

**Global Sustainability Summer School
Santa Fe Institute
22 Jul 2010**

Tragic Triumph: Cassandra, Pascal and the IPCC

***Professor H. J. Schellnhuber CBE
Potsdam Institute for Climate Impact Research***



Outline

- The CRU Crime
- IPCC: errors, reform, and the media
- Climate skepticism on the rise?
- Climate change and the integrity of science
- Tragic triumph

Part 1

- The CRU Crime
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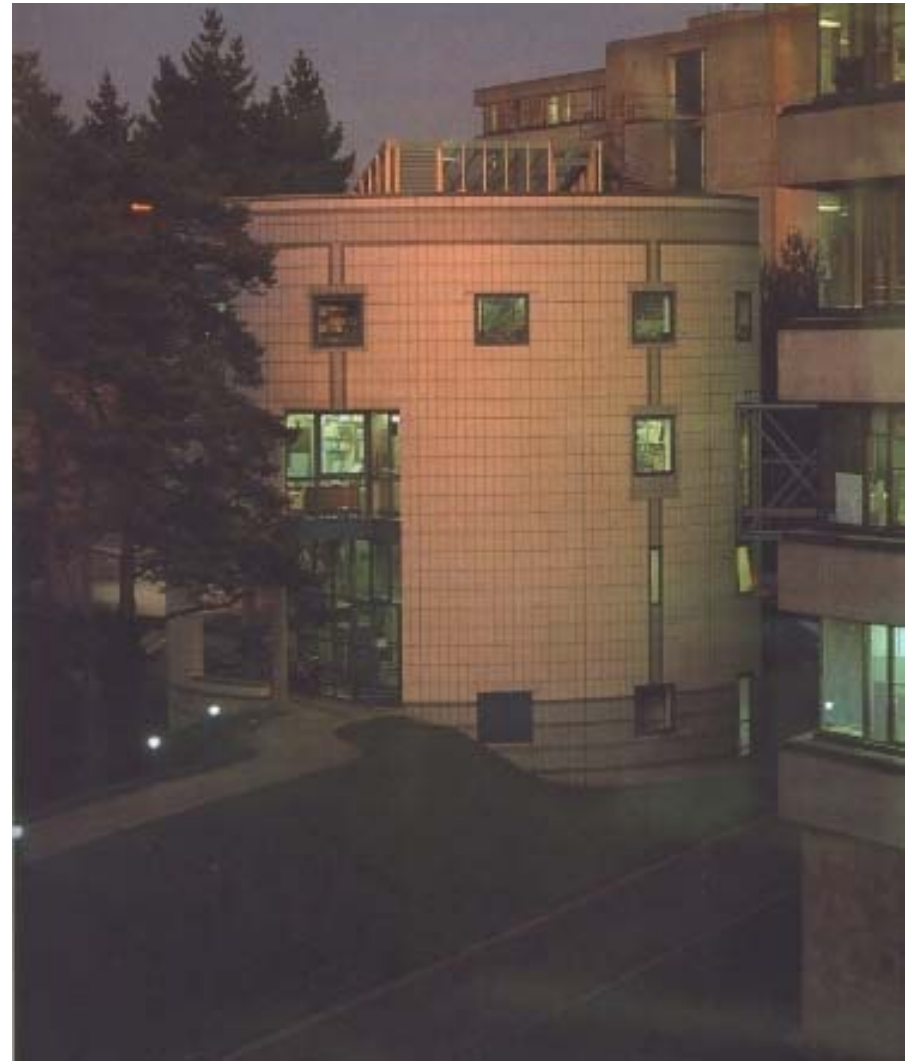
University of East Anglia – CRU E-mail Hacking (17 Nov 2009)

From: Phil Jones <p.jones@xxxxxxxxxxx.xxx>
To: ray bradley rbradley@xxxxxxxxxxx.xxx
Subject: Diagram for WMO Statement
Date: Tue, 16 Nov 1999 13:31:15 +0000

[...]I've just completed Mike's Nature trick [...]
to hide the decline[...]

At 09:41 AM 2/2/2005, Phil Jones wrote:

“I think I’ll delete the file rather than send to anyone.”



Three Inquiries

Governmental Report

31. March 2010



House of Commons
Science and Technology
Committee

**The disclosure of
climate data from the
Climatic Research Unit
at the University of
East Anglia**

Eighth Report of Session 2009–10

University Report

14. April 2010



Report of the
International Panel
set up by the
University of East
Anglia to
examine the
research of the CRU

Independent Report

7. July 2010

The Independent Climate Change E-mails Review

July 2010

Chair: Sir Muir Russell

Review team:

- Professor Geoffrey Boulton
- Professor Peter Clarke
- David Eyton
- Professor James Norton

Part 2

- The CRU Crime
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Most Discussed Errors of IPCC AR4 Himalaya Glaciers



Glaciers in the Himalaya are receding faster than in any other part of the world (see Table 10.9) and, if the present rate continues, the likelihood of them disappearing by the year 2035 and perhaps sooner is very high if the Earth keeps warming at the current rate. Its total area will likely shrink from the present 500,000 to 100,000 km² by the year 2035 (WWF, 2005).

(IPCC AR4, WG II, p. 493)

Rectification

- Current total area ~ 30,000 km² as cited in first §

Himalayan glaciers cover about three million hectares or 17% of the mountain area as compared to 2.2% in the Swiss Alps.

- Disappearance by 2035 would require 25-fold acceleration of estimated past loss rate of glaciers

(PBL report 2010)

Most Discussed Errors of IPCC AR4

Dutch land area below sea level



The Netherlands is an example of a country highly susceptible to both sea-level rise and river flooding because 55% of its territory is below sea level where 60% of its population lives and 65% of its Gross National Product (GNP) is produced.

(IPCC AR4, WG II, p. 547)

Rectification

- 55% at risk of flooding; 26% below sea level, 29% susceptible to river flooding

IPCC Errata Established

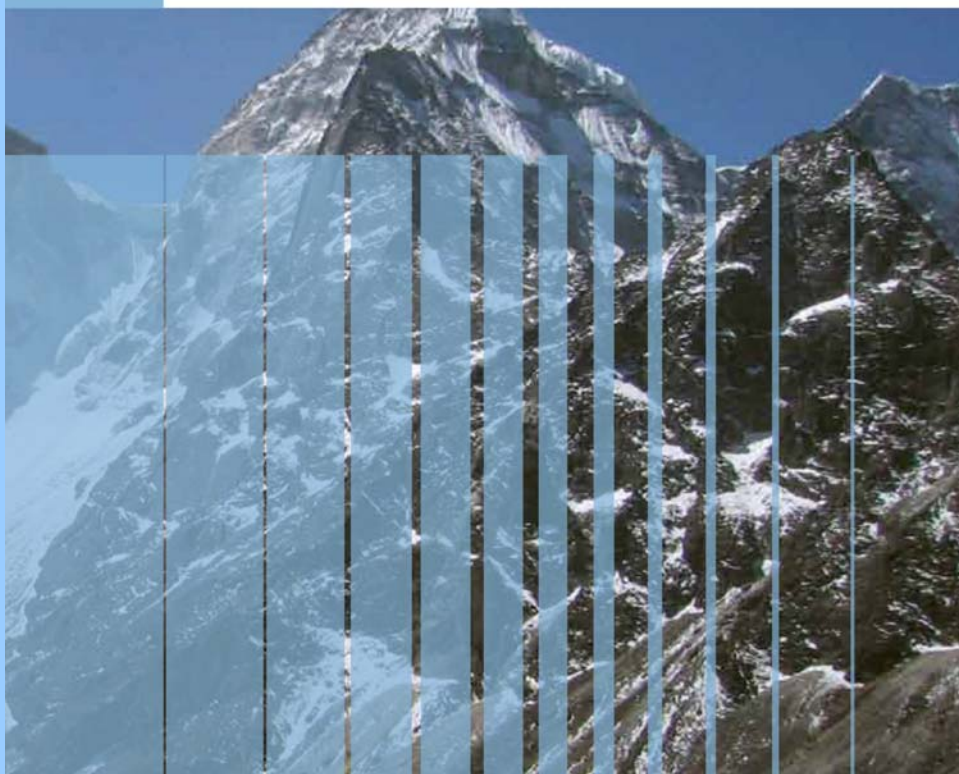
The screenshot shows the IPCC website interface. At the top right, the IPCC logo is displayed with the text "INTERGOVERNMENTAL PANEL ON climate change" and logos for WMO and UNEP. Below the logo are dropdown menus for "Languages" and "IPCC web pages", and a search box. A blue navigation bar on the left lists various site sections, with "Errata" highlighted under the "Errata" section. The main content area is titled "IPCC Fourth Assessment Report: Climate Change 2007" and "Climate Change 2007: Working Group II: Impacts, Adaption and Vulnerability". It includes a breadcrumb trail: "Contents > Errata > Errata". The "Errata" section is highlighted, and a note states: "Note. The following is a list of errata and corrections to the Working Group II contribution to the IPCC Fourth Assessment Report. Last updated 26 June 2010. (The page, section, column, and line identifiers refer to the printed and pdf versions of the report. The errata also apply to the html version, though the column and line numbers are not directly applicable.)" A table lists three errata items:

Page	Item	Correction
32	Technical Summary Figure TS.2	The four arrows running clockwise around the figure and placed alongside "Global integration", "Economic emphasis", "Regional emphasis", and "Environmental emphasis" should be removed.
50	Technical Summary	Australia and New Zealand. Line 4. Replace "0.3" with "0.4".
51	Technical Summary	Line 21. Replace "1.5 million" with "1.6 million".

547 Chapter 12 **Section 12.2.3**. Line 20. Delete “below sea level” and replace with “at risk of flooding”.

Assessing an IPCC assessment

An analysis of statements on projected regional impacts in the 2007 report

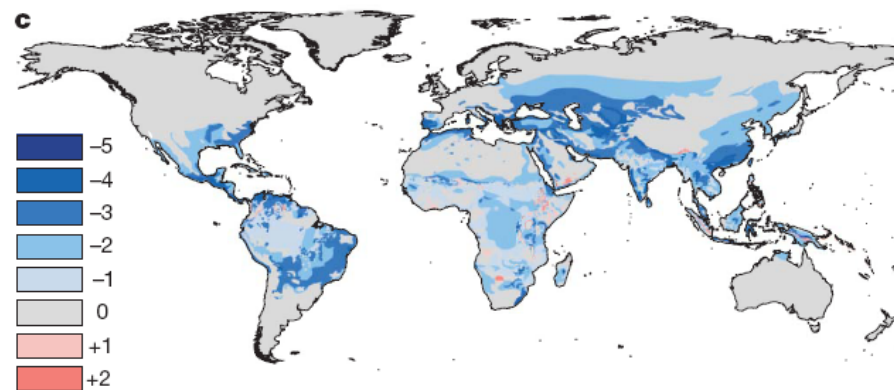
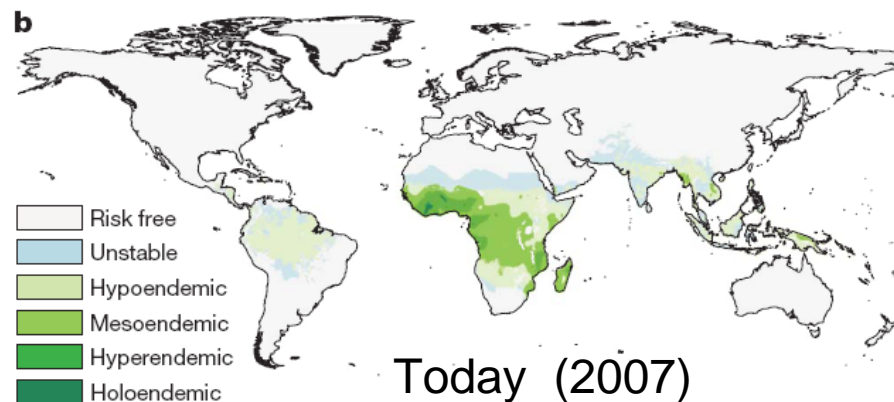
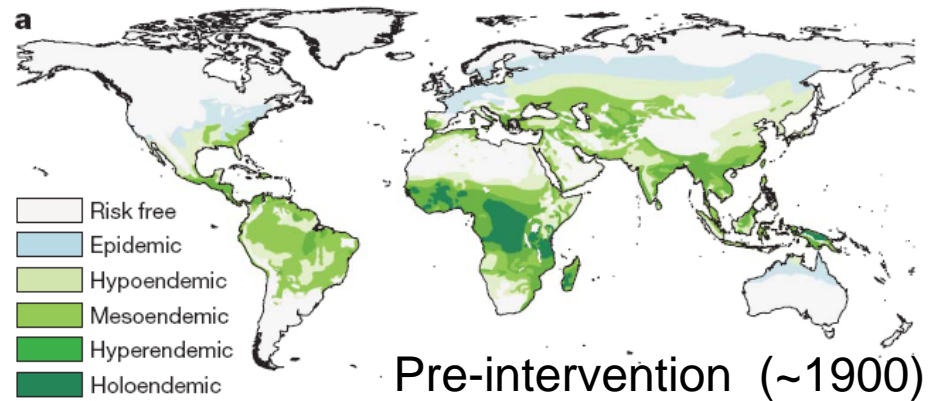


- No significant errors found in summary conclusions
- Provenance of summary statements needs to become more transparent in future reports
- Examples of negative impacts dominate at summary level; the relative contributions from other important areas (such as industrialisation, population growth, and land use) are not sufficiently accounted for.

Climate Change and Malaria Endemicity

„[...] the success or failure of our efforts against the parasite in the coming century are likely to be determined by factors other than climate change.“

(Source: Gething et al. 2010 Nature)



Change in endemicity (between 2007 and 1900)

InterAcademy Council Review of the IPCC

Home InterAcademy Council website [Contact](#)

InterAcademy Council
Review of the IPCC
An evaluation of the procedures and processes of the InterGovernmental Panel on Climate Change

SCIENCE FOR A BETTER FUTURE



InterAcademy Council

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Committee Announcement

InterAcademy Council Names IPCC Review Committee

[Download PDF Version \(40KB\)](#)

AMSTERDAM, Netherlands – [The InterAcademy Council \(IAC\)](#), an organization of the world’s science academies, announced today that [Harold T. Shapiro](#), an economist and former president of Princeton University and the University of Michigan, will chair a 12-member committee to conduct an independent review of the procedures and processes of the Intergovernmental Panel on Climate Change (IPCC). The review was [requested](#) in March by U.N. Secretary-General Ban Ki-moon and IPCC Chair Rajendra K. Pachauri.



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What do you think?

Submit your comments about the IPCC assessment process to the committee.

[Comment](#)

IPCC Reform – Separation of Church and State



Science



Politics

Amazongate, Africagate, Leakegate



Two articles by **Jonathan Leake**,
Environment Editor

*IPCC Shamed By Bogus
Rainforest Claim*
31 January 2010

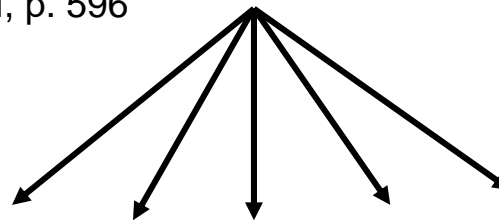
Up to 40% of the Amazonian forests could react drastically to even a slight reduction in precipitation; this means that the tropical vegetation, hydrology and climate system in South America could change very rapidly to another steady state, not necessarily producing gradual changes between the current and the future situation (Rowell and Moore, 2000). It is more

IPCC AR4, WG II, p. 596

*Africagate: top British scientist
says UN panel is losing credibility*
3 February 2010

By 2020, in some countries, yields from rain-fed agriculture could be reduced by up to 50%. Agricultural production, including access to food, in many African countries is projected to be severely compromised. This would further adversely affect food security and exacerbate malnutrition. *{WGII 9.4, SPM}*

IPCC AR4 Synthesis Report



Leak(e)age to newspapers around the world

Frankfurter Rundschau

*Neue Fehler beim Klimarat - Aus
Nordafrika machte IPCC ganz Afrika*
8 February 2010

Published Corrections

Frankfurter Rundschau

Klimawandel

Die Wahrheit über Fehler des Klimarats

Forscher warnen vor den Folgen des Klimawandels - und ihre Kritiker versuchen sie zu desavouieren. Der jüngste Erfolg der Skeptiker: eine Kampagne, die den UN-Klimarat in Verruf bringen sollte.

Retraction of article on Africagate
30 April 2010



NYT mentions retraction of FR article
24 May 2010

THE SUNDAY TIMES



Retraction of article on Amazongate
20 June 2010

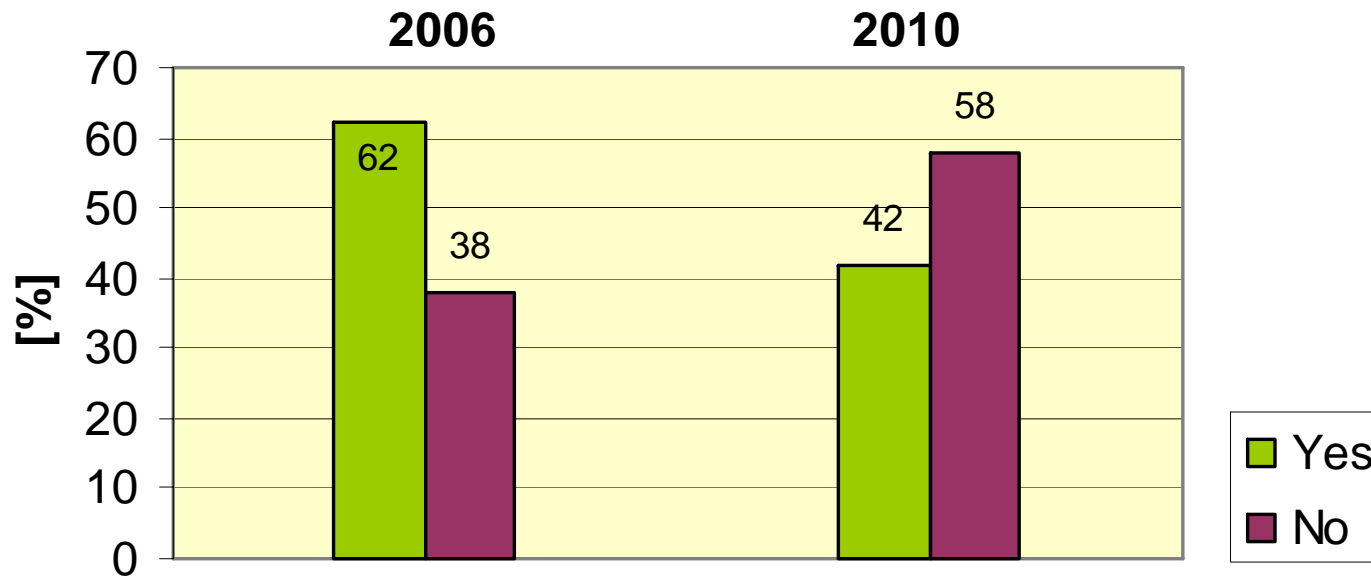
Part 3

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Public Opinion on Climate Change Issues in Germany

Spiegel Umfrage

Question: *“Are you personally afraid of climate change?”*



Climate skepticism on the Rise?

THE
HUFFINGTON
POST

JULY 1, 2010

Steep Decline In Americans' Belief In Global Warming

BBC NEWS

Climate scepticism 'on the rise'

SPIEGEL ONLINE

27. März 2010, 09:59 Uhr

SPIEGEL-Umfrage

Deutsche verlieren Angst vor Klimawandel

GALLUP

March 11, 2010

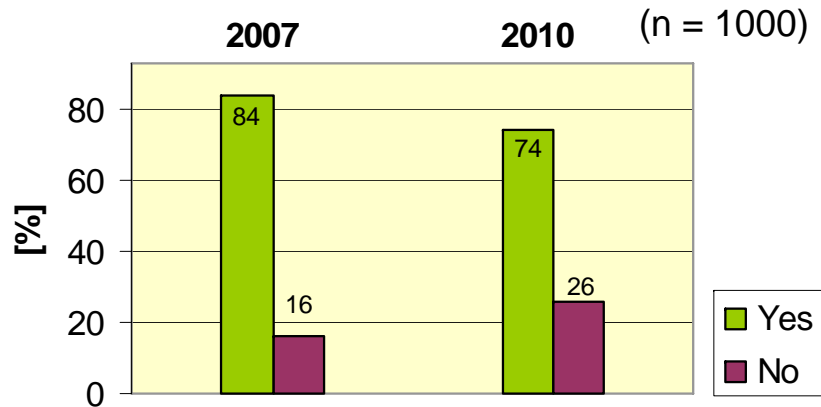
Americans' Global Warming Concerns Continue to Drop

Climate Skepticism on the Rise?

United States

Jon Krosnick (Stanford University)

Question: "Do you think that the earth's temperature has been heating up over the last 100 years?"

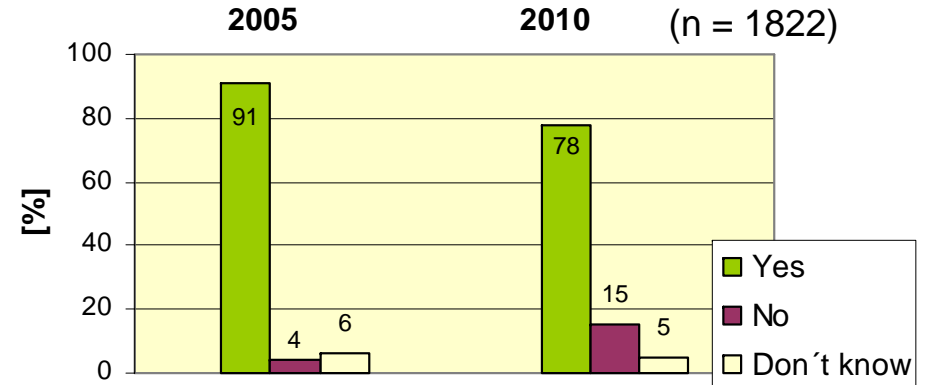


75% say human behaviour is substantially responsible

Great Britain

Ipsos Mori

Question: "As far as you know, do you personally think the world's climate is changing, or not?"



78% say warming is at least partly caused by human activity

A majority continues to believe in anthropogenic global warming

Continued Trust in Science



Small recent decline in people who believe in global warming probably due to **weather variability** and not due to increasing **skepticism about science**

- No decline in trust in environmental scientists (2008: 65%, 2009: 70%, 2010: 71%)
- Only 9% heard about the e-mails messages hacked from the computer system at CRU and believe they indicated that climate scientists should not be trusted; 13% likewise w.r.t. IPCC errors

(Source: J. Krosnick, NYT Op-Ed 8 June 2010)

From NIMBY to NOMBI – Not On My Bill



- Large majorities favor government limiting business's emissions of GHGs (76%) and offering tax breaks to encourage utilities to make more electricity from renewables (84%).



- At the same time, large majorities oppose direct taxes on electricity (78%) and gasoline (72%)

(Source: J. Krosnick, NYT Op-Ed 8 June 2010)

Part 4

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P. H. GLEICK,* R. M. ADAMS, R. M. AMASINO, E. ANDERS, D. J. ANDERSON, W. W. ANDERSON, L. E. ANSELIN, M. K. ARROYO, B. ASFAW, F. J. AYALA, A. BAX, A. J. BEBBINGTON, G. BELL, M. V. L. BENNETT, J. L. BENNETZEN, M. R. BERENBAUM, O. B. BERLIN, P. J. BJORKMAN, E. BLACKBURN, J. E. BLAMONT, M. R. BOTCHAN, J. S. BOYER, E. A. BOYLE, D. BRANTON, S. P. BRIGGS, W. R. BRIGGS, W. J. BRILL, R. J. BRITTEN, W. S. BROECKER, J. H. BROWN, P. O. BROWN, A. T. BRUNGER, J. CAIRNS JR., D. E. CANFIELD, S. R. CARPENTER, J. C. CARRINGTON, A. R. CASHMORE, J. C. CASTILLA, A. CAZENAVE, F. S. CHAPIN III, A. J. CIECHANOVER, D. E. CLAPHAM, W. C. CLARK, R. N. CLAYTON, M. D. COE, E. M. CONWELL, E. B. COWLING, R. M. COWLING, C. S. COX, R. B. CROTEAU, D. M. CROTHERS, P. J. CRUTZEN, G. C. DAILY, G. B. DALRYMPLE, J. L. DANGL, S. A. DARST, D. R. DAVIES, M. B. DAVIS, P. V. DE CAMILLI, C. D. DEAN, R. S. D. DEFRIES, J. DEISENHOFER, D. P. DELMER, E. F. DELONG, D. J. DEROSIER, T. O. DIENER, R. DIRZO, J. E. DIXON, M. J. DONOGHUE, R. F. DOOLITTLE, T. DUNNE, P. R. EHRLICH, S. N. EISENSTADT, T. EISNER, K. A. EMANUEL, S. W. ENGLANDER, W. G. ERNST, P. G. FALKOWSKI, G. FEHER, J. A. FERREJOHN, A. FERSHT, E. H. FISCHER, R. FISCHER, K. V. FLANNERY, J. FRANK, P. A. FREY, I. FRIDOVICH, C. FRIEDEN, D. J. FUTUYMA, W. R. GARDNER, C. J. R. GARRETT, W. GILBERT, R. B. GOLDBERG, W. H. GOODENOUGH, C. S. GOODMAN, M. GOODMAN, P. GREENGARD, S. HAKE, G. HAMMEL, S. HANSON, S. C. HARRISON, S. R. HART, D. L. HARTL, R. HASELKORN, K. HAWKES, J. M. HAYES, B. HILLE, T. HÖKFELT, J. S. HOUSE, M. HOUT, D. M. HUNTEN, I. A. IZQUIERDO, A. T. JAGENDORF, D. H. JANZEN, R. JEANLOZ, C. S. JENCKS, W. A. JURY, H. R. KABACK, T. KAILATH, P. KAY, S. A. KAY, D. KENNEDY, A. KERR, R. C. KESSLER, G. S. KHUSH, S. W. KIEFFER, P. V. KIRCH, K. KIRK, M. G. KIVELSON, J. P. KLINMAN, A. KLUG, L. KNOPOFF, H. KORNBURG, J. E. KUTZBACH, J. C. LAGARIAS, K. LAMBECK, A. LANDY, C. H. LANGMUIR, B. A. LARKINS, X. T. LE PICHON, R. E. LENSKI, E. B. LEOPOLD, S. A. LEVIN, M. LEVITT, G. E. LIKENS, J. LIPPINCOTT-SCHWARTZ, L. LORAND, C. O. LOVEJOY, M. LYNCH, A. L. MABOGUNJE, T. F. MALONE, S. MANABE, J. MARCUS, D. S. MASSEY, J. C. MCWILLIAMS, E. MEDINA, H. J. MELOSH, D. J. MELTZER, C. D. MICHENER, E. L. MILES, H. A. MOONEY, P. B. MOORE, F. M. M. MOREL, E. S. MOSLEY-THOMPSON, B. MOSS, W. H. MUNK, N. MYERS, G. B. NAIR, J. NATHANS, E. W. NESTER, R. A. NICOLL, R. P. NOVICK, J. F. O'CONNELL, P. E. OLSEN, N. D. OPDYKE, G. F. OSTER, E. OSTROM, N. R. PACE, R. T. PAINE, R. D. PALMITER, J. PEDLOSKY, G. A. PETSCH, G. H. PETTINGILL, S. G. PHILANDER, D. R. PIPERNO, T. D. POLLARD, P. B. PRICE JR., P. A. REICHARD, B. F. RESKIN, R. E. RICKLEFS, R. L. RIVEST, J. D. ROBERTS, A. K. ROMNEY, M. G. ROSSMANN, D. W. RUSSELL, W. J. RUTTER, J. A. SABLÖFF, R. Z. SAGDEEV, M. D. SAHLINS, A. SALMOND, J. R. SANES, K. SCHEKMAN, J. SCHELLHUBER, D. W. SCHINDLER, J. SCHMITT, S. H. SCHNEIDER, V. L. SCHRAMM, R. R. SEDEROFF, C. J. SHATZ, F. SHERMAN, R. L. SIDMAN, K. SIEH, E. L. SIMONS, B. H. SINGER, M. F. SINGER, B. SKYRMS, N. H. SLEEP, B. D. SMITH, S. H. SNYDER, R. R. SOKAL, C. S. SPENCER, T. A. STEITZ, K. B. STRIER, T. C. SÜDHOF, S. S. TAYLOR, J. TERBORGH, D. H. THOMAS, L. G. THOMPSON, R. T. TJAN, M. G. TURNER, S. UYEDA, J. W. VALENTINE, J. S. VALENTINE, J. L. VAN ETEN, K. E. VAN HOLDE, M. VAUGHAN, S. VERBA, P. H. VON HIPPEL, D. B. WAKE, A. WALKER, J. E. WALKER, E. B. WATSON, P. J. WATSON, D. WEIGEL, S. R. WESSLER, M. J. WEST-EBERHARD, T. D. WHITE, W. J. WILSON, R. V. WOLFENDEN, J. A. WOOD, G. M. WOODWELL, H. E. WRIGHT JR., C. WU, C. WUNSCH, M. L. ZOBACK

Climate Change and the Integrity of Science

LETTERS

edited by Jennifer Sills

Climate Change and the Integrity of Science

WE ARE DEEPLY DISTURBED BY THE RECENT ESCALATION OF POLITICAL ASSAULTS ON SCIENTISTS in general and on climate scientists in particular. All citizens should understand some basic scientific facts. There is always some uncertainty associated with scientific conclusions; science never absolutely proves anything. When someone says that society should wait until scientists are absolutely certain before taking any action, it is the same as saying society should never take action. For a problem as potentially catastrophic as climate change, taking no action poses a dangerous risk for our planet.

Scientific conclusions derive from an understanding of basic laws supported by laboratory experiments, observations of nature, and mathematical and computer modeling. Like all human beings, scientists make mistakes, but the scientific process is designed to find and correct them. This process is inherently adversarial—scientists build reputations and gain recognition not only for supporting conventional wisdom, but even more so for demonstrating that the scientific consensus is wrong and that there is a better explanation. That's what Galileo, Pasteur, Darwin, and Einstein did. But when some conclusions have been thoroughly and deeply tested, ques-



tioned, and examined, they gain the status of “well-established theories” and are often spoken of as “facts.”

For instance, there is compelling scientific evidence that our planet is about 4.5 billion years old (the theory of the origin of Earth), that our universe was born from a single event about 14 billion years ago (the Big Bang theory), and that today's organisms evolved from ones living in the past (the theory of evolution). Even as these are overwhelmingly accepted by the scientific community, fame still awaits anyone who could show these theories to be wrong. Climate change now falls into this category: There is compelling, comprehensive, and consistent objective evidence that humans are changing the climate in ways that threaten our societies and the ecosystems on which we depend.

Many recent assaults on climate science and, more disturbingly, on climate scientists by climate change deniers are typically driven by special interests or dogma, not by an honest effort to provide an alternative theory that credibly satisfies the evidence. The Intergovernmental Panel on Climate Change (IPCC) and other scientific assessments of climate change, which involve thousands of scientists producing massive and comprehensive reports, have, quite expectedly and normally, made some mistakes. When errors are pointed out, they are corrected. But there

is nothing remotely identified in the recent events that changes the fundamental conclusions about climate change:

(i) The planet is warming due to increased concentrations of heat-trapping gases in our atmosphere. A snowy winter in Washington does not alter this fact.

(ii) Most of the increase in the concentration of these gases over the last century is due to human activities, especially the burning of fossil fuels and deforestation.

(iii) Natural causes always play a role in changing Earth's climate, but are now being overwhelmed by human-induced changes.

(iv) Warming the planet will cause many other climatic patterns to change at speeds unprecedented in modern times, including increasing rates of sea-level rise and alterations in the hydrologic cycle. Rising concentrations of carbon dioxide are making the oceans more acidic.

(v) The combination of these complex climate changes threatens coastal communities and cities, our food and water supplies, marine and freshwater ecosystems, forests, high mountain environments, and far more.

Much more can be, and has been, said by the world's scientific societies, national academies, and individuals, but these conclusions should be enough to indicate why scientists are concerned about what future generations will face from business-as-usual practices. We urge our policy-makers and the public to move forward immediately to address the causes of climate change, including the unrestrained burning of fossil fuels.

We also call for an end to McCarthy-like threats of criminal prosecution against our colleagues based on innuendo and guilt by association, the harassment of scientists by politicians seeking distractions to avoid taking action, and the outright lies being spread about them. Society has two choices: We can ignore the science and hide our heads in the sand and hope we are lucky, or we can act in the public interest to reduce the threat of global climate change quickly and substantively. The good news is that smart and

A Turning Point in the Attack on Climate Science*

Quotes from the letter:

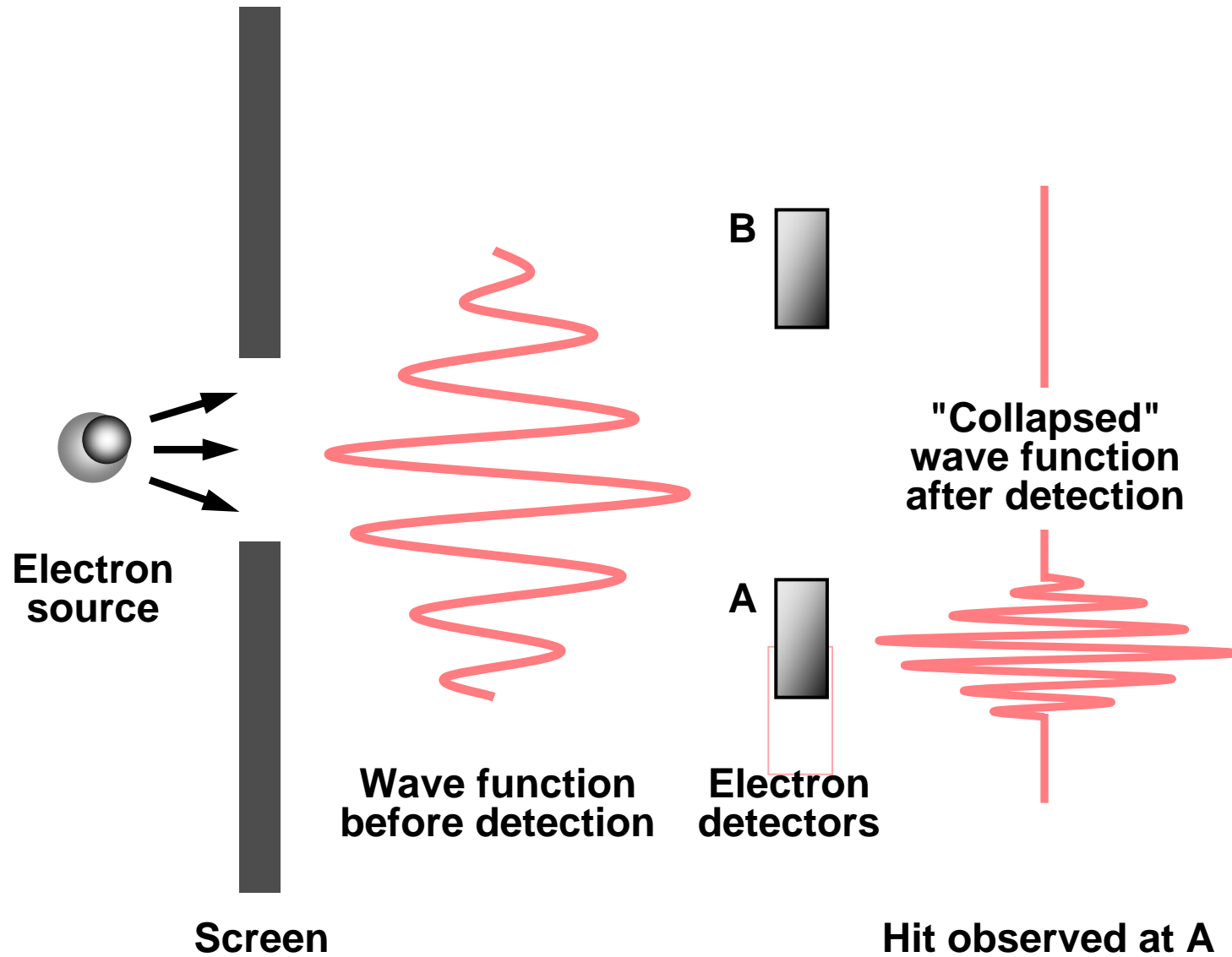
- “When someone says that society should wait until scientists are absolutely certain before taking any action, it is the same as saying society should never take action.”
 - “We [...] call for an end to McCarthy-like threats of criminal prosecution against our colleagues based on innuendo and guilt by association, the harassment of scientists by politicians seeking distractions to avoid taking action, and the outright lies being spread about them.”
 - “Society has two choices: We can ignore the science and hide our heads in the sand and hope we are lucky, or we can act in the public interest to reduce the threat of global climate change quickly and substantively. The good news is that smart and effective actions are possible. But delay must not be an option.”

(*Keith Schneider)

Part 5

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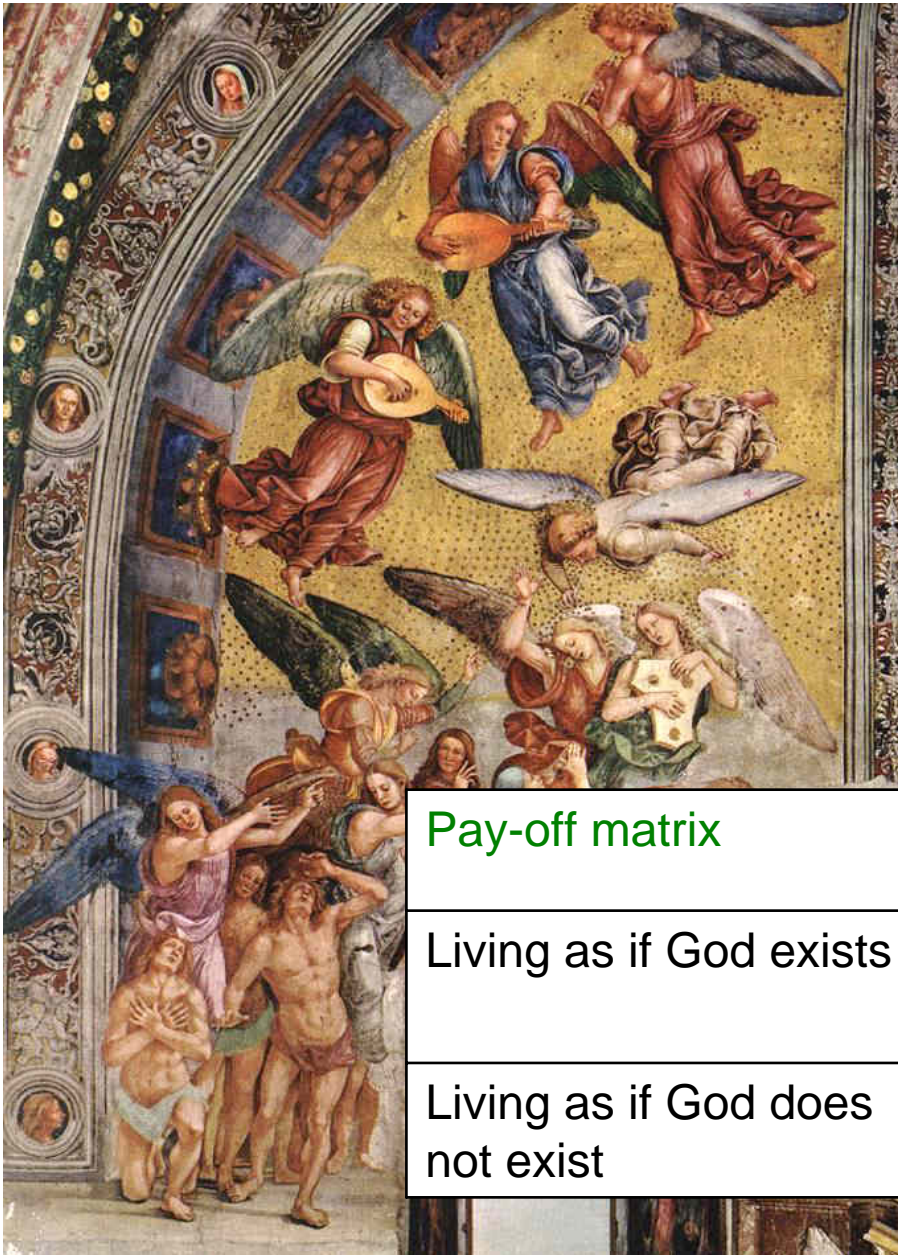
Copenhagen – Collapse of the Wave Function



Cassandra Prophecies



Pascal's Wager



Pay-off matrix

Living as if God exists

Living as if God does not exist

God exists

+ ∞
(heaven)

- ∞
(hell)

God does not exist

- x
(finite loss)

+ y
(finite gain)

Lucas Signorelli, Apocalypse 1499-1502, Cathedral of Orvieto

Humankind's Climate Wager

Assertions

A_1 : Unabated global warming will generate dangerous, if not disastrous, impacts

A_2 : Humankind will respond, with appropriate mitigation and adaptation measures, to the challenge sketched by science

Plausible probabilities

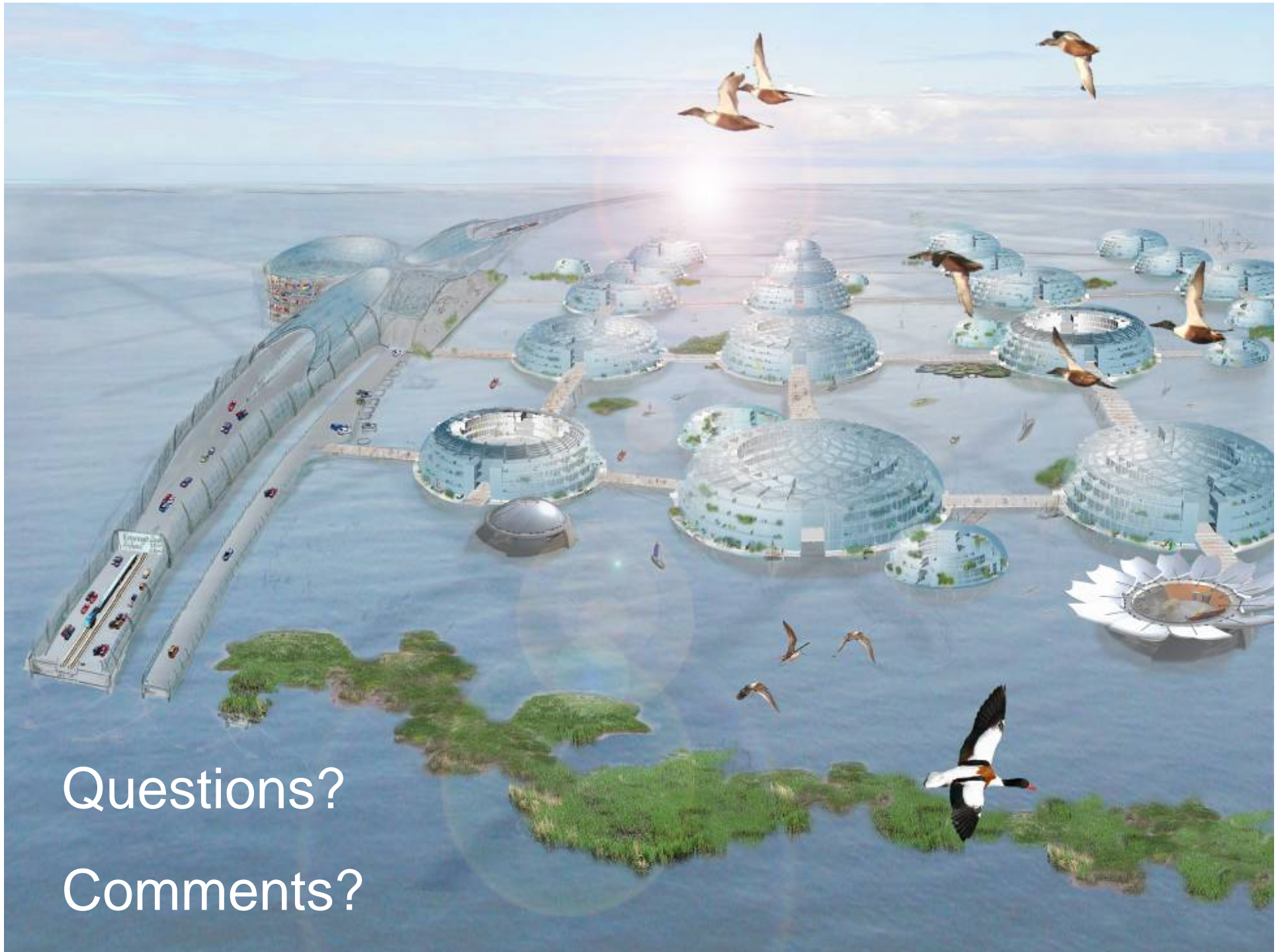
p_1 (A_1 is correct) = 0.9

p_2 (A_2 is correct) = 0.1

Joint-probability matrix for the global warming predictor-corrector problem

$A_1 \backslash A_2$	Correct	Incorrect
Correct	$p \equiv p_1 \cdot p_2 =$ $0.9 \cdot 0.1 = \mathbf{0.09}$ “ Tragic Triumph “	$0.9 \cdot 0.9 =$ $\mathbf{0.81}$ “ Tragedy “
Incorrect	$0.1 \cdot 0.1 =$ $\mathbf{0.01}$ “ Disgrace “	$0.1 \cdot 0.9 =$ $\mathbf{0.09}$ “ Farce “

(Schellnhuber 2010)



Questions?
Comments?