Alexander Kumar spent nine months conducting medical research on the East Antarctic Plateau, including three months’ darkness during the polar winter. Here he describes how he coped with both the chronic hypobaric hypoxia and the psychological pressures.

In hindsight, perhaps it would have been wiser to overwinter in Antarctica at one of the so-called ‘Caribbean’ stations on the coast. Instead, overcome by a sense of adventure – and romantic tales of polar exploration – I threw myself into the deep end, choosing to spend a year at Concordia Station, a French-Italian research outpost located at an altitude of 3,200 metres on the East Antarctic Plateau, the world’s highest, driest, coldest and largest desert.

Concordia is one of only three inland stations on the continent. There’s nothing around it in most directions for a distance equivalent to the drive between Paris and Barcelona. The surrounding landscape is a featureless, egg-white pancake devoid of natural life.

During our nine-month period of isolation, we were exposed to three months of complete darkness and static temperatures that plummeted below –80°C. We lived in an oxygen-deficient environment that subjected us to chronic hypobaric hypoxia. (Because of the atmospheric pressure at this high latitude, living at Concordia feels like being at an equatorial altitude of about 4,000 metres.)

It’s for these reasons that Concordia is being used as an analogue for human space exploration by the European Space Agency, and I was employed as the human spaceflight research doctor. My primary task was to conduct research aimed at increasing our understanding of what would be involved in sending astronauts on a return journey to Mars. The French contingent nicknamed us ‘hivernauts’; I called Concordia ‘White Mars’.

With just a scant four days of training, we arrived on the ice. After the last plane had skidded off down the ice runway, the frozen jet wash ice-blasting our faces, I looked around at our party of 13 European winterers. No-one spoke. We were now completely isolated and would be entirely self-sufficient for the next nine months.

The primary physician booked to work at Concordia for the winter season had unexpectedly left on that last flight. As a 28-year-old medical doctor, I was in the wrong place at the right time. For the first time in eight years, only one medical doctor would overwinter at Concordia. In addition to my research, I would have to perform double duty as the winter station doctor for the next 273 days – my longest-ever on-call shift.

MENTAL CHALLENGE
After setting up my research lab, organising my bedroom and arranging my personal effects, I enjoyed the last few
days of sunlight. Then I hunkered down for what can only be described as a psychological marathon.

Once you enter the Antarctic winter, there’s no way out. When the sun set for the last time on 8 May, I felt as though I was witnessing the end of the time. We entered a temporary ice age and were left wondering who had turned the lights off.

In my role as human spaceflight MD, I focused on physiology and psychology. I took blood, urine and saliva tests to look at genetic expression and also circadian rhythm data. At the end of our three months of 24-hour darkness. Without a daily structure, you’re left to freewheel through the world’s time zones. We were caught in a perpetual temporal washing machine, waking up in Bali and going to bed in Tumbuktu.

There were also probing questionnaires to complete, while computer-based tasks allowed us to assess various elements of brain function in order to chart the cognitive decline one would expect to see in the isolation and darkness of long-haul spaceflight. My research also aimed to identify new ways to occupy our minds and keep our physiology and psychology active. There was a continuous need for escape. Sometimes this took the form of a frustrating telephone call home, or an afternoon stroll in the freezing darkness. Sometimes this took the form of a frustrating telephone call home, or an afternoon stroll in the freezing darkness. Eventually, a calm desperation set in. One day, we found ourselves spray-painting and drilling a hole through a golf ball so that we could attach a piece of string to it. This enabled us to tee-off and not have to go looking for a white ball on the ice. Woodwork, photography, writing, reading and drinking coffee with a friend all offered safe releases, as did the occasional outdoor tennis match, which encouraged a healthy competition between us.

I blazed my way through 100 years of polar history and Sir David Attenborough’s entire DVD back catalogue. His documentaries reminded me of invigorating colours, which would otherwise have become a distant memory. Musical instruments were another release. However, if you do head down to Antarctica, I wouldn’t recommend packing a banjo with the intention of learning how to play it. A banjo played badly isn’t a suitable tool for international diplomacy.

AN END IN SIGHT

At Concordia, some of your nearest neighbours are astronauts onboard the International Space Station. You leave the doors unlocked. The only winter visitors come in hallucinogenic flashes across the dark sky in the shape of the Aurora Australis. While taking photographs outside and alone, I observed the clearest night sky available anywhere on the planet. Concordia regularity served up unparalleled 360° panoramas of the Milky Way. I quickly honed my cold-weather photography skills because even something as simple as removing a glove could have cost me my fingers. And I took care to re-warm my camera slowly when I returned inside – technology, wintering hasn’t changed much in its delicate components.

The winter solstice at the end of June brought midwinter celebrations of song and dance, during which we re-bonded as a group. Suddenly, breathing water together became less of an effort. Celebrating this time-honoured tradition dates back to Shackleton’s winterers on the ice. We donned extravagant costumes and planned and ate luxurious meals. Several months later, after six months of isolation, I emerged onto the station roof to witness the first sunrise I had heard only the first chords of the Beatles’ ‘Here Comes the Sun’ in my headphones when my music player battery died of cold injury. The sun’s appearance ended three months of darkness, awakening slumbering neurons. Colour permeated my senses.

I pushed through the final empty quarter of my winter sentence. By now, I was out of psychological fuel and travelling on fumes. Three debilitating months later, the first aeroplane slid down the runway. Within the space of an hour, my withdrawn comrades had blossomed into breezy characters.

NEW PERSPECTIVE

I returned to civilization aboard a Hercules transport aircraft. I hadn’t felt rain on my face for a year and upon my arrival in a wet New Zealand, I stood out in a downpour. Suffering from what I call ‘re-entry syndrome’, I found it frustratingly difficult to choose between a caramel macchiato and a double skinny pecan latte. On the ice, a coffee had just been a coffee. The continent taught me things about myself that I wouldn’t have otherwise touched upon. Ultimately, it isn’t about what you take to the Antarctic winter; it’s about what you learn and bring back.

Despite modern society’s addiction to – and reliance on – technology, wintering hasn’t changed much in the past century. Apseley Cherry-Garrard, a member of the scientific staff on Robert Falcon Scott’s Terra Nova expedition, wrote: ‘Polar exploration is at once the cleanest and most isolated way of having a bad time which has been devised.’

Typing this article with all of my fingers intact, I feel indebted to Antarctica. Wintering was, for me, the best of times and the worst of times. It was a privilege – one of the world’s greatest and most peculiar journeys.

Alexander Kumar has lived, worked and travelled in 70 countries on seven continents. His interests include global health, tropical medicine and extreme environments. He devised the human science research for Sir Ranulph Fiennes’ Coldest Journey and acted as principal investigator on a space-related Arctic project. Alongside his training in the NHS, he works as a freelance photographer and writer. www.alexanderkumar.com
Anyone planning to overwinter in the Antarctic will have to give their gear serious consideration. Not just for the kit you’ll need to protect against the freezing conditions (–110°C including windchill, anyone?) but also for the items you’ll want to distract yourself from the monotony and claustrophobia many experience during a polar winter.

1. **Insulating outer layer**  
   **Canada Goose Expedition Parka**  
   £750/21 kilograms  
   One of the warmest and most durable coats available. Originally developed for scientists working at McMurdo Station, this parka features several large external pockets and coyote fur in the hood.

2. **Fleece jacket**  
   **Brenig Aclimatise**  
   £140/525 grams  
   This waterproof and breathable jacket has aluminium in the laminated membrane to help reflect your body’s heat. It features zipped handwarmer pockets and a chest pocket. I designed my own version to include a high, windproof, stand up collar.

3. **Musical instrument**  
   **Grafton Clipper Resonator Plectrum Banjo**  
   £355/3.5 kilograms (depending on model)  
   I was inspired by polar explorer Leonard Hussey’s legendary banjo playing to learn to play a new musical instrument at Concordia. With a maplewood rim and a clamshell design, the Clipper is an affordable, lightweight and solid banjo.

4. **Camera**  
   **Canon EOS 5D Mark III**  
   £2,335/950 grams (body only)  
   The MKIII’s high ISO (25,600) enables you to use the camera for Antarctic astrophotography. I used a MKII at –110°C (with windchill), which is well below the stated operating temperature.

5. **Mid-layer**  
   **Jamieson & Smith Fair Isle Shetland wool jumper**  
   £300/500 grams  
   Renowned for being soft, strong and warm. Shackleton wore Fair Isle socks in Antarctica. And Edmund Hillary reached the summit of Mount Everest while wearing Shetland wool. Knitter Sandra Manson can knit you a Shetland jumper that will brighten up any winter.

6. **Food**  
   **Heinz Beanz**  
   68p/415 grams  
   I took a single tin with me, which survived through midwinter to my 29th birthday. I initially used the empty tin as an indoor golf hole and later as a penholder. A single serving of Heinz beans counts as one of your ‘five-a-day’.

7. **Pulse oximeter device**  
   **Lifebox pulse oximeter**  
   £160/200 grams  
   This oxygen-saturation monitor allows a medical professional to check that you are still oxygenating. An oximeter is an essential piece of kit for any expedition going to altitude. Celebrate a safe trip by donating a device from Lifebox to a rural hospital or clinic, where it will be used for monitoring patients during surgery.

8. **Satellite telephone**  
   **Iridium 9505A**  
   £1,030/375 grams  
   I have used this device to seek specialist medical attention for patients, to send tweets and emails, and to be interviewed on BBC radio. Be warned: there are few places on Earth where your mother can’t reach you on an Iridium.

9. **Trousers**  
   **Páramo Torres**  
   £110/514 grams  
   These insulated trousers are great for wearing inside and outside an Antarctic station. The Torres are water repellent, have articulated knees and can be worn as an overlayer or on their own. Fitted with full-length side zips.

10. **DVD box set**  
    **The Life Collection**  
    £51/2 kilograms  
    I watched Sir David Attenborough’s complete back catalogue during my Antarctic winter. His reassuringly familiar voice in the darkness provided me with a better understanding of our planet.

...several external hard drives to make copies of your scientific data and photographs. Additional gigabytes also allow you to store plenty of music and movies in readiness for the winter lockdown.