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I

INTERNATIONAL GEOPHYSICAL YEAR (IGY)

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Definition

The International Geophysical Year (IGY 1957–1958) was the most successful global effort to coordinate the measurement and collection of geophysical data from around the world during a period of anticipated maximum solar activity. It was also timed as a continuation of a series of international efforts to collect data at the poles, called the International Polar Years I and II (IPY 1882–1883 and IPY 1932–1933). The IGY actually was planned for 18 months, July 1, 1957, through December 31, 1958, and a follow-on International Geophysical Cooperation (IGC 1959) was necessary to complete the work and assemble the results, from January 1, 1959, through December 31, 1959.

During 2007–2009, there was a fourth international effort referred to as IGY-2 or IGY + 50, but instead of a coordinated singular management initiative, was organized as separate initiatives, the Electronic Geophysical Year (eGY 2007–2008), the International Polar Year (IPY 2007–2008), the International Heliophysical Year (IHY 2007–2009), and the International Year of Planet Earth (IYPE 2007–2009). To capture the work and materials from the IGY 1957–1958, organizers of the IHY created a legacy archive and recognition program entitled IGY Gold. During and after the IGY 1957–1958, the non-science public joined the scientists with pamphlets, magazine articles, films, children's toys, games, and books, all aimed at encouraging exploration and discovery.

Introduction and concept

A lack of knowledge of natural Earth processes and the interest by thousands of Earth scientists to explore and discover relationships of the processes combined with modern communications and global transportation improvements inspired and motivated the organizers and participants of IGY in a postwar world (the early 1950s). The more measurements were studied, the more questions evolved. To get the answers, the world Earth science community needed to cooperate and collect data together and facilitate a means to share this new data to enable new Earth science discoveries.

The concept seems simple today in the twenty-first century: propose global efforts to collect physical and chemical measurements of the Earth on a semicontinuous basis over a specified period of time. In the early 1950s, this task was burdened with a lack of infrastructure and a lack of resources in all parts of the Earth, governed by separate regimes speaking hundreds of different languages, and recovering from wartime conflicts. Just getting from point A to point B was a time-consuming task. All this was about to change.

History

While in Maryland, James Van Allen (1914–2006) and his wife Abigail hosted a dinner on April 5, 1950, for British geophysicist Sidney Chapman (1888–1970), a theoretical physicist interested in the earth's magnetic phenomena and a participant in IPY II 1932–1933. Also present at dinner was Lloyd Berkner (1905–1967), a former radio-engineer who had been on Admiral Byrd's 1928–1930 Antarctic expedition. According to Van Allen, the dinner conversation ranged widely over geophysics and especially geomagnetism and ionospheric physics. Following dinner, as they were all sipping brandy in the living room, Berkner turned to Chapman and said, "Sydney, don't you think it is about time for another international polar year?"

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Chapman immediately embraced the suggestion, remarking that he had been thinking along the same lines himself (Van Allen, 1998).

The time was ripe. Technological improvements in instrumentation and rocketry had enabled scientists to probe much deeper into the atmosphere and deep into the Earth. In the process of enlisting support among the international scientific societies, Chapman and Berkner found a strong preference for a global program encompassing additional geographical regions and additional physical science disciplines.

Chapman first presented the idea for a third IPY to the constituent scientific unions under the International Council of Scientific Unions (ICSU). The unions, in turn, presented the proposal to the ICSU General Assembly, and ICSU, in turn, invited the World Meteorological Organization (WMO) to participate as well as the national organizations adhering to ICSU. By 1953, there were 26 countries signed up in what came to be known at the International Geophysical Year 1957–1958. The disciplines included practically all the earth, atmosphere, and oceanic sciences, covering many parts of the globe beyond the polar regions.

Scope

By 1954, the international IGY organizing committee (set up by ICSU in 1952) was known as CSAGI after its French name, Comité Special de l'Année Géophysique Internationale. The CSAGI set the priorities for IGY projects to have at least one of these characteristics:

- Problems requiring concurrent synoptic observations at many points involving cooperative observations by many nations
- Problems in the geophysical sciences whose solutions would be aided by the availability of synoptic or other concentrated work during the IGY
- Observations of all major geophysical phenomena in relatively inaccessible regions of the Earth that can be occupied during the IGY because of extraordinary effort during that interval (the Arctic and Antarctic)
- Epochal observations of slowly varying terrestrial phenomena

These were not arbitrary or unreasonable criteria. Based on this defined planning and framework, the scope of the IGY program materialized and an organization including field operations, data collection synchronization, data reporting, and assembly and archiving was begun.

Operations

When comparing the organization of IGY to today's professional and scientific working groups, the IGY was controlled by two separate bodies, the CSAGI and the ICSU. Areas of science emphasis covered:

Meteorology	Cosmic Rays	Gravity
Geomagnetism	Glaciology	Nuclear Radiation
Aurora and Air Glow	Oceanography	Latitude and Longitude
Ionosphere	Rockets and Satellites	World Days and Communication
Solar Activity	Seismology	

Participating countries represented in expeditions or contributing and sponsoring in-country data collection included:

Afghanistan	German Democratic Republic	Norway
Argentina	German Federal Republic	Pakistan
Australia	Ghana	Panama
Austria	Greece	Peru
Belgium	Guatemala	Philippines
Bolivia	Haiti	Poland
Brazil	Hawaii	Portugal
Bulgaria	Honduras	Rhodesia and Nyasaland
Burma	Hungary	Romania
Canada	Iceland	San Salvador
Ceylon	India	Saudi Arabia
Chile	Indonesia	Spain
China (Nationalist)	Iran	Sudan
China (People's Republic)	Ireland	Sweden
Colombia	Israel	Switzerland
Costa Rica	Italy	Thailand
Cuba	Japan	Tunisia
Czechoslovakia	Korea, Democratic Republic of	Turkey
Denmark	Libya	Union of South Africa
Dominican Republic	Malaya	Union of Soviet Socialist Republics
East Africa	Mexico	United Kingdom
Ecuador	Mongolia, People's Republic of	United States of America
Egypt	Morocco	Uruguay
Ethiopia	Netherlands	Venezuela
Finland	New Zealand	Vietnam, Democratic Republic of
France	Nicaragua	Vietnam, Republic of
		Yugoslavia

Achievements

General achievements of IGY were:

- Global cooperation for improved Earth physical and chemical measurements
- Improved awareness and understanding of Earth processes
- Coordinated collection and assembly of multidisciplinary data

- Archive and sustainable safekeeping of data collected and shared
- Inspiration and hope for future similar programs and initiatives

Some of the most significant IGY achievements were:

- Defining the system of mid-ocean ridges that encircle the globe, furthering our understanding of the Earth's crust and the theory of Plate Tectonics.
- Discovery of the Van Allen radiation belts. These belts surround the Earth at altitudes of hundreds and at thousands of kilometers above the surface and are significant to present-day electronic communications.
- Collection of synoptic data, a comprehensive overview of global physical phenomena. These achievements were accomplished through organization of various scientific fields under the International Council of Scientific Unions (ICSU). This union created a series of technical panels with scientific goals and facilitated international cooperation.
- Under the collection of synoptic data, special attention was given to the Antarctic Continent. Neither the race for the South Pole in the early 1900s nor the age of exploration in the 1930s brought the influx of humanity experienced during the IGY to the ice-covered continent.
- A new value for total abundance of water in the form of ice on the Antarctic continent. Ninety percent of the planet's ice is found on and around the continent, locking 68% of the world's fresh water in the Southern Hemisphere.
- Improved meteorological predictions by understanding the weather patterns of the Southern Hemisphere.
- Advancements in the theoretical analysis of glaciers.
- Seismology of the Southern Hemisphere.
- The scientific cooperation in Antarctica paved the way for the Antarctic Treaty. The treaty signed December 1, 1959, created a continent free from nuclear weapons and open to scientific research; the first truly international territory.
- Improved science and math education. Through implied competition among countries, IGY generated a new sense of the importance of math and science to competitive problem solving.
- Sputnik and satellite measurements. IGY provided the first peaceful use of previously military equipment and technology to enhance the measurement capability and later communications of people on Earth.
- World Days and Communication. During the IGY, a calendar was arranged to achieve simultaneous observations in most disciplines. During some periods, intensification in observations was considered and the World Days program was established. There were three classes of special days: Regular World Days (RWD) and World Meteorological Intervals (WMI) were picked in advance on the calendar. Special World Intervals (SWI) were designed day to day and broadcast by the World Warning agency (AGIWARN).
- World Data Centers. The IGY was predicated on full and open data exchange. The World Data Centers were created to provide equitable access for use by all qualified scientists for public good and for geophysical research as a tool for sustainability.
- World Gravity Map. Over 60,000 observations and additional 150,000 anomaly values results from the various IGY programs. The raw data were prepared for storage and further analysis on punched paper cards for machine analysis. The final values was published as a monograph and supplied to the World Data Centers.
- Postage stamps, films, songs, and pamphlets. Outside of the scientists contributing, the new approach included outreach and generational attraction to science at all levels. These creative media and documentary projects contributed to the events during the IGY and continue through today to provide accounts and anecdotes about the progress made by participants in IGY.

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