Sustainable Transitions: What does this mean for the scientific worldview?

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Outline

- Why all the talk about transitions and transformations?
- What does it actually mean to transform?
- Can our dominant scientific paradigm handle this?

    Example: Quantum social theory
- Adaptation from the inside-out

We believe this statement reflects the key messages emerging from the proceedings of the Planet Under Pressure conference.

State of the Planet Declaration

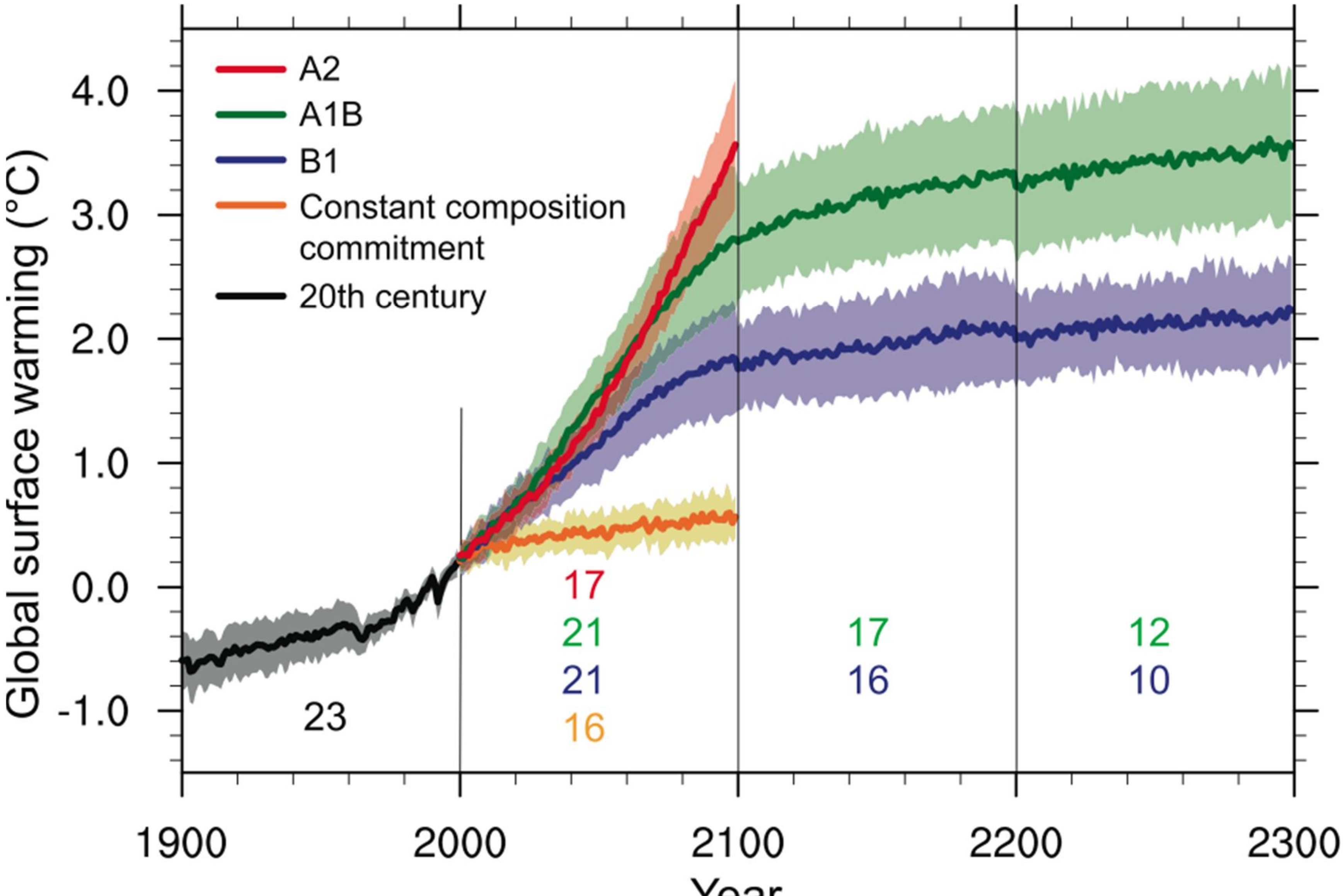
Planet Under Pressure: New Knowledge Towards Solutions

1. Research now demonstrates that the continued functioning of the Earth system as it has supported the well-being of human civilization in recent centuries is at risk. Without urgent action, we could face threats to water, food, biodiversity and other critical resources: these threats risk intensifying economic, ecological and social crises, creating the potential for a humanitarian emergency on a global scale.

2. In one lifetime our increasingly interconnected and interdependent economic, social, cultural and political systems have come to place pressures on the environment that may cause fundamental changes in the Earth system and move us beyond safe natural boundaries. But the same interconnectedness provides the potential for solutions: new ideas can form and spread quickly, creating the momentum for the major transformation required for a truly sustainable planet.

”Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level.”

(IPCC Fourth Assessment Report, WGI, SPM, 2007)



A2
A1B
B1
Constant composition commitment
20th century
Global surface warming (°C)
4.0
3.0
2.0
1.0
0.0
-1.0
17
21
21
16
23
17
16
12
10
1900
2000
2100
2200
2300
Year

Latest Information

Prospect of limiting the global increase in temperature to 2ºC is getting bleaker

30 May 2011

CO_2 emissions reach a record high in 2010; 80% of projected 2020 emissions from the power sector are already locked in

Energy-related carbon-dioxide (CO_2) emissions in 2010 were the highest in history, according to the latest estimates by the International Energy Agency (IEA).

After a dip in 2009 caused by the global financial crisis, emissions are estimated to have climbed to a record 30.6 Gigatonnes (Gt), a 5% jump from the previous record year in 2008, when levels reached 29.3 Gt.

In addition, the IEA has estimated that 80% of projected emissions from the power sector in 2020 are already locked in, as they will come from power plants that are currently in place or under construction today.

Overshoot, adapt and recover

We will probably overshoot our current climate targets, so policies of adaptation and recovery need much more attention, say **Martin Parry**, **Jason Lowe** and **Clair Hanson**.

If policy-makers are to reach international agreement on greenhouse-gas emissions at the United Nations Framework Convention on Climate Change conference in Copenhagen in December, they need to be optimistic that their decisions could have swift and overwhelmingly positive effects on climate change. The reality is less certain, but no less urgent.

Even the most restrictive emissions policies proposed to date leave a sizeable chance that significant climate change will occur over the next several decades, probably surpassing the 2 °C warming target adopted by the European Union and held by many as a dangerous limit beyond which we should not pass[1]. We must

policy would mean continual 3% year-on-year emissions reductions that could, after several centuries, lead to greenhouse gas concentration of about 350 parts per million (p.p.m.) of carbon dioxide equivalents. A new and useful approach for quantifying long-term emission targets is presented in two new pieces of work published in this issue (pages 1158 and 1163).

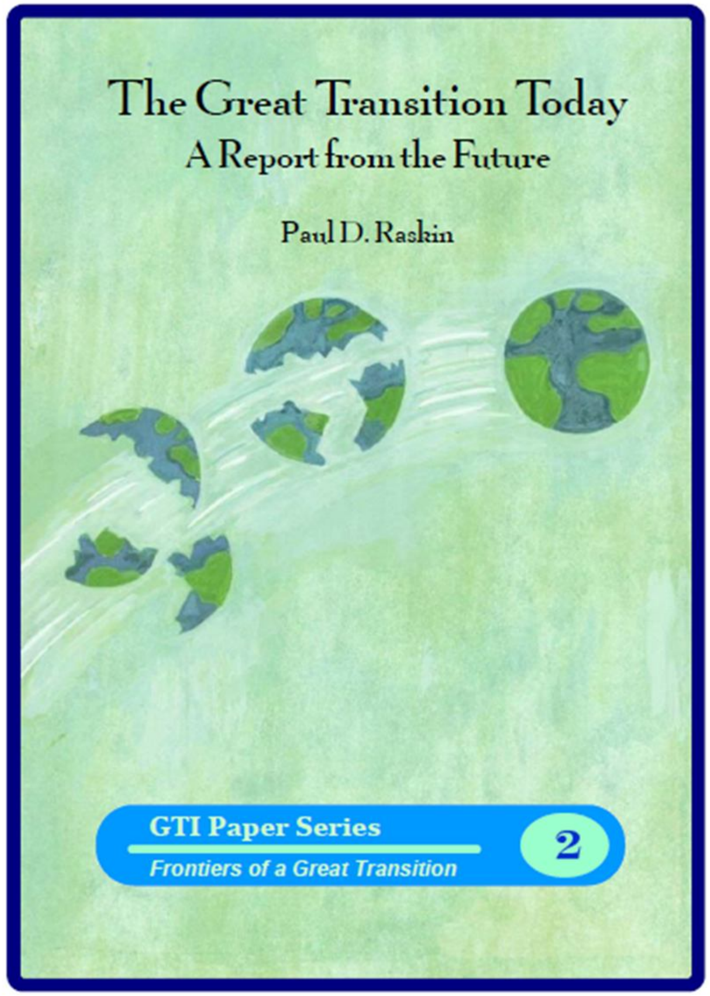
We have simulated the outcomes of this 3%-per-year reduction strategy with a simple Earth system model[2] and have plotted them on a table of projected effects that we constructed, with other Intergovernmental Panel on Climate Change Working Group II authors, for the IPCC 2007

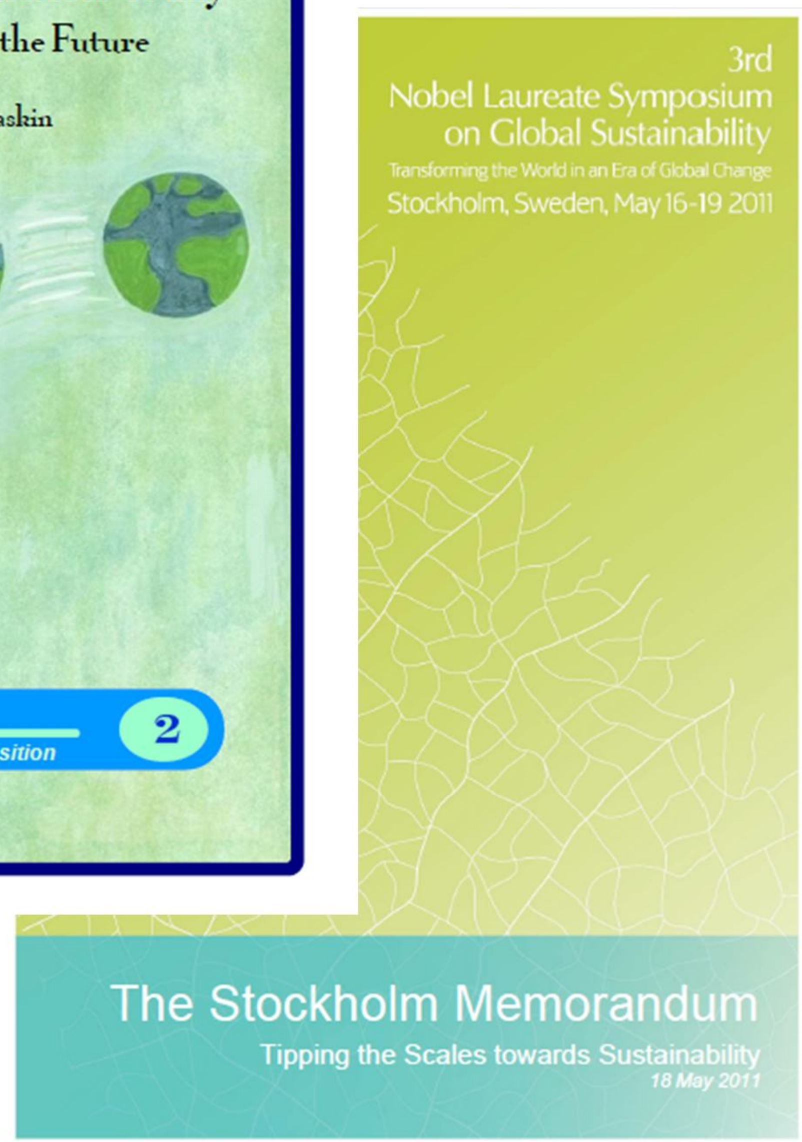
> "We should be planning to adapt to at least 4 °C of warming."

With the same 3%-per-year long-term emissions reductions but a slower start, peak temperatures would rise substantially and the overshoot would extend. For example, delaying mitigative action by ten years and so reversing emissions trends by 2025 would raise peak median temperature by about 2.5 °C; delaying by a further ten years (a 2035 downturn) would mean a rise of about 3 °C, with much longer recovery.

The damage from these levels of warming could be substantial, placing billions more people at risk of water shortage and millions more at risk of coastal flooding. To avoid such damage will require massive investment


WBGU
German Advisory
Summary for Policy-Makers
World in Transition
A Social Contract for Sustainability


The Great Transition Today
A Report from the Future
Paul D. Raskin
GTI Paper Series
2
Frontiers of a Great Transition


3rd
Nobel Laureate Symposium on Global Sustainability
Transforming the World in an Era of Global Change
Stockholm, Sweden, May 16-19 2011
The Stockholm Memorandum
Tipping the Scales towards Sustainability
18 May 2011

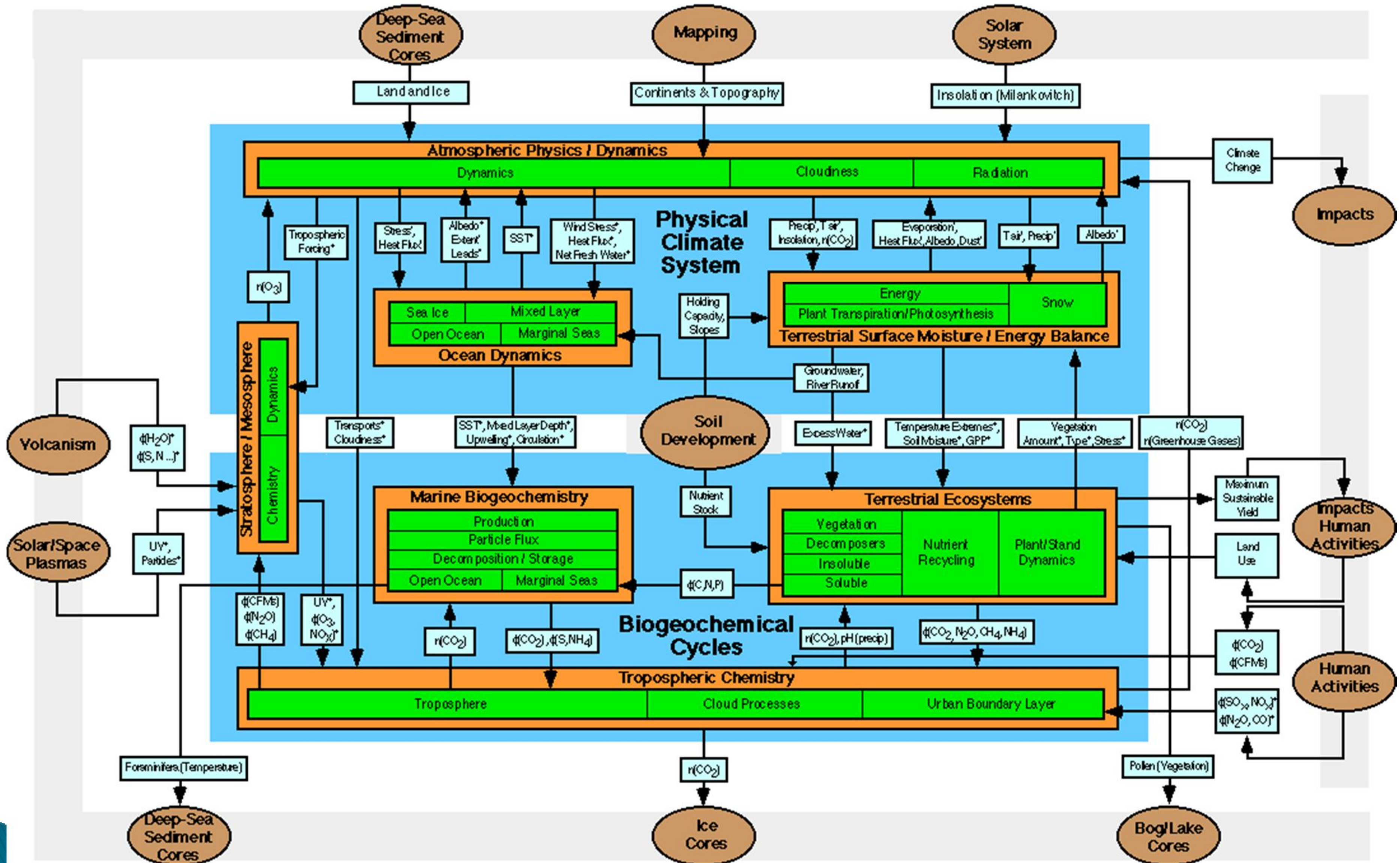
What does it mean to transform?

- Physical and/or qualitative changes in form, structure, or meaning-making.
- The powerful unleashing of human potential to commit, care and affect change for a better life.
- Not always considered desirable: Often creates uncertainty, discomfort and a sense of disequilibria (potentially anger and resistance if it seen as a response to particular interests and agendas).

Some important questions about ”transformation”:

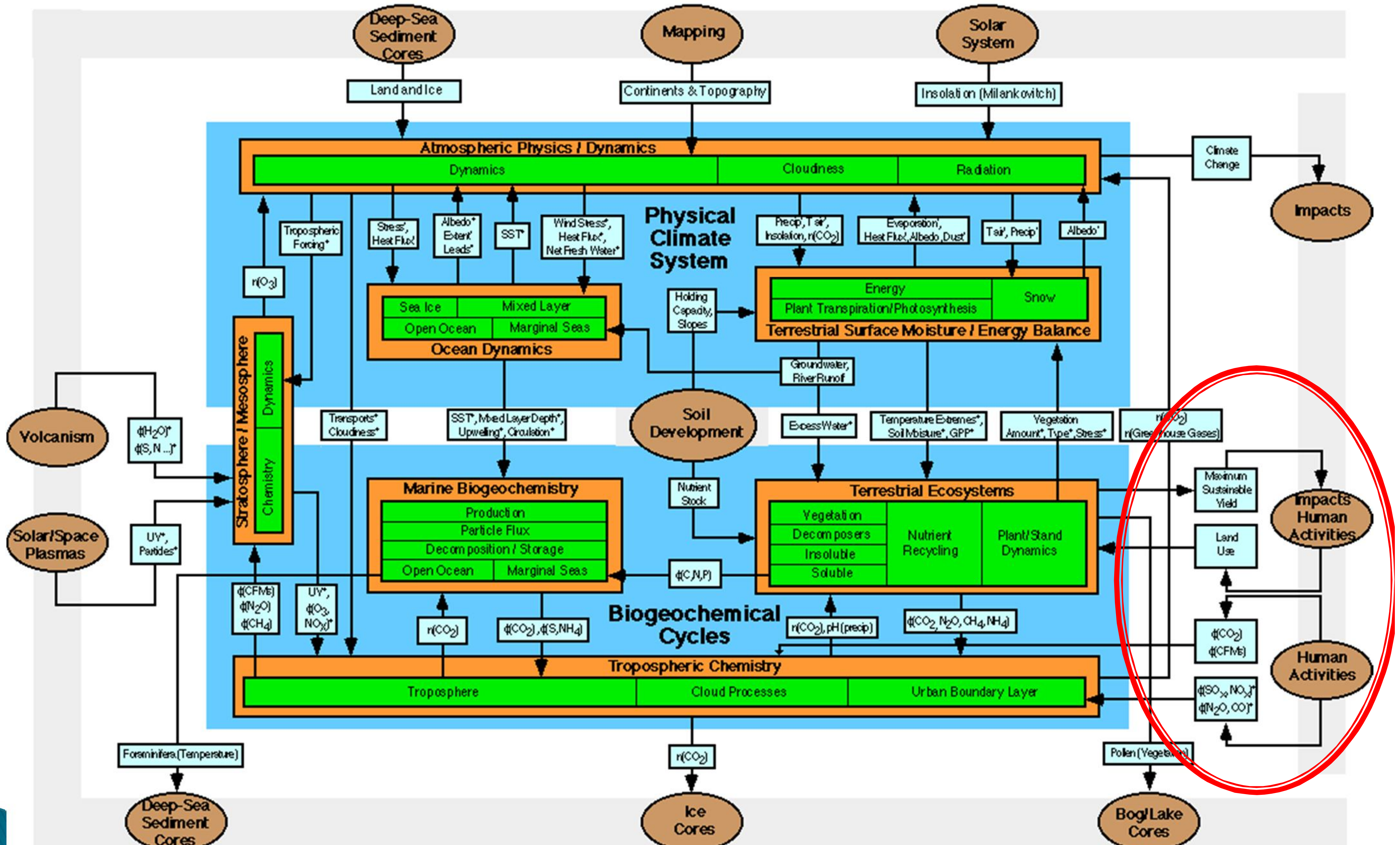
- Do we know how to make it happen?
- Do we have a sufficient knowledge base to inform strategies and actions for deliberate, ethical and sustainable transformation at the rate and scale that is called for?
- Can we innovate rapidly enough, and with sufficient intelligence, to transform systems along pathways towards global justice, gender equity, and long-term social and ecological resilience?
- Can we do this in a participative manner, without resorting to fear, force or folly?
- Does science itself need to change?

CONCEPTUAL MODEL of Earth System process operating on timescales of decades to centuries



' = on timescale of hours to days * = on timescale of months to seasons ϕ = flux n = concentration

CONCEPTUAL MODEL of Earth System process operating on timescales of decades to centuries



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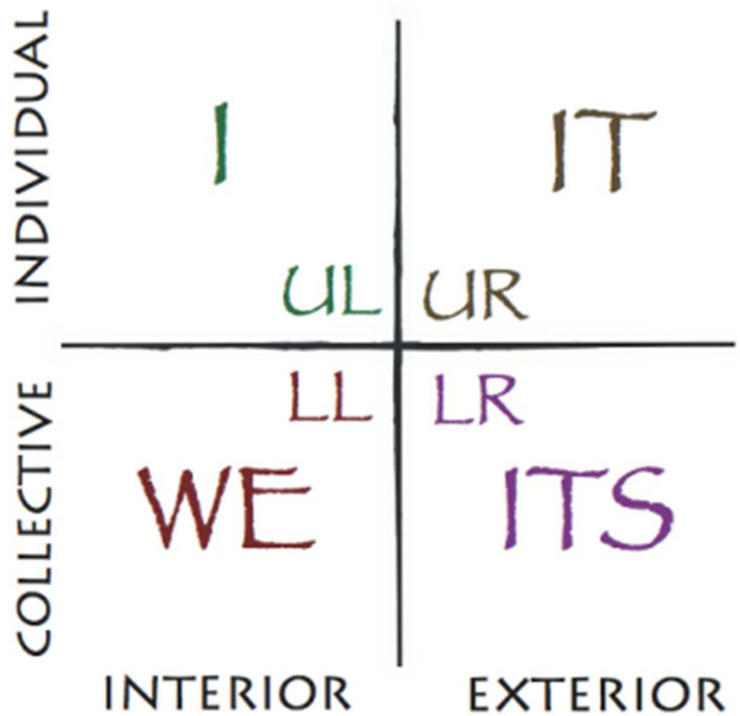
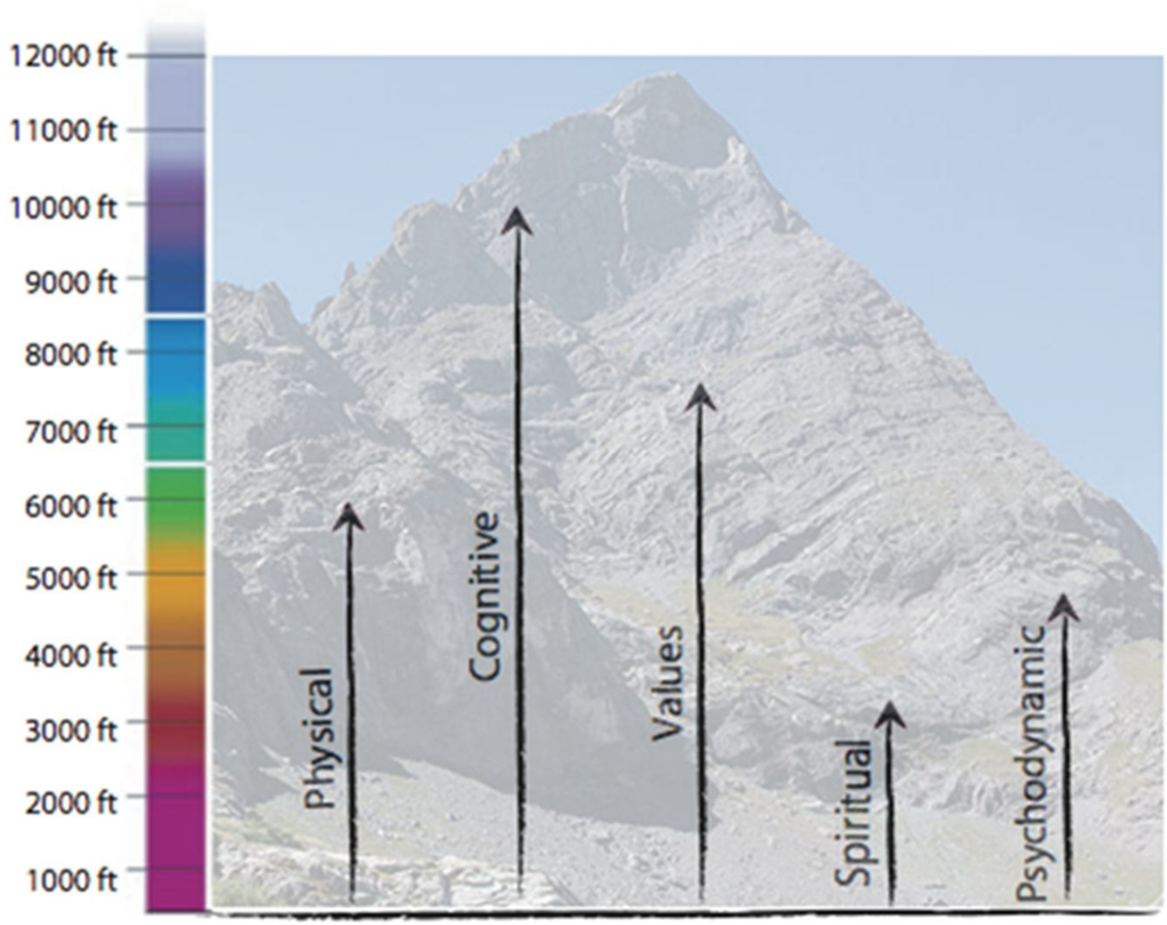
Perspectives



The "Deeper" Human Dimensions

Cognitive	*What am I aware of?*	Piaget, Kegan
Self	*Who am I?*	Loevinger
Values	*What is significant to me?*	Graves, Beck, Cowan
Moral	*What should I do?*	Kohlberg, Gilligan
Interpersonal	*How should we interact?*	Selman, Perry
Spiritual	*What is of ultimate concern?*	Fowler
Needs	*What do I need?*	Maslow
Emotional	*How do I feel about this?*	Goleman
Aesthetic	*What is attractive to me?*	Housen

Viewpoints


12000 ft
11000 ft
10000 ft
9000 ft
8000 ft
7000 ft
6000 ft
5000 ft
4000 ft
3000 ft
2000 ft
1000 ft
Physical
Cognitive
Values
Spiritual
Psychodynamic

Resistance by Scientists to Scientific Discovery

This source of resistance has yet to be given the scrutiny accorded religious and ideological sources.

Bernard Barber

In the study of the history and sociology of science, there has been a relative lack of attention to one of the interesting aspects of the social process of discovery—the resistance on the part of scientists themselves to scientific discovery. General and specialized histories of science and biographies and autobiographies of scientists, as well as intensive discussions of the processes by which discoveries are made and accepted, all tend to make, at the most, passing reference to this subject. In two systematic analyses of the social process of scientific discovery and invention, for example—analyses which tried to be as inclusive of empirical fact and theoretical problem as possible—there is only passing reference to such resistance in the one instance and none at all in the second (*1*). This neglect is all the more notable in view of the close scrutiny that scholars have given the subject of resistance to scientific discovery by social groups other than scientists. There has been a great deal of attention paid to resistance on the part of economic, technological, religious, and ideological elements and groups outside science itself (*1–3*). Indeed, the tendency of such elements to resist seems sometimes to be emphasized disproportionately as against the support which they also give to science. In the matter of religion, for example, are we not all a little too much aware that religion has resisted scientific discovery, not enough aware of the large support it has given to Western science? (*4, 5*).

The mere assertion that scientists themselves sometimes resist scientific discovery clashes, of course, with the sterotype of the scientist as "the open-minded man." The norm of open-mindedness is one of the strongest of the scientist's values. As Philipp Frank has recently put it, "Every influence of moral, religious, or political considerations upon the acceptance of a theory is regarded as 'illegitimate' by the so-called 'community of scientists.'" And Robert Oppenheimer emphasizes the "importance" of "the open mind," in a book by that title, as a value not only for science but for society as a whole (*6*). But values alone, and especially one value by itself, cannot be a sufficient basis for explaining human behavior. However strong a value is, however large its actual influence on behavior, it usually exerts this influence only in conjunction with a number of other cultural and social elements, which sometimes reinforce it, sometimes give it limits.

This article is an investigation of the elements within science which limit the norm and practice of "open-mindedness." My purpose is to draw a more accurate picture of the actual process of scientific discovery, to see resistance by scientists themselves as a constant phenomenon with specifiable cultural and social sources. This purpose, moreover, implies a practical consequence. For if we learn more about resistance to scientific discovery, we shall know more also about the sources of acceptance, just as we know more about health when we successfully study disease. By knowing more about both resistance and acceptance in scientific discovery, we may be able to reduce the former by a little bit and thereby increase the latter in the same measure.

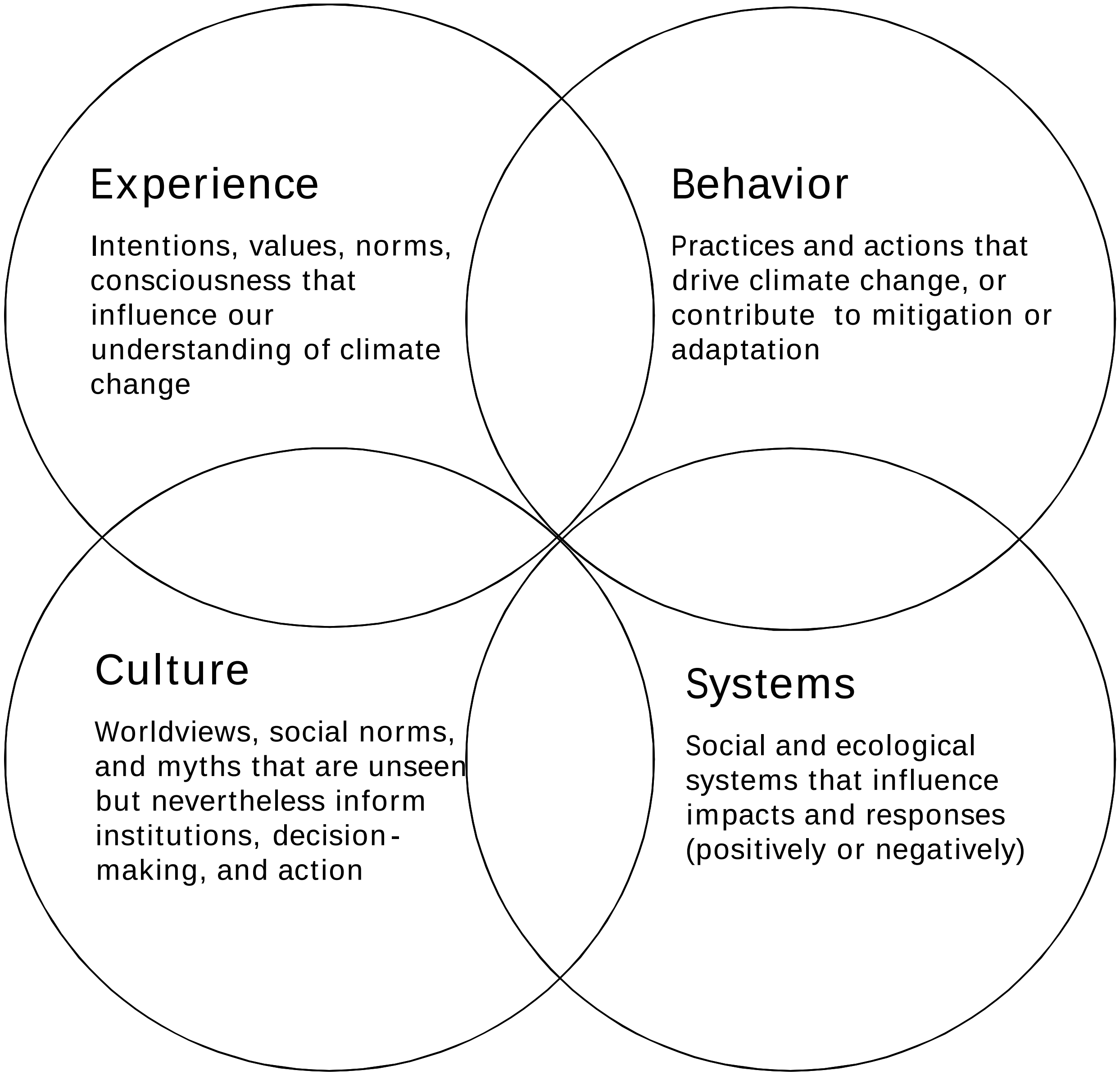
Helmholtz, Planck, and Lister

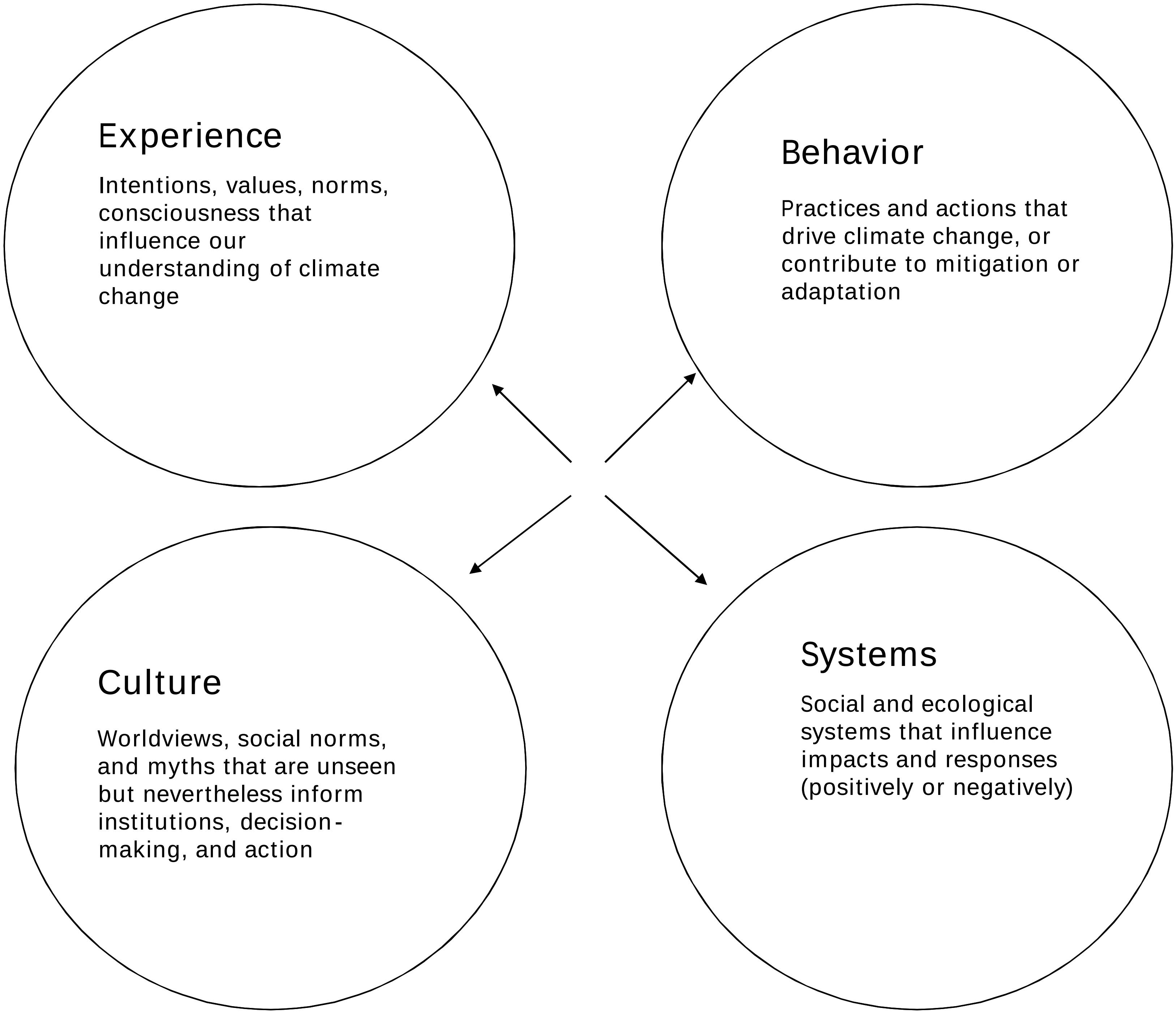
Although the resistance by scientists themselves to scientific discovery has been neglected in systematic analysis, it would be surprising indeed if it had never been noted at all. If nowhere else, we should find it in the writings of those scientists who have suffered from resistance on the part of other scientists. Helmholtz, for example, made aware of such resistance by his own experience, commiserated with Faraday on "the fact that the greatest benefactors of mankind usually do not obtain a full reward during their life-time, and that new ideas need the more time for gaining general assent the more really original they are" (*7–9*). Max Planck is another who noticed resistance in general because he had experienced it himself, in regard to some new ideas on the second law of thermodynamics which he worked out in his doctoral dissertation submitted to the University of Munich in 1879. Ironically, one of those who resisted the ideas proposed in Planck's paper, according to his account, was Helmholtz: "None of my professors at the University had any understanding for its contents," says Planck. "I found no interest, let alone approval, even among the very physicists who were closely connected with the topic. Helmholtz probably did not even read my paper at all. Kirchhoff expressly disapproved . . . I did not succeed in reaching Clausius. He did not answer my letters, and I did not find him at home when I tried to see him in person at Bonn. I carried on a correspondence with Carl Neumann, of Leipzig, but it remained totally fruitless" (*10*, p. 18). And Lister, in a graduation address to medical students, warned them all against blindness to new ideas in science, blindness such as he had encountered in advancing his theory of antisepsis.

Scientists Are Also Human

Too often, unfortunately, where resistance by scientists has been noted, it has been merely noted, merely alleged, without detailed substantiation and without attempt at explanation. Sometimes, when explanations are offered, they are notably vague and all-inclusive, thus proving too little by trying to prove too much. One such explanation is contained in the frequently repeated phrase, "After all, scientists are also

The author is professor of sociology at Barnard College, Columbia University, New York, N.Y. This is the text of a lecture delivered 28 December 1960 at the New York meeting of the AAAS.


Experience
Intentions, values, norms, consciousness that influence our understanding of climate change
Behavior
Practices and actions that drive climate change, or contribute to mitigation or adaptation
Culture
Worldviews, social norms, and myths that are unseen but nevertheless inform institutions, decision-making, and action
Systems
Social and ecological systems that influence impacts and responses (positively or negatively)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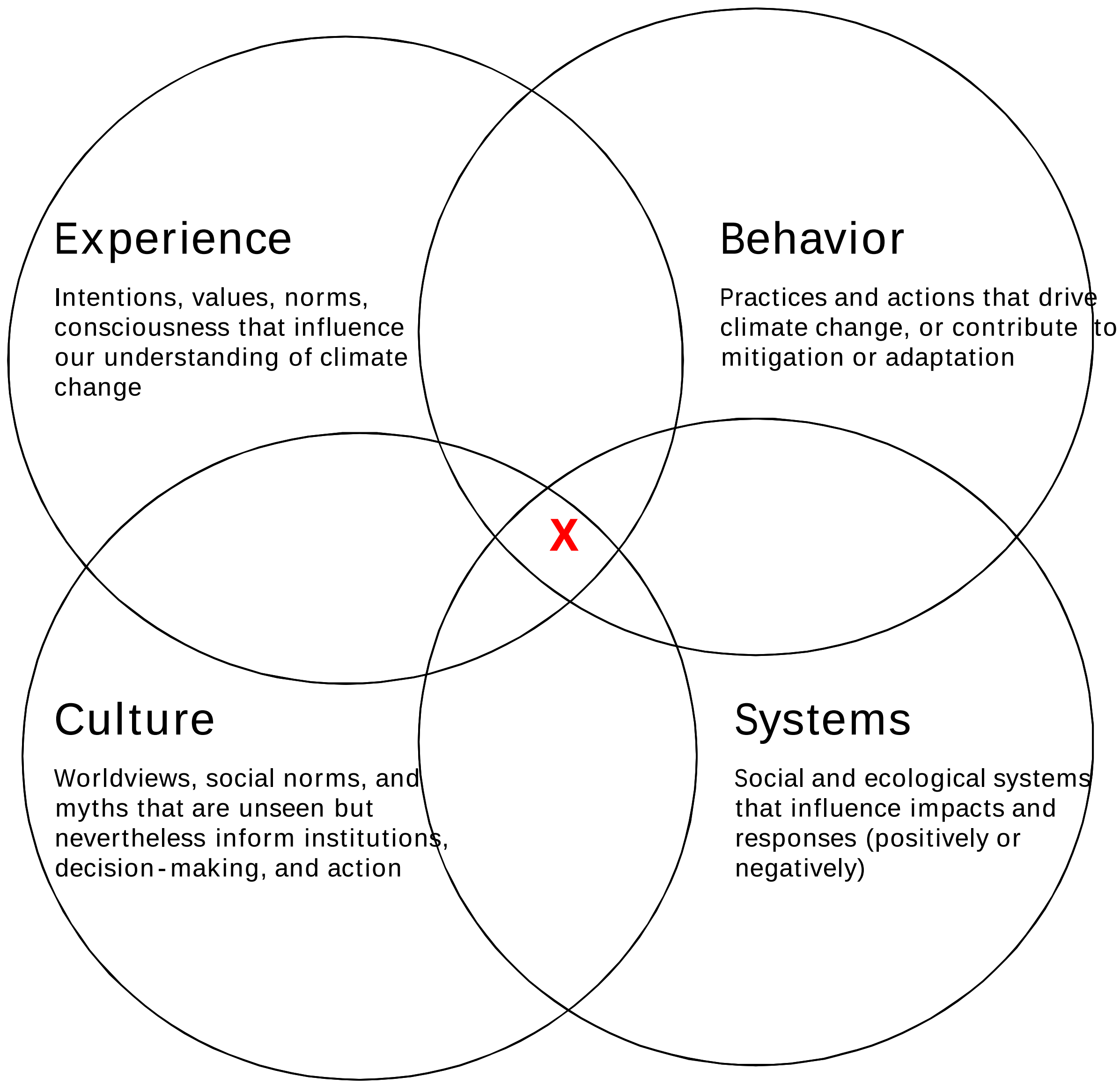
Experience
Intentions, values, norms, consciousness that influence our understanding of climate change
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Practices and actions that drive climate change, or contribute to mitigation or adaptation
X
Culture
Worldviews, social norms, and myths that are unseen but nevertheless inform institutions, decision-making, and action
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Social and ecological systems that influence impacts and responses (positively or negatively)

Research challenges

- What are our assumptions?
- Where are our blind spots?
- Can we take in new perspectives, especially those that do not fit into our own paradigms?

Paradigms: Two components

- ”Firstly, a set of fundamental theoretical assumptions that all members of a scientific community accept at a given time.
- Secondly, a set of ’exemplars’ or particular scientific problems that have been solved by means of those theoretical assumptions, and that appear in the textbooks of the discipline in question.” (Okasha, 2002, p. 81)

Okasha, S. 2002. *Philosophy of Science: A Very Short Introduction*. Oxford: OUP.

Paradigms (continued)

- ”A constellation of shared assumptions, beliefs, and values that unite a scientific community and allow normal science to take place.”
- ”When scientists share a paradigm they do not just agree on certain scientific propositions, they agree also on how future scientific research in their field should proceed” (this relates to research questions, methods, solutions, etc.) (Okasha 2002, p. 81)

- Kuhn stressed that normal scientists are not actually trying to test their paradigm. Rather, they unquestionably accept the paradigm, and conduct their research within its set limits. Results may be questioned, but the paradigm itself is non-negotiable.

- Kuhn: ”The transfer of allegiance from paradigm to paradigm is a conversion experience which cannot be forced.” (cited in Okasha 2002)
- ”…Kuhn called into question many assumptions that had traditionally ben taken for granted…” (Okasha 2002, p. 92)

Kuhn, T. 1962. The Structure of Scientific Revolutions. Chicago: Univ. of Chicago Press.

Normal science

- “The term refers to the routine work of scientists experimenting within a paradigm, slowly accumulating detail in accord with established broad theory, not actually challenging or attempting to test the underlying assumptions of that theory. Kuhn identified this mode of science as being a form of "**puzzle-solving.**"
- According to Kuhn, Normal science possesses a built-in mechanism that ensures the relaxation of the restrictions that bound research whenever the paradigm from which they derive ceases to function effectively.“

http://en.wikipedia.org/wiki/Normal_science

Post-normal science

- "Characterises a methodology of inquiry that is appropriate for cases where "facts are uncertain, values in dispute, stakes high and decisions urgent" (Funtowicz and Ravetz, 1991). It is primarily applied in the context of long-term issues where there is less available information than is desired by stakeholders."

http://en.wikipedia.org/wiki/Post-

Post-post-normal science?

- Are current environmental/social/economic/political/cultural/technological/Institutional/etc. problems too complex to be addressed even by post-normal science?

Environmental Change and Hyper-complexity

- **Dynamic complexity** (defined by cause and effect being distant in space and time
- **Social complexity** (defined by conflicting interests, cultures, and worldviews among diverse stakeholders)
- **Emerging complexity** (defined by disruptive patterns of innovation and change in situations in which the future cannot be predicted and addressed by the patterns of the past)

Scharmer, C.O. 2009. Theory U. Leading from the Future as it Emerges. San Francisco: Berrett-Koehler Publishers. pp. 342-343.

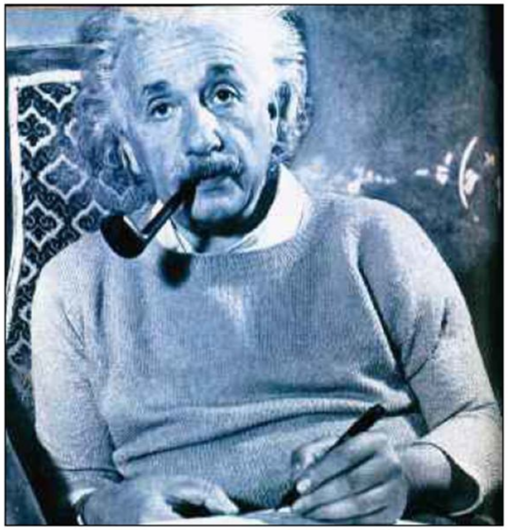
- ”The greater a system’s hyper-complexity, the more critical it becomes for organizations, companies, and communities to develop the capacity to operate from the deeper streams of social emergence and to access the power of the open mind, open heart, and open will.”
- ”Instead of continuing to do more of the same it is often better to address the same issue differently, at the next deeper level of complexity and emergence.”

Scharmer, C.O. 2009. Theory U. Leading from the Future as it Emerges. San Francisco: Berrett-Koehler Publishers. p. 343

- ”we have to abandon our conventional ways of reacting and operating” (i.e., the dominant mode of downloading that causes us to continuously reproduce the patterns of the past) (Sharmer 2009)

The problems we have created cannot be solved with the same thinking that created them.

Albert Einstein
(1897 - 1955)



Quantum Social Theory?

- ”what if the limitations of contemporary social science and philosophy of mind alike lie in their common assumption that the relationship of mind (ideas) to the body (the material world) must be compatible with classical physics?” (Wendt p. 183)

- Alexander Wendt, ”*Social Theory* as Cartesian science: An auto-critique from a quantum perspective. Pages 181-219 in S. Guzzini and A. Leander (eds) Constructivism and International Relations: Alexander Wendt and his Critics. London: Routledge.

Cartesian social science (Wendt 2006, p. 188)

1. Reality out there is not part of you or me in here, which means we must distinguish subject and object.
2. We can acquire knowledge of external reality through the scientific method."
3. Success in science depends on maintaining a distinction between fact and value.
4. Dualism itself: mind and matter are distinct, irreducible substances, each with its own laws of motion.

Implications for Social Theory

(Wendt 2006)

- It suggests that consiousness plays an essential and irreducible role in human behavior;
- Our knowledge or ourselves (our identity or sense of self) does not have determinate properties at any given moment, but becomes determinate only when we act in the world;
- Reasons are constitutive of action, not causes.
- Quantum humans should have free will (does not assume a deterministic world).

So what?

- ”A quantum social science would sometimes simply recapitulate or support existing social theories, perhaps especially post-modern ones such as performativity theory. Indeed, such redundancy is hoped for... But skeptics might nevertheless see it as a problem, that quantum social science is just ’old wine in new bottles’. This value added question is an important one, and we will not be able to answer it until after a quantum social science has been developed. Nevertheless there are several *reasons to think that the transformative implications of such thinking could be profound*.”
  (Wendt 2006, p. 219, italics added)

Transformative thinking?

- Approaching global change as a technical problem
- Approaching global change as an adaptive challenge

Technical problem → One that can be diagnosed and solved by applying established know-how and procedures; amenable to authoritative expertise and management of routine processes.

Adaptive challenge → Requires a change in mindsets; priorities, beliefs, habits and loyalties. Involves shedding entrenched ways, tolerating losses, gaining new capacities.

Beliefs, Values and Worldviews

- Responses to climate change are influenced by peoples attitudes, which are linked to values and worldviews.
- A focus on values and worldviews draws attention to the possibility that efforts to satisfy one group's values through climate policies and responses can create conflicts with the values of other groups. **Responses are not neutral**.
- Acknowledging that people see the world differently and may prioritize different values makes it clear that climate change cannot be assessed, interpreted, and responded to in one particular way.
- It enables us to connect better with people where they are at (connect to what they consider important), rather than where we are at (what we consider important).

Adaptation from the Inside-Out

- Examining our own blind spots, shadows, and projections;
- Challenging our own assumptions and beliefs (psychology research shows that we see what we believe);
- Developing capacity to do «adaptive work» by connecting with people's core values.

(

"I'm afraid you've had a paradigm shift."