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ANTARCTIC SCIENCE MAY BE RECENT, BUT IT DOES CHANGE

Ninety percent of all the geologists who ever worked in Antarctica can email each other. That comment, made some years back by a National Science Foundation program manager, is a way of saying we have come to know the Ice well only in recent decades. Society member Art Ford illustrates the point in "The road to Gondwana" in this issue.

Art brings his Antarctic half-century to life in a talk at the 21 July Garage Theater in Port Clyde, Maine. Paul Dalrymple, another living Antarctic history lesson, has hosted these Antarctic Gatherings every other summer for the last decade. Art's article below is based on one of the presentations; summaries of others will show up in future newsletters.

Movement of the continents was of high interest following the 1957-1958 IGY. As Art explains, the Antarctic was a key place to study it. Among scientists worldwide, the most highly cited Antarctic paper of the 1960s and 1970s was by J.R. Heirtzler on motions of the ocean floor and continents, published in the *Journal of Geophysical Research* (JGR) in 1968.

Another field of high interest then that's farther down on today's list of Antarctic priorities was magnetospheric physics. Donald Carpenter published two highly cited JGR papers, in 1963 and 1966, about the "knee," a region of the plasmapause where the stratosphere meets the magnetosphere, that then was studied best from Antarctica.

Antarctic science answered big, worldwide questions of the time. Those earlier research areas have yielded top billing in recent years to other fields. Steven Chown, president of SCAR, lists understanding the future of the ice sheets and what it means for sea level rise as one, and ways the region's systems will respond to global and local challenges as another.

Guy Guthridge

The road to Gondwana: the Cape Town SCAR meeting in 1963

by Art Ford

SCAR, the Scientific Committee on Antarctic Research, an outgrowth of the landmark 1957-58 International Geophysical Year (IGY), functions in part to encourage scientific research activities among the 50-some Antarctic Treaty nations by helping organize periodic meetings in the various research disciplines.

The Potsdam, Germany, organizing committee for the 9th International Symposium of Antarctic Earth Sciences (ISAES-9), of September 2003, asked me for its plenary lecture reviewing earlier symposia as I was the only one still extant who'd been to them all. Fifteen years later I am still around, to talk about how the first two such symposia closely reflected the rapid Earth science paradigm transformation from continental drift to the new plate tectonics, which occurred between the first two SCAR symposia, *i.e.*, Cape Town-1963 and Oslo-1970. (The pivotal societal transformation from the apartheid we witnessed to the Mandela freedom would unfortunately take much longer.)

Gondwana, that ancient southern hemisphere supercontinent of Paleozoic age, some 550 to 300 million years ago, was iconic for proponents of continental drift, but its rock and fossil evidence was virtually all in southern lands. Controversy raged between the "drifters" of the South – the likes of Tasmanian professor S. Warren Carey and South Africa's Alexander du Toit with his 1937 classic text *Our Wandering Continents* – and the continental "stablists" of the north, namely, everyone in academia but for two notables: Edinburg's Arthur Holmes and Germany's Alfred Wegener, who perished tragically in 1930 on the Greenland ice sheet. At the time of Cape Town's 1963 ISAES-1, professors of the South had led Earth science research into the Renaissance of continental mobility long before plate tectonics theory arrived, leaving those of us of the North still in the Dark Age. Cape Town would be a most appropriate site for this first Antarctic meeting.

South Africans made a tiger's leap at the chance to educate those Northerner skeptics by showing us their drift evidence. It was impressive to the continental "stablists" of the North. I'd been mapping Antarctica's rocks since soon after IGY. I worked in areas where du Toit in his 1937 book had clairvoyantly predicted that mountains (*e.g.*, the Ellsworths) at the head of the Weddell Sea would someday be found to contain rocks like those of the Cape Town region. A 1962-1963 University of Wisconsin field party indeed found them.

At SCAR-Cape Town, little credence was shown to Gondwana, except for two South African speakers: the world expert on the ancient Gondwana forests Edna Plumstead, and the University of Durban professor Lester King. Neither had been to Antarctica.

Most of the others talked only of their postage stamp-size areas, with little reference to the bigger picture of connections beyond the shores.

The chief organizer of this meeting, and editor of its resulting book volume, was Raymond J. Adie, geologist of the U.K.'s Falkland Islands Dependency Survey, forerunner to today's British Antarctic Survey. And now we know the how and why Cape Town was chosen: Ray was a South African émigré. For geology, there could not have been a more appropriate site!

The high point of this meeting was the field trip around the country to show those skeptical Northerners evidence of fossils and rock sequences of the Table Mountain sandstone and overlying Dwyca, Ecca, Beaufort, and Drakensberg sequences – all so similar to what we'd been studying in the Ellsworth, Pensacola, and Transantarctic mountains.

Little question remained on du Toit's brilliant story on that supercontinent, Gondwana. By the 1970 Oslo ISAES-2, Vine and many others had developed the North Atlantic and northeastern Pacific ocean-floor magnetic patterns that led to today's theories of sea-floor spreading and moving tectonic crustal plates.

Antarctic field studies increasingly were fitted into these theories at succeeding SCAR symposia. Cape Town 1963 was where it began.

The Stowaway: book review

by Alfred J. Oxton

The Stowaway: A Young Man's Extraordinary Adventure to Antarctica, by Laurie Gwen Shapiro (Simon & Shuster, 2018) arrived finally in the post, delivered of the same sort of persistence evinced by the book's 17-year-old protagonist Billy Gawronski. More of the same persistence was required of me to get started with the reading. I'm in over my head with reading; books are in piles around my pillow.

Once started, this tale of Antarctic adventure moved right along. From Billy's first attempt to stow away on Richard E. Byrd's ship by swimming the murky Hudson River at night to his finally hitchhiking to Virginia for another attempt is a tale that rivals Paul Siple's pursuit of all the Boy Scout Merit Badges that underpinned his quest for a berth in Byrd's first (1928) Antarctic expedition.

Once Gawronski (who pointed out that he was 18 now and therefore an adult) was given free reign by his father and was accepted by Byrd as "mess boy," the story sails along: through storms at sea, the Panama Canal, the ritual of crossing the Equator, provisioning at Tahiti, layover in New Zealand... Been there, done that, was my initial response to some of those vignettes. But Billy Gawronski's was different to what I did, and so I had to look again through his eyes and see a different experience.

And of course his adventure was at an earlier time: telegraph vs internet, the bark *Bolling* vs the NOAA ship *Surveyor*, the crowds of anticipation surrounding this incredible expedition into the unknown vs the business as usual of my time on ice.

Overall, I found *The Stowaway* to be well worth the read. Too bad Gawronski, for all his persistence, went on to obscurity while Siple went on to greatness. There should have been room for both of them.

James McClintock receives SCAR Education and Communication award

by Polly Penhale

James McClintock

SCAR in 2018 presented its first Education and Communication Award to James McClintock, Professor at the University of Alabama, Birmingham, USA. The Scientific Committee on Antarctic Research presents annual medals to recognize excellence in research and outstanding service to the international Antarctic community.

The award citation highlights Dr. McClintock's focus on Antarctic climate change and impacts on the unique shallow-water benthic marine ecosystem. It acknowledges Dr. McClintock's understanding of the Antarctica environment, the protection of its ecosystems, and the inherent value of sustaining it. Throughout his career,

Dr. McClintock has been committed to communicating the understanding of Antarctic issues to both peers and the public.

Interviewed about this prestigious award, Dr. McClintock said, "The support I have received over my three-decade Antarctic research career from the United States Antarctic Program (USAP) has been instrumental to my developing a growing focus on both studying and communicating the impacts of climate change. This has particularly been the case over the past 18 years as my marine biological research program supported by USAP took me, my co-principal investigators, and our students to Palmer Station on the central western Antarctic Peninsula. Here, I found myself surrounded by climate change playing out in real time, and the realization that there was an urgency and a responsibility for scientists such as myself to inform the general public about the increasing impacts of global climate change."

Dr. McClintock's book *Lost Antarctica: Adventures in a Disappearing Land* (Saint Martin's Press, 256 p., 2012) describes the unique world in Antarctica with its stark beauty, harsh environment, and fascinating ecosystem made up of organisms ranging from microbes to whales. As climate change progresses, Dr. McClintock sees changes in a world that he has studied for over 30 years.

A rock from the Antarctic

Art Ford gets around. Yes, he goes to familiar places like Cape Town (see his article starting on page 2). If you read "Incident in the Crary Mountains" in this issue, you will notice that Art was aboard the airplane that clipped a mountain and flew home to tell about it. Art also was with Peter Rowley (another Society member) in Palmer Land in 1987.

Your editor is aware of Art's Palmer Land trip because one day in February 1988 a wood box showed up in the mail at the National Science Foundation, where I worked, with my name on it. Inside was a rock and a letter. Here's the letter:

"This sample is from outcrop 4329, a nunatak in the center of the Guthridge Nunataks. The rock is a fine-grained glassy, volcanic rock, probably an ash-flow tuff, of probable Jurassic age. It is typical of most other nunataks in the area, which define the axis of a volcanic arc running the length of the Antarctic Peninsula. Art Ford and I collected your samples on 10 January 1987, during a long, cold day. By the time we turned the snowmobile south to outcrop 4329, the wind was at mach 1 and we were running at almost that speed! Thus we did the geology of that nunatak in about 10 minutes, grabbing your samples in the process!"

The letter is signed, "Peter D. Rowley, U.S. Geological Survey."

The rock to this day occupies a bookshelf in the house where I live in Old Town, Alexandria, Virginia. Pete's letter is alongside. I have never been to Guthridge Nunataks.

Art and I wondered if Pete might be coming to the 2018 Antarctic Gathering in Port Clyde, Maine. "Thanks for the invite," Pete wrote, "but must decline. My wife Dawna still works (for BLM) and I am the stay-at-home manager of our mini ranch (6 horses, 2 dogs, 4 cats, chickens) in rural SW Utah. All those animals would really miss me if I were to go visit you guys. Plus, I always seem to have some geology to map around here, whenever I can get away! And today I put in 2 hours of work in my consulting business, which still limps along."

Pete continued, "I do not remember sending that rock to Guy but I made it a policy to do that a lot when I visited areas named after geologists or other people I knew. I tried to get large (football size) rocks, then send them."

For his part, Art told Pete the e-mail exchange "brought back fantastic memories

of a memorable season with you and BAS on the Black Coast of Palmer Land."

Incident in the Crary Mountains, 22 November 1960

by John C. Behrendt

I could see nothing through the clouds from the right-hand seat in the cockpit of the plane, where I was recording the altimeter readings. Our height had been varying between 2200 and 2300 feet above the surface of the West Antarctic ice sheet. "Hooch" Clark, who was operating radar and radio, reported on the intercom that there was "a target 13 [nautical] *miles ahead."*

A radar target meant only one thing: mountains! I got nervous, but said nothing. Lou Helms, the copilot at the controls in the left seat, began to climb fast. Two minutes later we were at 8300 feet but still only 2250 feet above the snow level. There was no visibility. A minute later we had pulled up to 8640 feet elevation above sea level, but the snow surface was also coming up and was still only 2300 feet below. Then the radar altimeter [which measured the height of the plane above the snow using a radar pulse] began to unwind. Thirty seconds later we had climbed to 8680 feet, but the ground was now only 1500 feet below.

For the next 30 seconds I could only stare at the radar altimeter which dropped with terrifying rapidity to less than 50 feet (a red light came on). Meanwhile, Lou was pulling the nose up until we began to stall. The air speed dropped below 80 knots.

The plane would stall at 77 knots and fall toward the ice below.

Of course all hell broke loose throughout the aircraft. Joe Walker, the pilot, who had been dozing in a seat on the port side across from the navigator, was startled by a can of orange juice falling off a shelf onto his lap. Andy Holzener, the plane captain (crew chief), had come forward into the aisle between Lou and me. Lou was yelling for Andy to "Get Joe!"

Tom Laudon was hanging onto the ropes in the main cabin and could see a rock outcrop just to starboard; the wing of the plane was perpendicular to the cliff. Pete Bermel had been standing directly behind the navigator in the aisle observing how he plotted our positions and saw him put on his helmet and tighten his seat belt. Pete started to run for a seat and was thrown through the air. Art Ford was hanging on and saw an outcrop to starboard. Dick Wold, who had been operating the magnetometer and listening to the intercom, was struggling to keep the geophysical equipment from tipping over. He could see that the magnetic field had been coming up very fast during the preceding minute and he finally saw the garbled signal from the magnetic sensor (called the "bird") as it bounced along the snow or rock 60 feet or less below. Suddenly, the bird broke off.

About this time the trailing edge of our starboard wing hit a rock.

Meanwhile, Joe had rushed forward, pushed Andy aside and took a half-kneeling position between Lou and me. The plane was shuddering violently in repeated progressive stalls.

Joe was yelling at Lou to "Get the nose down! Get the nose down!" Joe finally reached with his left hand and did this himself, by yanking the controls from Lou's hands. We made a vertical bank to the left and dove. With his right hand Joe started to pull the throttles all the way back to kill the two engines. He figured it would be better to crash sliding forward along the surface than flipped over on our back. With the fuel off, we were slightly less likely to burn. He was sure the three of us in the cockpit would go through the windshield, but possibly those in the cabin might survive. Miraculously(? [sic]) we picked up air speed, and did not plow in! The radar altimeter showed 200 feet.

Through much of this action, I could see the sun glowing feebly through the fog directly in front of us. It was swinging violently from the port side to the starboard and back. We all had complete vertigo. We had been flying almost true north, with the

sun to our south at this time of day. Obviously, we somehow had turned completely around. I wished fervently that this would end soon.

There were a few seconds respite, during which I dove out of the cockpit seat and Joe scrambled in. I went charging back to strap myself into a seat, but could not find the belt. (I also had not had my seat belt fastened in the cockpit.) I dropped the data book and felt guilty about it. A note at this time in my data book reads: "Amongst mountains we cannot see and trying to get the hell out. Barely clearing tops."

The plane staggered around like a drunken man and finally began to climb. We went up to 13,500 feet and could catch glimpses of mountains apparently as high on either side. I felt giddy and exhilarated from the lack of oxygen at this elevation (I thought).

The sun was now shining, and it felt very good to be alive!

I was a 28-year old graduate student and was leading my first Antarctic field party. We were flying over the West Antarctic Ice Sheet in the late evening in a ski-wheel Navy R4D8 (DC-3). Marine Capt. Joe Walker, the aircraft commander, was 29.

Art Ford, John Aaron, and Pete Bermel, USGS, Dick Wold, Tom Laudon, and I (University of Wisconsin) were the USARP scientific personnel. Later, Wold and I spent many years with the USGS. Bermel, Laudon and Wold died in 2017.

John Behrendt (left) and Dick Wold at Byrd Station in 1960 (photo by Tom Laudon)

We had headed toward the Toney Range on a course north-northwest from Byrd Station with nothing visible below but the featureless, sastrugi-covered ice sheet. I recorded the barometric and radar altimeter readings to measure the snow surface elevations every 5 minutes.

Andy, the plane captain, ran around just after takeoff checking on each wing for fuel leaks, letting the magnetometer bird out, and monitoring the twin propeller engines. A Navy photographer and six civilian scientists of the United States Antarctic Research Program (USARP) were observing and operating a magnetometer. They were crammed into the main cabin, which also was crowded with our survival gear, JATO bottles (used for jet assisted takeoff) and a 500-gallon internal fuel tank full of aviation gasoline. We planned to land and do several hours of field geology in the unexplored area toward which we were flying.

In reconstructing the incident later, it became clear that this is what happened:

At 2310 (local Byrd Station time), an hour and a half out of Byrd, we entered clouds and did not come out. We had drifted off course to the left by 20 miles and into the volcanic Crary Mountains. This range had been discovered, mapped, and named three years earlier by Charles Bentley's oversnow traverse party, as had the Toney Mountains about 90 miles farther on, so they were on the latest edition of the air navigation chart SP5. However, the Navy air navigation chart the air crew was using was obsolete. It showed no mountains in this area.

We had tried to fly through a 10,000-ft pass between two 12,000-ft peaks at an aircraft altitude of less than 9000 ft.

Later, Andy and Joe both said they thought they felt the wing hit the mountain, during the stalls. We were shuddering and banging around so violently that the rest of us thought they were mistaken; we were probably feeling "stall buffet" – the airflow over the plane beginning to break down

before the airflow breaks down completely and the wings have no lift.

We had made four stalls, first one wing stalling and dropping, then the pilot recovering control, only to stall again to the other side, each stall more extreme. During this time we turned about 180 degrees and headed to the south, away from the mountains. However, at one point an outcropping came so close on the right that our wing hit the rock. The magnetometer sensor – encased in a fiberglass "bird" normally towed about 60 feet below and slightly behind the plane – dragged along the ground for 17 seconds before it broke off.

When Joe, the pilot, grabbed the controls and dove, we picked up air speed, and because we had turned away from the peaks, we did not crash. All this time the engines were running at full takeoff power. As we tried to clear the hidden mountains, Joe circled, and slowly we climbed to the level of the tops of the peaks in our unpressurized plane.

During the incident everyone was doing his job, not because of bravery or duty, but because no one had time to think. Lou and Joe flew the plane. The radar man, who did not know the pilot had no forward visibility, watched the radar target ahead split into two peaks as we apparently (to him) proceeded between them. The navigator tried to plot the rapid course and elevation changes. Dick operated the magnetometer. I recorded times and elevations in a data book. The incident lasted about 3 minutes after the snow surface started to rise fast.

When the crisis was over, Joe called me forward and asked if I wanted to go on. "Sure, if you're willing," I replied. We got the rear door off, reeled in the old magnetometer cable, and put the spare bird out.

We civilian scientists barely understood what we had gone through and were quite shaken. Joe, however, was surprised that we carried a spare cable and bird, as though these were normal occurrences. Actually, we had the spare in case of an electronic breakdown.

At 2352 Joe called me forward and noted that the whole area was clobbered in by clouds. He suggested we go home and try again another day. I heartily agreed. We landed at Byrd, 4½ hours after we had left it, a somewhat chastened group, at 0130 (23 November) Byrd time.

We climbed slowly out of the plane, walked over, and examined the right wing. There was a fist-sized dent in the tip. Joe and Andy had been right. Dick and I examined the end of the magnetometer cable where the bird had pulled off after dragging on the ground. I still have this end as a grim memento of the luck that prevailed that day.

We all agreed that this was the closest call any had ever been in or heard of. There is no doubt that we all would have been killed if we had crashed.

I got together with Fred, the navigator, and plotted our track last night. I found that we were in amongst the Crary Range during the trouble. These mountains are shown on the 5th edition of the SP5 map which I have, but not on the 3rd edition which is all Fred had to go on. Just this error could have killed us all.

Dented Wing Tip on R4D *Semper Shaftus*
(photo by Tom Laudon)

My outlook was permanently changed. A minor example; since that near-death experience, I have never to this day ridden in a car or flown in a plane without putting on a seat belt.

This incident in the Crary Mountains, although the most dramatic of my life, characterized the United States Antarctic Research Program and Navy Operation Deep Freeze in the early days of the "Scientific Age." I only gradually came to that realization, while writing this account describing my third and fourth seasons as a geophysicist in Antarctica.

From 1955 at the start of Deep Freeze through 1961 there were 19 deaths in aircraft accidents, or 3.8 per year. Since 1970 there have been two fatal aircraft accidents. The aircraft death rate during the early years was 38 times the rate in the past three decades.

We took for granted the "routine" aircraft and crevasse incidents. From the International Geophysical Year beginning in 1957 until 1966, we Americans (with others from the Soviet Union, France, Australia, Argentina, New Zealand and the United Kingdom) made a successful geophysical reconnaissance of the Antarctic ice sheet. But our accomplishment had a grim price.

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From: Behrendt, John C., 2005, *The Ninth Circle; a Memoir of Life and Death in Antarctica, 1960-1962*, University of New Mexico Press, 240 p. The italicized sans serif text is from my journal, written at the time. Note the names of people aboard the plane who are or were members of the Antartican Society.

Stephen DenHartog, 1933-2018

"With great sadness," writes Dorcas DenHartog, "I relate to you that my father passed away April 23rd. Before he left, I know he was able to read the most recent Antarctican Society newsletter – it was on the bar where he stood to read his mail and do the crossword puzzle."

Denny was beloved by many in the Society. Our treasurer Paul Dalrymple attended a celebration of his life on 24 May in Norwich, Vermont, and provided remarks on behalf of the Society and as a longtime friend.

Stephen "Denny" DenHartog

Stephen Ludwig DenHartog died unexpectedly at his home in Hanover, New Hampshire.

He attended Phillips Exeter Academy, class of 1951, and went on to study geology at Harvard University. In 1954 he found himself in the Army, testing ordinance at the cold weather testing facility at Fort Churchill, on Hudson Bay. He returned to Harvard, graduating with the class of 1957. He was first in the Antarctic during the International Geophysical Year (IGY), 1957-1958. He went on to get a masters in geology at the Montana School of Mines.

In 1967 his Arctic and Antarctic experience led him to Hanover to work for the Army's Cold Regions Research and Engineering Laboratory. There he helped design, build, and then work for the ice engineering department until his retirement in 1993. His kids said that dad blew up ice jams for a living.

Denny was the sole or lead author of 19 papers regarding cold regions and a coauthor on another dozen. Antarctic papers on which he was lead or sole author were

published between 1959 and 1993 and ranged from analyses of snow pit samples taken during the 1958-1959 Little America to Victoria Land traverse to a field survey of potential airstrip locations at Mount Howe.

Chris Elfring, 1955-2018

Chris Elfring

Chris Elfring was the director of the Polar Research Board, National Academy of Sciences, from 1996 to 2013, a period that included planning for, and follow-up on, the 2007-2008 International Polar Year, which was the largest and most ambitious focused undertaking in polar regions since the 1957-1958 International Geophysical Year.

The Polar Research Board during the years of Chris's tenure was – other than the funding agencies – the critical U.S. organization integrating scientists of different disciplines, research organizations, and nationalities to develop a program of research that was necessary, collaborative, and achievable. This focused undertaking enabled – or emboldened – organizational and scientist-to-scientist collaborations that, example after example, would not have happened without strong ties that the commitments of organizations like the PRB made possible.

Chris's hand is all over the Academy's 2012 publication *Lessons and Legacies of International Polar Year 2007-2008*, nap.edu.

Chris, of Takoma Park, Maryland, died from brain cancer on 7 June. She received a B.A. from Denison University and an M.S. from the University of Wisconsin. In 1979, she moved to Washington, D.C., as a AAAS Science Fellow working at the Office of Technology Assessment. Summers in the early 1980s, Chris was a park ranger at Acadia National Park in Maine.

Chris began her career with the National Academies of Sciences, Engineering, and Medicine, in 1988. Most recently she was executive director of the Gulf Research Program. Previously, she directed the Board on Atmospheric Sciences and Climate as well as the PRB. In 2012, the American Meteorological Society awarded her the Cleveland Abbe Award for Distinguished Service to the Atmospheric Sciences, and she was elected an AMS Fellow.

Chris had a long interest in the policy dimensions of science and in communicating science to nonscientists.

A celebration of her life will be held Sunday, 5 August 5, at 10:30 a.m. at Woodend Sanctuary, 8940 Jones Mill Road, Chevy Chase, Maryland.