

## Guest Editorial

### The future of Antarctic Science is ours to define

**D**ateline: 30 August 2050 - *“As the austral winter ends an integrated, international scientific team of ~1000 is fanning out across our planet’s southern regions. The vital signs of the Antarctic are being monitored by artificial intelligence networks of sensors and robotics and aircraft and space-borne detectors day and night year-round. Data is streamed to a coupled, holistic model that updates forecasts of weather and climate; ocean and sea ice conditions; ice, water, heat and chemical budgets; and the status of and trends in living systems and biodiversity. In situ samples automatically collected since last summer will be retrieved to calibrate sensors and dispatched to international archives for wide usage. Tens of millions of people view the state of the Antarctic environment daily in real-time and the knowledge gained supports management and protection of the region by the more than 100 nations of the Antarctic Treaty System.”*

While predicting the future is wrought with uncertainties, the first attempt to do so in 2012–16 has proven essential to realizing the promise of Antarctic science in the 21st century. The goal was to bring the international community together to discern future directions in Antarctic science and identify the challenges to delivering that future. The success of these efforts was assured by assessments of progress and refreshing the vision in 2020, 2030, and 2040. The foundational exercises included an Antarctic science roadmap and a pragmatic guide to delivering the science that engaged > 1000 members of the community. The “Antarctic Science Horizon Scan”, led by the Scientific Committee on Antarctic Research (SCAR), identified eighty high priority scientific questions to answer by 2035. The “Antarctic Roadmap Challenges” (ARC) project, led by the Council of Managers of National Antarctic Programs (COMNAP), explored the critical requirements to deliver the science including enabling technologies, access to the region, logistics/infrastructure and international cooperation. ARC concluded that Antarctic science would continue to be resource intensive, much would be field-based and international cooperation was essential. Requirements were defined to advise which investments would realize the greatest scientific returns. New models of cooperation were adopted that surmounted barriers to international collaboration and addressed the challenges of ‘big data’. Other crucial challenges were the availability of human resources and critical skill sets, communicating the importance of Antarctic science to a global audience, the necessity of sustained financial support and inspiring the participation of the next generation. While the Horizon Scan and ARC provided a framework for the community, the specific research conducted was defined, as before, through national funding processes. The science outputs were determined by the research funded and the key variables required to accurately forecast the state of the Antarctic environment. The usefulness of the Horizon Scan and ARC were ultimately proven by its realization in national actions and investments, and the production of knowledge critical to informing global debates on the human role in future planetary trajectories.

One lesson was clear - the Antarctic community needed to work together toward a collective vision of future scientific objectives and how best to achieve those goals. In the end the greatest benefits were derived from the friendships developed, the mentoring of the next generation and the new collaborations that advanced Antarctic science in ways that would not have otherwise occurred. Will the momentum of Antarctic science continue into the second half of the 21st century? Are you willing to participate in and lead the next “future gazing” efforts? Paraphrasing Michelangelo - “The greatest danger is ...not that we set our aim too high and miss it, but that it is too low and we reach it”.

MAHLON C. KENNICUTT II, MICHELLE ROGAN-FINNEMORE, YEADONG KIM,  
KAZUYUKI SHIRAIISHI & JERÓNIMO LOPEZ-MARTINEZ