A Vision for the Development of the Geophysical Sciences in Canada

from the CGU and CMOS for consideration by NSERC

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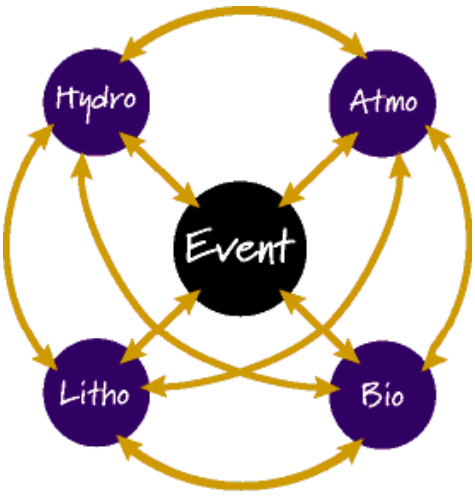
What are the Geophysical Sciences?



- Those branches of earth sciences in which the principles and practices of physics are used to study the Earth. The earth system interactions comprising the atmosphere, cryosphere, hydrosphere, biosphere, lithosphere, deep Earth and near-Earth space environment are a unifying theme.
  - Atmospheric Sciences
  - Ocean/Marine Sciences
  - Hydrological Sciences
  - Cryospheric Sciences
  - Biogeosciences
  - Solid Earth Sciences
  - Near-Earth Space Sciences

Geophysical Sciences in the United States

- American Geophysical Union: 45,000 members, derived from NRC, independent scientific society since 1972
- Four fundamental areas:
  - Atmospheric and ocean sciences
  - Solid Earth geophysics
  - Hydrological sciences
  - Space sciences
- Extraordinarily successful model

Canadian Meteorological and Oceanographic Society

- 1939: Canadian Branch, Royal Meteorological Society
- 1967: independence as Canadian Meteorological Society
- 1977: Oceanographers join - Canadian Meteorological and Oceanographic Society
- 1100 members, operates journal *Atmosphere-Ocean*
- Goal: to advance atmospheric and oceanic sciences and related environmental disciplines in Canada

Canadian Geophysical Union

- Evolved from NRC Associate Committee on Geodesy and Geophysics (ACGG) and AC on Hydrology (ACH).
- ACGG was replaced in 1974 by CGU - initially joint between GAC and CAP
- 1988 CGU becomes independent academic society, retains links to CAP, GAC
- 1992 ACH joins CGU as Hydrology Section
- 2002 Geodesy Section formed
- 500 members, hosts CNC-IUGG
- Goal: Advance and promote the physical study of the Earth and its space environment.

CNC – IUGG

Canadian National Committee of the

International Union of Geodesy and Geophysics

The IUGG: a Union of 8 International Associations (IA's)

IAG:	Geodesy
IAGA:	Geomagnetism and Aeronomy
IACS:	Cryospheric Sciences
IAHS:	Hydrological Sciences
IAMAS:	Meteorology and Atmospheric Sciences
IAPSO:	Physical Sciences of the Oceans
IASPEI:	Seismology and Physics of the Earth's Interior
IAVCEI:	Volcanology and Chemistry of the Earth's Interior

Note: CMOS and CGU fields cover all but one Int. Assoc. - IAVCEI

NRC – IUGG

National Research Council – International Union of Geodesy and Geophysics

- NRC is the *Adhering Member* of IUGG for Canada.
- NRC pays annual fees of ~$18,000 to IUGG for Canada.
- IUGG collects fees from ~80 member countries and distributes this income among the 8 Int. Associations.
- NRC has a Partnership Agreement with one scientific society for each international organization that it adheres to (such as the IUGG).
- NRC's *scientific partner* w.r.t. to the IUGG is the CGU.

GSC – IUGS

Geological Survey of Canada - International Union of Geological Sciences

- GSC pays fees to the IUGS for Canada.
- CFES (Canadian Federation of Earth Sciences , formerly the Canadian Geoscience Council), is the GSC's scientific partner.

[IUGS memberships fees flow through CFES budget]

Canadian Federation of Earth Sciences - a consortium of geological societies

Acronyms	Affiliations
AEG	Association of Exploration Geochemists
BC&YCM	BC and Yukon Chamber of Mines
CAG	Canadian Association of Geographers
CANQUA	Canadian Quaternary Association
CEGS (KEGS)	Canadian Exploration Geophysical Society
CGS	Canadian Geotechnical Society
CIM	Canadian Institute of Mining, Metallurgy and Petroleum
CSCOP	Canadian Society of Coal and Organic Petrology
CSEG	Canadian Society of Exploration Geophysicists
CSPG	Canadian Society of Petroleum Geologists
CWLS	Canadian Well Logging Society
GAC	Geological Association of Canada
IAH-CNC	Internat'l Association of Hydrogeologists Canadian Nat'l Chapter
MAC	Mineralogical Association of Canada
MINAC	Mining Association of Canada
PDAC	Prospectors and Developers Association of Canada
RSC (EOASD) Sciences	Royal Society of Canada (Earth, Oceanographic and Atmospheric Division)

At the International Level:

Earth Science activities are coordinated through two International Unions

- IUGG (geophysical sciences)
  - Canadian membership fees paid by NRC
- IUGS (geological sciences)
  - Canadian membership fees paid by GSC

In Canada:

Federal government membership support follows a similar split.

- NRC – Geophysical Support
- GSC – Geological Support

A Model for Coordinating Geoscience Research in Canada

Follow the International Structure

- Coordinate activities of IUGS-related fields under a consortium of Geological Societies - CFES
- Coordinate activities of IUGG-related fields under a consortium of Geophysical Societies – CSGS

How to Coordinate the Geophysical Sciences?

1. Expand role and activities of CNC-IUGG

2. Coordinate a consortium of geophysical societies under the auspices of the CNC-IUGG:

   Canadian Societies for the Geophysical Sciences (CSGS)

   [endorsed in principle by CGU Executive Committee and CMOS Executive Committee]

What is CSGS?

- A mechanism to link, integrate and coordinate the geophysical sciences in Canada
- A voice from the geophysical sciences to government, funding agencies, industry, the public.
- A way to promote the advancement of the geophysical sciences in Canada

Goals

- Facilitate collaboration and exchange amongst Canadian geophysical societies
- Coordinate and promote a vision for the integration of the geophysical sciences in Canada

Why?

Benefits from:

- commonality of approach – application of physics to dynamical earth systems, linkages to environment, chemistry, biology, geology
- scientific exchanges and interdisciplinary linkages in the geophysical sciences,
- coordinated voice to scientific funding bodies and government on issues of policy relating to and support for the geophysical sciences,
- a vision for the advancement of the geophysical sciences in Canada

Where are the Geophysical Sciences in Canada?

IUGG has associations corresponding to –

- Geodesy,
- Geomagnetism & Aeronomy,
- Hydrology,
- Meteorology & Atmospheric Sciences,
- Physical Sciences of the Oceans,
- Seismology & Physics of Earth's Interior,
- Volcanology and Chemistry of the Earth's Interior,
- Cryospheric Sciences

In Canada, 7 out of 8 of these associations link to CGU and CMOS

Activities

- Joint CGU/CMOS meetings.
- Enhance profile of geophysical sciences with the public and representation in secondary and post-secondary education
- Identify and recommend research support by governments and others
- Recommendations to member societies

Membership/Operation

- Any society that makes a contribution to the geophysical sciences
- Possible interest from
  - Canadian Society for Soil Science
  - Canadian Geomorphology Research Group
  - others
- Chair alternates between CMOS and CGU
- Reports to CNC-IUGG

Current NSERC Organization of Geoscience Funding

- GSC08 Solid Earth Sciences
- GSC09 Environmental Earth Sciences
- Geophysical Sciences are split between these committees. As the 'Earth Science' committees NSERC has looked for a coordinated voice from the constituent scientific communities, however this has not always developed effectively.
- Geological Sciences and Geophysical Sciences are fundamentally different in approach, priorities and subject area, despite common interest in 'the Earth'.
- Consistent loss of funding in reallocation exercises.
- Logical for NSERC to align its funding delivery mechanisms with international and national organization of science to promote better scientific development

Proposed NSERC GSC Geophysical Sciences

- Sciences in which the principles and practices of physics are used to study the Earth and the earth system. Earth system interactions involve the atmosphere, cryosphere, hydrosphere, biosphere, lithosphere, deep Earth and near-Earth space environment.
  - Atmospheric Sciences
  - Ocean Sciences
  - Hydrological Sciences
  - Cryospheric Sciences
  - Biogeosciences
  - Geodesy
  - Geomagnetism and Aeronomy
  - Tectonophysics
  - Near-Earth Space Sciences
  - Geomorphology
  - Soil Sciences

Goals of Geophysical Sciences in NSERC

- Demonstrate that Geophysical Sciences are important to Canadians and deserving of increased support for fundamental and applied research
- Provide scientific foundation and tools for improved stewardship of the Earth and Earth Systems and for sustainable economic development

NSERC GSC Geophysical Sciences could address key issues

- Natural disasters: volcanism, earthquakes, floods, drought, extreme weather, tsunamis, landslides
- Environmental sustainability: freshwater, oceans, soils, geothermal, infrastructure
- Environmental Health: air pollution, water quality, soil/earth/ocean health
- Global Change: atmospheric change, biogeochemical fluxes, glaciers, Earth evolution
- Sea Level and Coastal Change: sea level rise, continental rebound/subsidence, tectonics

NSERC Geophysical Sciences & Strategic Science

- Water Resources
- Natural Hazards
- Impacts and Adaptation to Climate Change
- Sustainable Energy Development
- Earth Observation & Modelling Systems
- Near-Space based Technologies
- Polar science
- Ocean Systems
- Preserving Natural Capital

Fundamental Science is 'Capital' Applied Science is 'Interest'

- Applied geophysical sciences are key to Canada's prosperity, safety, sustainability.
- Obligation of Canadian science to be socially relevant
- Applied science is sustained and improved by fundamental science
- NSERC is the ONLY mechanism that invests in the development of fundamental geophysical sciences
- Canada's long term competitiveness, prosperity and quality of life therefore depends on NSERC's investment in fundamental geophysical sciences