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THE GERMAN ANTARCTIC EXPEDITION*

The *Deutschland* sailed south on Dec. 11, 1911, from the harbor of Grytviken, South Georgia. On Dec. 14, in $57^{\circ} 10' S.$ and $32^{\circ} 56' W.$, the first ice was encountered but progress was hardly impeded till Dec. 17, in $61^{\circ} 2' S.$ and $31^{\circ} 57' W.$, when the ship was held fast in heavy pack ice. Between this date and Dec. 31 only thirty-one nautical miles were covered. From Jan. 1, 1912, to Jan. 6, under varying ice conditions, the ship had to force its way through pressure ridges and was finally held fast in the pack from Jan. 6 to Jan. 10 in $63^{\circ} 47' S.$ and $28^{\circ} 9' W.$

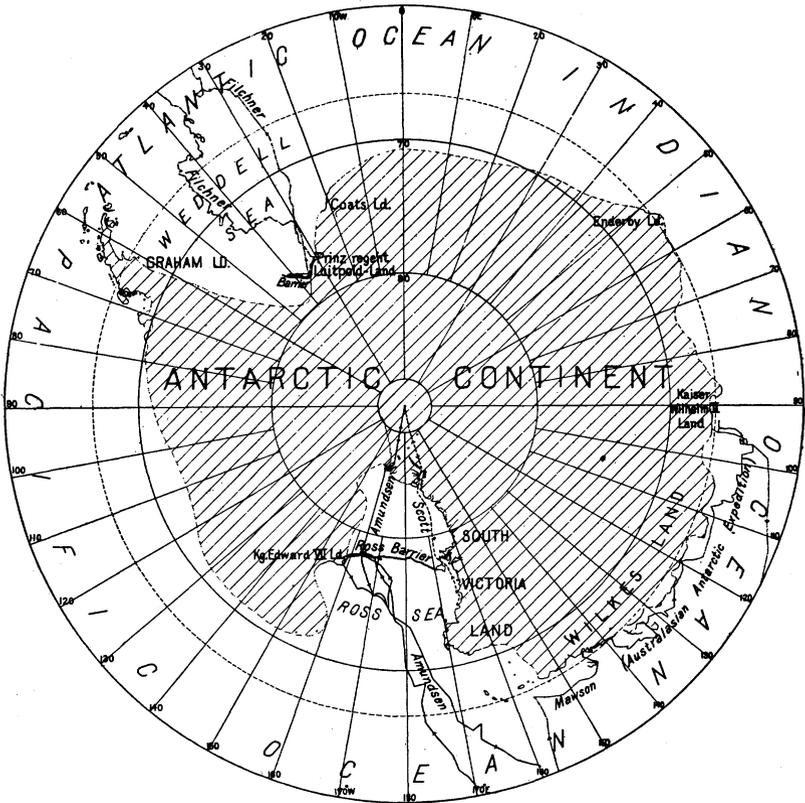
After Jan. 10, however, we had a clear way, finding leads to the south and southeast in which we advanced as far as $70^{\circ} 47' S.$ and $26^{\circ} 38' W.$ (Jan. 14). Here heavy pack ice again held us back. We feared we might be forced to winter in this low latitude, and Captain Vahsel thought of steering east or southeast to be nearer land; but, on Jan. 24, the ice suddenly opened and on we went south.

Three days later, on Jan. 27, we had the first intimation of land; blue ooze was obtained from a depth of 3,432 meters (11,256 feet), while earlier, after crossing the rise of a little over 1,000 meters (3,300 feet) below sea level between the Sandwich group and the South Orkney Islands in latitude 60° to $61^{\circ} S.$, the ship was constantly over depths of 4,000 to 5,000 meters (13,120 to 16,400 feet). On the following day, in $73^{\circ} 26' S.$ and $30^{\circ} 14' W.$, the soundings decreased rapidly to 600 to 800 meters (1,960 to 2,600 feet). The land we had been looking for—through more than 1,000 nautical miles of ice, could not be far away; but, to our astonishment, on Jan. 29 we observed a slight swell from the southeast which meant that ice-free water lay to the south. On the following day we passed a line of icebergs and compact heavy pack ice that would have prevented us from keeping on a southerly course. It seemed as if the south and southwest winds had pushed this ice against the land. As snow was falling and the weather was thick, Captain Vahsel preferred to turn to the east under slow steam and wait for clearer weather.

In the afternoon, when the weather cleared, in $76^{\circ} 48' S.$ and $30^{\circ} 25' W.$, we saw inland ice which rose gradually to a height of

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200 to 300 meters (650 to 980 feet) and broke off abruptly to the sea in a vertical wall twenty to thirty meters (65 to 100 feet) high. Under this immense mass of ice land undoubtedly lay hidden, the ice-covered Antarctic Continent. Nothing else was visible but this ice shield shining in the sun, an indescribably monotonous picture, and yet how many gazed at it with straining eyes, for they believed they were no longer far from their goal. But landing on the ice



Map of the Antarctic Showing the Routes of the Amundsen, Scott, Mawson and Filchner Expeditions. Scale, 1 : 60,000,000.

wall, which was twenty to thirty meters high, seemed very difficult if not impossible. So the ship steamed along to find a good place to land. The position of the ice coast was determined by continuous compass measurements.

On Jan. 31 we reached a small bay in $77^{\circ} 48' S.$ and $34^{\circ} 39' W.$ It was named Vahsel Bay. Here a low mass of ice (barrier ice),

about eight to thirty meters (26 to 98 feet) high, meets the edge of the inland ice. Between this lower ice and the inland ice lies the bay. The lower ice was divided by numerous leads frozen over. Along its border some icebergs had been cemented to it by sea ice. The fact was determined that the submarine ridge, which we had followed to the southwest and the south along the edge of the inland ice, rises at Vahsel Bay to about 800 to 1,000 meters (2,600 to 3,300 feet). This ridge, which is rounded in form, continues to the south, leaving the lower ice mass to the west. To the south of Vahsel Bay three nunataks in the land ice, proved conclusively that a new land lies under the immense mass of the inland ice. The barrier ice mass to the west of Vahsel Bay continues beyond the reach of vision to the southwest and west, evidently maintaining its level character. It, too, like the inland ice, falls off to the sea in a vertical wall ten to twenty-five meters (33 to 82 feet) high. It seems to be an ice barrier similar to that in the Ross Sea.

The Director landed two parties in Vahsel Bay to seek a suitable place for a winter station. They reported that the ascent of the inland ice and of the barrier ice was possible. The Director, however, decided that the main object was to determine, by sledge trips, the penetration of this ice barrier toward the interior of the Continent and, if possible, to connect with Shackleton's explorations on the Ross Barrier and the plateau adjoining it on the south. To determine positively that this phenomenon was an ice barrier the Director proposed to continue to take the ship along the barrier to the west, surveying its course. If a more favorable location for wintering should be found, Vahsel Bay was to be given up; if not, the expedition was to return to the bay. In spite of Capt. Vahsel's fear that the ship might be stopped by ice on its trip west, so that return to the bay would be impossible, the Director began the trip. At midnight a sounding in $77^{\circ} 45' S.$ gave 620 meters (2,034 feet) near the barrier. Conditions were thus seen to be similar to those of Ross Barrier, confirming the idea that this is really an ice barrier similar to that in Ross Sea.

On Feb. 1, the ship met heavy masses of pack ice in front of the barrier but the ship was kept on her course west-northwest and northwest through the ice till 9 A. M. On Feb. 2, when our position was $77^{\circ} 12' S.$ and $39^{\circ} 5' W.$ a sounding gave 700 meters (2,300 feet). To the west and northwest the ice blink continued, nor was there any reflection of water to be seen on the sky. Under these circumstances the Director, in agreement with Capt. Vahsel, decided to return to Vahsel Bay and establish winter quarters thereabouts. The

Director was led to this decision because, in all probability, the ice barrier continues in an increasingly northerly direction the farther west one goes. The ice blink to the west and northwest seemed to indicate this. To push northwest through the heavy pack along the edge of the ice barrier was impossible. The *Deutschland* had evidently reached the most southerly point of the barrier in Vahsel Bay. This bay seemed feasible for landing, and Capt. Vahsel considered it suitable. Then, too, land had been sighted there, and the proximity of the barrier ice would make it easier to explore by sledge the region between East and West Antarctica.

So the ship was turned back, and, on Feb. 2 and 3, the region of the bay was examined. The newly discovered land was named Prinzregent Luitpold Land. It was found that the ice mass to the west of Vahsel Bay was separated both from the ice barrier on the west and the inland ice on the east by leads, frozen over at the time, so that it was drift ice with no connection that could be crossed, either with the inland ice or with the ice barrier. Thus Vahsel Bay did not seem a very favorable place for the establishment of winter quarters. Capt. Vahsel also believed that landing on the ice barrier, because of the pressure of the advancing pack ice, was no more feasible than landing on the inland ice, where the ship would be endangered by falling ice masses. He had no fears for the *Deutschland* if she remained in Vahsel Bay, as the ship could here be protected from ice pressure. A winter station therefore seemed possible only on the drift ice. Under these circumstances the ship could not have returned, as she would have to remain in Vahsel Bay.

On Feb. 3, dark sky (the reflection of water) became visible to the west and northwest, and as far as one could see the sea was ice-free. The Director decided again to sail to the west along the ice barrier, to discover, if possible, a more suitable landing place. He was aware that on this trip the ship might risk being cut off from Vahsel Bay by pack ice, but he was willing to run this risk as the journey might result in finding a better landing place.

So the ship set sail west again. To the west of Vahsel Bay the sea was almost ice-free; but in the night of Feb. 3-4 much pack ice and numerous icebergs were passed. On Feb. 4, the ship's course followed large leads. The noon position was $76^{\circ} 57'$ S. and $40^{\circ} 54'$ W. The edge of the ice barrier which the ship had followed now disappeared from sight. A brisk north wind was pushing much ice against the barrier and the position of the ship was less favorable than on Feb. 1; so Dr. Filehner ordered a return to Vahsel Bay, which was immediately carried out.

This second advance to the west seems to show that the current which carries the ice to the southwest and south along Coats Land and Luitpold Land and then west along the barrier, probably bends around to the north along the coast of Graham Land. It seems probable that this current causes a great accumulation of ice near the western part of the barrier and Graham Land. As it was early in February that these great quantities of ice were met, the chances for a ship to penetrate to the west were remote. The exploration of the barrier seems possible only by sledge expeditions.

On Feb. 5, the ship again arrived at Vahsel Bay. The erection of the winter station at once demanded all our attention. It was decided to place the camp on the flat surface of an iceberg attached to the ice mass within easy reach of the ship and also of the inland ice. On Feb. 8, the timber for the house, and all the animals, provisions and tents for a working staff of six men were landed. On Feb. 11 and 13, coal and other material were landed. The work was delayed, however, by repeated storms; and on Feb. 18 the iceberg broke loose and began to drift. The task of saving the material was at once begun, and nearly everything was returned to the ship.

The party did not yet despair of establishing a winter station on the inland ice. On Feb. 25, a lot of supplies were taken to the inland ice and placed 200 meters above sea level. On Feb. 28, another depot was erected and Dr. Brennecke and Dr. Heim were landed with their equipment to engage in scientific work. The depot was about 600 meters from the edge of the inland ice and two kilometers to the north of the first depot. It contained about 1,000 kilograms of provisions. In order to lift the boxes easily to the inland ice, Kling had rigged pulleys, and one box after another was thus hauled out of the boat. The edge of the inland ice at this place was eight to ten meters above the sea.

By March 2, however, Captain Vahsel considered the position of the ship dangerous and he favored taking her as soon as possible to the open sea. Director Filchner finally decided to return north to winter in South Georgia and attempt another landing in 1913.

On the morning of March 4 we accordingly began the return with heavy hearts. We found open water, occasionally streaked with new ice. The course led along the coast of the new found land. From March 5, new ice constantly impeded our progress, and so the course was directed more to the north. Although the ship sailed on March 6 under full steam and, at times, with all sails set, only three miles were covered. On March 7 we dynamited the ice without much

success. On the following night the first ice pressure occurred. So the struggle went on. By April 17 we were held fast in the midst of old floes in $72^{\circ} 24' S.$ and $40^{\circ} 12' W.$ We had resigned ourselves to drifting, a condition we had tried to avoid, and we now devoted our attention to scientific work.

A hole was kept open in the ice near the ship to observe the growth of the ice and similar phenomena. Over a second hole a tripod was erected where soundings were made, temperatures observed at various depths, samples of water procured, and current measurements taken and specimens of the fauna procured with the plankton net. The meteorological station was established on the ice and ground thermometers set up in it. A series of resistance thermometers were also used to determine the temperature of the ice and air at different heights. A storage house was built for the kites and captive balloons. Almost daily observations, with self-registering instruments, were made of the upper air currents, and very high altitudes were attained. The magnetic observatories were erected early in April. The whole region is magnetically extremely quiescent, due to a relatively low inclination for so high a latitude. There was only meager occurrence of *aurora australes*. We observed a few of them but they were weak, generally a pale, flat arc over the southern horizon from which rays shot out. Only once did we see the drapery effect. We, however, observed frequent and multiform meteorological and optical phenomena, such as light columns, rings, dog-suns, as well as a phenomenon not hitherto observed, a column of light, vertical to the horizon and situated in the meridian opposite to the sun.

Sub-antarctic birds prevailed in the lower latitudes; of strictly Antarctic birds we only met the Adélie penguin (a few specimens); the Emperor penguin we met with frequently but never in large numbers—the largest flock may have numbered twelve specimens. *Pagodroma* and *Thalassoeca* were the only inhabitants of the air that we saw and we met a few of them during the whole winter. Whales were seen in the leads as far south as we went. Of Antarctic seals only a few specimens of the sea leopard, Ross's seal and the Weddell seal were secured. The crab-eater occurred very frequently on the whole trip; we hunted it where we could as it furnished meat for the dogs and ourselves. Thanks to our excellent cook, this meat, prepared in different ways, was excellent in flavor. It was much preferred to canned meats; the liver was considered a particular delicacy.

From June 23 to 30 the Director, with Dr. König and Kling,

undertook an expedition with dog sleds to the land alleged to have been found by Morell. The non-existence of this land was proven.

During the drift we suffered a severe loss in the death of Capt. Richard Vahsel. On the trip out to Buenos Aires in 1911, Capt. Vahsel had already complained of symptoms which he thought to be rheumatic. Unfortunately his condition did not improve in the severe Antarctic climate. At the beginning of the winter night (middle of May), Capt. Vahsel began to feel ill; an old heart trouble reappeared which made him take to his bed. His condition became continually worse until his death on Aug. 8. On Aug. 10, his body had a seaman's burial, just at the Antarctic Circle, which he had crossed twice, and beyond which he had sailed the ship three degrees farther south than any one before in that region. The Director appointed First Officer Lorenzen to his place.

The ship was frozen fast in the ice on May 6, 1912, and then began its drift. The Weddell Sea is the seat of a barometric minimum of about 735 millimeters. Under the influence of this cyclone, into which the winds blow, a circular system of air currents develops which coincides roughly with the edge of the land, so that the winds blow toward the south and southwest along the coast of Coats Land and Prinzregent Luitpold Land, toward the west and northwest along the barrier, and toward the north and northeast along Graham Land. The ice fields follow these air currents, although they are sometimes pushed slightly out of the general direction. They respond quickly, however, to temporary changes in the wind direction, so that the direction of the drift always corresponds to the direction of the wind. It seems that when the barometric minimum increases in intensity the winds drive the ice fields toward the nucleus of the depression and thus cause dangerous ice pressures. When the minimum decreases the ice fields tend to separate and thus give the ice more freedom of motion. Thus we met with open water in the south where sea winds predominate. This was also the experience of Weddell.

Our drift led us first to the west-northwest, until May 7, in 72° S. and 42° W. Then it turned to the north and maintained this direction until the beginning of October, when we reached 65° S. and 42° W. From this time the drift was more irregular but in general toward the northeast. At the beginning of September the proximity of the open sea became noticeable; the registrations of the magnetic balance showed the presence of a ground swell; the ice opened up near the ship and large leads were formed. In September heavy ice pressure occurred in front of the ship but did not

quite reach the vessel. When the ice broke up again a large lead, nearly 100 meters wide opened and into it the bow of the ship projected. Although subsequently this lead became covered with ice it later gave us a chance to escape from the ice without difficulty, as the lead was connected with another large lead. By the middle of November, the melting of the ice on its under side had progressed so far and the ice was so soft that it was decided to free the ship. For this purpose a channel was easily dynamited to the second lead and on Nov. 26 we freed the ship under steam.

The large number of icebergs, which became more frequent as we advanced north, was noteworthy. Sometimes 200 bergs were in sight; we also met them in great numbers in the open sea; indeed, the southern coast of South Georgia was literally blocked by the ruins of icebergs with their well-known fantastic forms, due to melting.

On Dec. 19 we reached South Georgia. From here the members who did not wish to join the next voyage of the expedition started on their return to Germany. An immediate return to the south could not be undertaken mainly because the rudder, which had been damaged, had to be exchanged for a new one before undertaking another long ice voyage and because other repairs to the ship required a dry dock. The hull of the ship was intact.

The *Deutschland*, therefore, went on to Buenos Aires while the members who had withdrawn followed on the transport *Harpon*. In Buenos Aires, Dr. Filchner placed the ship at the disposal of the Argentine Government to relieve the members of the Oficina Meteorologica Argentina in South Georgia.

The *Deutschland* will leave there the entire material and the animals. All the provisions will be deposited there too, in order to avoid being spoiled by the warm climate of Buenos Aires. From South Georgia the ship is to sound the Dincklage Bank. About May the *Deutschland* will reach Buenos Aires and then go into dry dock in order to carry out a trip to the Sandwich Islands southeast of South Georgia, during the current year. At the end of the year the second trip to the newly discovered land can be made again and the explorations in the Antarctic continued according to the original program.