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FLORIDA CENTER FOR ENVIRONMENTAL STUDIES
Charles E. Schmidt College of Science
Florida Atlantic University

Using a *Sustainability Science* Frame to Advance Ecosystem Restoration

Dr. Colin Polsky
Director, CES
Professor of Geosciences

4/23/15

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I. Problem statement

→ We face an uphill battle to maintain, much less grow, Federal support for (increasingly) complex, large-scale ecosystem restoration projects around the globe.

II. A persistent & counter-productive framing legacy

III. Let's consider ditching the old frame

The Framing of Decisions and the Psychology of Choice

Amos Tversky and Daniel Kahneman

SCIENCE, VOL. 211, 30 JANUARY 1981

Problem 1 [$N = 152$]: Imagine that the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed.

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Problem 1 [N = 152]: Imagine that the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed.

If Program A is adopted, 200 people will be saved.

If Program B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved.

Which of the two programs would you favor?

Problem 2 [N = 155]:

If Program C is adopted 400 people will die.

If Program D is adopted there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die.

Which of the two programs would you favor?

The Framing of Decisions and the Psychology of Choice

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Problem 1 [N = 152]: Imagine that the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed.

If Program A is adopted, 200 people will be saved. [72 percent]

If Program B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved. [28 percent]

Which of the two programs would you favor?

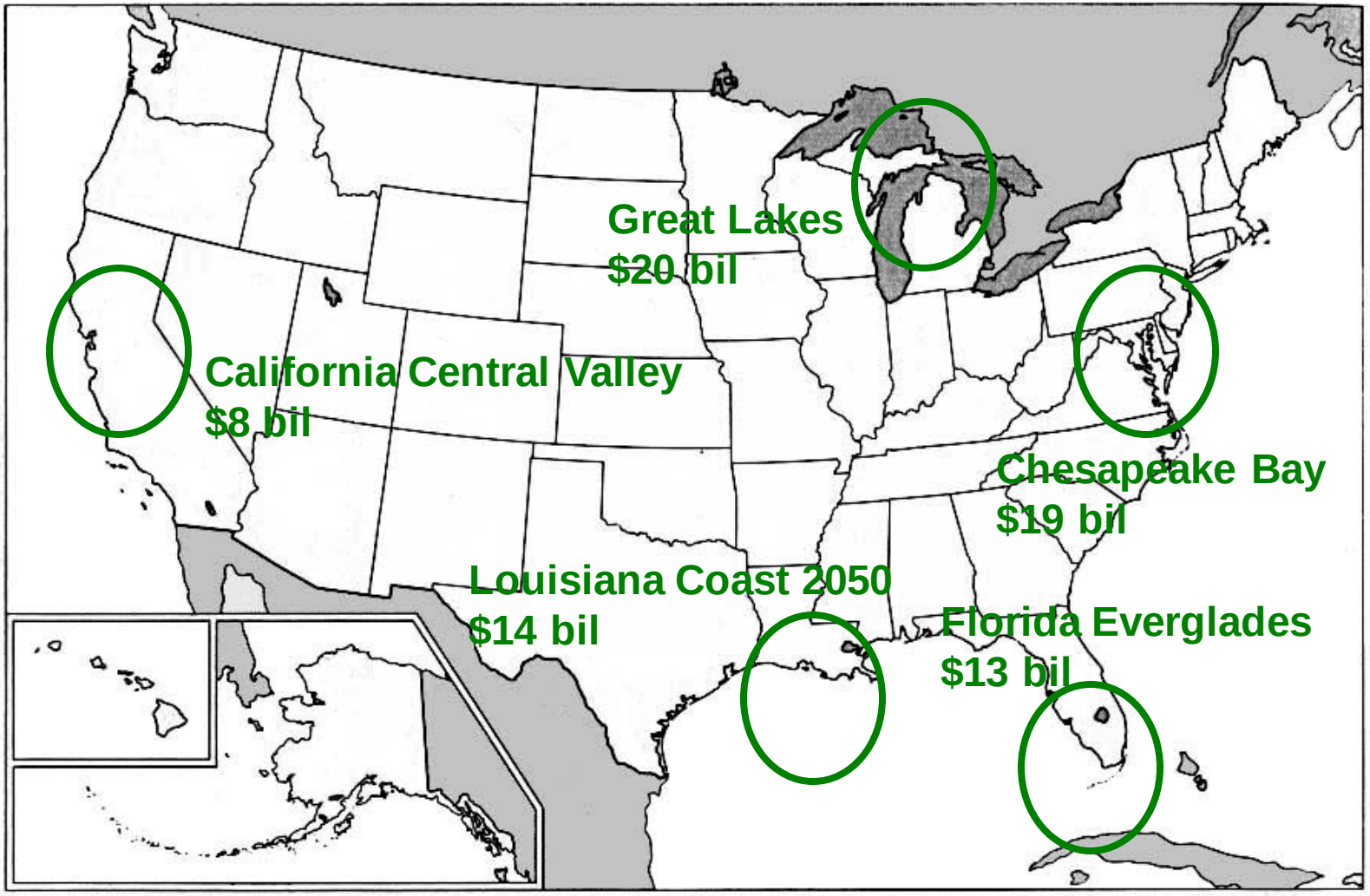
Problem 2 [N = 155]:

If Program C is adopted 400 people will die. [22 percent]

If Program D is adopted there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die. [78 percent]

Which of the two programs would you favor?

“Getting the water right” is not just a Florida problem



Basic *versus* Applied Research

Dr. Vinton Cerf testimony to the U.S. Senate
Commerce, Science and Transportation Committee
The Federal Research Portfolio: Capitalizing on Investments in R&D
July 17, 2014: http://www.c-span.org/video/?91012-1/federal-research-portfolio-capitalizing-investments-rd

Vannevar Bush, WWII "Office of Scientific Research and Development" for FDR/Truman

- led Manhattan Project, *inter alia*

Seeded NSF & NASA, *inter alia*

- principle that Federal gvt should support science

THE WHITE HOUSE

WASHINGTON

November 17, 1944

Dear Dr. Bush:

The Office of Scientific Research and Development, of which you are the Director, represents a unique experiment of team-work and cooperation in coordinating scientific research and in applying existing scientific knowledge to the solution of the technical problems paramount in war. Its work has been conducted in the utmost secrecy and carried on without public recognition of any kind; but its tangible results can be found in the communiques coming in from the battlefronts all over the world. Some day the full story of its achievements can be told.

There is, however, no reason why the lessons to be found in this experiment cannot be profitably employed in times of peace. The information, the techniques, and the research experience developed by the Office of Scientific Research and Development and by the thousands of scientists in the universities and in private industry, should be used in the days of peace ahead for the improvement of the national health, the creation of new enterprises bringing new jobs, and the betterment of the national standard of living.

It is with that objective in mind that I would like to have your recommendations on the following four major points:

First: What can be done, consistent with military security, and with the prior approval of the military authorities, to make known to the world as soon as possible the contributions which have been made during our war effort to scientific knowledge?

The diffusion of such knowledge should help us stimulate new enterprises, provide jobs for our returning servicemen and other workers, and make possible great strides for the improvement of the national well-being.

Second: With particular reference to the war of science against disease, what can be done now to organize a program for continuing in the future the work which has been done in medicine and related sciences?

The fact that the annual deaths in this country from one or two diseases alone are far in excess of the total number of lives lost by us in battle during this war should make us conscious of the duty we owe future generations.

Third: What can the Government do now and in the future to aid research activities by public and private organizations? The proper roles of public and of private research, and their interrelation, should be carefully considered.

Fourth: Can an effective program be proposed for discovering and developing scientific talent in American youth so that the continuing future of scientific research in this country may be assured on a level comparable to what has been done during the war?

New frontiers of the mind are before us, and if they are pioneered with the same vision, boldness, and drive with which we have waged this war we can create a fuller and more fruitful employment and a fuller and more fruitful life.

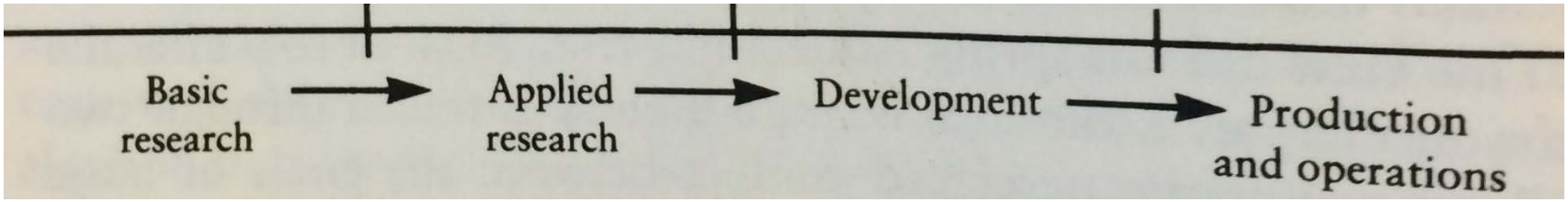
I hope that, after such consultation as you may deem advisable with your associates and others, you can let me have your considered judgment on these matters as soon as convenient reporting on each when you are ready, rather than waiting for completion of your studies in all.

Very sincerely yours,

/s/

Franklin D. Roosevelt

Dr. Vannevar Bush,
Office of Scientific Research and Development
Washington, D. C.



Bush's 3-part argument:

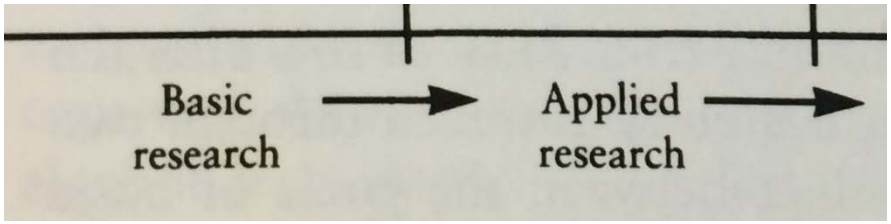
1. **basic = research performed w/o thought of practical ends;**
2. **basic research is the pacemaker of technological progress;**
3. **if basic & applied are mixed, then applied invariably drives out the pure**

"It is obvious that most of the basic secrets of nature have been unraveled by men who were moved simply by intellectual curiosity, who wanted to discover new knowledge for its own sake. The application of the new knowledge usually comes later, often a good deal later; it is also usually achieved by other men, with different gifts and different interests."

– *Murray Report of the Committee on Australian Universities* (1957), quoted in Stokes (1997:11)

"Because the National Science Foundation's mandate is to support basic research, the NSF Cultural Anthropology Program does not fund research that takes as its primary goal improved clinical practice or applied policy. A proposal that uses anthropological methods to understand a social problem but does not propose to make a theory-testing and/or theory expanding contribution to anthropology will be returned without review." (http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505057)

If anesthesia was widely introduced in 1846, then why did cardiac surgery not take off for ~100 yrs?!?



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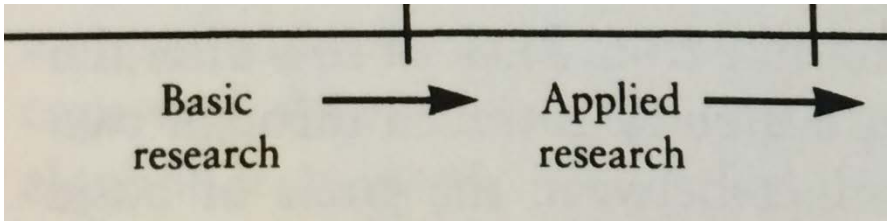
then why did cardiac surgery not take off for ~100 yrs?!?

37% **21%**



25%

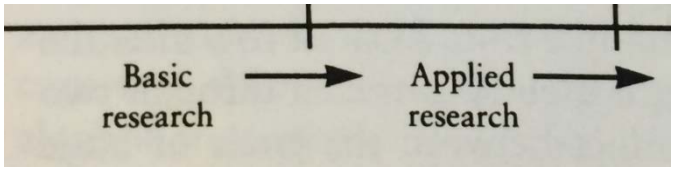
Conclusions

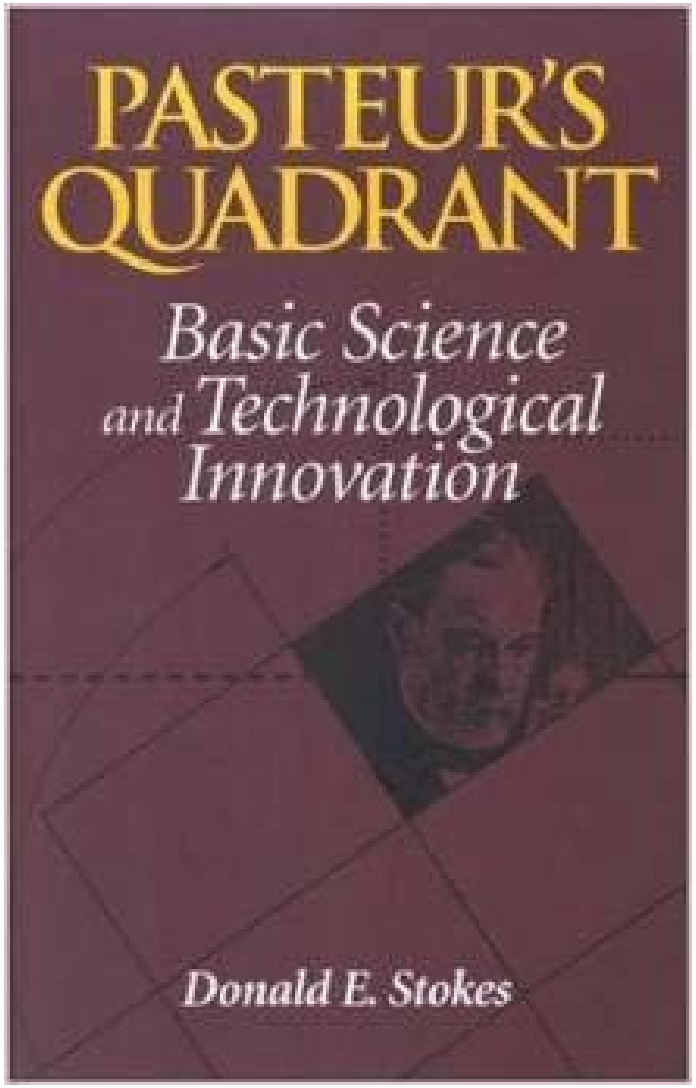
The basic-applied binary is:

- **not linear & sequenced**
- **wrong often enough to call into question its validity**
- **therefore deserves elaboration**

Frame-breaking

What would happen if we bent the line?





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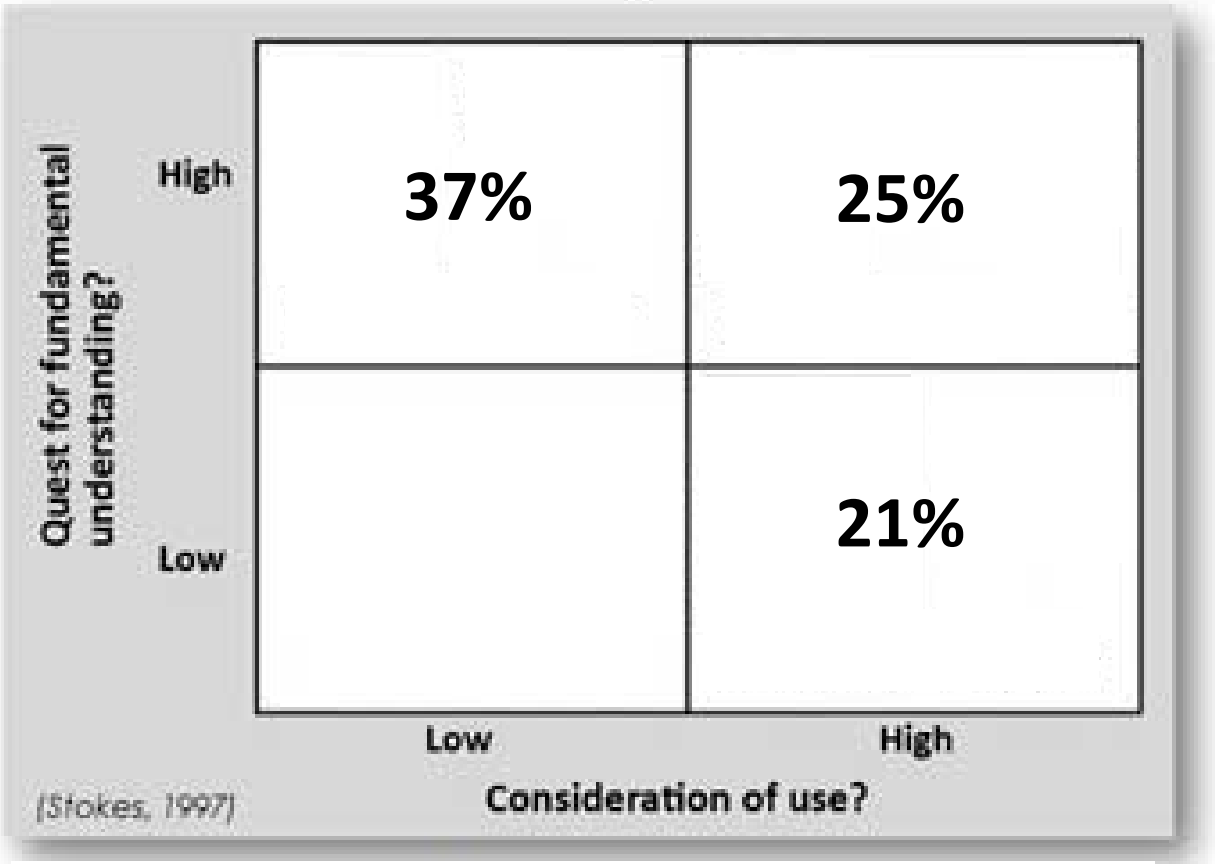
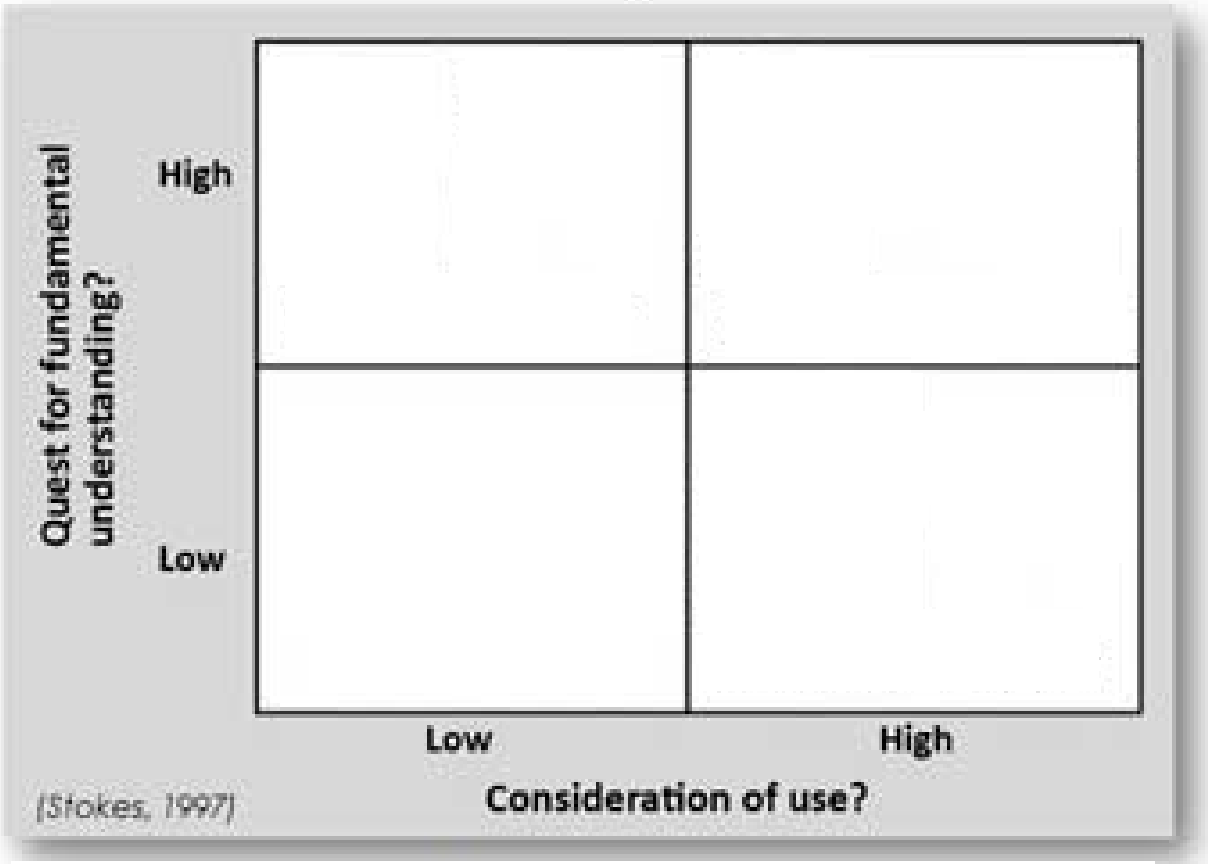


General form



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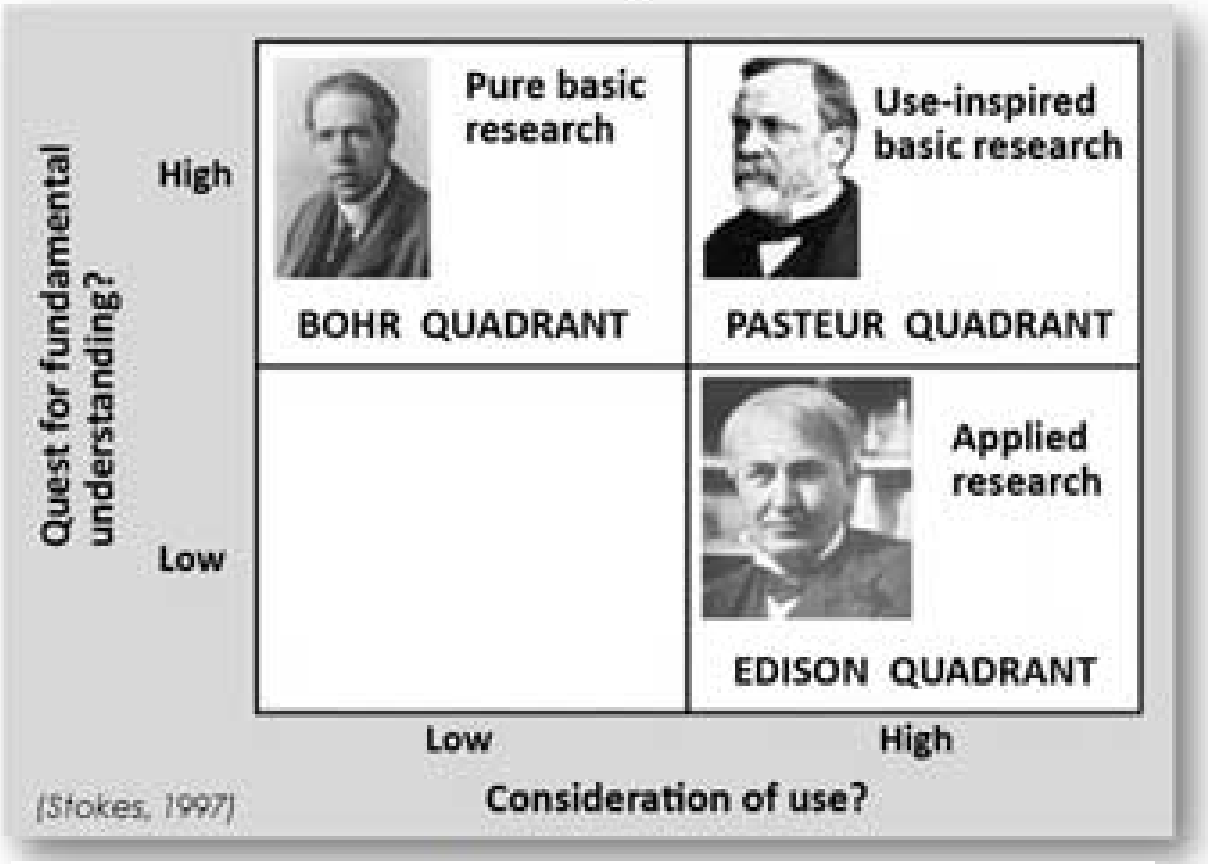

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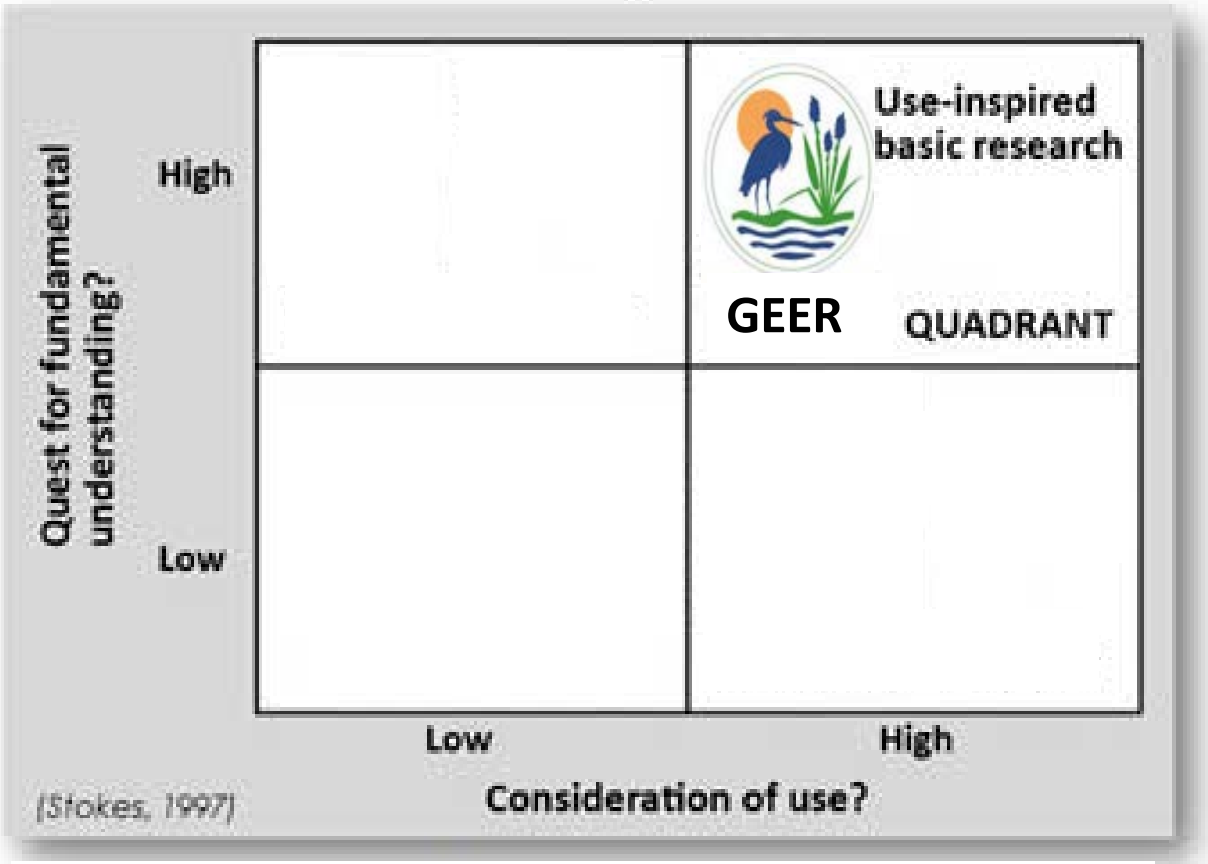

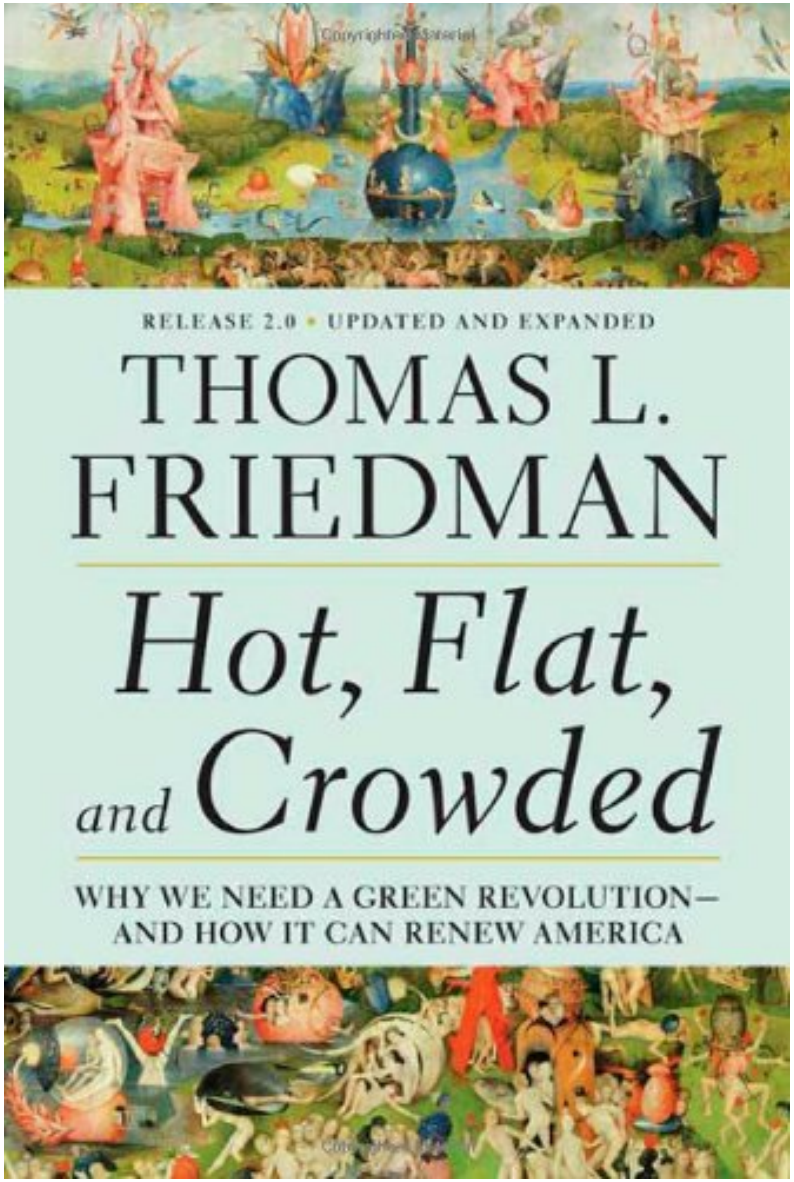
RELEASE 2.0 • UPDATED AND EXPANDED
THOMAS L.
FRIEDMAN
Hot, Flat,
and Crowded
WHY WE NEED A GREEN REVOLUTION—
AND HOW IT CAN RENEW AMERICA

TOP 10 MAJOR CITIES: CONNECTIVITY

RANK	CITY
1	Hong Kong
2	Singapore
3	Dubai
4	Berlin
5	Stockholm
6	Brussels
7	Washington, DC
8	Hamburg
9	Munich
10	Miami

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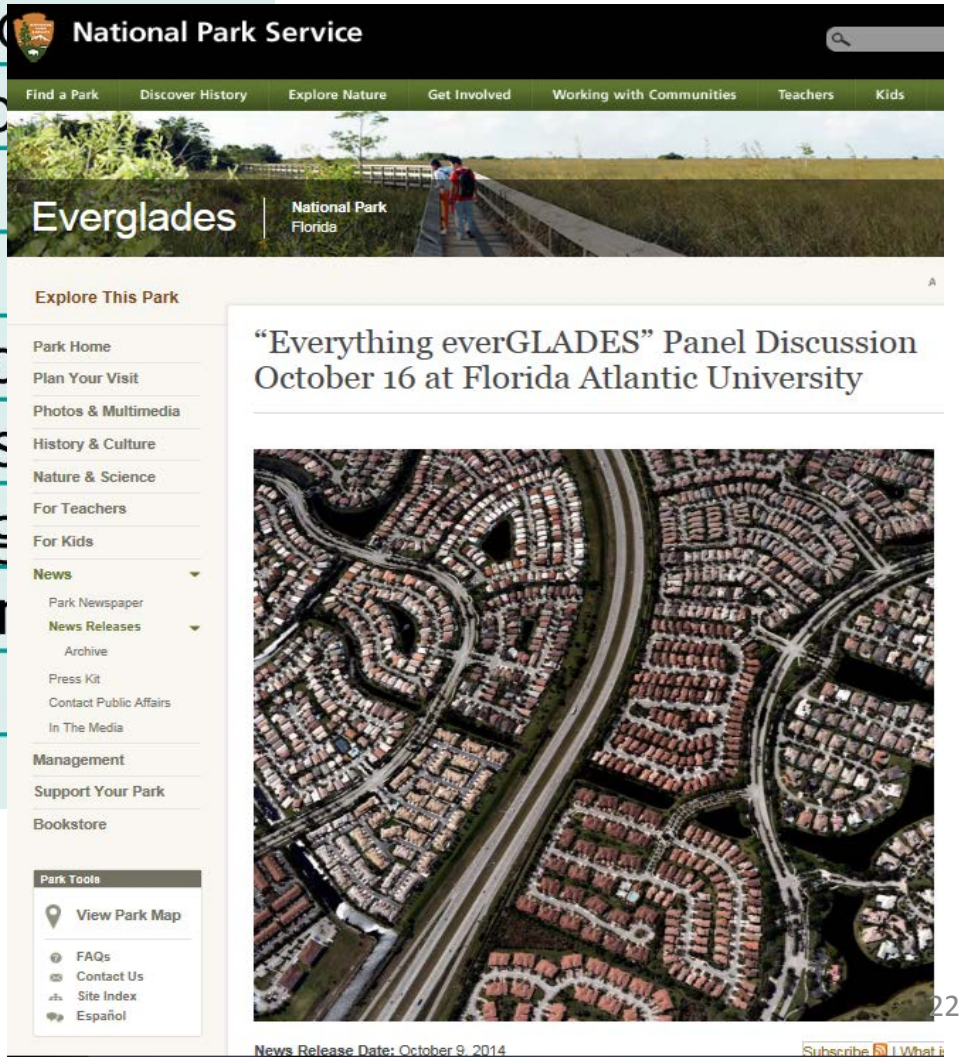

Sustainability Science?

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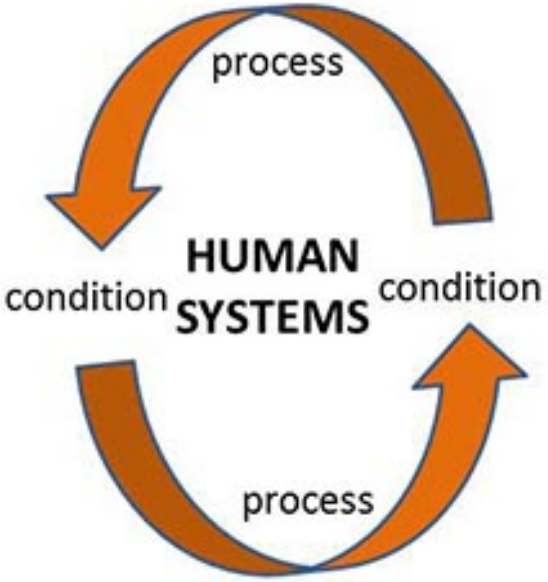

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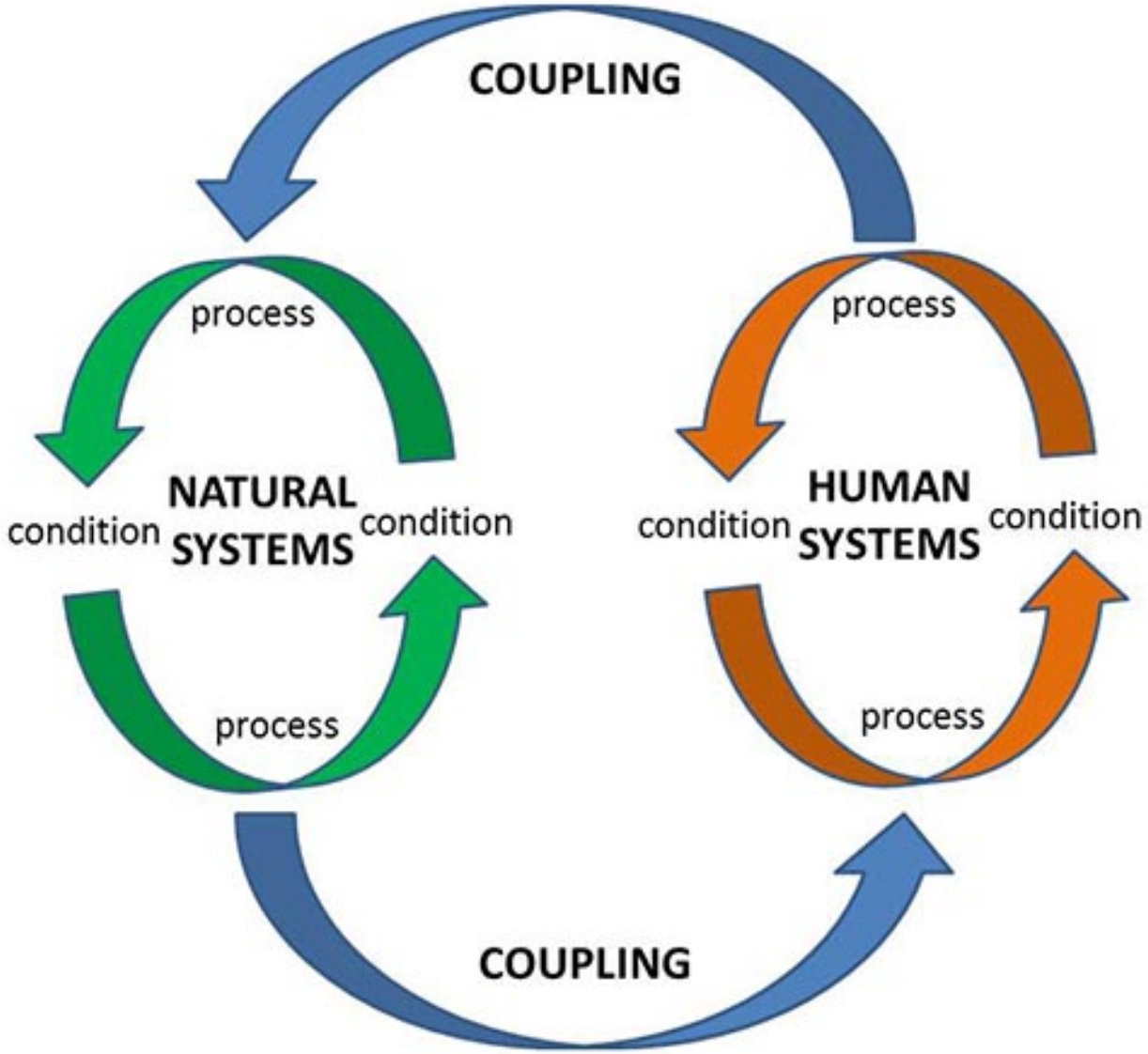

U.S. NSF-CNH program

What kind of a science is sustainability science?

Robert W. Kates[1]
Independent Scholar, Trenton, ME 04605

PNAS | **December 6, 2011** | vol. 108 | no. 49 | **19449–19450**

What kind of a science is sustainability science?

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7 central research questions:

1. **What shapes the long-term trends and transitions that provide the major directions for this century?**
2. **What determines the adaptability, vulnerability, and resilience of human–environment systems?**
3. **How can theory and models be formulated that better account for the variation in human–environment interactions?**
4. **What are the principal tradeoffs between human well-being and the natural environment?**
5. **Can scientifically meaningful "limits" be defined that would provide effective warning for human–environment systems?**
6. **How can society most effectively guide or manage human-environment systems toward a sustainability transition?**
7. **How can the "sustainability" of alternative pathways of environment and development be evaluated?**

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end

cpolsky@fau.edu

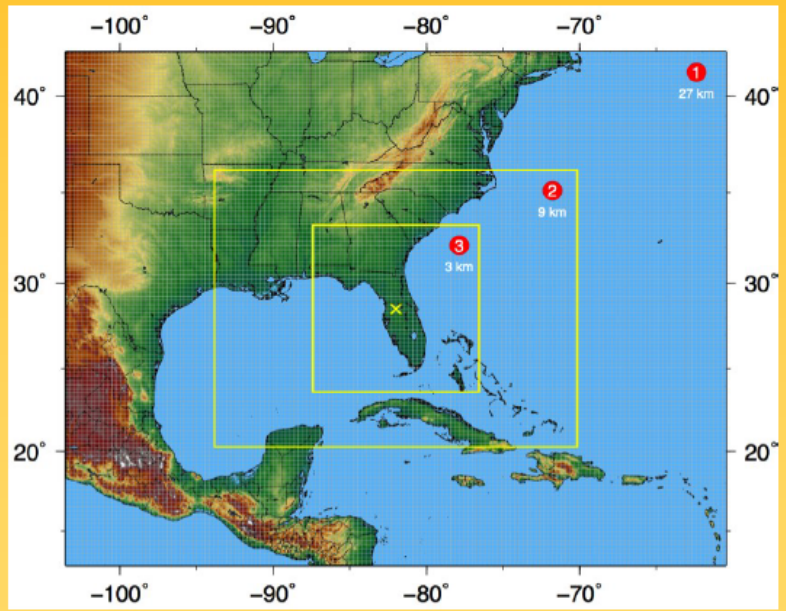
SAVE THE DATE #1

US Geological Survey & Center for Environmental Studies at Florida Atlantic University Present:

Precipitation Downscaling Technical Meeting

Mon. June 22 & Tues. June 23, 2015 ▪ FAU Davie Campus

Join us for a scientific meeting for Florida environmental scientists & managers! in-depth & Interdisciplinary.



How can precipitation downscaling be used to improve Everglades science & restoration?

www.ces.fau.edu/climate_change/downscaling

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USGS
science for a changing world

For more info: MaryBeth Hartman mhartman@fau.edu ● Image source: University of Miami

SAVE THE DATE #2

US Geological Survey & Center for Environmental Studies at Florida Atlantic University Present:

Invasive Species Technical Meeting

September 2015 ▪ FAU Davie Campus

Still in the early planning stages!
Who should attend: academics, practitioners, scientists & decision makers.

What are the next steps for risk assessment and how do we collectively design an implementation strategy?

USGS science for a changing world

FAU Florida Center for Environmental Studies
Charles E. Schmidt College of Science
Florida Atlantic University

www.ces.fau.edu/climate_change/invasive-species

For more info: MaryBeth Hartman mhartman@fau.edu • Image source: Florida Wildlife Magazine