Gerlache and his team built King Baudouin Station on a small ice shelf in Dronning Maud Land, one of the last blank places on the maps. The station remained operational for three years and was a valuable link in the network of geophysical observatories covering the southern continent. It also served as a staging post for geographic reconnaissance and aerial photography, whilst dog teams operating in the mountains made it possible for geological, topographical and glaciological surveys to be carried out. In the beginning of 1961 the station was closed following the government's decision to stop funding Antarctic research. Three years later the station was rebuilt by a Belgian-Dutch expedition in which the Dutch participated for one third. The geophysical observations at the station were expanded, the field work was continued and some oceanographic studies were carried out on the journeys to and from Antarctica. Three years later "King Baudouin Station" was closed again and the name erased from the maps. Three short summers operating from the South African Station meant the end of the autonomous Belgian effort.

An overview is given of the scientific work, of the logistics involved and of the daily life at the station and in the mountains. Finally in an attempt to evaluate the effort in this period some points are stressed :

- The Belgian observatory was a valuable and vital link in a geophysical network covering what was then an unknown part of the southern continent. Geographic reconnaissances and photogrammetric surveys filled in blank areas on the map. The first geological, glaciological and topographic surveys were carried out in the Sør Rondane mountains, and many other scientific studies were initiated and later published.
- This scientific work enabled Belgium to participate in one of the most successful international programmes ever : the IGY. It also enabled Belgium to become one of the original twelve signatories to the Antarctic Treaty.

It must be regretted that not all field work was finalized by publications. The lack of continuity can be blamed for this. The major shortcoming of the Belgian Antarctic programme was the lack of government planning and government policy as illustrated in this overview.

There are still Belgian scientists working in Antarctica but Belgium is no longer present.

Introduction

On January 11 1958 the 60-year-old weather-beaten flag of the "*Belgica"* flew again in Antarctica : a simple ceremony marked the construction of a geophysical observatory in 70°25'S and 24°18'E to operate as Belgium's contribution to the International Geophysical Year (IGY).

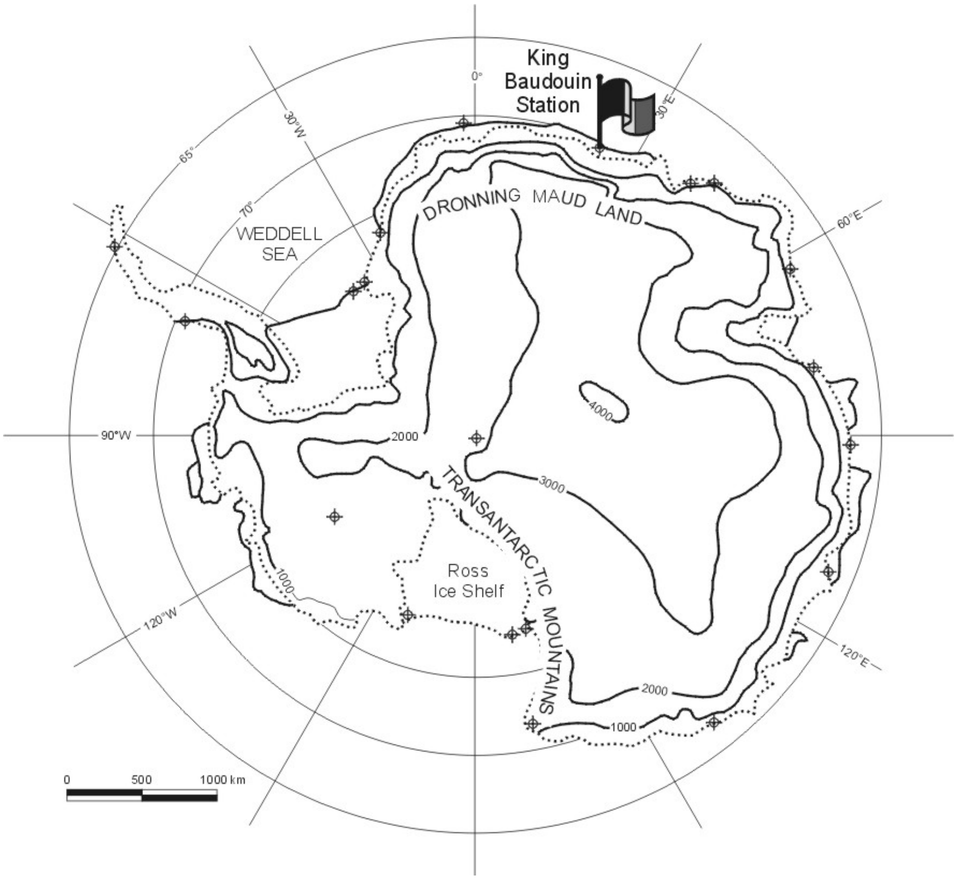

Figure 1 : The main IGY observations (1957, the stations on the Antarctic Peninsula are not shown). Situated between Norway Station some 1000 km to the west and SYOWA (Japan) to the east, the Belgian Station formed a valuable link in the geophysical network covering the sixth continent.

With King Baudouin Station operational, Belgium joined ten other nations already active in Antarctica (Argentina, Australia, Chile, France, Japan, New Zealand, Norway, UK, USA and USSR). The network of observatories that they established in response to the recommendations of the IGY covered the last major blank area on the geophysical maps of this planet. The establishment of the stations and the associated ship and aircraft operations also provided opportunities for other scientists to conduct their research e.g. in the earth sciences.

From 1958 onwards, the Belgian scientists enjoyed this association with an international group of Antarctic scientists. They soon formed a closely-knit team, linked by the common difficulties and hardships of the polar environment, the difficult and expensive logistics, and the struggle to deal with administrative paperwork whilst preparing themselves for blizzards and crevasses. The collaboration was unique, both between the individuals and between the scientific teams working under the umbrella of SCAR. This Special (later Scientific) Committee on Antarctic Research laid down guidelines and recommendations, and also provided a unique forum for discussion and exchange of information.

It is often said that this excellent collaboration between the scientists paved the way for their governments to collaborate as well, which resulted in the signing of the "Antarctic Treaty". By freezing all territorial claims this Treaty eliminated the real threat of conflict which then existed between some

nations with overlapping claims. It should be remembered that Belgium – although it had no claims - was one of the original signatories to the Treaty. Our diplomat Prof. Alfred van der Essen was instrumental in reaching so many agreements that he and Dr. Brian Roberts (UK) earned the unofficial title of "Founding Fathers of the Treaty".
It is also worth remembering that the backbone of the diplomatic representation to the Treaty was and still is formed and strengthened by the research activities in Antarctica.

Return to the Antarctic

The *"Belgica"* flag that flew in early January 1958 was also a symbol of a new beginning. Can it be taken as a sign that Belgian interests, which for more than half a century had focused narrowly on parts of tropical Africa, finally widened and discovered the rest of the world? This evolution was not spontaneous, and tradition and inertia in both the academic world and in governmental administration had to be overcome.

Meteorologist Edmond Hoge was the first to advocate Belgian participation in the Antarctic within the framework of IGY, but he failed to convince the authorities. The proposals by Air-Force meteorologist Frank Bastin also failed to catalyse a new initiative. The scientific community (the local IGY Committee) planned its contribution to be carried out between the national borders and in what was still Belgian Congo.

When Gaston de Gerlache decided to try to continue what was to become a family tradition, he had much better assets. His wartime experience as a Spitfire pilot in the RAF and his subsequent career as a lawyer led to this unique combination of a man of action who understood, or at least accepted, the stream of paperwork, the beloved tool of the government. The memory of his father, the now famous leader of the "*Belgica"*, opened many doors including those of reluctant cabinet ministers. They had much better plans for government subsidies, rather than financing research in an uninhabited part of the world.

The impressive series of the scientific results from the *Belgica* Expedition probably helped him to convince the scientific community. The local Belgian IGY Committee surprisingly reversed its negative advice given a few months earlier, and endorsed de Gerlache's initiative. When King Baudouin marked his interest, the last sceptics turned into enthusiastic supporters and in October 1956 the Council of Ministers voted a subsidy of 40 million (1956) Belgian francs.

The 1958 Belgian Antarctic Expedition was born and preparations began. The most urgent and critical task for de Gerlache was to ensure supplementary funding. Thanks to many private contributions and the help of the Ministry of Defence (personnel and equipment) an additional 20 million BF became available. The link with the Meteorological Wing of the Belgian Air Force deserves a special mention. From 1957 until the Belgian observatory was definitively abandoned (1967) the Meteo Wing provided meteorologists and technicians. An important part of the preparation of the expedition was also taken care of by this unit, especially in 1957 and 1958. Frank Bastin[1] was responsible for the scientific programme and Xavier de Maere[2] planned and designed the station to be built and its technical infrastructure.

Equally urgent was the recruitment of the 17 scientists and technicians[3]. This was critical as most of the members needed some extra training, e.g. the pilots practised take offs and landings on glaciers and the dog driver had to learn to handle a team of dogs from the Inuit on the West Coast of Greenland. Several members took a course on snow and ice techniques in Chamonix. The expedition leader also took part in a traverse in Adelie Land. This short trip was the only Antarctic experience available in the team.

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[1] Frank Bastin (Commanding Officer Meteorological Wing) was to lead the 1959 expedition.
[2] Xavier de Maere (Second in Command Meteorological Wing) was chief meteorologist and Second in Command of the 1957 expedition.
[3] A complete list of participants and their function is given in appendix 1. The average age of the participants in 1957 was 35.3 with the youngest 23 and the oldest 50 years of age.

To Dronning Maud Land

To ensure complete coverage, the network of geophysical observations had to be spread evenly over the southern continent. When Belgium finally decided to participate in the IGY, most stations were already built. The easily accessible areas had already been occupied, as well as those where buildings could be erected on a rock foundation[4].

De Gerlache's choice fell finally on Breidvika in Dronning Maud Land. Information on the area was scarce. In 1937 a Norwegian expedition with seaplanes, operating from a whaling factory ship, had taken aerial photographs. A rough map of the coast, with an indication of mountains further inland, was produced. Access to the ice shelf – still called the Barrier – was considered to be possible.
During "Operation High Jump" (1946 – 1947), a US Navy plane had taken a series of oblique and vertical photographs of the mountain range 200 km to the South. Norsk Polarinstitutt produced a map from these photographs in 1957 and christened the range Sør Rondane. The nearest geological information came from an area 1000 km further west, studied by a joint Norwegian-British-Swedish expedition some 10 years before.

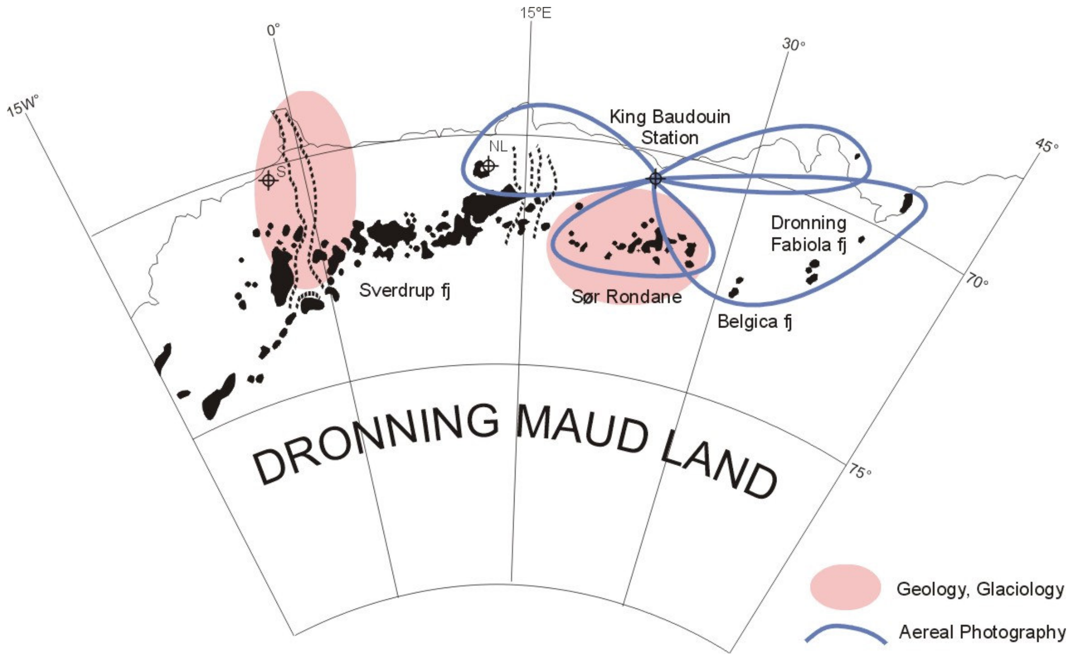

Figure 2 : King Baudouin Station and Belgian field work in Dronning Maud Land (1957 - 1970)

The choice of Breidvika for the Belgian station had a series of consequences : little was known about the belt of sea ice off the Dronning Maud Land coast except that it was broad and therefore difficult to navigate. Judging from the Norwegian charts the first rock outcrop was situated some 120 km to the south, so the station had to be built on an ice-shelf. This location in a virtually unexplored part of the continent proved a real bonanza for geologists, glaciologists and geographers, who from the outset joined the geophysicists at the station.

The expedition reached the coast of Dronning Maud Land on board two small Norwegian sealers during the last days of 1957. They were still uncertain of landing conditions and especially worried about access to the ice shelf. Unloading stores and equipment on the sea ice proceeded smoothly. A ramp formed by snow accumulation in the narrow inland end of one of the small inlets enabled access to the top of the ice shelf. From here transport over the smooth and level ice shelf was easy. After a few days of hard work, the first prefabricated building was erected some 14 km from the sea and "King Baudouin Station" could be marked on the maps.

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[4] Not all sites were chosen because they were easily accessible : the USA established an observatory at the geographic South Pole. Established by air, the operation was an ambitious and major logistic (and financial) achievement. The station has been rebuild since, and is still operational.

Figure 3 : Unloading the expedition's ship on the sea ice, from where the supplies were taken inland. Access to the ice shelf was possible in some small inlets where snow accumulation formed a ramp against the 20 m high cliff. The seaward end of this small ice shelf is around 200 m thick. (Photograph : T. Van Autenboer)

The geophysical observatory

Soon the first scientific observations started, to be expanded progressively as the two other buildings were completed and the instrumentation installed. The observatory programme, which did not change substantially during the next few years, was based on IGY recommendations[5].

The *meteorological* programme responded to one of the important IGY recommendations and included both surface and upper air measurements. The surface observations provided a three hourly record of temperature, pressure, wind, visibility and cloud cover. The upper air programme depended on the twice-daily launching of hydrogen-filled balloons with continuous radar-tracked sondes. These radioed pressure and temperature and allowed height, wind speed and direction to be calculated as the balloons climbed to their maximum altitude. Solar radiation and albedo were other important measurements as was the precipitation. The snow accumulation was also measured by the glaciologist on a series of markers some distance from the station. Normal accumulation was around 1 m/year (40 cm of waterequivalent).

The meteo team was usually the largest at the station. It came well-prepared as most observers and technicians were on detachment from the meteorological wing of the Belgian Air Force.

[5] The description of the station and the activities there, did not change substantially during the next two years. The new station, which was built in 1964 and in use until 1967, was almost an exact copy of the first one.

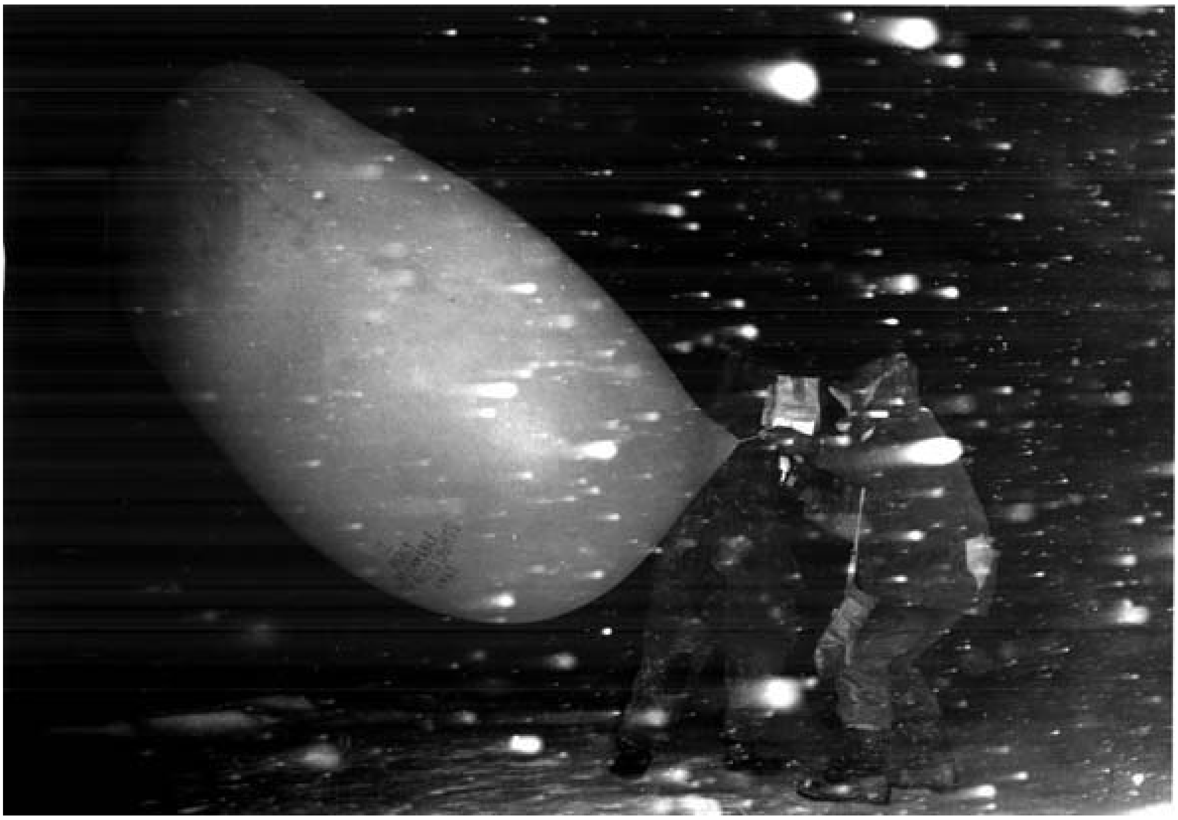


Figure 4 : A daily task for the meteorologists in summer and in winter, during day or night : launching balloons regardless of weather, temperature and wind speed. (Photo : L. Goossens, 1960).

They had to brave the elements to launch their balloons. It soon became a sport to get the radiosondes airborne under the worst possible conditions. Only exceptionally strong gales and blizzards stopped this daily exercise. Part of their work was not so pleasant and even dangerous : the preparation of the hydrogen for the balloons. Based on a chemical reaction involving caustic soda, an iron-silicium compound and water, it left sticky residues in the high pressure gas bottles. Modifications to the standard radiosondes were made to measure the *atmospheric electricity* and its gradient.

The *nuclear radiation programme* reflected the growing concern about the biological effects of the increased radiation caused by the nuclear and thermonuclear tests. The possibility of using these artificial products as tracers was already considered, e.g. to study the movement of air masses between the northern and southern hemisphere. (The use of these tracers later enabled the very limited snow accumulation on the polar plateau to be measured.) Continuous measurements of the radioactivity of the air and of the precipitation (snow and microscopic dust) were made at the station.

A related proposal was made to filter the melting water of the station in order to collect and study the meteoritic dust. The pure Antarctic environment was supposed to be ideal for this study, as was proved by the discovery much later of a rich harvest of meteorites on the blue ice fields. The study of extraterrestrial matter started at the Belgian station, was continued with success with the US Antarctic Program, as well was the use of the radioactive fallout as a reference horizon to measure the precipitation on the polar plateau.

The magnetic field is part of an interacting group of physical phenomena in and around the earth (i.e. atmospheric electricity, ionosphere, aurora and propagation of radiowaves). The *geomagnetic* observations were carried out in two special huts. One of them housed several photographic recorders operating at different speeds to differentiate between long and short term variations of the components of the magnetic field vector. In the other hut absolute measurements were regularly made.

The huts, in which no magnetic material such as steel nails or ordinary light bulbs could be used, were constructed at some distance from the magnetic disturbances of the station. In bad weather the scientist was guided to his daily tasks by a rope stretched between bamboos. Occasionally when the trap door of his hut was heavily drifted up, a rescue party from the main station had to go to dig him out. The magnetic sanctuary was roped off and strictly “off limits” to anyone not having a clear bill of magnetic health. However this did not impress the free-roaming dogs. An overcautious scientist even accused these friendly animals of causing magnetic storms! Cornered to explain the unlikely cause and effect, he pointed to the metallic clasp on their collars.

The solar UV radiation ionises the gases in the higher reaches of the atmosphere. Recombination takes place during the night and results in distinct ionised layers which reflect radiowaves. To study the ionosphere, a short wave radio signal with a frequency sweep from 1 to 25 MHz is sent. The time for the reflections to be received gives the height of the reflector or the ionised layer. With increasing frequency, the signal passed through the lower layers to be bounced off the next one. Signals are sent at fixed times (8 to 14 per hour), the reflections visualised on an oscillograph and recorded on 35 mm film.

The ionosphere sounder was massive and formed the central piece of equipment in the science building. It was also expensive (6% of the subsidies for 1958).
The ionosphere specialist could do his work in comfort. However, he had to face the cynical remarks of his colleagues as his programmed bursts of EM-signals disturbed the radio communications, and the equipment of pre-transistor age strained the rather limited capacity of the 20 kilowatt power plant.

Figure 5 : The ionosphere sounder. (Photograph : T. Van Autenboer, 1966)

The occurrence of *aurora* in high latitudes is linked to the earth’s magnetic field which creates preferential belts for the interaction between the solar particles and the atmospheric gases. Visual observations at the station could be made in comfort through a cupola in the roof, while a special all-sky camera with a 180° view of the heaven recorded minute per minute the evolution of these spectacular phenomena. Aurora observing at King Baudouin Station was at best a part-time occupation so it was entrusted to the geodesist and occasionally to one of the pilots who were not expected to do much night-flying.

The main *geodetic work* was of course the geographic exploration and the ground control for the aerial photography. The location of the station however, had to be determined as precisely as possible by astronomical positioning. This was probably the coldest of all jobs. The geodesist had to stand still for hours behind his theodolite adjusting the tiny knobs. For this he needed to uncover his fingers for a minute at a time during the coldest winter nights when no blizzards or drifting snow obscured the stars.

Figure 6 : The radio shack. Daily radio transmission of scientific data to Mawson, the Australian mother station, daily contact with Belgium and on rare occasions contact with sledging parties or aircraft. (Photograph :T. Van Autenboer, 1966).

Good radio communications were important to transmit the scientific data both to the network set up by IGY and to the world at large for guidance and advice when problems arose. The meteorological measurements had to be transmitted almost as soon as they became available to Mawson, the Australian station. From Mawson they were relayed to the USA where different synoptic maps were produced and forecasts prepared. This illustrates the importance of the link formed by the Belgian Station.

Most observations had to be made simultaneously at the different Antarctic stations. Accurate time keeping was therefore essential and depended on the reception of time signals from a transmitter with the call sign WWV.

The medical facilities, including a complete set of surgical instruments, were also located in the same building. Physiological research on the effect of cold weather and

strenuous work was carried out there.
Several observations such as ionosphere soundings and magnetic intensity, were still recorded on film so a well-equipped photographic laboratory was necessary.

The station

A lot of logistic support was needed to enable people just to live and work and to keep the instruments running. Besides the "Science" building, two other buildings were constructed : "Power" and "Quarters".

Constructions in the coastal areas of an ice shelf, where the snow accumulation is high, have their specific problems[6]. After some months, the buildings were covered by snow and only the protruding antennae and chimneys indicated that there were people living and working beneath. The electric light in the station was switched on permanently and the entrance was through the roof.
The accumulating snow load, accentuated by differential settling, slowly crushes the buildings, greatly curtailing their life expectancy. In addition, the warmth of the station melts the snow around it and a steadily increasing number of pots, pans and tins were needed to collect dripping water. Life expectancy of such a station is short.

Figure 7 : One year after construction the buildings are completely covered by snow and life becomes subterranean. Only aerials, smoking chimneys and observation cupolas indicate that there is life below the surface. The small raised hut contains a panoramic aurora camera. (Photograph : L. Goossens, 1960)

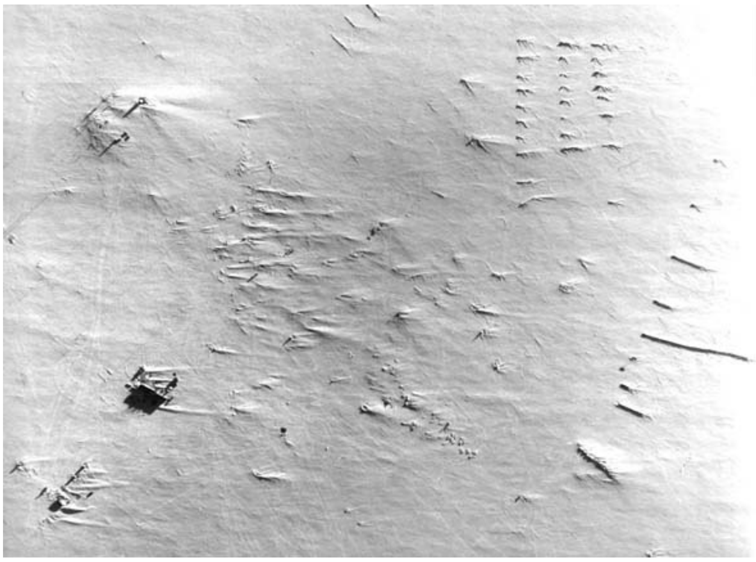


Figure 8 : King Baudouin Station seen from the air. Upper left : the snow covered station; lower left : erection of a new building; upper right : depot of material; centre right : long lines of fuel drums. (Photograph : Antarctic Expedition 1960)

A mechanical workshop and three 20 KW generators were housed in the "Power" building. The exhaust from the engines melted snow for the water supply. Kitchen and washrooms had running water, rather unique in the Antarctic at that time. Bread was baked in the kitchen and required an extra generator to provide sufficient electricity for the range.

The kitchen, washroom, living room, dormitory and radio shack were located in the main building. Corridors between the three main buildings were also used to stock the food supply and served as deep-freeze storage. A small hut used for the production of hydrogen for the meteo-balloons could be reached through a narrow and twisting snow tunnel (to minimize the danger of explosion).

[6] The station was built on a floating glacier or "ice shelf". Ice shelves produce the tabular icebergs of the Southern Ocean. The buildings must now be completely crushed underneath an estimated 17 metres of snow. Since 1990 a huge rift appeared between the seafront of the shelf and the station (H. Decleir, pers. comm.). Sometime in the distant future, the station will drift on the ocean inside an iceberg.

Little was known of the sea ice conditions which, even with the satellite coverage that became available years later, remained unpredictable. An extra year's supplies had to be stored should the relief ship not be able to reach the station during the following austral summer. This resulted in long lines of drums and crates of every size and description, marked by bamboo poles as the snow would soon erase any sign of their presence. A snow-shovel would be the appropriate symbol to mark such a station on the maps.

Work and life at the station[7]

Figure 9 : The glaciological pit reached a depth of 16 m in 1959 and was slightly deepened one year later. The ice stratigraphy was recorded. As a bonus mining the ice provided the water for the station. (Photograph : L. Goossens, 1960).

Once the buildings were erected and the instruments operational, most of the work could be done indoors. Fortunately, maintenance and general chores often meant working outside. This reintroduced some meaning into notions of day and night and provided much needed physical exercise. It also enabled some to tell tall stories about narrow escapes from blizzards and storms, while on many summer days the warmth of the sun could be enjoyed.

Digging a glaciological pit underneath the station was done at night as the electric saw used too much electricity for daytime use. When the pit reached its final depth of –16 m, it had provided a lot of ice for the water supply, and a lot of fun. As the shaft got deeper, stranger and stranger discoveries were enthusiastically announced. The resulting wild theories finally collapsed when mussels embedded in the ice at –15 m proved to be cooked and gave away the prank.

The dogs – huskies purchased on the West Coast of Greenland – lived outdoors. They were only brought in for short spells, when they were heavily coated with ice. Fed on frozen seal meat cut by chainsaw (a "bloody" job), they were free to roam outside and enjoy their fights. They were practically the only patients of the medical officer.

An important part of the "outside" work consisted of digging supplies out of the snow and bringing them into the station. A familiar sight was that of a lonely scientist, armed with packing lists, digging out crates, one after another, only to find that the required spares were in the very last one. The cook had less trouble finding volunteers to help him with his stores. Digging 44 gallon fuel drums out of the depots and taking garbage out of the station were never-ending tasks. Garbage collected in empty fuel drums and human waste were hoisted out of the station by block and tackle and dumped some 500 metres away. Liquid waste including used sump oil of all type of engines was even easier to dispose of as it percolated through the snow and disappeared. This easy way of disposal left no traces as within hours or days the refuse was covered by a blanket of snow and nobody thought anymore about it.

Maintenance of vehicles and aircraft was a cold and frustrating job. Everybody accepted the cursing of the mechanics when yet another Snocat had broken down or refused to start. Starting vehicles in bad weather was a major undertaking. Under poor conditions a small portable, hand cranked gasoline heater was pulled out of the base at the end of a rope and used to defrost and start a larger aircraft heater. With the larger heater in operation, there was a good chance of starting the Snocat, that is, if the batteries due from the base (where they were kept warm) arrived in time … After several hours, the vehicle would be ready to start working, if of course the weather had not deteriorated in the meantime.

[7] This paragraph contains some anachronisms which will only irritate former winter party members. Digging of the glaciological pit e.g. was only done in 1959.

Figure 10 : Overcast and wind still days were opportunities for outside activity. Supplies and spares were lowered through the hatch into the station. Waste collected in drums was pulled up by block and tackle. The small gantry crane was constructed to facilitate removal of material and waste from the base, from 8 m below the surface. After a few hours of operation the electric motor burned out, so the block and tackle had to be used again. (Photograph : T. Van Autenboer, 1966)

Life at King Baudouin Station was good : the buildings were warm and comfortable and the wining and dining worthy of a good restaurant (the wine had been provided by a generous benefactor). The library was well stocked and there were plenty of records and some 16 mm films (rather old ones because of the expense involved). Video recorders were still a thing of the future.

The radio operators had to keep to their schedules feeding the daily observations into the Antarctic network, and also keeping in contact with Belgium. They often doubled as radio amateurs, unofficially exchanging messages with friends and girlfriends all over the world. Especially dramatic were the messages received from Central Africa and relayed to Belgium shortly after the independence of Congo.

Sputnik, the first satellite, had just been launched and satellite coverage did not yet exist, so radio communications often suffered from poor ionospheric conditions. Participants could enjoy the – sometimes difficult – radio communications with home (a free telephone call and telegram every fortnight).

However, space was at a premium. The crowded conditions and life within a small group of people sometimes led to stress. The "subterranean" life and the long Antarctic night eliminated the difference between day and night. Together with the lack of physical exercise during long spells of blizzards, this often caused insomnia. The factors determining the local life and work were hardly ever overshadowed by news of the outside, even when this included earth-quakes, revolutions, wars, etc. Heated discussions about the respective merits of dog versus mechanized transport sometimes became personal whilst a prank with phoney newscast about a catastrophic devaluation of the national currency hardly raised an eyebrow. The lack of major problems caused the minor ones to be blown out of all proportion. "Tempests in a glass of water" de Gerlache called them in his memoirs. This "midwinter fatigue" soon faded away with the return of the sun and in most cases disappeared completely with the arrival of the relief ship which brought new people and direct news from home. In one sad case however, "fatigue" was an euphemism. Unfortunately this case was also a lasting one and has required continuous care ever since.

The difficulty to reach the station and its resulting isolation is illustrated by the very few visits from other expeditions to King Baudouin Station : six in six years, in the author's memory. Visitors were very welcome as a sign of life from another world, a possibility to exchange souvenirs, to gossip and above all as an occasion to celebrate. The Soviets, flying in two-engined Ilyushins, were the most frequent visitors, starting with the search-and-rescue operation in 1958 and ending in 1967 with a large geological party under the academician G. Ravich. Staying in the emergency building, they flew back and forth in their sturdy Antonov 6 biplanes. The time difference between Moscow and Brussels was much appreciated as New Year 1967 had to be celebrated twice ! Beginning of 1966 the IGY veteran M. Muruyama and his team visited the station on board the brand-new icebreaker Fuji. Hot baths were a treat. The South African ship RSA called at the beginning of 1967 to collect our dogs who were to pursue their geological career further to the east …

Field work during the first year (1958)

Navigation in the pack ice and the first reconnaissance inland were facilitated by the small Bell helicopter which the 1958 expedition had at its disposal. As soon as the equally small Auster aircraft was air-worthy, it began taking aerial photographs of the coastal areas. Assembled in long strips and fixed in space by geodetic observation points, these photographs would form the basis of new maps. Before winter, the Auster and a party with Snocats reached the eastern part of the Sør Rondane Mountains. They returned to the station with the small plane towed ingloriously behind a Snocat, but with the news that appeals to the hearts of all explorers : a massif had been sighted further east and it was within range of the Sør Rondane.

During winter, the aircraft mechanic repaired the plane and painstakingly adjusted the cylinder head directly to the cylinder block, as no spare packing could be found. Once winter was over, field work resumed with the two dog teams and their geologist-drivers starting the first survey in the eastern part of the range. The Auster was busy ferrying people to and from the station one at a time and the first photographs of the new range raised the explorers' spirits.

The helicopter, small and underpowered, was of little use above 1500 m. It was left behind in the Sør Rondane whilst a team of four worked in the new range, already christened the "Belgica Mountains". Bad luck struck as the ski of the Auster was caught by a sastrugi breaking the strut and ski[8]. After waiting for a few days, hoping for a rescue by vehicle, the four started to walk back, unaware of the panic at the station and the turmoil in the international press.

They had of course no radio contact. When the aircraft did not return on schedule, the aircraft mechanic set out on a predetermined route but failed to cross the heavily crevassed area which barred his route. The worried base leader informed Brussels. As the distance from Antarctica increased, so did the anxiety which became panic, and international help was requested. The Soviets dispatched a large aircraft from the other side of Antarctica. After several days of serrated flights and down to its last fuel, the plane woke the four Belgians resting in their small tent before starting yet another day of walking.

The 1959 Expedition

When the disappearance of de Gerlache and his three companions made headlines, Air Force meteorologist Frank Bastin and the 21 members of the 1959 expedition were in Cape Town ready to set sail for Antarctica. The decision to continue the research was reached by the Council of Ministers in June 1958. This left only five months in which to select personnel, prepare the scientific programmes and organize the logistic support. This was only possible because the ship had been chartered and the station was operational. The direct information from Antarctica also suggested practical solutions for problems which were theoretical before.

One month before the ministerial decision, the Commonwealth Trans Antarctic Expedition (TAE) had reached McMurdo Sound, completing the first crossing of the southern continent. This major undertaking, led by Dr. Vivian Fuchs, took two years, while the actual crossing was done in 99 days. It involved establishing bases and operating aircraft on both sides of the continent to support the traverse party travelling with dog teams, Snocats and World War II Weasels. The Trans Antarctic Expedition enjoyed tremendous publicity in the international press, especially after a journalist managed to present it as a race to the South Pole between Fuchs from one side and Edmund Hillary of Everest fame (who was to provide support) from the other side of the continent.

[8] Nine years later, the author located the aircraft lying upside down. Underneath, undisturbed by gales and blizzards, the pipe of the geodesist was found, still ready for use.

This achievement, and probably the newspaper headlines, had a major impact on the 1959 expedition. A major traverse was planned to reach a point 2450 km due south of the Belgian station. This would bring the party to the South Geographic Pole. In the plan of operations, this distance is given but no mention is made of the fact that this would be the Geographic South Pole.

Fuchs, by then Sir Vivian, also managed to convince one of his TAE companions, Ken Blaiklock, to accompany the Belgians to bring much needed polar experience into the team. Ken, a surveyor by profession, had the experience of six Antarctic winters, had been Base leader, and was the first man since Amundsen in 1911 to drive his dog team all the way to the South Pole. His experience with dogs and polar field work was crucial during the following expeditions.

The ambitious plan for the South Pole traverse was expensive in both extra personnel and equipment. When the “POLARHAV” sailed from Cape Town, three new Snocats were on board. In addition to the normal supply of fuel, some 300 extra 44 gallon drums had been delivered and several crates of dynamite. The old seismic equipment used by TAE was obtained on loan from BP. The expensive gravimeter was carefully suspended in a cupboard.

But for the usual gales, the trip to the Antarctic was quick and uneventful. When the pack ice was reached in brilliant sunshine, it was open and easily navigated. The kitbags were packed since the Belgian station was only hours away …

It was still “only hours away” seven weeks later when the US “GLACIER”, then the most powerful icebreaker in existence, arrived from the other side of Antarctica to free the icebound “POLARHAV”. Slowly it had to cut a channel through the dense sea ice. The expedition members had time to walk from their ship to the “GLACIER”. They climbed on board to observe the icebreaking for some hours before returning to their own ship. Once freed from the ice, the Norwegian ship was not powerful enough to follow in the channel cut by the icebreaker. Personnel and supplies were transferred from the small Norwegian sealer to the big icebreaker.

Figure 11 : The US Coastgard icebreaker "Glacier" frees the Norwegian sealer Polarhav which has been trapped in the ice for seven weeks. The Belgian team on board the Polarhav transferred to the icebreaker with all their equipment to continue the trip to the station. (Photograph : US Navy, 1959)

A beer party was held on the ice (the US Navy and the Coastguard ships are dry !) and some 200 US sailors and about 30 Norwegians and Belgians enjoyed their cold beer in an equally cold and sleazy dribble. A football match which produced a satisfactory score of some concussions and several broken arms and legs had to be concluded before the GLACIER continued to the Belgian station. Some weeks behind schedule, unloading proceeded extremely rapidly and taking over the station was hurried up. Finally, on February 21 1959, the “GLACIER” left Breidvika with de Gerlache and his team on board. They were transferred to the “POLARHAV”, which had been waiting near the edge of the pack ice.

In less than two months, international solidarity once more had proved to be generous at a cost that far exceeded the entire budget of the Belgian expedition.

The plans for the South Pole traverse were not changed despite the late arrival. A party of seven soon left in five Snocats, towing ten sledges, each loaded with twelve 44 gallon drums of fuel. When the convoy was within sight of the first nunatak, the weather deteriorated. The vehicles were left in line, heel to toe, facing straight into the wind (the worst possible way of parking vehicles because of the formation of snow drifts). This lack of experience and a blizzard – unexpected as usual - meant the practical end of the “South Pole dream”. It took seventeen days to get moving again, with one damaged Snocat left behind in a field pockmarked by deep trenches where vehicles and sledges had been dug out.

The mountains were reached without further difficulties and the two dog teams, which accompanied the Snocats part of the way, stayed behind to start geological and topographical surveys of the Sør Rondane mountains. The motorized team was unusually fortunate to find a route[9] up Gunnestadbreen, an outlet glacier cutting through the range. Between the sheer rock face on the western side and the serracs on the eastern side, a narrow corridor led to the upper reaches of the glacier. Led by one of the dog teams signalling the crevasses, the Snocats reached one of the last outcrops of the Sør Rondane on the edge of the polar plateau, where a big fuel depot was established.

Figure 12 : Bad weather coming. Let us prepare for a blizzard. (Photograph : T. Van Autenboer, 1959)

On their way back this party reached the abandoned vehicle and found the geological team camping there, also on their way home. Very reluctantly, the dog team had to agree to join the mechanized party which had decided to push on come hell or high-water, regardless of weather, of day and night and lack of sleep.

The following days were hell! Packing up the tent. Digging out sledges. Waiting. Digging again. Trying to move again. No luck. More waiting. No shelter from the wind and drifting snow. No shelter in which to eat or to rest. What is happening? Not enough food? Not enough fuel? Another Snocat to be abandoned. Still waiting. Wind increasing to blizzard strength. Getting nowhere. Dogs in and out of the Snocats. Exhaustion and finally lethargy.

[9] This passage was also used by A. Hubert and D. Dansecoer on their remarkable 1999 crossing of Antarctica.

After three, four (or was it five?) days, camp was finally set. It took hours to put up the tent, clothes wet and frozen, sleeping bags full of snow, hands frost bitten. Desperation was now very close. After a shivery night, the youngest mechanic of the vehicle party managed to get things moving again and at a critical moment, the weather improved, long enough to reach the station.

The return was not a triumph. Two vehicles had been abandoned, three members out of seven of the Snocat party were completely incapacitated and arrived home in sleeping bags. A depot had been established only some 450 km short of the planned point.

Disaster could have been the prize for inexperience. A major catastrophy had been narrowly averted. Was it due to impatience or was it panic? It certainly meant exhaustion and desperation, with lack of experience being the main culprit. Years later, the same ground was covered more than one month deeper into winter and without incident. With patience and a good tent, the worst blizzard can be weathered.

The abandoned Snocats were recovered later. The vehicles only returned to the mountains in full summer, doing some seismic shooting to determine ice thickness. They also brought supplies for the two men and seventeen dogs who were to carry out the geological and topographical surveys of the Sør Rondane.

The geophysical observations at the station, which began in 1958, continued without interruption. Daily data transmissions were carried out with the same regularity. The digging of a glaciological pit to study the stratigraphy of the ice was started and served as the drinking water supply.

The medical officer started a physiological study to determine the effects of cold weather and physical stress on the human body. At the station a meteorologist tried to simulate sledging conditions living in a crate, subsisting on half rations and doing hard physical work. As a reward for this dedication, the variation in the secretion of his 16 hydroxysteroid glands were immortalised in a publication. The main victims however were the geologist and the surveyor working with the dogs in the mountains. For them it meant collecting body fluids during 24 hours and keeping partly-filled urine bottles in their sleeping bags to prevent them from freezing.

This sledging party (a geologist and a surveyor with their seventeen dogs) left the station in October 1959. On their return from the mountains in May 1960, they found a completely new team at the station.

The 1960 Expedition

The departure of the POLARHAV from Ostend in December 1958 had been marked by a simple ceremony. The Minister of Education announced that it had been decided to organize Belgian Antarctic activities on a more permanent basis and that at least ten more expeditions were to follow. This probably encouraged the home base, as a “Centre for Polar Research” was established, complete with a director, a technical and financial division, a secretariat, a library, and even someone responsible for the welfare of the families left behind in Belgium.

When the 1960 expedition arrived in Dronning Maud Land, it was on board the largest ice-strengthened vessel ever chartered by the Belgians. As impressive as the size of the ship was the new equipment : two brand new aircraft (a DH3 Otter – the work-horse of the Arctic - and a Cessna 180), new vehicles increasing the transport capacity to seven Snocats and two smaller Muskegs, plus a new and large building to serve in case of an emergency, more Greenland huskies, reinforced by a psychiatrist to study the behaviour of the winter party.

The expedition leader was Guido Derom, a former Air Force pilot. He was also in charge of the scientists and technicians who could use the ship’s short stay in Antarctica to carry out their research. These “summer” people were soon classified as “tourists” by the over-wintering party.

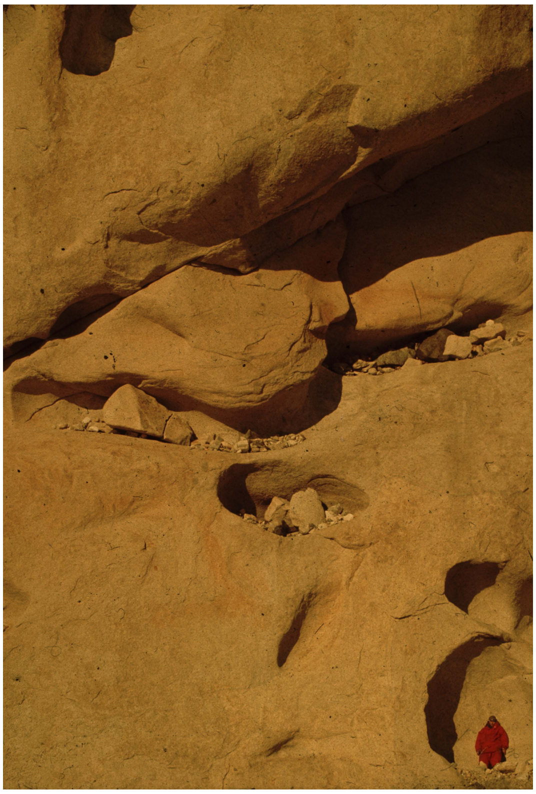


Figure 13 : Sør Rondane (Menipa). Honeycomb weathering in granite. (Photograph : T. Van Autenboer, 1960)

The available aircraft were put to good use by a team led by Antoine de Ligne, by now a veteran pilot of the 1958 expedition. The "Otter" was equipped with a very modern, large aerial camera, on loan from the Ministry of Defence. The oldest pilot managed to reach a height of 17 500 ft, quite a performance with the piston-engined airplane. The beautiful photo mosaics and the geodetic control points on the ground enabled accurate and detailed maps of the coastal areas and the "Belgica Mountains" to be produced.

The geophysical programme at the station remained almost the same as in previous years. The observations continued without interruption and were carried out meticulously and with the same punctuality. The glaciologist studied the crystallography of the alternating summer and winter layers in the glaciological pit. The measurements of the radioactivity were expanded and now included a radiometric survey in the mountains. The psychiatrist conducted tests and interviews and was suspected of recording some conversations. His presence at the station also freed the other medical officer, who was promoted to assistant surveyor.

Characteristically, Derom managed to inject some sporting spirit into routine chores, which he turned into Boy Scout outings. The record of successful meteo balloon launchings by the first expeditions had to be broken, even if it meant that all expedition members had to be mobilized. Linked arm in arm against the raging storm, they formed a human shield behind which the balloon could be inflated.

During winter, seal meat stored about 7 km from the station was needed. This meat was cut into thick blocks which was frozen into one layer of "concrete" half a meter thick and buried 2 m under the snow. It was an opportunity to get some people who were showing the first symptoms of "winter fatigue" out of the station. This simple task was quickly transformed into a major and complex operation aptly termed "Wintergarden". It involved a tent camp with every man that could be freed from his job, the dog teams, Snocats and the Cessna. During the few hours of twilight, the small aircraft flew back and forth between the camp and the station bringing a thawed out chainsaw to the "gardeners" and flying one blocked by frozen gore and ground meat back to the station. The flying time was four minutes. The operation was a success, the dogs enjoyed the meat.

The aircraft greatly improved the possibilities of the sledging parties which now numbered three dog teams. The geologist and the surveyor of the 1959 party stayed for a second year in the south enabling a six month long field season (October 1959 to May 1960).

The surveyor established a triangulation network over the major part of the Sør Rondane mountains whilst the geologist mapped the rock outcrops. Food boxes, as soon as they were empty, were filled with rock samples. A gravity survey was carried out with the gravimeter suspended in a frame on the dog sledge[10]. Topographic measurements and gravity data led to the first estimate of the amount of ice channelled by the glaciers through the mountains[11].

[10] This way of transporting the very expensive and delicate instrument was rather unusual. Its key component was a tiny spring in fused quartz which was very sensitive to shocks. It was found that dog-sledge transport caused less "drift" than carrying it by hand.

[11] For this, stakes were placed across the glaciers and their position and elevation were determined from the triangulation network. The difference in position measured later, gave an idea of displacement and velocity. Gravity measurements allowed calculation of the ice thickness, which combined with the velocity gave an idea of the ice discharge.

Figure 14 : Gravimetry in the Sør Rondane with the Cesna (summer 1960). (Camera : T. Van Autenboer, 1960)

With the arrival of the 1960 expedition, the population in the Sør Rondane doubled. A physicist joined the geologist to measure the radioactivity of the rock outcrops. The surveyor was placed under permanent medical surveillance as the second medical officer became his assistant. He helped to build cairns and to carry the heavy theodolithe and tripod to the mountain tops.

The expedition leader joined the sledging parties towards winter. He wanted some experience... He was lucky to get a lot of it in a very short time. In really bad weather the catabatic winds destroyed his tent. Later the sledge was ruined by the sastrugis and with the abatement of the wind, the temperatures dropped (close to 60°C below at night). On the way back to the station in May 1960, he was made to run besides the sledge in order to keep the dogs in good shape… He kept to his aircraft afterwards.

During the winter the conversation at King Baudouin Station reflected the difficulties in Brussels. Would the expeditions be continued or would the base be closed? When it was finally clear that the station was to be abandoned, seven members volunteered to man the station for another year and to continue part of the programmes. This offer was rejected in Brussels.

The sledging parties were flown back to the mountains in the middle of September 1960. After a comfortable two hour flight, a team of two men, nine dogs, sledge and equipment was ready to start working and had food for at least 30 days. A small transmitter was installed in the central part of the mountains which allowed occasional radio contact with the base. Before the only link between the sledging parties and the outside world had been a tiny receiver. They could not answer or ask for assistance. This did not really matter : before the arrival of the airplanes no assistance could be given.

By October 1960, the air team had established a temporary camp in the central Sør Rondane. From here the two planes, flying together, carried out a geographical reconnaissance of the unknown area between the Belgica Mountains and SYOWA, the Japanese station some 400 km further east, where fuel was available for the long flight back.

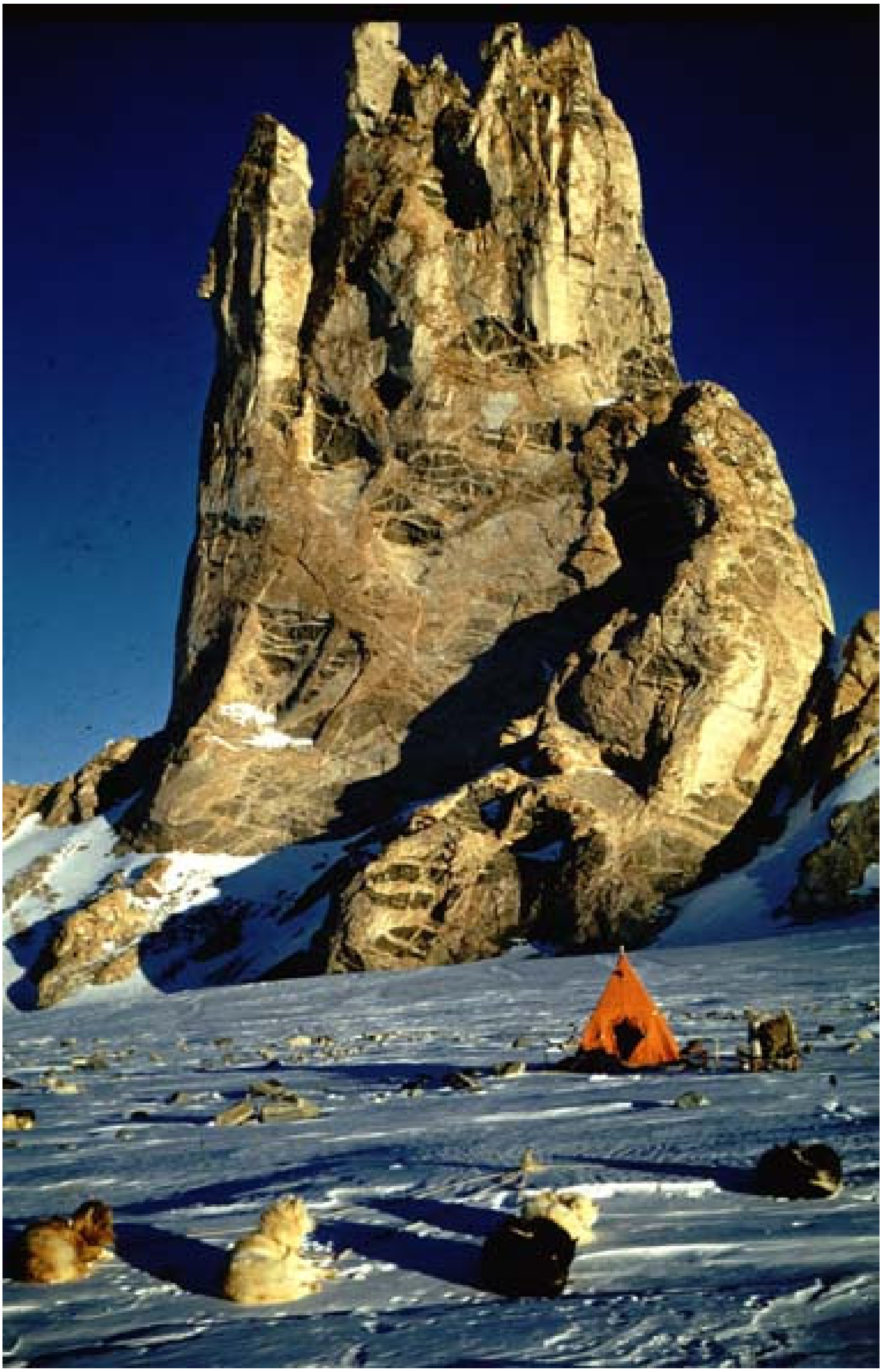
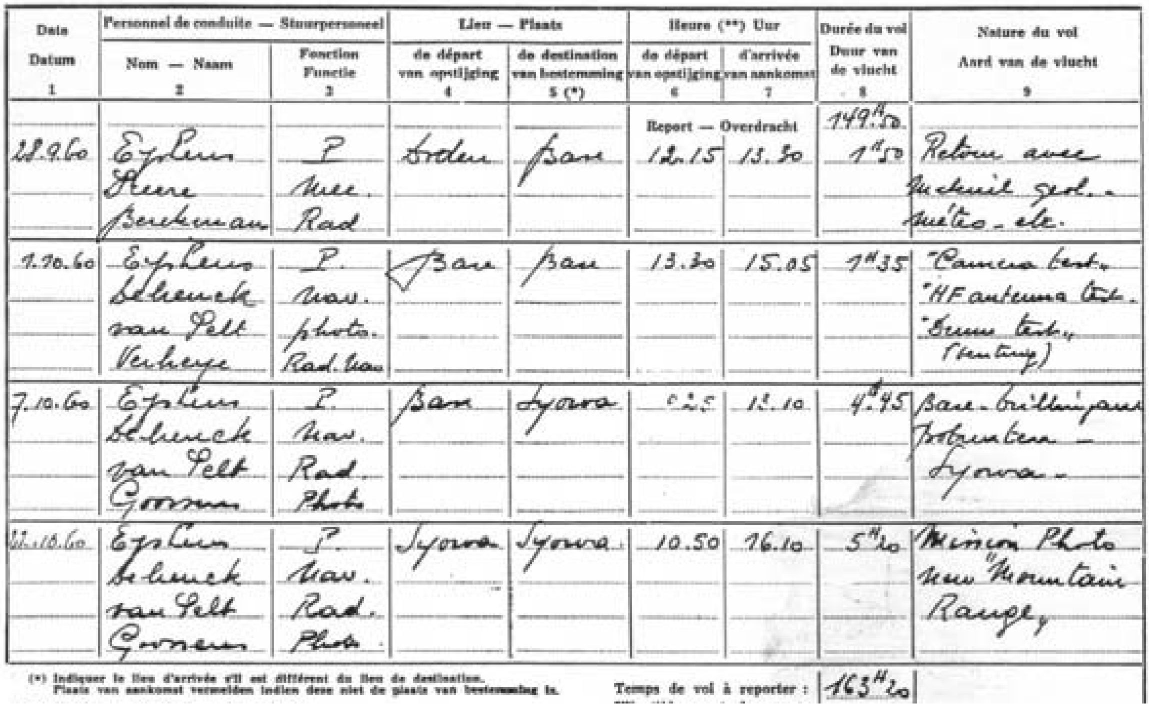


Figure 15 : Sør Rondane (Tårnet). This sheer rock face is some 800 m high and about 2 km from the tent. (Photograph : T. Van Autenboer, 1960)

A small, uncharted mountain range was observed and later photographed. In November 1960 it was named the “Queen Fabiola Mountains”. In the meantime, a Japanese traverse using the information from the aerial reconnaissance reached the same mountains and carried out the first geological and morphological studies. When the Japanese named the same mountains “Yamato Mountains”, telegrams flew back and forth. Finally the question was referred to the diplomacy and authority of the Foreign Ministry. As a result, the different names still apply to the same mountain area with “Dronning Fabiola Fjellet”, as used on the Norwegian map, the most common.

Towards the end of the year, the tail section of the Otter was damaged beyond the possibilities of local repair. However, it was flown back to the station[12].



Date / Datum 1	Personnel de conduite — Stuurpersoneel: Nom — Naam 2	Fonction / Functie 3	Lieu — Plaats: de départ / van opstijging 4	de destination / van bestemming 5 (*)	Heure (**) Uur: de départ / van opstijging 6	d'arrivée / van aankomst 7	Durée du vol / Duur van de vlucht 8	Nature du vol / Aard van de vlucht 9
					Report — Overdracht		149h50	
28.9.60	Eyskens Pierre Berckman	P Méc. Rad	Boden	Base	12.15	13.30	1h50	Retour avec matériel géol. - météo - etc.
1.10.60	Eyskens Schlenck van Pelt Verheye	P. nav. photo. Rad. nav	Base	Base	13.30	15.05	1h35	"Camera test. "HF antenna test. "[illegible] test. ([illegible])
7.10.60	Eyskens Schlenck van Pelt Goorman	P. nav. Rad. Photo	Base	Syowa	[illegible]	12.10	4h45	Base - [illegible] - [illegible] - Syowa -
22.10.60	Eyskens Schlenck van Pelt Goorman	P. nav. Rad. Photo.	Syowa	Syowa	10.50	16.10	5h20	Mission Photo new "Mountain Range"

(*) Indiquer le lieu d'arrivée s'il est différent du lieu de destination.
Plaats van aankomst vermelden indien deze niet de plaats van bestemming is.

Temps de vol à reporter : 163h20

Figure 16 : The logbook of the DH3 Otter noting the observation of uncharted mountains between the Belgica Fjellet and the Japanese station (on October 22, 1960). The mountains were christened Dronning Fabiola Fjellet by G. De Rom. The Japanese who reached these mountains somewhat later refered to them as Yamato Mountains.

The relief vessel which arrived mid January 1961 carried a large summer party, including a photogrammetric and geodetic team which without the Otter had no official task to perform. A drilling team led by Edgar Picciotto, glaciologist of the 1958 expedition, very successfully used the short summer-stay to drill a 116 m deep hole in the ice shelf and to study the stratigraphy of the ice core. It was also a pioneer undertaking in stable isotope geochemistry with the analysis of the heavy oxygen isotope, a prelude to the study of the climatic history of the earth. As during the previous summer, some biologists were able to study the oceanic life.

The dog teams returned from the mountains to find a station where the scientific programmes were terminated, and instruments and equipment packed and ready for transport to the ship. A delay due to bad weather which prevented the last Snocats, the dog teams and the Cessna aircraft from reaching the ship, apparently made the captain afraid of becoming icebound. When the weather improved, a last and sour note was struck. Although the ice was breaking up and drifting out to the open sea, the captain refused to keep his vessel near the ice front, thereby abandoning Snocats, a precious sledge load of meteorological data and the Cessna aircraft on the sea ice. Heated discussions resulted. The captain ignored the evidence, referred to the danger of besetment and refused to enter the bay, whilst the expedition leader was unwilling to abandon his equipment. However, when the Cessna sailed by on an ice floe hardly wider than its wingspan, it became clear that the rest of the equipment was now

[12] In the company of a equally red Snocat, it now forms a bright contrast to the grey of the surrounding fighter planes in the Air Force Museum in Brussels.

lost and sail was set for the north. This sad episode was never explained. The captain was evidently over cautious and the expedition members not cautious enough having left their results until the very last moment to be brought on board.

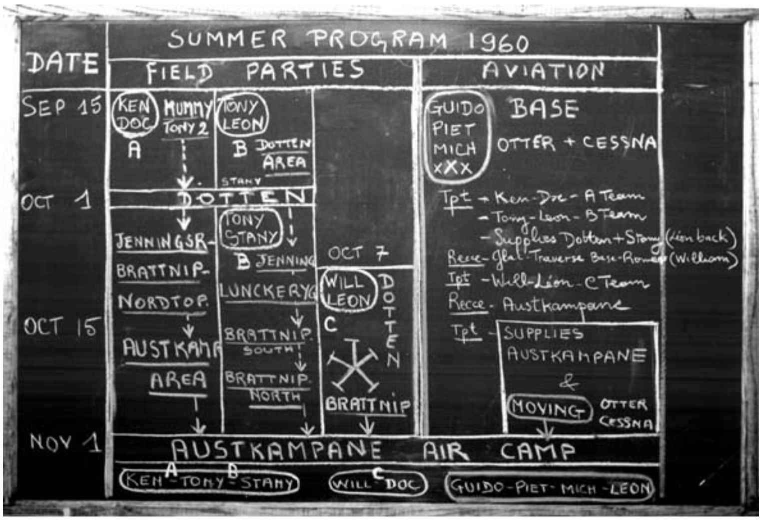


Figure 17 : Blackboard at the station : planning the field activities for the 1960-61 summer. (Photograph : L.Goossens, 1960)

As had been the case in the two previous years, the expedition was welcomed home during a very official reception attended by members of the royal family (in 1959 King Baudouin had welcomed de Gerlache and his team). The aftermath of the expedition formed a sad contrast to the royal welcome and fell into a total vacuum : the large secretariat which once existed had evaporated. Despite its size, or probably because of it, no provisions had been made for the scientific data to be analysed and published and almost nothing had been done to prepare for the return of the material and equipment. It was left to Ms Paulette Doyen, the lonely remaining scientific secretary, to deal with this long list of problems. The interpretation and publication of results depended almost entirely on the initiative of the individual scientist and the devotion of the secretary. Thanks to her efforts at least some of the results of 1959 and 1960 have been saved[13].

The governmental decision to close the Belgian station less than one year after a substantial investment in equipment had been made, was never officially explained. No-one questioned the minister who two years earlier had announced the ten year plan. Apparently it is the undisputed privilege of politicians not to be held responsible for their announcements and to be able to change plans at very short notice.

1964-1967 : The Belgian-Dutch expeditions

Three years later, de Gerlache convinced the government to continue the research in Antarctica, this time in collaboration with the Netherlands. The Dutch participation was limited. They took part in the expedition in the - for the Belgians - safe proportion of one in three. The Belgian research was financed by the recently created Science Policy Department. The Dutch programme was organised by the Royal Meteorological Office with the financial support provided by Z.W.O., the organisation funding pure scientific research.

This renewed activity at King Baudouin Station very fortunately coincided with another international effort to coordinate research : the International Quiet Sun Year, when solar activity was at its lowest, and the disturbance of the interrelated fields of ionosphere, geomagnetic field, aurora and atmospheric electricity at a minimum.

The 1964 Belgian-Dutch expedition was led by Luc Cabes, the geomagnetician of the 1958 Belgian expedition. It arrived in Dronning Maud Land on board of the MAGGA DAN, one of the Dan ships well known in polar waters. The station, almost a replica of the first base, was rebuilt on the same site. Comfort was increased as prefabricated and insulated panels were used to construct the corridor between the buildings which replaced the iced-up slippery gangway of the first station. The observatory programme on the whole remained identical, but was expanded with ozone observations. More emphasis was put on the atmospheric electricity and new instrumentation was installed, such as a nuclear proton magnetometer, a Selzer coil to measure rapid geomagnetic variations and riometers to measure cosmic noise.

[13] All data reports of the 1958 expedition which was organised under the direct responsibility of G. de Gerlache were published.

Figure 18 : Top : The library in the living room of the station built in 1958 (Photograph : L. Goossens, 1960). Below : Seven years later the snow accumulation slowly crushes the buildings. The library shelves can be identified on both photographs (Photograph : T. Van Autenboer, 1967).

The MAGGA DAN returned to the station at the beginning of the next year (1965) with de Gerlache coordinating the different activities. These included the handing over of the station to the new team led by Winnoc Bogaerts, the air operation under Antoine de Ligne with a turbo powered helicopter and the old timer Cessna. A rather large geological and geodetic team led by Tony Van Autenboer was to work in the Sør Rondane. The helicopter proved extremely useful for the ice reconnaissance and for local work during unloading. For field work in the mountain range its usefulness decreased rapidly with distance, due to its heavy fuel consumption which could not be met by the transport capacity of the Cessna.

For the first time, motor toboggans were used and found to be very fuel efficient and reliable, though slow. The summer party covered a broad field of activities. Glaciological stakes dating from 1959 were remeasured, which gave a 7 year observation period for the glacier movement.

Orientated rock samples were taken for paleomagnetic studies, additional aerial photographs were taken and large rock samples were taken for geochronological dating. The diplomat Alfred van der Essen, present as an observer, was allowed to carry some of the heavier rocks. This first hand experience undoubtedly added weight to his authority during the next meeting of the “Antarctic Treaty”.

The programme at the station continued during 1965 with additional measurements of ozone concentrations and atmospheric electricity. Some field work was initiated. The surveyor established a geodetic network of markers over the ice shelf and linked to the adjacent ice-rises, where the glacier rides over the bedrock. Without fixed points in the neighbourhood, the survey was to be repeated to provide information on the relative deformation and movement of the ice.

The snow accumulation and the melting of the ice, caused by heat loss from the station, had their effect on the buildings which were designed with economy in mind. During the winter Exantar (the office in Brussels) received a ciphered telegram from the station leader who was worried about the safety of the quarters. A steadily increasing number of stanchions were needed to prop up the broken rafters in the roof of the building[14]. It was clear that the life expectancy of the new base would not equal that of the Clements huts assembled in 1958. This shows that “quality rather than economy” is the best advice for a polar environment. This was also proved by the Rhombic antenna dating from 1958, which had weathered innumerable gales and blizzards, but was put to use again during the winter of 1965, thereby improving radio communications.

[14] The buildings survived another year. However, in 1966 a small forest of props and stanchions formed a labyrinth in the living room.

The 1966 Belgian-Dutch expedition continued the observations at the station, increased the emphasis on the atmospheric electricity and the study of the ozone layer[15] even more. The expedition leader was geologist Tony Van Autenboer, for whom it was to be his third full year in the south. This meant that the investigations in the mountains were to be continued. In 1960 he had experienced the excellent and flexible collaboration between aircraft an dog teams. He hoped to continue in a similar way, but he was now limited by a tight budget. He managed however to obtain an Otter aircraft on loan from the US Army, but the huskies had to be purchased on the west coast of Greenland.

Figure 19 : Putting the wings on the DH3 Otter, on the sea ice (1967). (Photograph : T. Van Autenboer)

With the additional support of the helicopter on loan from the Belgian Army and the old-timer Cessna, a large air team was operational during the ship's stay in Breidvika. A photogrammetric survey of the coastal areas with geodetic control points was carried out. Also during that summer, high altitude balloons were launched to study the solar particles. A biologist studied the feeding habits and behaviour of the penguins for a second season, to determine the best conditions for their transport to the Antwerp Zoo, where he intended to offer them the best care and hospitality. Other biologists studied the marine life.

Figure 20 : The huskies were keen to supplement their daily 450 grams of pemmican. (Photograph : T. Van Autenboer, 1959)

The Otter aircraft established depots in the mountains for the geological parties. The food included rations especially elaborated for sledging parties by the Medical Research Council (UK) and dog pemmican (450 gram/day/dog). The depots having been established, the autonomy of the sledging parties was considerably increased. The velocity and ice-thickness profiles were remeasured and expanded to include the faster streaming glaciers to the east and west of the mountain range, and enabled the total discharge of ice through the range to be calculated as 1.6 km^3/yr. The maximum velocity was 38 m/yr, the greatest ice thickness 2 km, while the bottom of some of the ice filled fjords was found at 300 m below sea level.

The relationships between the different rock units were studied in more detail. It was by then clear that the Sør Rondane belonged to the East Antarctic craton : with metamorphic rock 900 to 2700 million years old cut by younger (600 million year) granitic intrusions.

The sledging parties stayed as long as possible in the mountains and only returned to the station at the beginning of the winter when there was hardly any daylight left. During these last days, the temperature dropped below –50°C in the morning sun and was estimated close to -60°C at night. These low temperatures were experienced only when there was not a whisper of wind and when the crisp dry and cold air created a special but not unpleasant atmosphere. It was considered wise to avoid the increased air intake associated with strenuous physical exercise. The dogs also had to be rested very frequently. When pulling the sledge, a small cloud of steam appeared above the team. On waking up in the morning – a double sleeping bag and a reindeer skin underneath provided sufficient insulation – the tent was filled with a mist of tiny ice crystals. A thin blanket of snow, formed from the condensation of their respiration, covered the sleeping bags. Brushing away this snow before lighting the primus is essential. This contrasts with conditions at the height of the summer. With twenty four

[15] The hole in the ozone layer was certainly measured but it was not realised that there was a "hole" as the wider regional picture was not yet available.

hours of sun, the entrance to the tent was often left open and in the mornings one could feel the warmth of the sun on the canvas of the tent through the down of the sleeping bag.

Figure 21 : Small (2 x 2 m) pyramid tents offered sufficient comfort when the floor was covered with reindeer skins and heavy down sleeping bags, even with outside temperatures close to sixty below. Food was mainly dehydrated and prepacked. Kerosene was rationed : 1/2 litre a day for winter and 1/4 litre a day for summer sledging. (Phototograph : T. Van Autenboer, 1960)

Worst of all were the blizzards. They merit the most dramatic descriptions to be found in romantic literature. Visibility reduced to nought, the anorak opening in front of the face immediately clogged by snow, unable to walk because of the lack of visibility and the force of the gale…
Blizzards could be weathered in some comfort inside the tent (and sometimes welcomed as a day of rest), but when they lasted more than a few days – which was often - the condensation caused ice to accumulate between the tent walls. The reindeer skins underneath the sleeping bags soon became saturated.

During winter at the station, a coded telegram brought the sad news : the base was to be closed for a second time. Again no official reason was offered which generated persistent and credible rumours that horse trading between the two countries had broken down. The Netherlands refused to continue the Antarctic collaboration unless the Belgians shared the cost for some large-scale antenna project.

Packing equipment and instruments again marked the final days at the station.

Before King Baudouin Station was closed and its name erased from the maps, another summer programme was carried out. It included the continuation of the photogrammetric survey and the first geological observations in the “Belgica Mountains”. A very large oceanographic team worked on the voyage to and from the Antarctic and transformed the ship into an oceanographic laboratory with all kind of devices to be towed behind the vessel or to be lowered into the ocean. Every possible parameter was measured (water depths, temperature and oxygen content, salinity and many others). Every nook and cranny of the ship’s saloon was filled with pumps, meters and recorders. Data sheet and samples were everywhere. In spite of this major undertaking very few results were published.

Figure 22 : The dogs were hitched in a fan formation as used by the Inuit. This keeps the dogs happy as they like to work in company. Each dog hauls approximately its own weight over distances of 30 to 40 km a day.
(Phototograph : T. Van Autenboer, 1966)

Collaboration with South Africa (1968-1970)

By now the dogs had become interested in the hard rock geology of the east Antarctic craton and joined the South African expedition. They were to meet their Belgian friends again during the three following summers (1968, 1969 and 1970) when joint summer-expeditions with South Africa were organised. Belgium was to provide aerial support with the Otter, whilst the South Africans offered their hospitality on board their ship (m.v. R.S.A.) and at SANAE Station, 1000 km to the west of the former Belgian Station.

In the summer of 1968, the Belgian team concentrated its fieldwork on Jutulstraumen. This impressive, 50 kilometres wide, heavily crevassed glacier cuts through the mountains and nourished "Trolltunga", one of the very large ice-tongues. The geology on the east side was studied and gravity and magnetic profiles were measured across the glacier and its tributary Viddalen. The interpretation of the results made it clear that the glacier was conditioned by its position on a down-faulted block and that its asymmetrical bottom profile reached depths of 1500 m below sea level and a maximum ice-thickness of 2500 m. Jutulstraumen is an ice filled fjord not unlike Sognefjord in Norway with a similar depth of 1300 m below sea level. The velocity of the ice-stream is high (300 m/yr) and the total discharge was calculated to be ± 13 km^3 per year. This yearly production could meet the demand for water in Flanders (counting all water : domestic, industrial and agricultural) for more than 15 years.

At the end of the season, the two small planes were flown back from Cape Town to Belgium to avoid the substantial cost of sending them by sea. This 17 day trip provided more adventure than the entire summer in the Antarctic[16].

For the 1969 season, a prototype of ice-radar was commercially available[17]. This allowed continuous measurements of the ice thickness to be made from an airplane, a big improvement over the gravimetric method. The Belgian team rented an ice-radar, tested it on Hardangerjøkelen in Norway and used it extensively in western Dronning Maud Land. They produced maps of ice thicknesses and of the subglacial relief as results of the first systematic radio-glaciological mapping.

During the radar flights, the disappearance of part of the Trolltunga - an immense ice tongue fed by Jutulstraumen - was observed. Satellite pictures showed that an area of some 4500 km^2 had calved off at least two years before the disappearance was noted. The resulting iceberg was followed for 10 years on satellite images. Its area corresponds to 14 % of the surface of Belgium, a country which according to Sarah Wheeler (Terra Incognita) seems to function almost exclusively as a measuring device for natural disasters[18].

The continuation of the radioglaciological survey was planned for the 1970 season. Unfortunately, a rough landing in poor visibility caused the strut of the ski of the Otter to pierce the radio equipment and a reservoir of hydraulic oil. The fire which resulted completely destroyed the plane, including the radar.

This seems to have been a symbolic end. Back in Belgium, it was soon learned that continuing the collaboration with South Africa –however advantageous – would be vetoed by some politicians.

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[16] Most of the flying was done at tree top level to avoid detection as permission to fly over several central African countries was refused. Nevertheless the team (4 in the Otter and 2 in the Cessna) was arrested twice. Navigation aids on the ground were not working and maps outdated. The paperwork was also impressive. The team had to produce dozens of manifests without knowing what a manifest was or what it meant to be. The local authorities studied the documents very carefully, most of the time the way we handed them over, i.e. upside down. They were apparently satisfied with our literary efforts.

[17] The permeability of ice for radio waves had been known since the twenties when the aerials of the Bird expedition continued to function when buried in the snow. Based on the failure of standard altimeters over the Greenland ice cap, US Army CRELL conducted some measuring tests in the mid sixties. Dr. Stan Evans of Scott Polar Research Institute (UK) developed the first specifically designed ice-radar, the idea was generated during the study of the reflections of ionosphere records.

[18] Some exaggeration is perhaps not unusual to this journalist, as the original 4 500 km^2 of icebergs have now become 12 000 square miles or 26 400 km^2.

Europe in Antarctica ?

The Antarctic science perspective was now changing rapidly… The symposium on Antarctic Geology in 1970 in Oslo heralded a new era when the Norwegian newspapers headlined “Gold in Antarctica”. Based upon the discovery of gold in rocks similar to the gold-bearing conglomerates of South Africa, this drew the attention to the theoretical mineral richness of the Southern Continent. Geologists soon enhanced this theoretical presence to probable occurrence when promoting their research. This was to backfire as the budding “Green Movement” soon understood possible occurrences to be proven reserves. The spectre of oil spills and mining wastes of these still–to–be-discovered deposits triggered an active campaign. The politicians, eager to find issues on which to agree, ultimately banned all mineral exploration and exploitation within the framework of the Antarctic Treaty.

From 1970 onwards, there was also a change in other aspects of the Antarctic scientific scenery. The observatories were by then operating on a permanent basis, the logistic possibilities had increased considerably and most of the continent was mapped. The exploratory phase was nearing its end and problem-solving science emerging. The proposal for a European programme in Antarctica was an example of this new approach, aimed at one broad problem : the changing environmental quality.

The first proposal for such a collaboration caught on rapidly. A committee chaired by de Gerlache was established by the Council of Europe. A series of meetings in most European capitals was needed to formulate a programme, to finalize a logistic plan and to calculate its cost. The core of the proposal was a study of the Dronning Maud Land ice dome, as an archival source of environmental data on the variation of climate and atmospheric composition and the study of its mass balance as part of the interaction with the oceans and the world’s climate. The science was sound as became clear when the programme resurfaced later in national and international programmes (e.g. the EPICA European Programme on Ice Coring). The idea to pool resources to realize a major undertaking was of course evident. Politically it failed. As the agreement on how to proceed between the smaller European countries was excellent, the reason for this failure might have been the attitude of the main players in European politics. The UK stated from the beginning that all its resources were already claimed by their ongoing programme. They offered however to help when possible and did so effectively (Thank you Dr. Charles Swithinbank !). The German delegate was convinced that the best way to conduct Antarctic research was to carry it out in Greenland. In the author’s opinion the French were the most difficult. Convinced of the value of their own programme and considering their own ways of implementing it as the only possible, they were reluctant to consider any other alternative. It seemed that they wanted to call the tune, lead the dance and wave their flag.

In Belgium the proposal by the Council of Europe was not even considered. This marked the end of autonomous Antarctic research in Belgium.

Evaluation

It is not easy to evaluate the Belgian effort in Antarctica during this period. A general overview should not dwell on comparisons between the different expeditions nor try to compare their scientific and technical achievements.

Mainly thanks to the initiatives of Gaston de Gerlache and the memory of the “Belgica”, Belgium once again learnt that its interests should not only be focused narrowly on darkest Africa. This enabled Belgium to participate in one of the most successful International Scientific Projects of global interest : the International Geophysical Year. It did so as a full partner and was recognised as such with the King Baudouin Station operational in one of the remote areas of Antarctica.

The Belgian station was constructed in what was then the largest blank area on the world-map. Before it became operational, the area was equally blank on the geophysical maps. Once operational, it formed a vital link in the geophysical network covering the icy continent and much of the southern hemisphere. It was highly valued internationally for the quality and punctuality of its observations and the regularity of the data transmission. Systematic measurements of the radioactivity of the air were first carried out at the Belgian Station, as were some physiological studies on the effects of hard physical efforts in cold weather on the human body. This station also was a staging post for geographic exploration, mapping, geology, glaciology and later biology and oceanography.

The establishment of this scientific observatory allowed Belgium to become one of the twelve original signatories to the Antarctic Treaty. This unique treaty, signed in 1959, eliminated the real threat of conflict which once existed between nations with overlapping territorial claims by freezing “sovereignty ambitions”. It now offers one of the most fruitful areas for international collaboration in scientific research. The Belgian scientific programme in Dronning Maud Land formed the backbone of our diplomatic representation to the Treaty.

The scientific merit of King Baudouin Station was the indispensable and highly valued link which it provided in a network covering Antarctica. This network allowed the study of physical phenomena on a continental scale. In aerology e.g. it led to the determination of the upper air cyclonic paths above the South Polar continent with the advection of warmer air-masses from lower altitudes[19].

Most geophysical observations have been published as data reports. There has been little interest in further study and analysis of this data. With the exception of a few publications and the study of the climatology and of the rapid variations of the magnetic field, little has been done.

In the field of other sciences there was a rich harvest of publications, mainly in international journals. Most of them dealt with the earth sciences : glaciology, geochemistry, geology, geochronology, palaeomagnetism or geomorphology. The first geological map of the Sør Rondane was published and the geodetic work in this mountain range was used by Norsk Polarinstitutt to produce a new topographic map.
Details of coastal outlines, ice-shelves and mountain ranges were soon to be added to the maps. Thanks to the photogrammetry, new and detailed maps of these coastal areas and mountains were produced. Several papers on marine biology were published, but the results of a large-scale oceanographic survey are still awaited.

Figure 23 : Shipping empty, often leaky, drums back to the scrap yards in Belgium in 1967. Following the code of good environmental practice "avant la lettre ?" Unfortunately the action was purely financial : obtained on loan from a government agency the drums had to be paid for if not returned; the state of the drum did not matter. (Photograph : T. Van Autenboer, 1967)

In general it is clear that the analysis and study of the results depended very much on the interest and the goodwill of the individual scientists[20].

It was evident that Antarctic exploration was well received in Belgium and attracted the interest of the general public. The very generous contributions of materials, food and equipment from many private firms must be seen as a token of this appreciation. The successful sale of postage stamps could be taken as a similar signal.

One very black mark on the Belgian record was a complete neglect of the – by now elementary – care for the environment : dumping waste, letting waste liquids (including sump oil) drain away, abandoning fuel depots and dynamite, …, all polluting the biggest reserve of pristine water on this planet. It must be stressed that in this the Belgians did not differ from the other nations. This neglect by scientists and technicians under no production stress simply means that they were unaware of the potential impact of such practices. It also means that we should not judge industry too harshly e.g. when they used poorly drained ground to dump their waste. The practice has changed and nowadays, following the Madrid Protocol of the Treaty recommendations, most of the waste is shipped out of Antarctica. At some stations, costly clean-up operations are being carried out. Such an operation is technically impossible at the former Belgian Station. However Belgium should endeavour to retrieve the fuel dumped on top

[19] It is this air-movement and the associated precipitation that allows a unique record of past climatic changes with global significance to be found in the ice-cores of deep drill holes. It also explains the high interdaily variability of the temperature which was already described and noted during the “Belgica” expedition by H. Arctowski.
[20] It has been said that to ensure publication and continuity in the results, it would have been better to contract universities or research institutes. Perhaps so, but the one attempt to do so was far from positive.

of Gunnestadbreen in 1959 before wind and ice crystals erode the drums. Care must also be taken of the explosives abandoned there[21].

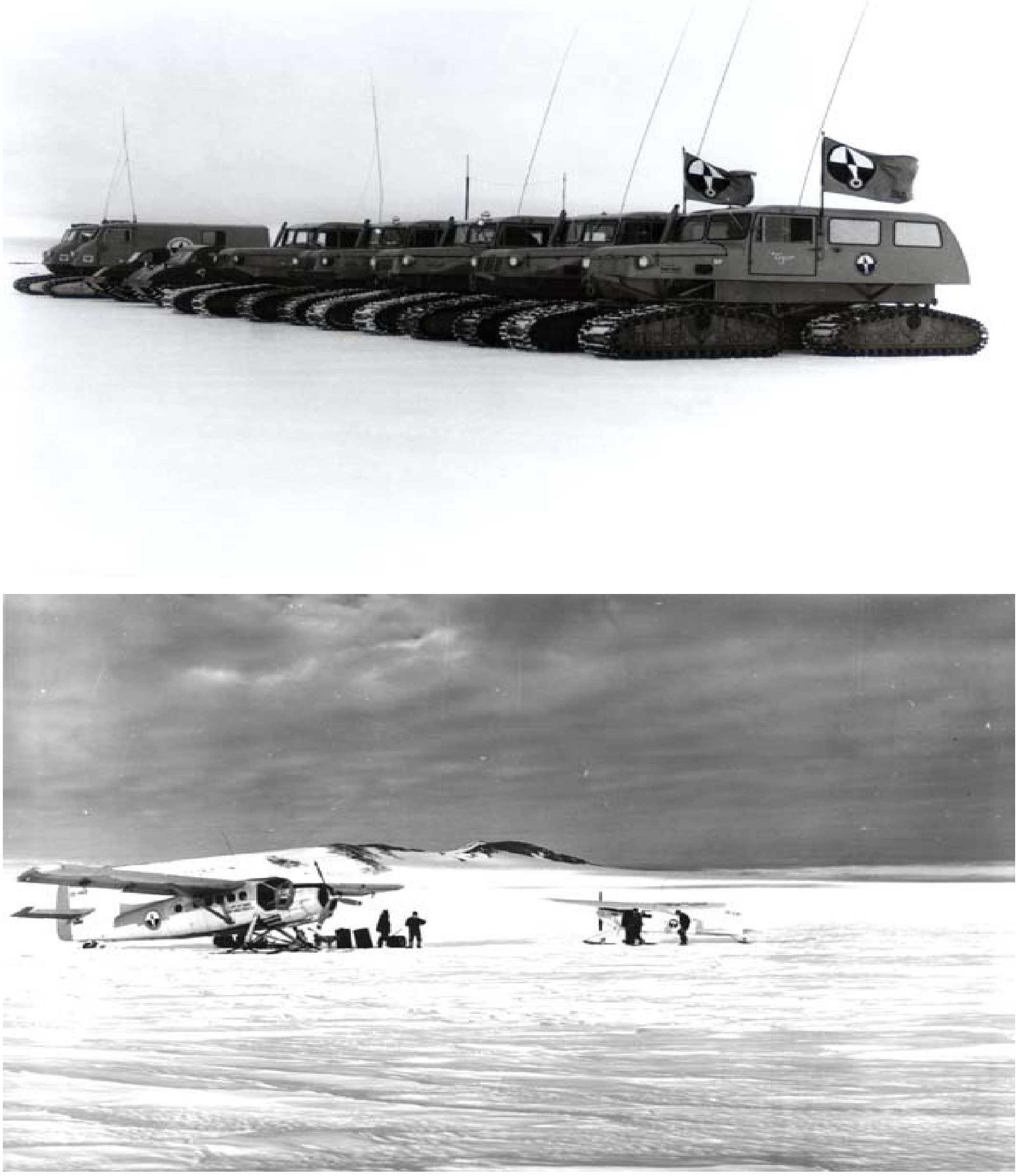

Figure 24 : Seven Snocats, two Muskeg tractors, three dog teams, two aircraft and one emergency building. With the observatory fully operational, this meant that a maximum of logistic possibilities was available when the government decided to close the station. (Photograph : L. Goossens, 1960 and T. Van Autenboer, 1966)

There are other aspects of these polar activities which can be regretted or judged otherwise. The geographic exploration e.g. still had a touch of the heroic age and some unnecessary risks were taken. Three aircraft were lost and a near catastrophe with a vehicle traverse was narrowly averted. Fortunately there was no loss of life. The absence of organization at home after the return of the 1960 expedition with a lack of provision for the analysis and publication of the data was another major shortcoming.

The little interest shown in continuing the analysis of the geophysical data must be regretted, but it can be blamed partly on the uncertainty of governmental decisions and the lack of continuity.

[21] H. Decleir revisited the Sør Rondane with the Japanese expeditions and met a Japanese explorer who, unable to read the markings, proudly showed him a case of TNT found on a moraine and left there by the Belgian expeditions 30 years earlier.

This leads to the overriding conclusion that the major shortcoming is to be found on the home front and at the highest decision-making level.

For a government to finance Antarctic Research substantially and then to withdraw this support soon after the announcement of a 10-year-plan by the minister responsible for this research, and immediately after allowing the acquisition of expensive equipment, is difficult to understand. And when this scenario repeated itself three years later, it became obvious that there had been no sound analysis of the implications and benefits of this investment, that there was no long-term planning, that there was no policy on Antarctica and that there was definitely no science policy[22].

However some government agencies did keep a careful watch on what was happening in Antarctica : between 1947 and 1998 no less than ten special stamps featured Belgium's role in the Southern Continent[23].

It should also be said that most of the scientists and technicians who spent one full year in the South and experienced the Antarctic winter treasure the memory of that year and would not have wanted to miss the experience.

King Baudouin Station is no longer marked on the Antarctic charts. Thanks to the generous invitations from other nations, there are still Belgian scientists working in Antarctica. Belgium however is no longer present.

Figure 25 : Members of the 1966 Belgian-Dutch Antarctic expedition, closing King Baudouin Station on February 9, 1967. This also marked the end of Belgium's autonomous presence in Antarctica. (Photograph : T. Van Autenboer, 1967)

[22] This statement is made in connection with Antarctic Research covering the period 1957-1970. It is also relevant in other fields : similar short-lived flares were a Centre for Volcanology and a Centre for Geomorphology.

[23] The special surcharge and the purchase of the stamps by philatelists all over the world made this a profitable operation. Six of these stamps had a special surcharge; the profits from only two of them went to Antarctic research. The destination of the revenue from the others – which was substantial and would have been enough to finance three summer expeditions – has not been made public.

Acknowledgments

The author is indebted to many people who made his polar ventures possible – especially to Gaston de Gerlache – and to all those with whom he shared this experience. Two sledging companions deserve a special mention : Ken Blaiklock the first year in the mountains, and Stany Berckmans. Ken introduced him to dog driving, sledging and the "Cremation of Sam McGee". Stany, a rock of equanimity, grew more and more imperturbable as things went from bad to worse.

The Sør Rondane was the last unexplored big mountain range on this planet. We enjoyed there one of the last periods of freedom with our only concern to work and to live (sometimes to survive). Only weight limited our actions. No exhaust ! No radio communications and messages received on a tiny receiver could be ignored or declared unintelligible when they did not suit us…

The seventeen Eskimo sledge-dogs were our companions and friends, not mere draft animals.

On a later journey, trapped inside our tent by one of the worst blizzards ever, Hugo Decleir told me a fascinating story of pulsations and rapid variations of the magnetic field vector. Tempted to include this together with many other comments that he made and for which I am grateful, I decided to leave this for him to share with his grandchildren. He also diluted some of the considerations which he - as editor – considered too acid. Thanks are also due to former companions Jos Van Baelen, Ken Blaiklock, Jaques Maquet, Walter Loy and Roger Ketelers for their corrections, remarks and warnings.

If inadvertently someone should try to read this paper, then he should share the author's gratitude to Ann Markham, Chris Cammaer and Petra Snellings. Chris meticulously misunderstood every word that could be misunderstood in the fifteen draft versions typed out by Petra. Chris also reduced, enlarged, cut and assembled figures and photographs and changed dead and stale phrases into a readable story. Ann hoped to have identified a client but found a patient in need of a program (sorry : programme) for syntax, grammar, orthography, punctuation, colons, hyphens, commas and many more commas…

Addendum : Members of the Belgian Antarctic Expeditions 1958 - 1970

Belgian Antarctic expeditions

1958 de Gerlache de Gomery G. (B) expedition leader/pilot
Cabes L. (B) geomagnetism, Carels R. (B) photography, de Ligne A. (B) pilot, De Maere d'Aertrycke (B) meteorologist & second in command, della Faille d'huysse G. (B) cook, Giot J. (B) topography/geology, Hoogewijs J. (B) radio, Hulshagen C. (B) mechanic, Loodts J. (B) geodesy, Picciotto E. (I) geology/glaciology, Van de Velde M. (B) mechanic, Van Gompel T. (B) medical officer, Vandepoel G. (B) meteorologist; Vanderdoodt M. (B) meteorologist, Vanderheyden H. (B) aircraft mechanic, Vandevelde H. (B) ionosphere.

Summer party 1957-1958 Laenen P. (B) mechanic, Vanhomwegen J. (B) pilot, Vanhoudt R. (B) logistics, Wolaver (USA) observer.

1959 Bastin F. (B) expedition leader/meteorology
Blaiklock K.V. (UK) geodesy, Caussin S. (B) mechanic, Cools H. (B) logistics, Dieterlee G. (F) seismology, Dillen L. (B) photography, Dircken F. (B) cook, Kelecom A. (B) ionosphere, Ketelers R. (B) radioactivity, Maquet J. (B) geodesy, Remson G. (B) radio, Schonlau R. (B) radio, Staquet M. (B) medical officer, Suetens P. (B) radioactivity, Swaab H. (B) mechanic, Van Autenboer T. (B) geology/gravity, Van Baelen J. (B) meteorology, Van de Can Y. (B) glaciology, Van der Schueren A. (B) atmospheric electricity, Vandenbosch (B) meteorology, Verfaillie G. (B) magnetism, Warnon R. (B) mechanic.

Summer party 1958-1959 Boulanger R. (B) radioactivity, Crosby M. (US) observer, Kipfer P. (B) radioactivity.

1960 Derom G. (B) expedition leader/pilot
Berckmans S. (B) radioactivity, Blaiklock K. (UK) geodesy, Colin D. (B) medical officer psychiatry, De Breuck W. (B) glaciology, Debauve J. (B) cook, Dubois J. (B) medical officer, Eyskens P. (B) pilot, Foccroulle M. (B) geomagnetism, Goossens L. (B) photography, Gordts F. (B) meteorology, Gregoir J. (B) meteorology, Mouton W. (B) mechanic, Pierre M. (B) mechanic, Pirsoul P. (B) meteorology, Van Autenboer T. (B) geology/gravity, Van Marcke R. (B) radio, Van Pelt G. (B) meteorology, Vereecken E. (B) mechanic, Verheye J. (B) ionosphere.

Summer party 1959-1960 Chatelle J. (B) navigation, Lepere F. (B) photography, Van der Ryt L. (B) geodesy, Deschilder R. (B) photogrammetry, Pauwels E. (B) photogrammetry, Closset F. (B) biology, Capart J.J. (B) biology, de Jamblinne de Meux P. (B) geodesy, Waegeneer R. (B) meteorology, Loy W. (B) geology, Paul R. (B) meteorology Van Rillaer R. (B) meteorology, Vanderheyden H. (B) mechanic, de Ligne A. (B) pilot/leader air-team, Loodts J. (B) geodesy, Giot J. (B) geodesy.

Summer party 1960-1961 Libotte A. (B)
Waregne J. (B) photogrammetry, Van Eyck D. (B) photogrammetry, Deruyck J.P. (B) photography, Parmentier A. (B) navigator, Schell J. (B) biology, Steyaert H. (B) biology, Gosse J.P. (B) biology, Van der Ben D. (B) biology, Flandre J.P. (B) nuclear radiation, Leroy P. (B) medical officer, Michiels P. (B), De Jamblinne de Meux P. (B) geodesy, Piciotto E. (I) glaciology, Giot J. (B) geodesy, Norling T. L. (S) engineer, Confiantini R. (I) chemist, Fiocco A. (I) technician, Fontanive A. (I) technician, Da Roit Q. (I) technician, Black B. (USA) observer.

Belgian-Dutch expeditions

1964 Cabes L. (B) expedition leader/geomagnetism
Bruggemans T. (B) cook, Buis P. (NL) atmospheric electricity, Deschamps J. (B) nuclear radiations, Gordts F. (B) meteorology, Loodts J. (B) geodesy, Rietman J. (NL) Meteorology, Schouleur L. (B) medical officer, Van Ameijde J. (NL) meteorology, Van de Velde M. (B) electrician, Vanderdoodt M. (B) meteorology, Vanderheyden H. (B) mechanic, Vandevelde H. (B) ionosphere, Verschoor P. (NL) radio.

<u>Summer party 1963-1964</u> Piciotto E. (I) glaciology, De Breuck W. (B) glaciology, Hutse (B) construction, Gouwy A. (B) construction, Houben J. (B) construction, Viaene M. (B) construction, Anthony D. (USA) observer.

<u>Summer party 1964-1965</u> de Gerlache de Gomery G. (B) coordinator summer program
Van Autenboer T. (B) leader field party geology, Beyens F. (B) mechanic, Blaiklock K. (UK) geodesy, Capart A. (B) oceanography, de Fierlant G. (B) oceanography, de Spot E. (B), oceanography, Doolaeghe R. (B) mechanic, Goossens L. (B) photography, Hoogewijs J. (B) radio, Harberts G. (NL) oceanography, Michot J. (B) geology, Mousset J. (B) geodesy, de Ligne A. (B) pilot, Souchez R. (B) geomorphology, Steyaert M. (B) oceanography, van den Sande A. (B) biology, van der Essen A. (B) specialist Antartic Treaty, van der Salm J. (NL) geodesy, de Biolley B. (B) pilot, Zijderveld J. (NL) paleomagnetism.

<u>1965</u> Bogaerts W. (B) expedition leader/atmospheric electricity
Boxus L. (B) cook, De Mulder L. (B) electrician, Derwael J.-J. (B) geodesy, Foccroule M. (B) geomagnetism, Ketelers R. (B) radioactivity, Noback H. (NL) ionosphere, Peeters R. (B) medical officer, Pirsoul P. (B) meteorology, Roest J. (NL) meteorology, Sarlet A. (B) mechanic, Van Dam J. (NL) mechanic, van der Veen K. (NL) meteorology, Van Rosmalen M. (NL) radio, Vanhoudt R. (B) meteorology, Wisse J. (NL) ozon.

<u>Summer party 1965-1966</u>
Ameye A. (B) geodesy, Buis P. (NL) solar particles, de Biolley B. (B) pilot, De Broyer C. (B) biology, Deruyck J.P. (B) photography, Doolaeghe R. (B) mechanic, Fagnoul R. (B) pilot, Ferket R. (B) bulldozer, Hudders G. (B) radio, Lambert L. (B) pilot, Mousset J. (B) topography, Nicolas G. (B) mechanic, Pierre M. (B) mechanic, Toussaint G. (B) biology, Van den Sande P. (B) zoology, van der Laan J. (NL) solar particles, van der Salm J. (NL) geodesy, van Grondelle A. (NL) oceanography.

<u>1966</u> Van Autenboer T. (B) expedition leader/geology/gravimetry
Corbisier J.M. (B) meteorologist, De Winde J.P. (B) geodesy, Decleir H. (B) geomagnetism solar radiation, Doneux M. (B) radio, Dutoit J. (B) cook, Fouquet R. (B) electricity, Franq P. (B) mechanic, Gordts F. (B) meteorology, Kraan C. (NL) atmospheric electricity, Lallemand E. (B) geodesy, Marx H. (B) medical officer, Meerburg A. (NL) meteorology, ozone, Meijer H. (NL) radio, Naert K. (B) geology, Stelling C. (NL) ionosphere, ten Bosch J. (NL) mechanic, Van Vliet C. (NL) meteorology

<u>Summer party 1966-1967</u>
Ameye A. (B) topography, Anichini G. (I) biology, Ballester A. (E) oceanography, de Fierlant G. (B) oceanography, Decleir W. (B) biology, Demaret J.C. (B) oceanography, Deruyk J.P. (B) photography, Derwael J.J. (B) geodesy, Doolaeghe R. (B) mechanic, Fagnoul R. (B) pilot, Favart D. (B) oceanography, Lambert L. (B) pilot, Loeber T. (NL) oceanography, Massart J.M. (B) pilot, Meisch M. (B) oceanography, Moureau J. (B) logistics, Mousset J. (B) geodesy, Nicolas G. (B) mechanic, Pierre M. (B) mechanic, Rietman J. (NL) electricity, san Feliu J. (E) oceanography, Sarlet A. (B) logistics, Steyaert M. (B) oceanography, Van den Sande P. (B) zoology.

Belgian expeditions (with South Africa)

<u>Summer party 1968</u> Van Autenboer T. (B) expedition leader/geology/glaciology
Arnhem R. (B) pilot, Beyens F. (B) mechanic, Daniels V. (B) mechanic, Decleir H. (B) geomagnetism/gravimetry, Deruyck J.P. (B) photography, Derwael J.J. (B) geodesy, Fagnoul R. (B) pilot, Loy W. (B) geology.

<u>Summer party 1969</u> Van Autenboer T. (B) expedition leader/geology/glaciology
Corbisier J.M. (B) electrician, Daniels V. (B) mechanic, Decleir H. (B) gravimetry/glaciology, Fagnoul R. (B) pilot, Kother W. (B) pilot, Nicolas G. (B) mechanic, Stelling C. (B) electronics.

<u>Summer party 1970</u> Van Autenboer T. (B) expedition leader/geology/glaciology
Arnhem R. (B) pilot, Berckmans S. (B) electronics, Corbisier J.M. (B) electrician, Decleir H. (B) gravimetry/glaciology, Dubray R. (B) mechanic, Nicolas G. (B) mechanic, Schollaert M. (B) pilot.