4 Academic Cultures new synergies needed at universities to accelerate society's response to climate change

Mark Hixon, Oregon State University presenting impressions from the Columbia River Quorum

organized and hosted by the Spring Creek Project
Oregon State University









10 February 2009. Proceedings of the National Academy of Sciences USA.

Irreversible climate change due to carbon dioxide emissions

Susan Solomon^{a,1}, Gian-Kasper Plattner^b, Reto Knutti^c, and Pierre Friedlingstein^d

^aChemical Sciences Division, Earth System Research Laboratory, National Oceanic and Atmospheric Administration, Boulder, CO 80305; ^bInstitute of Biogeochemistry and Pollutant Dynamics and ^cInstitute for Atmospheric and Climate Science, ETH CH-8092, Zurich, Switzerland; and ^dInstitut Pierre Simon Laplace/Laboratoire des Sciences du Climat et de l'Environnement, Unité Mixte de Recherche 1572 Commissariat à l'Energie Atomique—Centre National de la Recherche Scientifique—Université Versailles Saint-Quentin, Commissariat a l'Energie Atomique-Saclay, l'Orme des Merisiers, 91191 Gif sur Yvette, France

Contributed by Susan Solomon, December 16, 2008 (sent for review November 12, 2008)

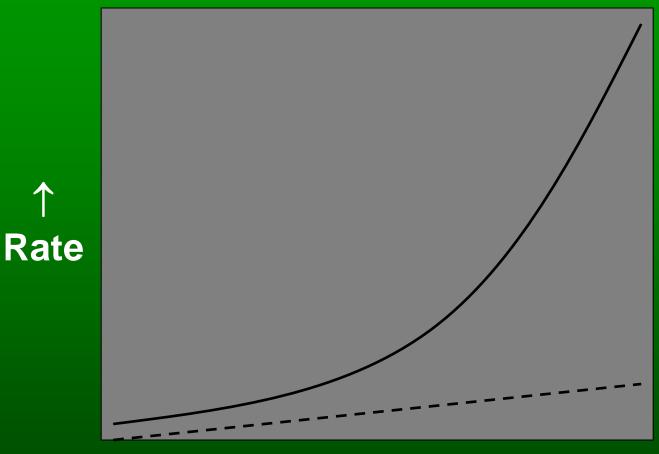
The severity of damaging human-induced climate change depends not only on the magnitude of the change but also on the potential for irreversibility. This paper shows that the climate change that takes place due to increases in carbon dioxide concentration is largely irreversible for 1,000 years after emissions stop. Following cessation of emissions, removal of atmospheric carbon dioxide decreases radiative forcing, but is largely compensated by slower loss of heat to the ocean, so that atmospheric temperatures do not drop significantly for at least 1,000 years. Among illustrative irreversible impacts that should be expected if atmospheric carbon dioxide concentrations increase from current levels near 385 parts per million by volume (ppmv) to a peak of 450-600 ppmv over the coming century are irreversible dry-season rainfall reductions in several regions comparable to those of the "dust bowl" era and inexorable sea level rise. Thermal expansion of the warming ocean provides a conservative lower limit to irreversible global average sea level rise of at least 0.4-1.0 m if 21st century CO2 concentrations exceed 600 ppmv and 0.6-1.9 m for peak CO₂ concentrations exceeding ~1,000 ppmv. Additional contributions from glaciers and ice sheet contributions to future sea level rise are uncertain but may equal or exceed several meters over the next millennium or longer.

dangerous interference | precipitation | sea level rise | warming

others build up under sustained warming because of the time lags of the processes involved. Here we illustrate 2 such aspects of the irreversibly altered world that should be expected. These aspects are among reasons for concern but are not comprehensive; other possible climate impacts include Arctic sea ice retreat, increases in heavy rainfall and flooding, permafrost melt, loss of glaciers and snowpack with attendant changes in water supply, increased intensity of hurricanes, etc. A complete climate impacts review is presented elsewhere (8) and is beyond the scope of this paper. We focus on illustrative adverse and irreversible climate impacts for which 3 criteria are met: (i) observed changes are already occurring and there is evidence for anthropogenic contributions to these changes, (ii) the phenomenon is based upon physical principles thought to be well understood, and (iii) projections are available and are broadly robust across models.

Advances in modeling have led not only to improvements in complex Atmosphere–Ocean General Circulation Models (AOGCMs) for projecting 21st century climate, but also to the implementation of Earth System Models of Intermediate Complexity (EMICs) for millennial time scales. These 2 types of models are used in this paper to show how different peak carbon dioxide concentrations that could be attained in the 21st century are expected to lead to substantial and irreversible decreases in dry-season rainfall in a number of already-dry subtropical areas and lower limits to eventual sea level rise of the order of meters,

the challenge

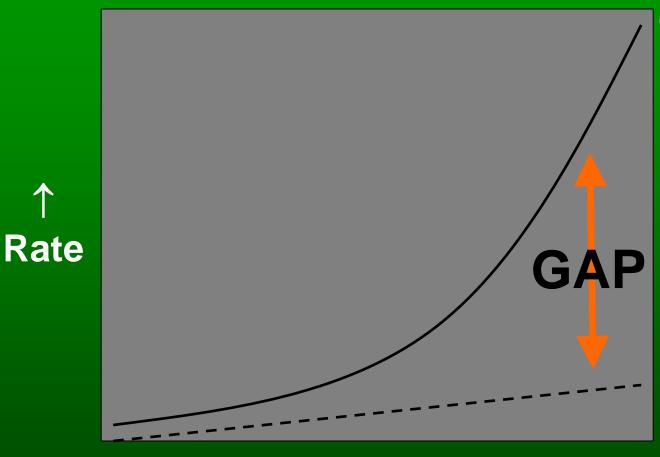


environmental degradation

society's response

Time \rightarrow

the challenge

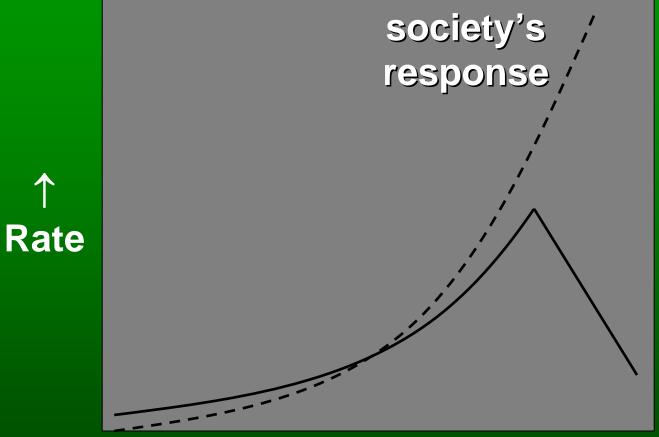


environmental degradation

society's response

Time \rightarrow

the goal

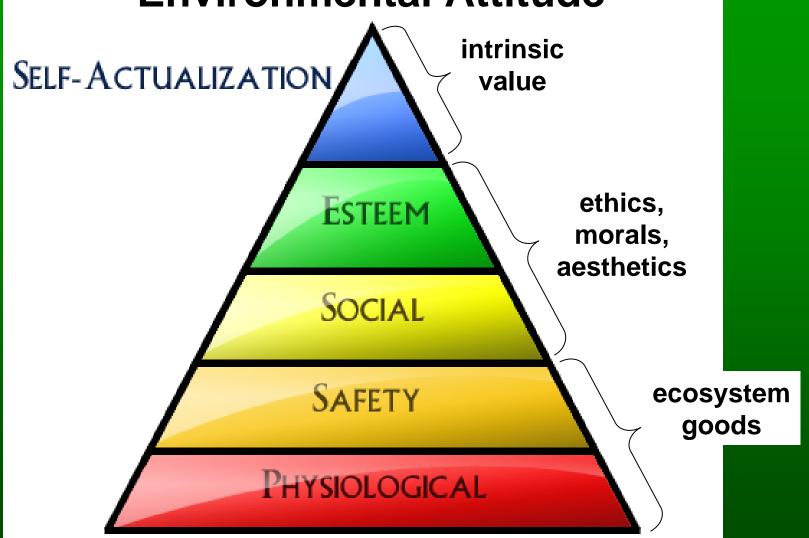


environmental degradation

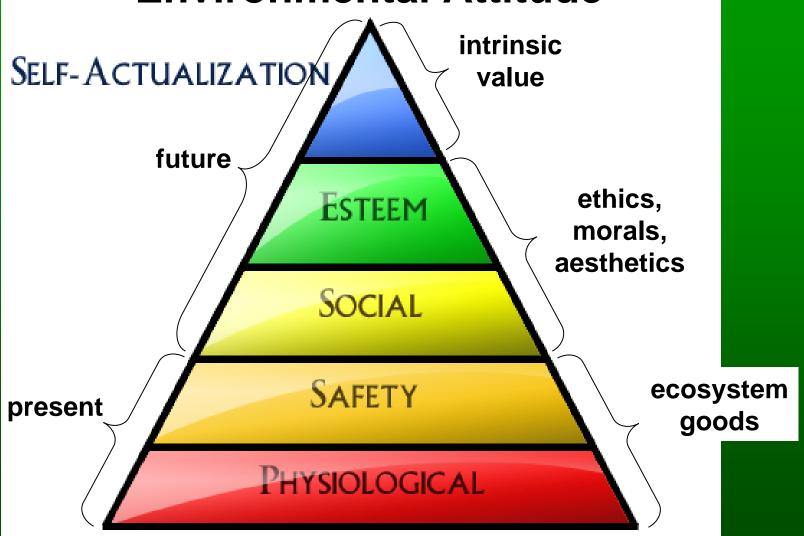
Time \rightarrow

ABRAHAM MASLOWS HIER ARCHY OF NEEDS SELF-ACTUALIZATION, ESTEEM SOCIAL SAFETY PHYSIOLOGICAL

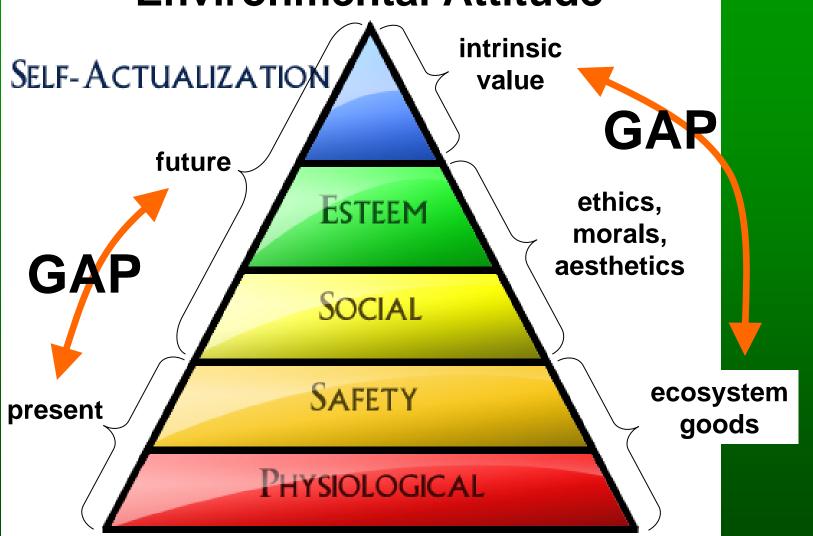
Need, Focus, and Environmental Attitude



Need, Focus, and Environmental Attitude



Need, Focus, and Environmental Attitude



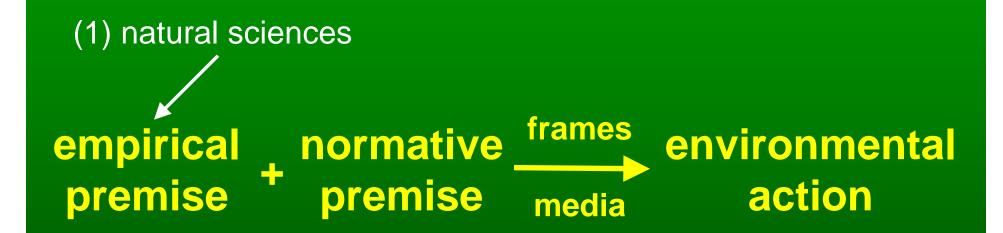
"We don't need more scientific assessments to tell us how fast our life-support systems are going down the drain. What we do need is something never done before – to mobilize scientists, social scientists, scholars in the humanities, and the general public to find & promote ways to change human behavior."

--Paul Ehrlich (2009)

unfinished syllogism

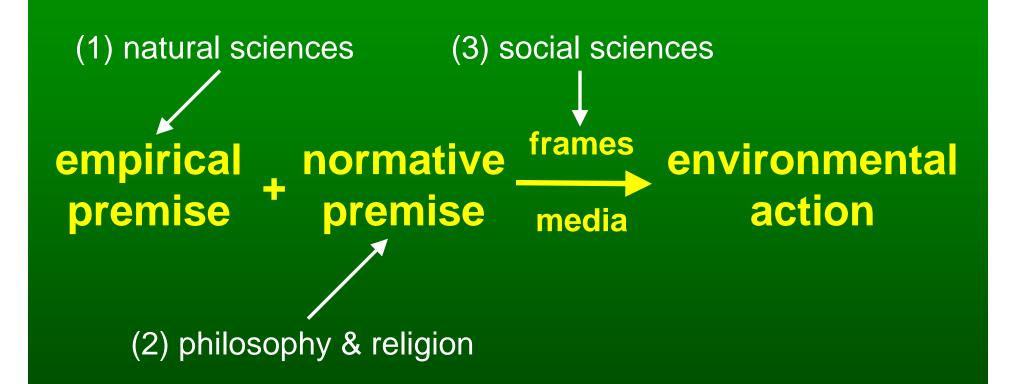
empirical + normative frames environmental premise premise media action

unfinished syllogism

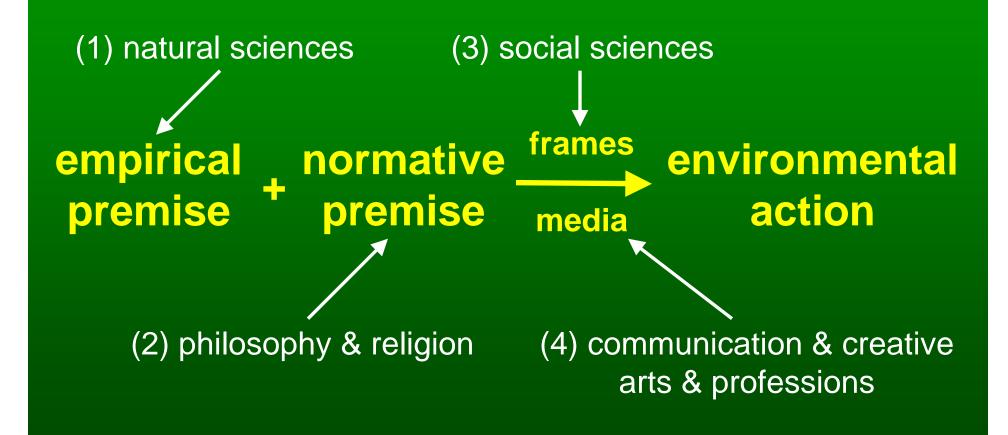


unfinished syllogism 4 academic cultures

unfinished syllogism 4 academic cultures

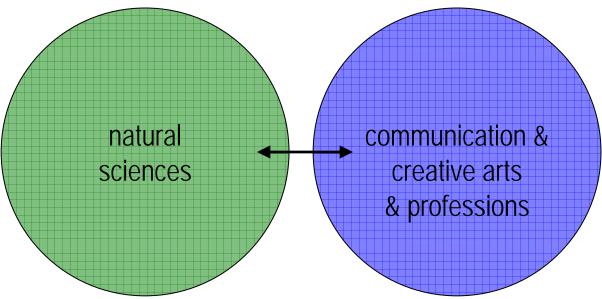


unfinished syllogism 4 academic cultures

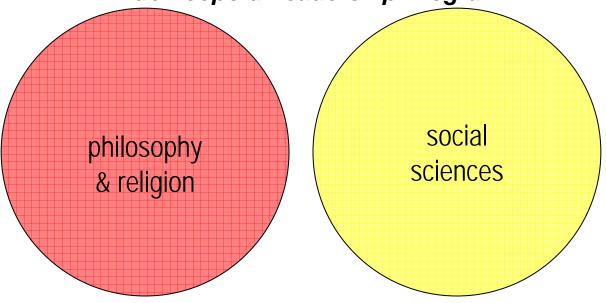


The Present communication & natural creative arts sciences & professions social philosophy sciences & religion

The Present



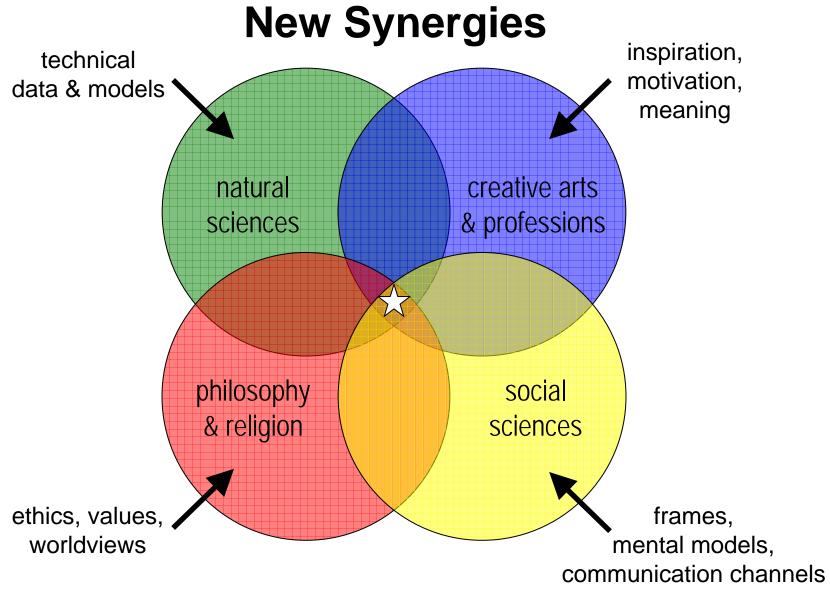
Aldo Leopold Leadership Program



The Present communication & natural creative arts sciences & professions Spring Creek Project social philosophy sciences & religion

The Vision inspiration, technical motivation, data & models meaning natural creative arts & professions sciences philosophy social & religion sciences ethics, values, frames, mental models, worldviews

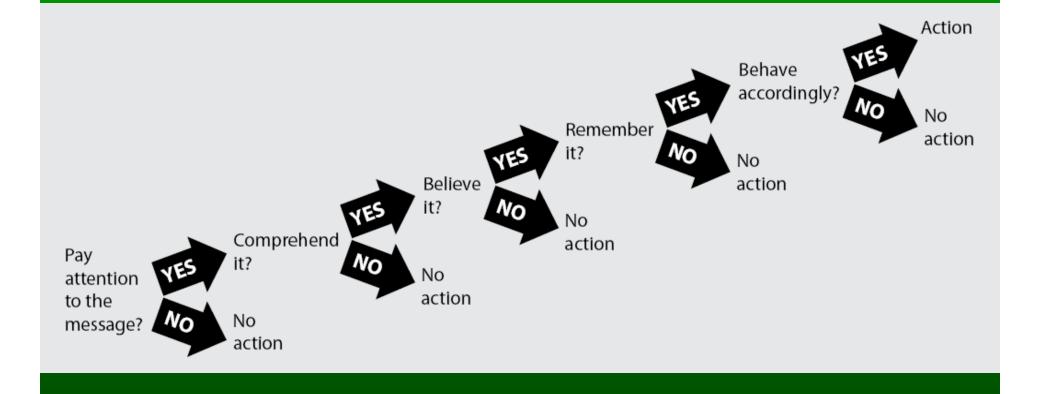
communication channels



Environmental Humanities Program at OSU

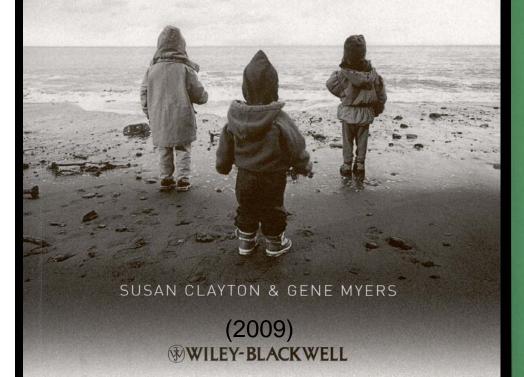
Millennium Assessment of Human Behavior at Stanford

the practical challenge





Understanding and promoting human care for nature



5 5 >

Free-Choice
Learning and
the Environment

dited by

John H. Falk Joe E. Heimlich Susan Foutz

(2009 AltaMira Press)

Eighty Visionaries on Why It's Wrong to Wreck the World

Mara Ral Ground

(September 2010 Trinity Univ Pr)

Edited by Kathleen Dean Moore and Michael P. Nelson

...time will tell...

