Natural Sciences and Society

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International Environment Forum (IEF)
http://iefworld.org
and
ebbf - ethical business building the future
http://ebbf.org

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Globalization

• is the logical next step in human evolution, but
• Economic globalization is driven by powerful governments and multinational businesses for their own benefit
• Social globalization is being strongly resisted
• Globalization of environmental problems threatens future sustainability
• Globalization of information makes us aware
Present unsustainability

- Population will grow to 9 billion by 2050
- Economy not creating enough employment
- 20% of population uses 80% of resources
- Energy challenge / climate change threats
- Growing water shortages
- Loss of biodiversity and ecosystem services
- Food production capacity at risk
- Extremes of wealth and poverty widening
- Financial system is vulnerable
- Governance failing to cope
Main trends in science

• Increasing specialization: renaissance polymath => gentleman naturalist => extreme specialist
• Increasing reductionism
• Technological sophistication
• Teamwork - multiple authors
• Grantsmanship - research funding
• Citation ratings, high profile journals
• Peer review - quality vs. conformity
Emerging needs

• Sustainability requires transdisciplinary approaches - natural and social sciences
• Integrated complex systems perspectives
• Emergent properties of complex systems
• Tipping points, sudden transformations, non-linear system dynamics, chaos
• Multiple levels of organization
• Linking science and policy

Science today is poorly structured to respond to these needs


Scenarios from World 3
(Meadows et al. (1992) Beyond the Limits)

Business as usual                 Transition 1995                     Transition 2015
Where are we now?

Sustainability Science

ICSU, IGBP, IHDP, WCRP 2001

“The cultivation, integration, and application of knowledge about Earth systems gained especially from the holistic and historical sciences (such as geology, ecology, climatology, oceanography) coordinated with knowledge about human interrelationships gained from the social sciences and humanities, in order to evaluate, mitigate, and minimize the consequences, regionally and worldwide, of human impacts on planetary systems and on societies across the globe and into the future – that is, in order that humans can be knowledgeable Earth stewards.”

It must encompass different magnitudes of scales (of time, space, and function), multiple balances (dynamics), multiple actors (interests) and multiple failures (systemic faults). [Wikipedia]

Ecological Economics


Tensions

- Ideal of scientific neutrality **versus** social engagement
- Quality peer review **versus** citizen science and indigenous knowledge
- Independent investigation (pure science) **versus** political/donor/grant-driven priorities (applied science)
- Discipline-based academic careers **versus** multi-disciplinarity
- Public sector/academic research **versus** corporate research for profit
- Advanced country science **versus** developing country science
The Iron Curtains

• Barriers between disciplines (not publishing beyond your field, specialized language for in-group, peer review by orthodoxy)
• Barrier between natural and social sciences
• Barrier between science and religion (untestable, subjective, not an acceptable source or field of study)

Breaking down the silos (post-2015 dialogue)
Anti-science Movement

- Vested interests: tobacco industry and lung cancer; oil/coal industry and climate change
- Fundamentalist religion and evolution
- Unlimited funding ($1b/yr for climate skeptics)
- Falsehood as public information, deliberate disinformation, distortion, cherry-picked data, etc.
- Excellent marketing, psychological sophistication, dominant media
- Front organizations, infiltrate scientific journals
- Seeding doubt and destroying confidence in science
Science for Policy

• UNEP Global Environment Outlook reports

• Intergovernmental Panel on Climate Change (IPCC)

• Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services (IPBES)

• planned UN Global Sustainable Development Report
Scientific Advisory Processes

- National State of the Environment and Sustainability reports - 150 countries
- UNEP Global Biodiversity Assessment 1995
- Millennium Ecosystem Assessment 2005
- Global International Waters Assessment 2006
- International Assessment of Agricultural Knowledge, Science and Technology for Development 2008
- Intergovernmental Platform on Biodiversity & Ecosystem Services (IPBES) 2013 Bonn
- planned UN Global Sustainable Development Report
Science-derived Sustainability Indicators

• CSD Work Programme on Indicators 1994-2006
• Environmental Vulnerability Index 2004
• Environmental Sustainability Index revised 2005
• Environmental Performance Index 2008
• Now preparing Sustainable Development Goals and Indicators for post-2015
Limited political receptivity

• Short-term perspective, next election
• Powerful economic interests and lobbies
• Corruption
• Lack of understanding of science
• Ideology before rationality
• Legislating against science
• Limited attention
• Do not like science making them look bad
• Lack of leadership and political will to take necessary but unpopular decisions
Science has failed to solve problems

- Scientific reality versus political reality
- Priority to economics
- Dominance of short-term thinking
- Assumption of technological fix
- Scientific understanding does not usually change behaviour
- Grudging acknowledgment that something more is needed (but not religion)
Science demonstrates unity

• Validity of spiritual principles illustrated by science
• Coral reef as complex ecosystem illustrating unity in diversity, balance, symbiosis and cooperation, emergent properties
Coral reef ecosystem

L'écosystème du récif corallien
Corals animal/plant symbiosis

Coraux animaux/algues en symbiose
High reef biodiversity

400 corals, 4000 molluscs, 1500 fish just on the Great Barrier Reef

400 coraux, 4000 mollusques, 1500 poissons juste sur le Grand Récif Barrière
Complex spatial organization

Organisation spatiale complexe
Coral reef like a city

Récif comme une ville
Clownfish and anemone (mutual assistance)
Poisson clown et anémone (aide mutuelle)
Public mobilization for science

• Science education in schools
• Science journalism
• Bringing science to the grassroots level
• Public participation in monitoring and assessment
• Citizen Science (reefwatch, streamwatch)
• Indigenous science (SPREP, UNESCO)
• Local scientific institutions, science accessible to everyone
New paradigm for science

Scientific and technological activity... must cease to be the patrimony of advantaged segments of society, and must be so organised as to permit people everywhere to participate in such activity on the basis of capacity....

[This] will require the establishment of viable centres of learning throughout the world, institutions that will enhance the capability of the world's peoples to participate in the generation and application of knowledge.

(Bahá'í International Community. 1995. *The Prosperity of Humankind*)
...the majority of technological development is driven by market forces that do not reflect the basic needs of the world’s peoples. Furthermore, the emphasis on the transfer of technology without accompanying efforts to increase participation in the generation and application of knowledge can only serve to widen the gap between the rich and the poor—the ‘developers’ and the ‘users’ of technology. Developing the capacity for identifying technological need and for technological innovation and adaptation—in light of societal needs and environmental constraints—will be vital to social progress. The transformation of complex social realities will require the development of institutional capacity within local populations to create and apply knowledge in ways that address the specific needs of that population. This question of institutional capacity (e.g. the establishment of regional centers of research and training) constitutes a major challenge to sustainable development. If successfully met, however, the result will be to break the present unbalanced flow of knowledge in the world and dissociate development from ill-conceived processes of modernization. “Modern” technologies will be characterized by an orientation towards addressing locally defined needs and by priorities that take into account both the material and moral prosperity of society as a whole.

(Bahá’í International Community, Rethinking Prosperity: Forging Alternatives to a Culture of Consumerism, 2010)
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