EDITORIAL

Future Earth

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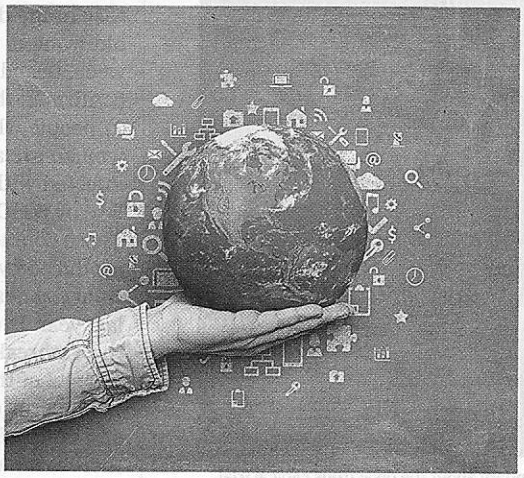
The new year ushers in important international agendas secured at the end of 2015: the Paris climate agreement to limit global warming to a 1.5° to 2°C increase and adoption of the United Nations Sustainable Development Goals. Both actions reflect the world's recognition that development in all nations hinges on a stable and resilient Earth system. This is a political paradigm shift, fortified by three decades of remarkable advancements in Earth system science. The International Geosphere-Biosphere Programme (IGBP), which ended in December 2015, can take considerable credit for coordinating and catalyzing much of this fundamental research. The recently launched Future Earth research program builds on this legacy and is the right response to the new scientific challenges.



"Future Earth...is the right response to the new scientific challenges."

Formed in 1986, IGBP became the first major international program to conceptualize Earth as a whole system. Its objective was "to describe and understand the interactive physical, chemical and biological processes that regulate the total Earth system...and the manner in which they are influenced by human activities." Its visionary research agenda attracted leading scientists from advanced and developing countries, and brought together thousands of researchers through interlinked research initiatives such as the Global Carbon Project (GCP) and the Past Global Changes (PAGES) project, all of which continue to generate key scientific insights. In December 2015, GCP published its 10th annual carbon budget during the Paris climate summit, indicating a decline of 0.6% in the growth rate of carbon dioxide emissions in 2015, potentially the first decrease during a time of world economic growth. Earlier last year, PAGES researchers concluded that sea levels could stabilize at around 6 meters higher than preindustrial levels if global temperature were to increase 1° to 2°C.

The integrated systems perspective is what made IGBP so important, particularly its focus on the dynamics and feedbacks between the climate system and the biosphere. From its freewheeling intellectual spirit, unbounded by political mandates, emerged profound scientific insights, such as the concept of the "Great Acceleration" in human activity since the 1950s, and quantification of this impact on Earth. IGBP will forever be associated with the concept of the Anthropocene—the scientific conclusion that Earth has entered a new geological epoch dominated by human interference—which was first discussed at an IGBP meeting in 2000, was published in the IGBP newsletter that same year, and was central to IGBP's first synthesis report, *Global Change and the Earth System: A Planet Under Pressure*. IGBP was a foundation for the now-established field of Earth system science and influenced the research trajectory of many institutes.

This new knowledge, and the sheer scale of responsibility that the Anthropocene represents, necessitate an evolution to global sustainability science. Future Earth is the next logical step and brings together natural and social sciences to work toward more integrative global change science and solutions-oriented research that engages governments, civil society, research funders, and the private sector. The new initiative has the support of an influential coalition of international bodies, including the International Council for Science, the United Nations, and the major national research funders. Future Earth international offices have now been established in Canada, France, Japan, Sweden, and the United States, and national and regional networks and offices are growing rapidly. But Future Earth's success will lie in its ability to stay true to IGBP's legacy. As IGBP projects transfer to Future Earth, the new program must continue to attract the best scientists and institutions.

Earth system resilience and stabilization are necessarily rising to the top of political and scientific research agendas. With humanity at a critical juncture, Future Earth has the potential to become the largest, most ambitious international research program ever undertaken.

– **Johan Rockström**

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