ANTARCTICA: THE BEST PLACE ON EARTH TO COLLECT METEORITES

FIGURE 1 Members of the ANSMET team collect a meteorite. PHOTO CREDIT: NANCY CHABOT

One of the questions most commonly asked of a meteoriticist is where the best places are to hunt for meteorites. The answer? The arid deserts of the planet. Unfortunately for the average meteorite enthusiast, many of these deserts are not easily accessible and do not boast overly comfortable weather conditions. They are either extremely hot or, in the case of Antarctica, extremely cold. It turns out, however, that of all the places on the surface of this wet and warm planet, the Antarctic has the best environment for preserving meteorites for as long as it takes to find them—usually many thousands of years. Climate, topography, and glacial processes create an Antarctic meteorite "conveyor belt" that protects meteorites from becoming aqueously weathered and concentrates them in places where they can be collected. Soon after landing, most meteorites get buried by snow and ice and slowly move with the Antarctic ice sheet as it travels downslope toward the Southern Ocean. Luckily for cosmochemists, the Transantarctic Mountains act as a barrier to this gravitational flow, stranding pockets of ice. Dry katabatic winds rush down from the pole and speed the loss of ice through both sublimation and abrasion, leaving regions of compressed, blue ice with its cosmic cargo sitting on the surface, ripe for collection (FIG. 1).

The systematic recovery of meteorites from Antarctica began in 1969 when a Japanese expedition found the first concentration site (the extraordinary Yamato ice field). For 33 of the last 34 years, the United States has sent a team to the Antarctic ice to collect meteorites. As of the latest season (2010–2011), almost 20,000 meteorite specimens have been recovered by the US's Antarctic Search for Meteorites (ANSMET) program. Japanese, German, Italian, Chinese, and, most recently, South Korean meteorite-hunting teams have brought back another 30,000 or so pieces of Solar System material (China, 10,000; Japan, 20,000; Italy, 1200). While the deserts of the southwestern United States, Australia, Chile, and particularly northern Africa have yielded many meteorites, Antarctica remains the best place to find large numbers of fresh meteoritic samples. These teams have found more extraterrestrial material in 30 years than has been collected over recorded time.

FIGURE 2 Members of the ANSMET team search a blue ice field by snowmobile at the Meteorite Hills. PHOTO CREDIT: CARI CORRIGAN

FIGURE 3 A member of the ANSMET team conducts a search on foot in a glacial moraine in the MacAlpine Hills. PHOTO CREDIT: YULIA GOREVA

As the author knows firsthand, the US-led ANSMET team generally takes between 6 and 12 people per year as volunteers to spend 6 to 7 weeks camping in nine-foot-square Scott tents on the slopes of the Transantarctic Mountains. Teams generally bring back anywhere from 200 to 1400 meteorites per season, depending on the number of team members, the locations searched, prior experience at the site, and, of course, the weather. Weather plays a huge part in determining how many of the 45 or so days are spent in tents, hunkered down playing cribbage, and how many are spent searching blue ice fields (FIG. 2) and glacial moraines (FIG. 3) for the telltale signs of a meteorite. The best visual marker is fusion crust, the melted layer of material that forms on the outside of a rock as it passes through the Earth's atmosphere. For example, the fusion crust on lunar meteorites (FIG. 4) can have an unusual green tint (the color of moldy cheese). Meteorites sometimes reveal features not seen in terrestrial rocks: chondrules or native iron–nickel metal. The study of meteorites recovered from Antarctica has yielded major discoveries in cosmochemistry. Included in this treasure trove are new types of chondritic meteorites from the earliest moments of the Solar System, samples that record the onset of melting of asteroids, and meteorites from the Moon and Mars, including the first meteorite recognized as having come from the Moon.

A photo of a basaltic lunar meteorite as it appeared when collected in the La Paz ice field in Antarctica. PHOTO CREDIT: ANSMET

For the specialist, Antarctic meteorites offer the chance to study rare and primitive rocks containing, in one case, materials altered by extraterrestrial water and, in another, interstellar grains forged in extrasolar furnaces before our Solar System was born. The coldest continent is home to a dazzling variety of extraterrestrial rocks and has given us a rich harvest. Remarkably, these meteorites are available freely to any qualified scientist, anywhere, who wants to study them. Requests are taken on a rolling basis, although the Meteorite Working Group meets biannually (March and September) to review requests, approximately one month after each new Antarctic Meteorite Newsletter is published. Request forms and newsletters can be found at http://curator.jsc.nasa.gov/antmet/index.cfm. More information on the US's Antarctic Search for Meteorites program can be found at http://geology.case.edu/~ansmet.

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