

**Presentations**

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10-8-2015

**Reflections From A (Mostly) Non-Academic Career: Looking Back and Moving Forward**

Paul Sandifer

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Reflections From A (Mostly)  
Non-Academic Career:

Looking Back and Moving Forward

Paul A. Sandifer, Ph.D.  
VIMS 75<sup>th</sup> Anniversary Celebration,  
8 Oct. 2015

# Presentation Outline

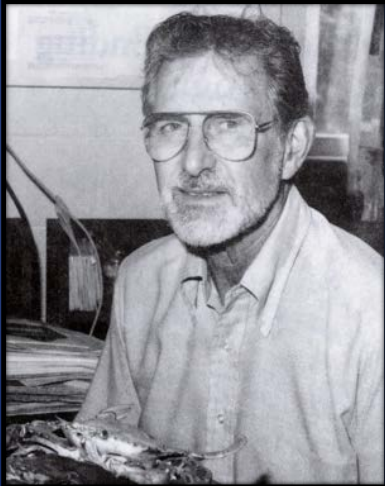
1. Brief biography and a few lessons learned
2. How VIMS prepared me
3. Big hairy coastal and ocean issues
4. Thoughts on improving graduate education
5. Questions

# 1964-1968: Undergraduate Years at the College of Charleston



**Fort Johnson, SC circa 1941**

# Aug 1968-Jan 1972: VIMS Years





# Feb 1972-Apr 2003: The SCDNR Years

Ongoing construction circa mid-late 1971



# Research Boundaries





# My First Assignment Was To Initiate An Aquaculture R&D Program



# Waddell Mariculture Center, SC



Opened in mid-1984

# Marine Resource Division Director, Jan 1984- July 1997



Social and economic drivers

Fishery stakeholder



Paul Sandifer, Blood-Sucking Regulator

# SCDNR Director: July 1997-Apr 2003



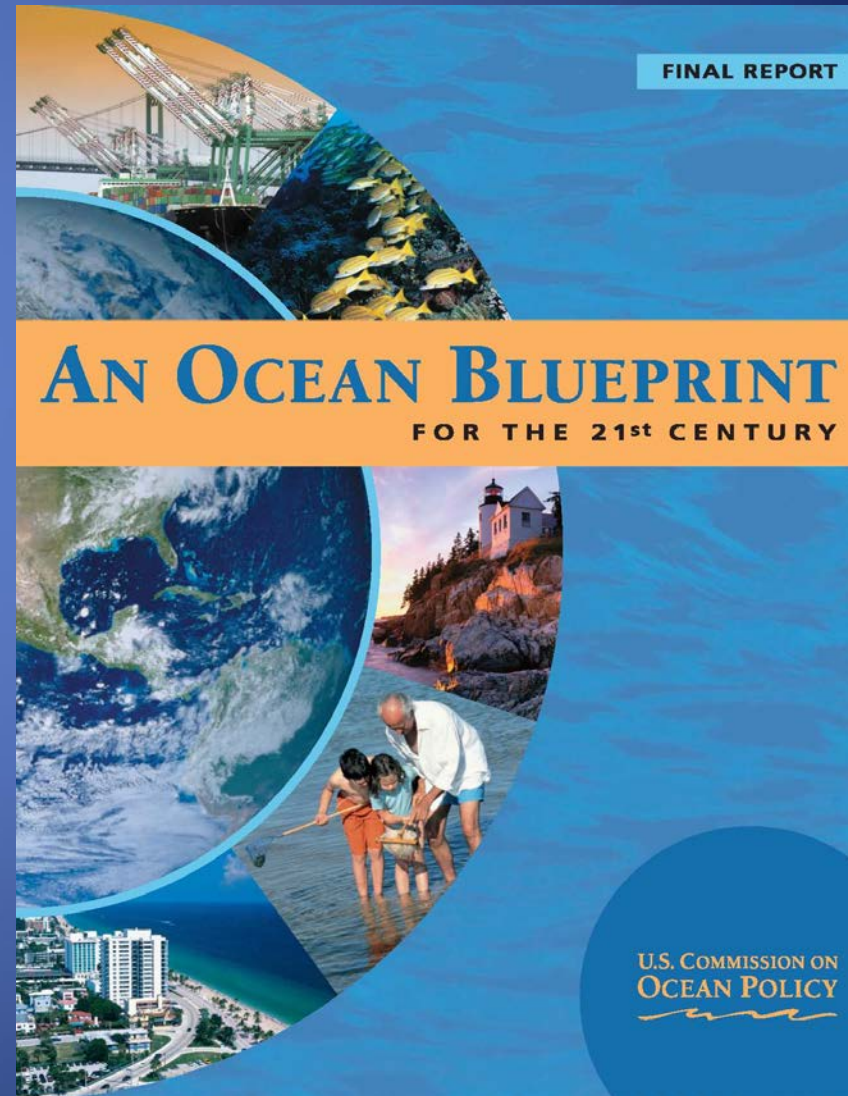
# Hollings Lab



# U.S. Commission on Ocean Policy, 2001-2004



16-member, independent, bi-partisan group,  
26 scientific advisors, 16 public meetings, 18  
regional site visits, 450 witnesses, extensive  
scientific and stakeholder review processes



# Some Fun Things I've Gotten To Work On

## SC Department of Natural Resources

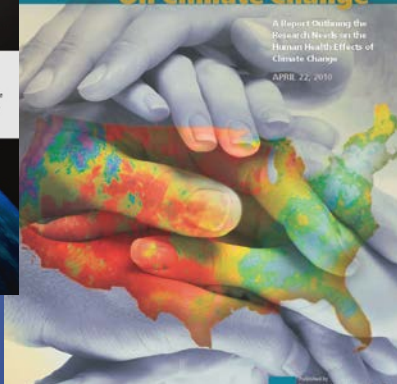
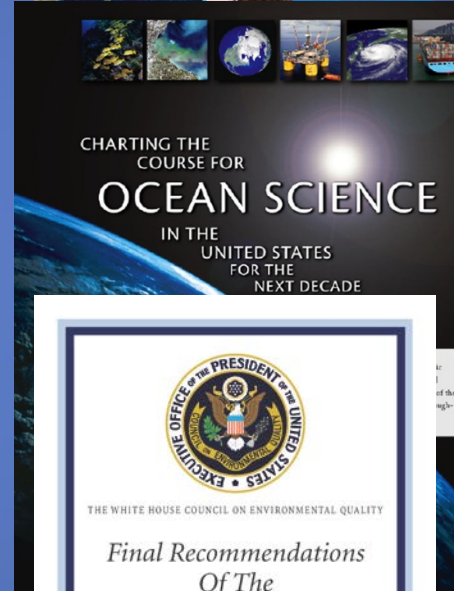
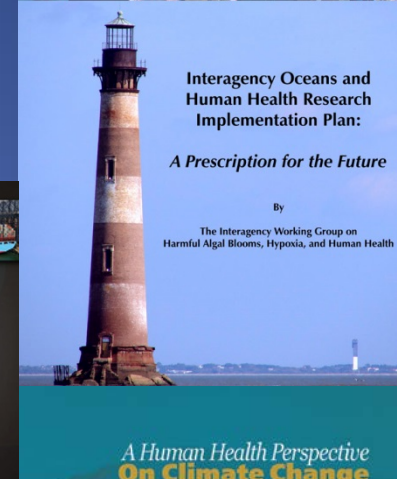
- Many issues involving aquaculture; marine, coastal and inland fisheries, wildlife, water and land resources; emergency response to hurricanes, floods, drought; law enforcement.
- Many land/water/habitat /biodiversity conservation projects such as ACE Basin Project and NERR and Jocassee Gorges project
- Consolidation of 5 entities into single Department of Natural Resources
- Development of Waddell Mariculture Center & Hollings Marine Laboratory
- Lots of policy and politics





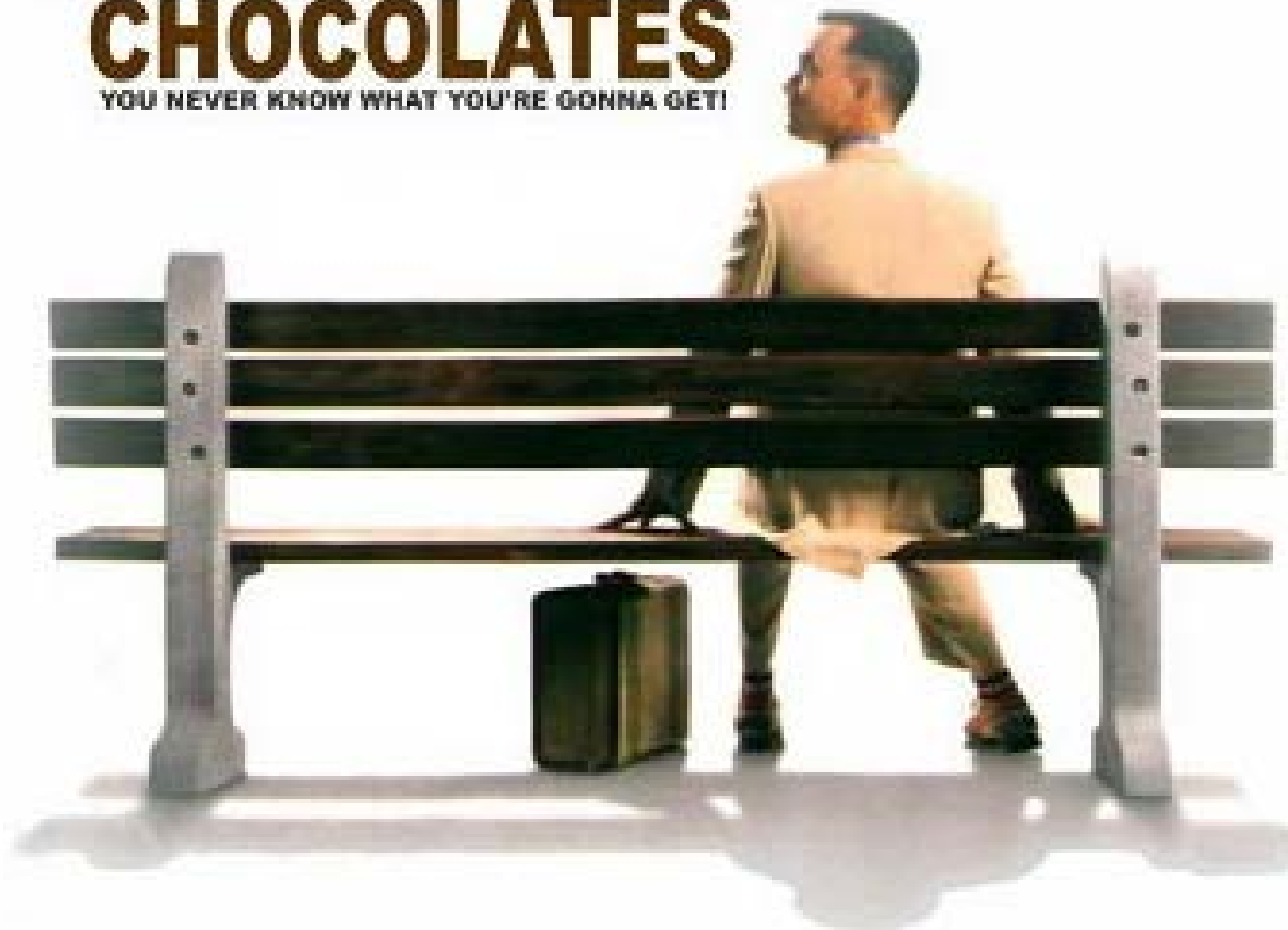
# Fun Things I Go to Work On At NOAA

- US Commission on Ocean Policy
- Oceans and Human Health
- U.S. National Ocean Policy
- Numerous interagency working groups and leadership roles
- DWH Oil Spill Response
- NOAA Scientific Integrity Policy
- Strengthening NOAA Science
- Climate and Health
- Ecological Forecasting
- RESTORE Science Program for GoM
- Science policy, planning, politics



# LIFE IS LIKE A BOX OF CHOCOLATES

YOU NEVER KNOW WHAT YOU'RE GONNA GET!





# Strengthening NOAA Science

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*Findings from the NOAA Science Workshop*

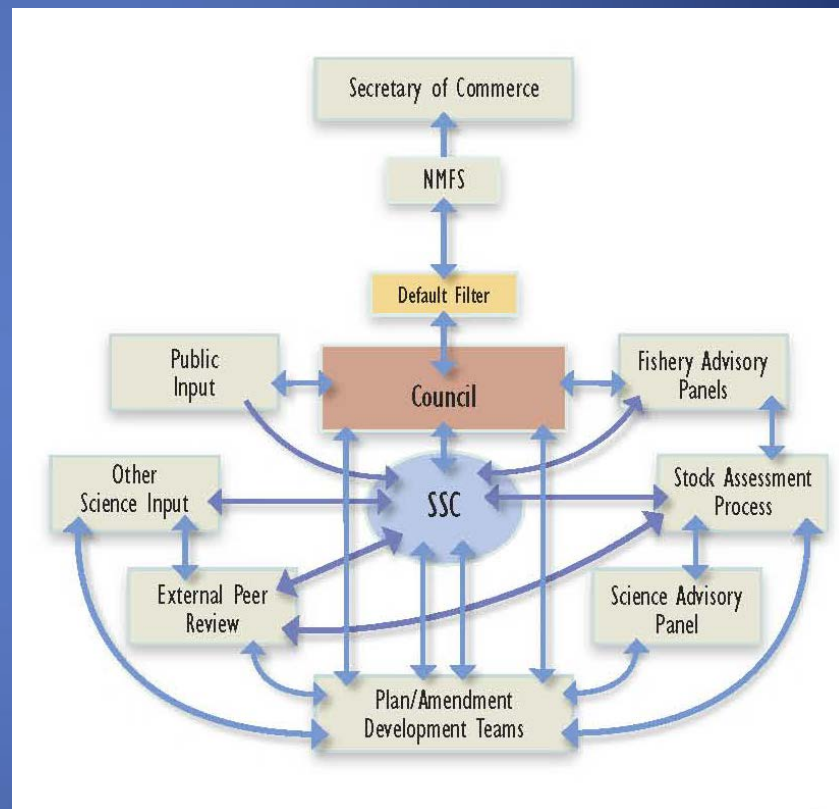
*April 20-22, 2010*



Co-Chairs: Dr. Paul Sandifer and Dr. Randall Dole  
Prepared by the NOAA Science Workshop Program Committee

# Lessons Learned About Using Science To Inform Management Decisions

Data and scientific analyses – no matter how rigorous – cannot make management and conservation decisions. They can only *inform* decision-making.

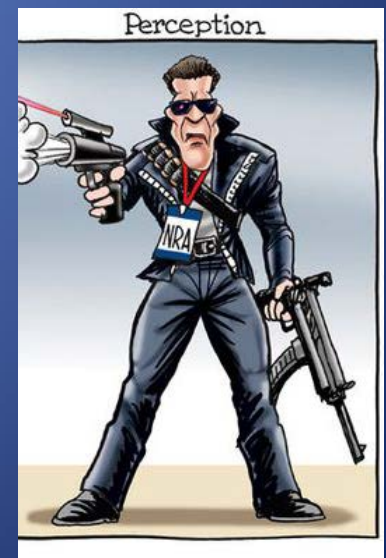
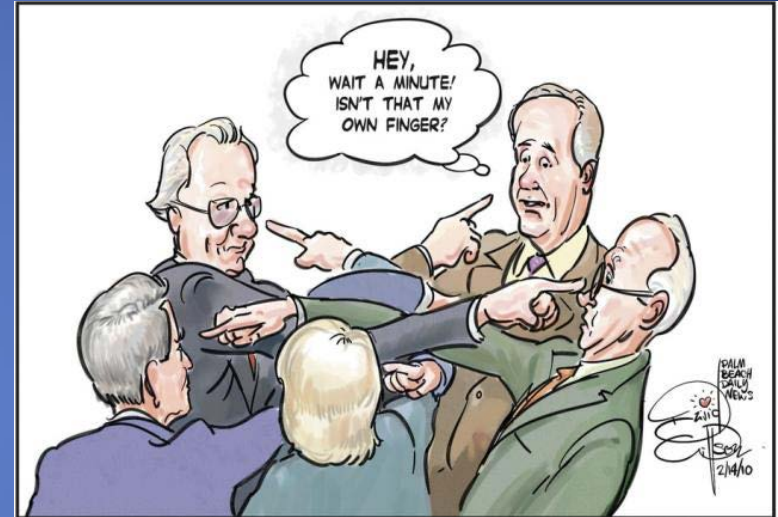


From Sandifer & Rosenberg 2005

# Lessons Learned About Using Science To Inform Management Decisions

Everyone wants government to tell someone else what to do; no one wants government to tell *them* what to do!

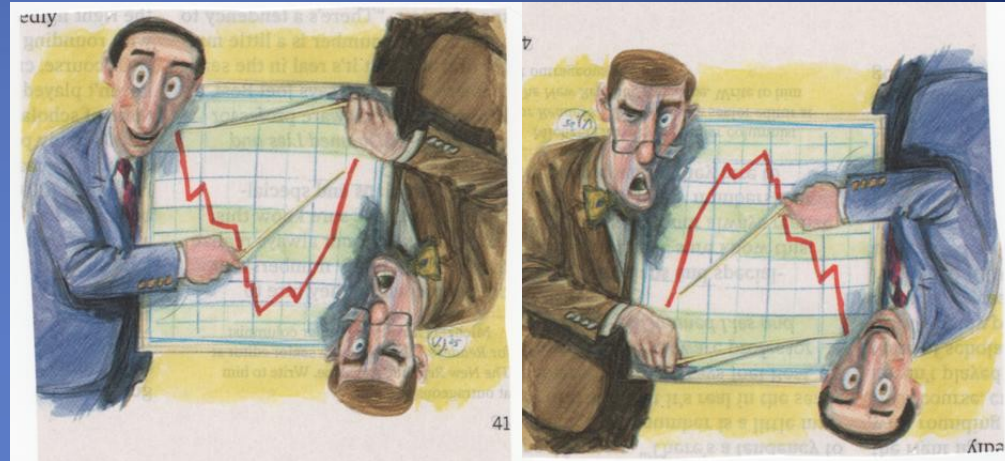
Perception actually is reality.



# Lessons Learned About Using Science To Inform Management Decisions

Everyone wants decisions based on the “best available science” or “sound science.” But only if that science supports their point of view.

And everyone wants “Just The Facts.” But whose facts? Yours, mine, his, theirs, or ours? Who interprets and gets to choose?



# Lessons Learned About Using Science To Inform Management Decisions



The available data and analyses often don't tell you what you really need to know and may get very different interpretations. Be prepared.

# What VIMS Did For Me

- VIMS provided me an excellent graduate education in marine science. This became the foundation for my entire career.





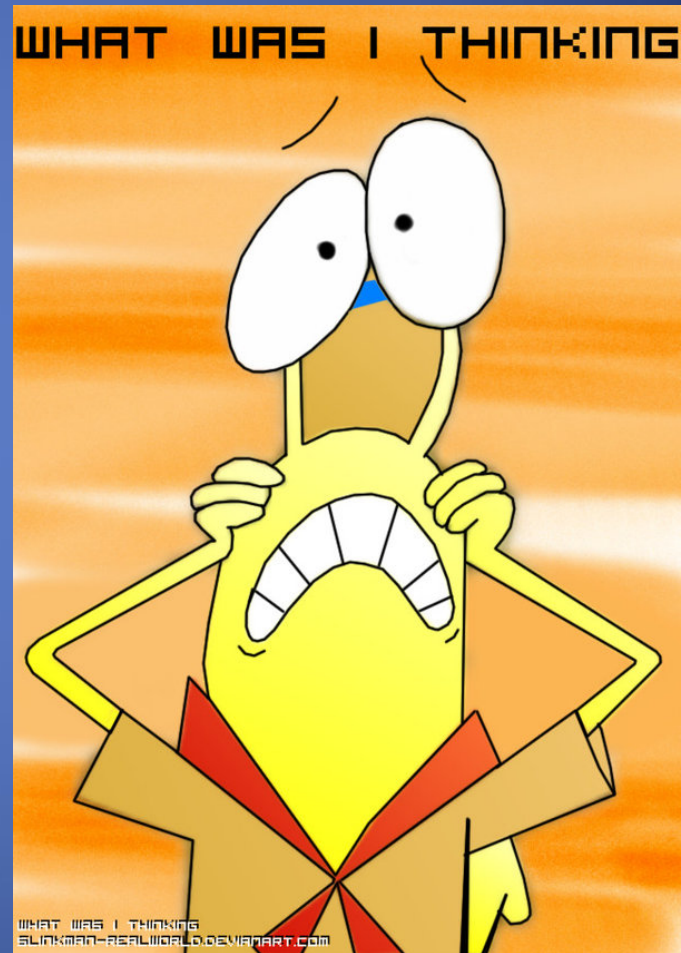
# What VIMS Did For Me

- VIMS taught me to rely on what I could do without a lot of guidance or oversight. It taught me resilience, how to scrounge, borrow, barter, or build whatever I needed for my research.



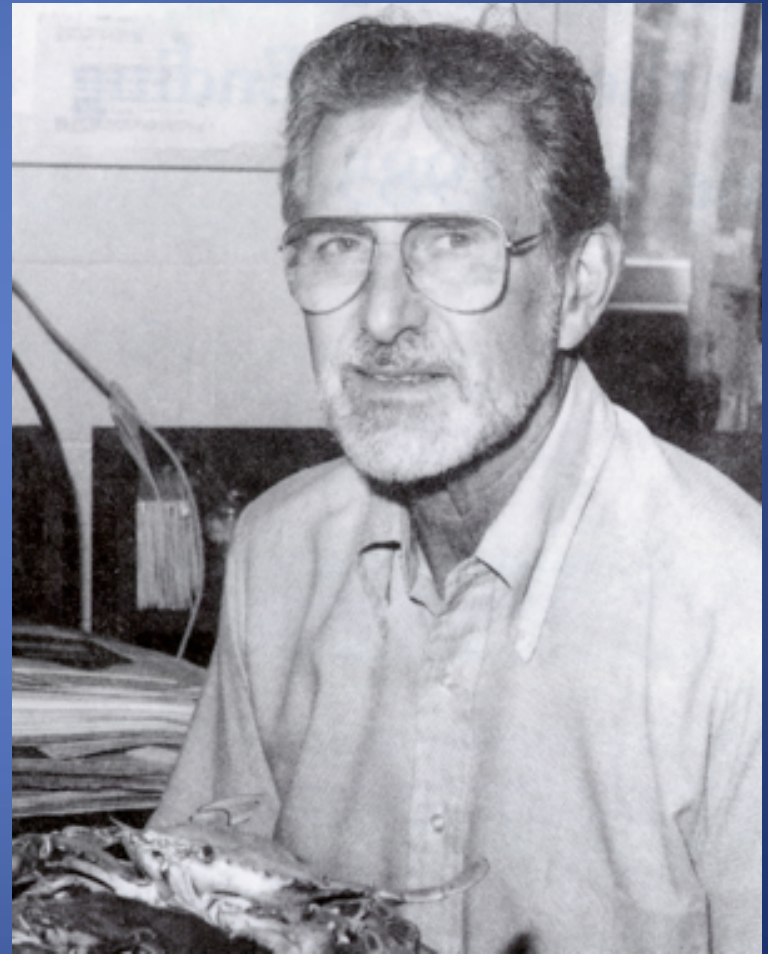
# What VIMS Did For Me

- VIMS allowed me the flexibility to skip the master's degree and go directly for the Ph.D. as fast as I could. I definitely don't recommend this, but it was crucial for me.



# What VIMS Did For Me

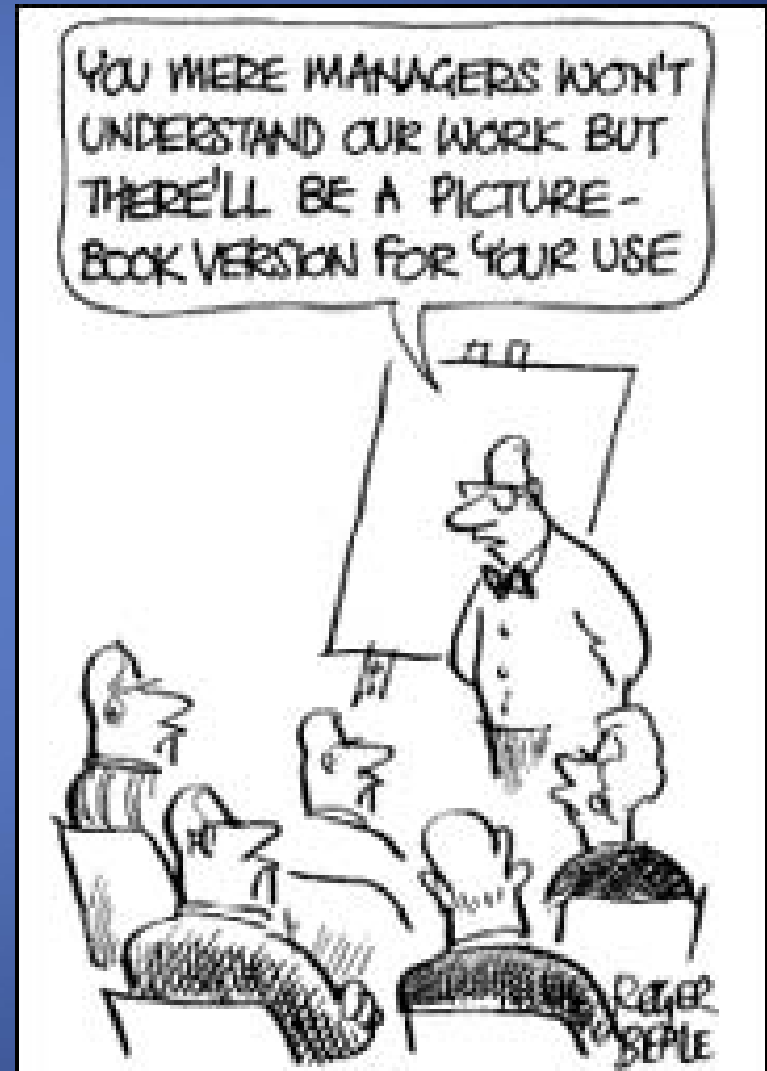
- VIMS showed me in spades what a good mentor is, and how I should act when it became my turn.



Willard A. Van Engel, the Blue Crab “Pope” of Chesapeake Bay

# What VIMS Did For Me

- Van pushed me to achieve. He was a tough task master, and hounded me to write papers and publish.
- By requiring me to go out with crabbers, Van made me begin to learn how to talk about science with “normal” (non-scientific) people.



# What VIMS Did For Me

- My experience at VIMS, and my contacts there, helped me get my first job!



# What VIMS Did For Me

- My VIMS experience shaped the way I looked at life as a Ph.D. VIMS provided the best example of what a state marine laboratory – and its links to academia - should be, and we shamelessly copied and modified the VIMS model in South Carolina.

VIMS North



“VIMS South”



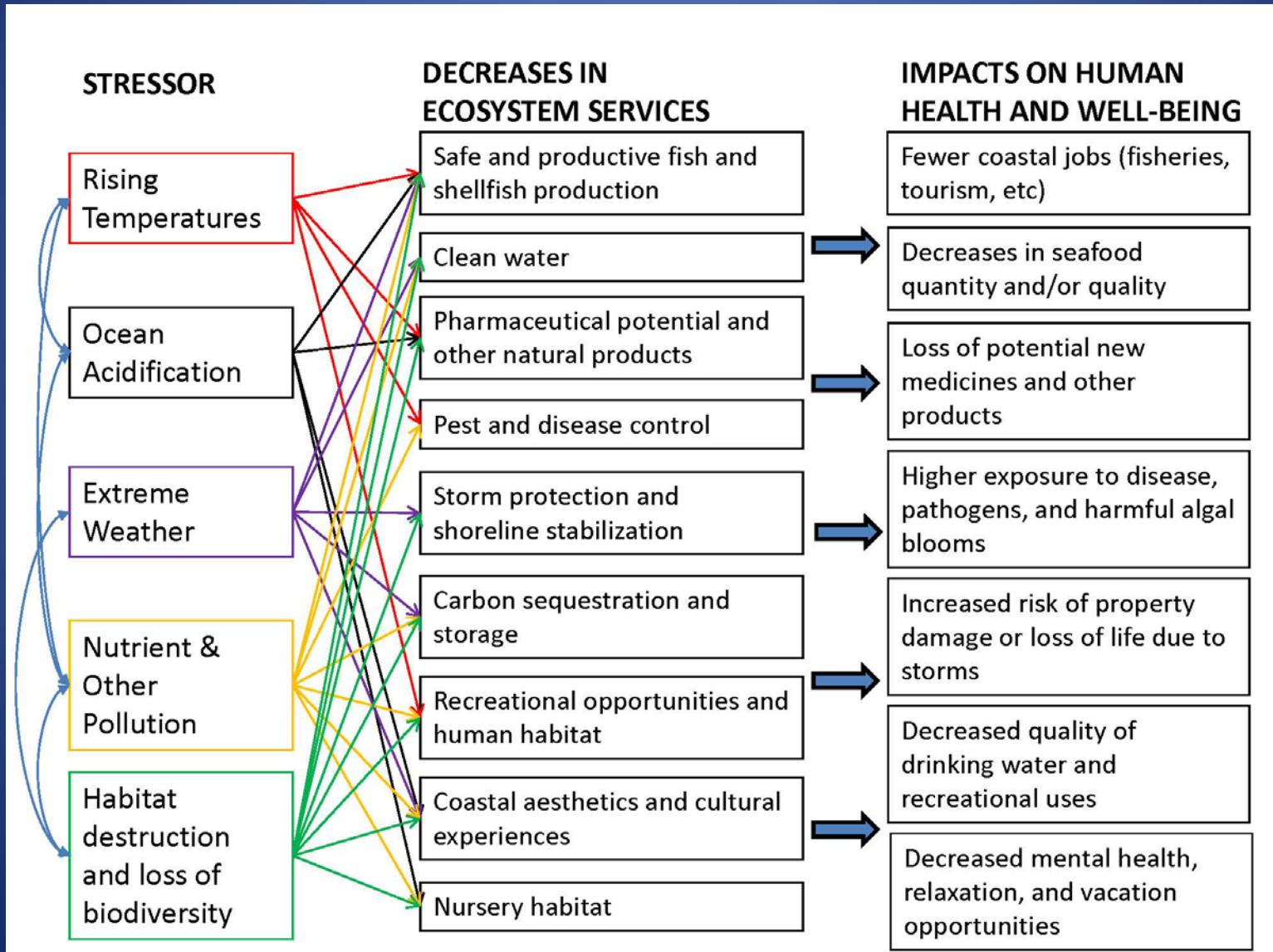
# Some Big Hairy Ocean Issues

- Climate Change and Resiliency
- Human Health and Well-Being, Ecosystem Services, Biodiversity
- Robust coupled Earth-Ocean-Atmosphere system models
- Institutionalization of the National Ocean Policy
- Inter- and multi-disciplinary approaches
- Integration of natural and social sciences



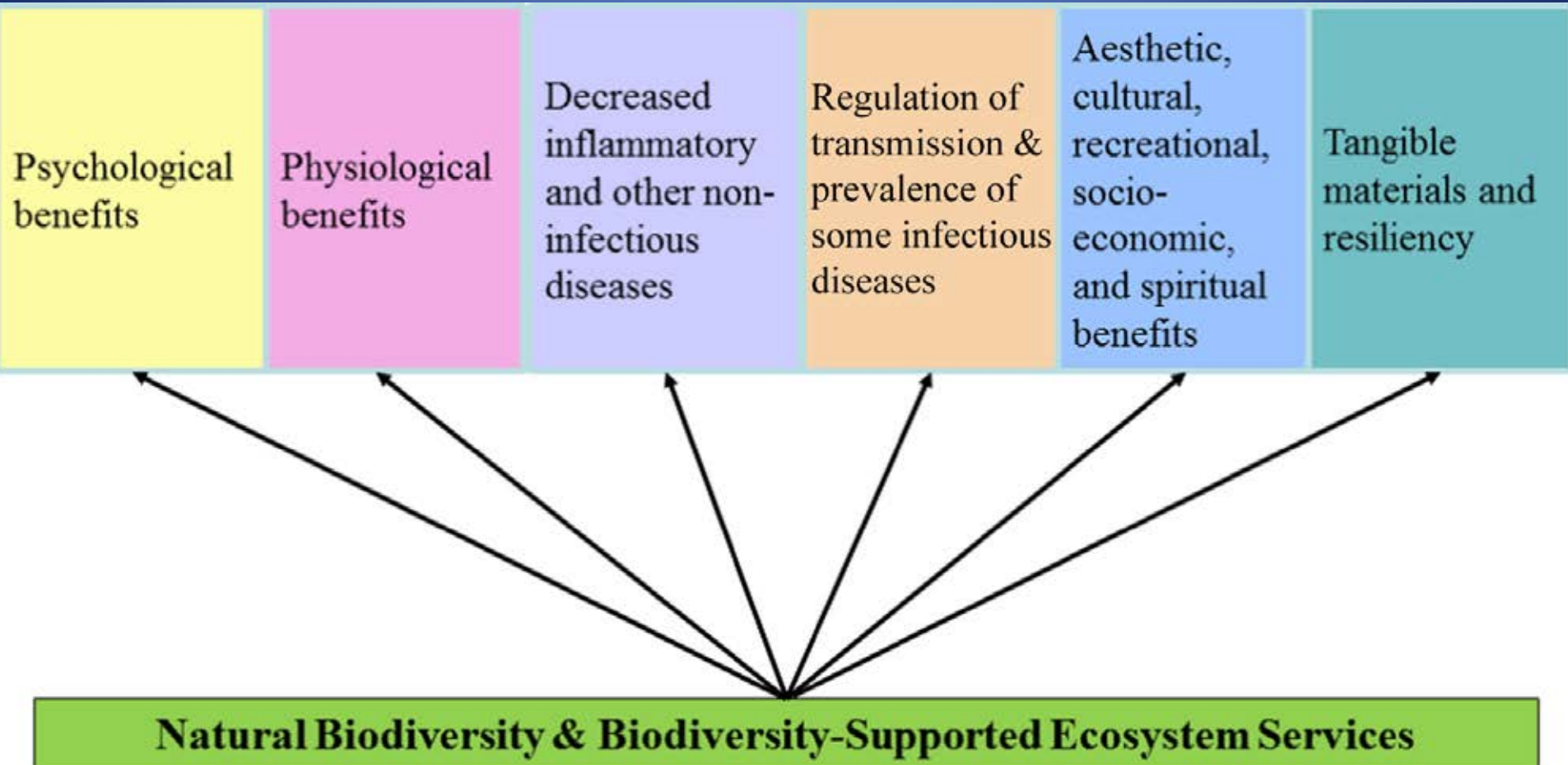
“Human health is a coastal issue.” Bill Miller, UGA

# Examples of Interactions Among Environmental Stressors, Reduced Ecosystem Services, and Health Impacts





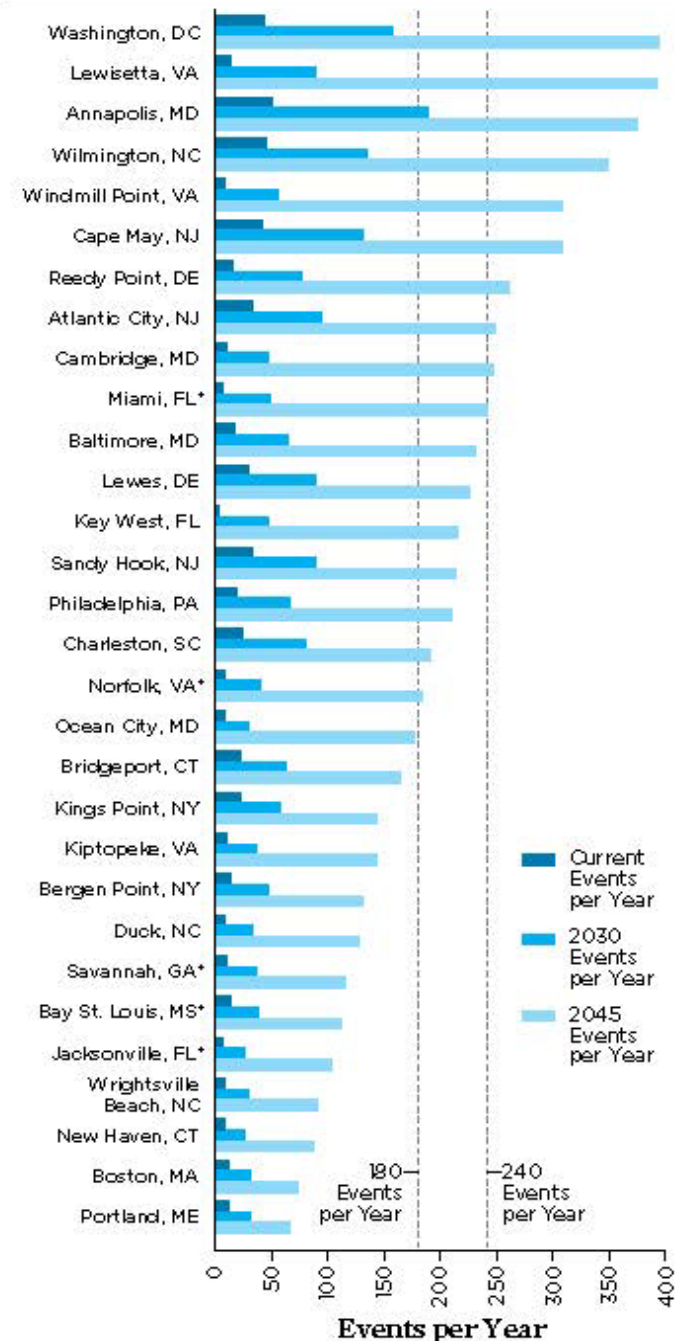
# Major Pathways By Which Nature and Biodiversity Provide Health Benefits to Humans



# SLR and Inundation Estimates

- 30 of 52 locations can expect at least 24 tidal floods annually by 2030 and some much more.
- By 2045, 1/3 of the communities can expect  $\geq 180$  tidal floods/yr or 15/month (basically every other day) and 9 locations could average  $\geq 240$  events/yr

FIGURE 4. Tidal Flooding Today, in 2030, and in 2045



# Some of What We Already See In



A12: Friday, October 2, 2015

OPIN

## The Post and Courier

Founded in 1803

PAMELA J. BROWNING, Publisher

MITCH PUGH, Executive Editor

CHARLES R. ROWE, Editorial Page Editor

FRANK WOOTEN, Assistant Editor

### Editorials

## *Rising tide of local flooding*

**F**looding caused by heavy rain brought downtown Charleston to a standstill on Thursday. As frustrating — and potentially dangerous — as the situation was for unlucky commuters, inundated streets are hardly unusual on rainy days in the Lowcountry.

It is decidedly less common, however, for streets to flood when the sun is shining.

Unusually high tides earlier in the week forced some streets on the peninsula to close even though it hadn't rained. A potent combination of strong winds, ocean currents, water temperatures and the recent "supermoon" helped drive high tides well above the normal level.

Indeed, seasonal variations in tides, as measured by the mean harbor water level, have occurred in Charleston for at least as long as people have been keeping track. Fall tends to bring the highest tides of the year.

But paddleboarders on Market Street are becoming a more common sight than in the past — and not just because nobody had

likely to happen at this time of the year.

But even astronomically high tides in 1922 probably wouldn't have forced the peninsula to shut down.

That's because the second obvious trend is that overall sea levels are rising. Despite some fluctuation from year to year, each passing decade has seen a noticeable increase in the average water level in Charleston Harbor.

Overall, the mean water level in the harbor stands about 1 foot 9 inches higher today than in 1922. Globally, mean sea levels have risen by about 6 inches over the same period of time, according to data collected by NASA.

Scientists largely agree that climate change is a driving factor, though estimates for future increases range from a few inches to several feet.

There is, however, one area of near-universal consensus: Sea-level rise isn't going to stop anytime soon.

That's troubling news for Charleston. At the very least, it represents a tremendous





# Examples of Health Implications of Increased Coastal Flooding

- Increased exposure to and incidence of infectious diseases
- Increased exposure to and incidence of pollutant-associated disease.
- Increased asthma and respiratory illnesses.
- Increased psychological stress and related physiological symptoms.
- Damage to critical infrastructure, including hospitals, water and waste water treatment plants, transportation arteries, housing.
- Loss or inability to maintain and/or expand health-enhancing green spaces.
- Inability to deliver health services

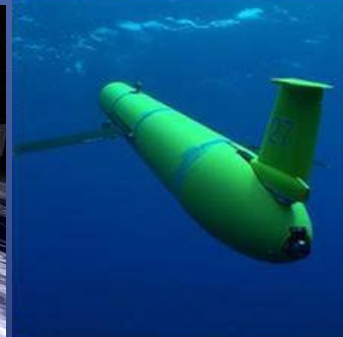
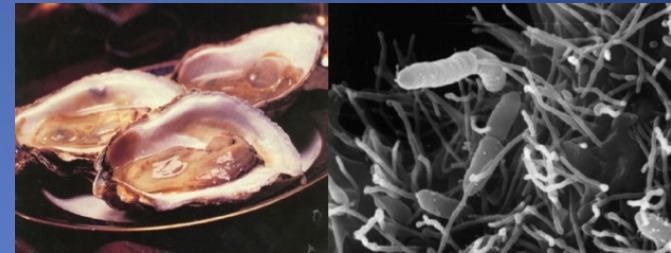
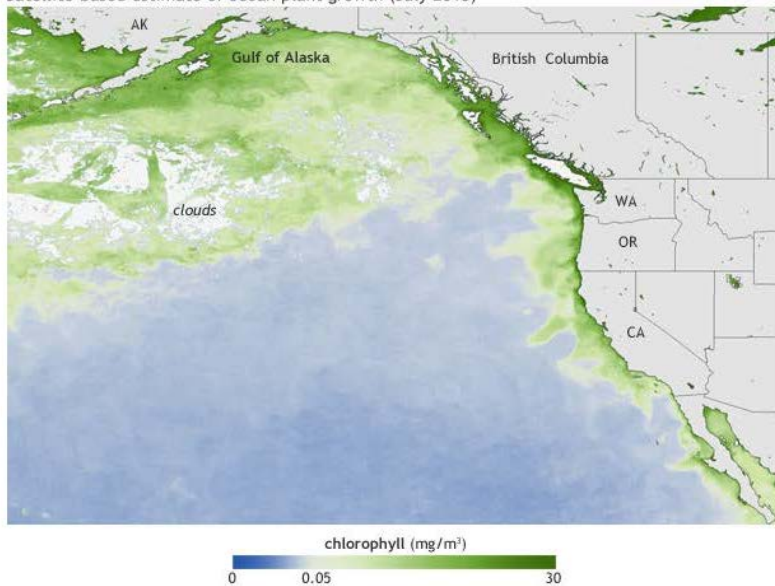
# Other Coastal Health Threats

## Record-setting bloom of toxic algae in North Pacific

August 6, 2015

A record-breaking algal bloom continues to expand across the North Pacific reaching as far north as the Aleutian Islands and as far south as southern California. Coinciding with well above average sea surface temperatures across the North Pacific and West Coast of North America, the bloom is laced with some toxic species that have had far-reaching consequences for sea life and regional and local economies.

Satellite-based estimate of ocean plant growth (July 2015)



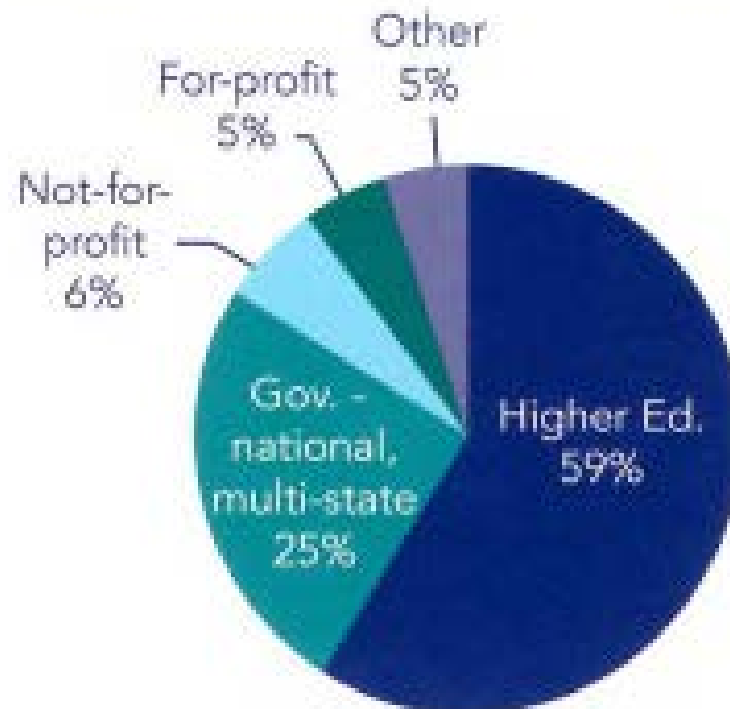


WILLIAM  
& MARY

VIRGINIA INSTITUTE OF MARINE SCIENCE



Major job sectors at graduation for 186 School of Marine Science Ph.D. recipients who entered the program between 1990 and 2011.



# What About The Future?

“All available evidence suggests that over 60% of new Ph.DS.’s in science in the United States will not have careers in academic research, yet graduate training in science has followed the same basic format for almost 100 years, heavily focused on producing academic researchers. Given that so many students will not join that community, the system is failing to meet the needs of the majority of its students.”

Alan Lershner, CEO Emeritus of the AAAS – Editorial in Science

# Scientific Integrity & Conduct

These should be a core part of any scientist's education. Extremely important to instill a culture of integrity in one's research and in dealing with others and to maintain the rights of scientists to speak their minds on science matters without interference, intimidation, or fear of retribution.

**“Integrity is doing the right thing, even when no one is watching.” C.S. Lewis**

**“You don't luck into integrity. You have to work at it.” Betty White, actress**

NOAA FORM 58-5 (4-04)

National Oceanic and Atmospheric Administration	NOAA Administrative Order 202-735D	
NOAA ADMINISTRATIVE ORDER SERIES	DATE OF ISSUANCE December 7, 2011	EFFECTIVE DATE December 7, 2011
SUBJECT: SCIENTIFIC INTEGRITY		

## SECTION 1. PURPOSES.

.01 To promote a continuing culture of scientific excellence and integrity, and to establish a policy on the integrity of scientific activities that the agency conducts and uses to inform management and policy decisions. In addition, the intent of the policy is to strengthen widespread confidence – from scientists, to decision-makers, to the general public – in the quality, validity, and reliability of NOAA science and to denote the agency's commitment to a culture of support for excellence of NOAA's principal science asset, its employees.

Achieving these purposes requires commitment from scientists, their managers, and those who use scientific results to set policy. Therefore, this Order also establishes reciprocal responsibilities among all three groups through a Code of Scientific Conduct and Code of Ethics for Science Supervision and Management for NOAA employees and contractors who conduct, supervise, assess, or interpret scientific information for the use of NOAA, the Department of Commerce, and the Nation.

.02 The Procedural Handbook to this Order establishes processes for responding to allegations of misconduct. The Procedural Handbook has the full force and authority of this NOAA Administrative Order (NAO).

.03 Future guidance and resources related to scientific integrity and the implementation of this NAO will be made available to staff and the public on the Scientific Integrity Commons website at <http://nrc.noaa.gov/scientificintegrity.html>.

## SECTION 2. SCOPE.

.01 To achieve its purposes, this Order will:

- Establish NOAA's Principles of Scientific Integrity and the general NOAA Policy on Integrity of Scientific Activities.
- Define the reciprocal responsibilities among scientists, their managers and supervisors, and policy makers by establishing a Code of Scientific Conduct and a Code of Ethics for Science Supervision and Management.
- Provide for compliance training and maintenance of a NOAA Scientific Integrity Commons website for its employees.
- Set procedures for resolving allegations of misconduct and consequences for misfeasance by adopting an associated Procedural Handbook.



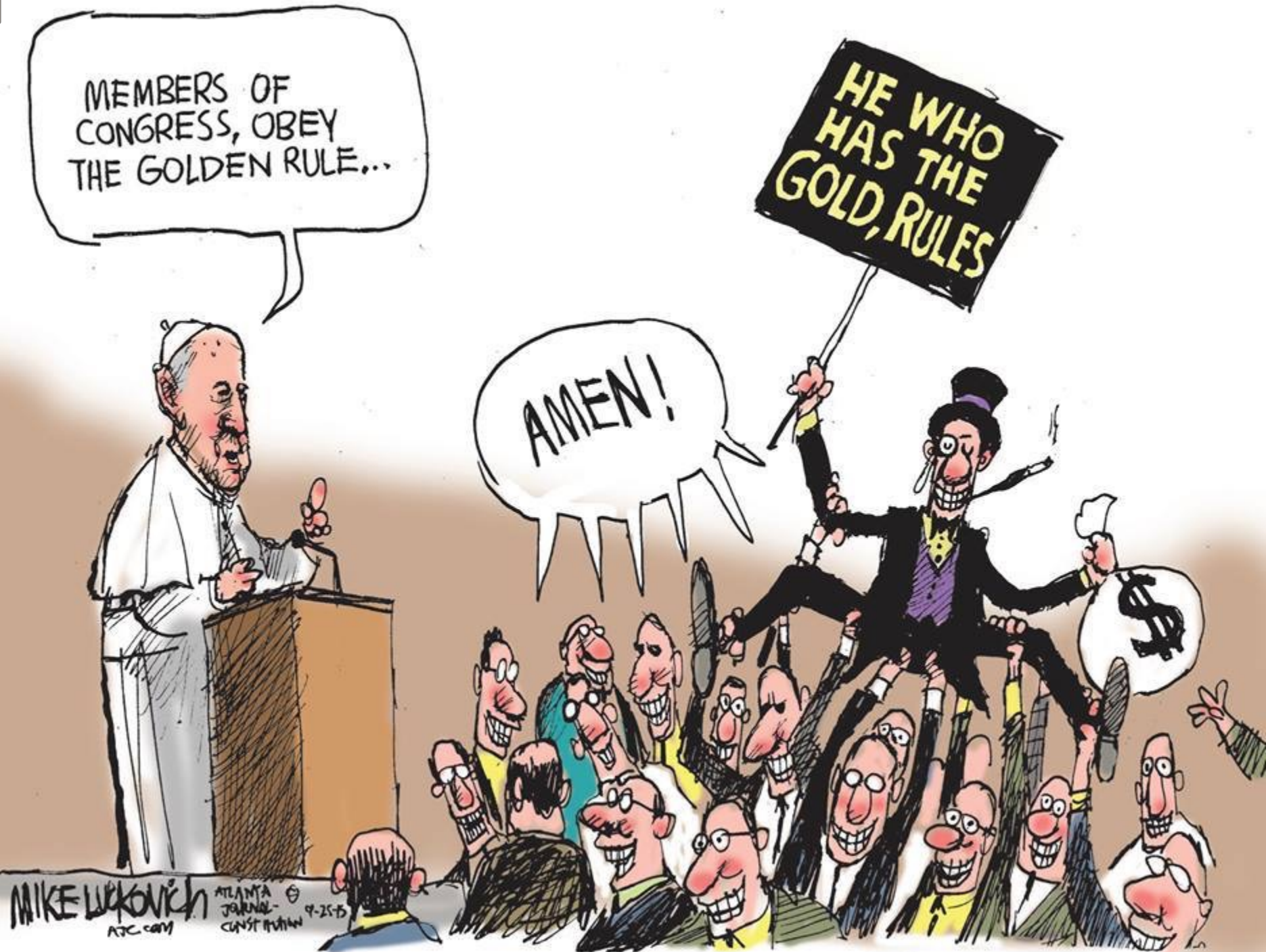
MEMBERS OF  
CONGRESS, OBEY  
THE GOLDEN RULE...

AMEN!

HE WHO  
HAS THE  
GOLD, RULES

MIKE LUKOVICH  
ATC.COM

ATLANTA  
JOURNAL-  
CONSTITUTION  
9-25-05

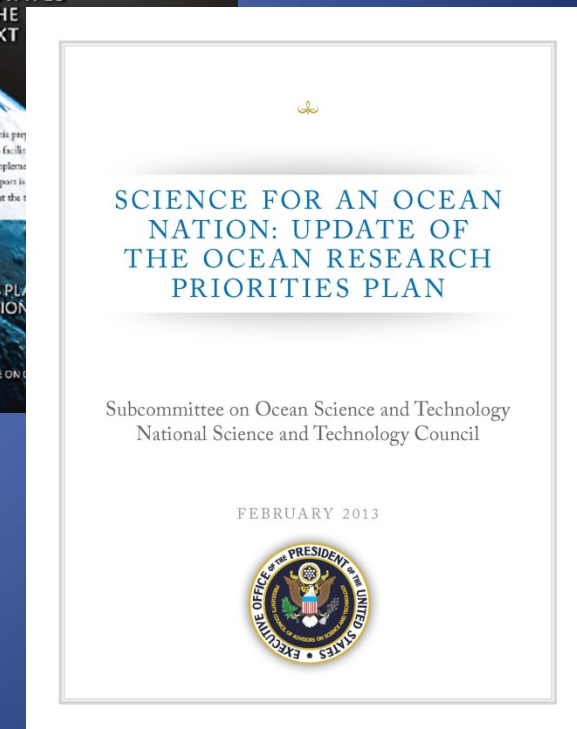
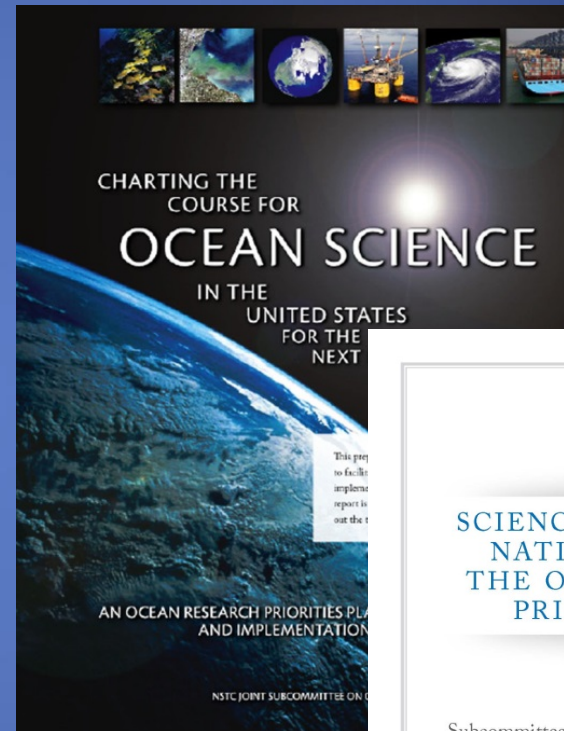


# Future Training Needs

- The other “Golden Rule” – s/he who controls the gold rules.
- Faculty should prepare students to respond to the “so what?” questions about their research. Why is it important?
- Career options
- Grantsmanship, budgeting and budget execution, personnel management and people skills, communication skills.
- Crisis management and response.
- Big “P” and little “p” politics

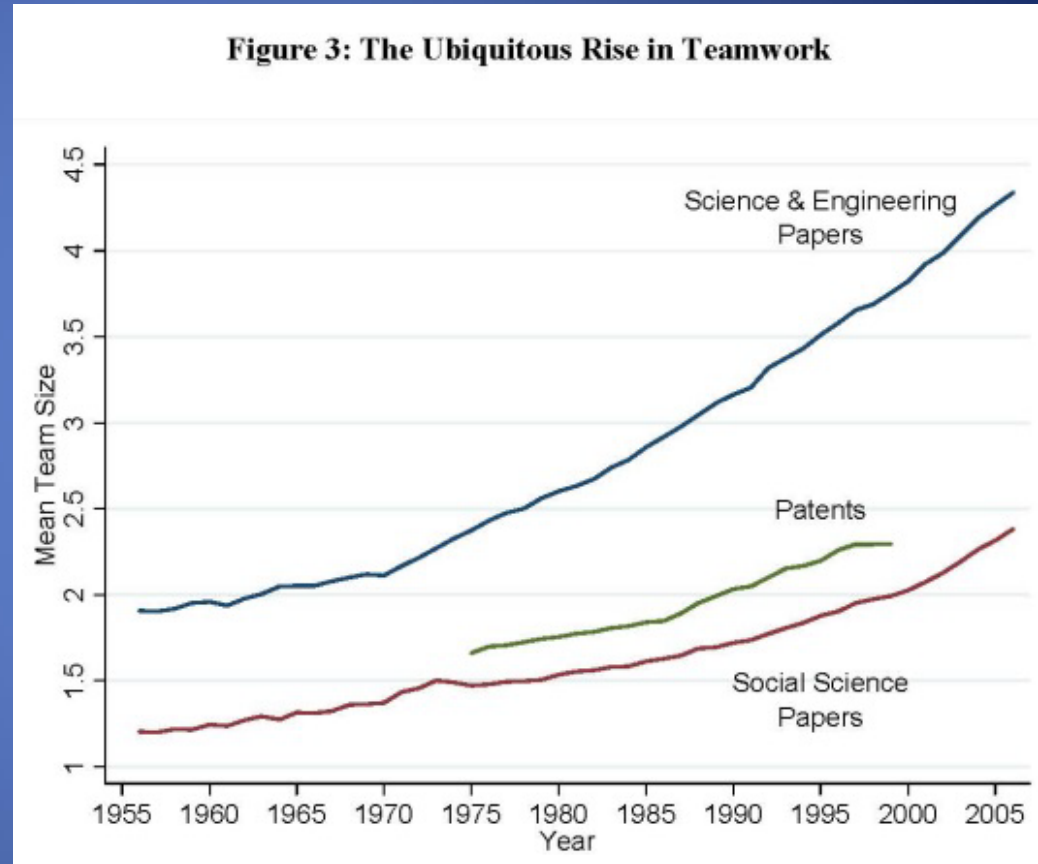
# Future Training Needs

- Use and limitations of science in policy, management, and regulatory contexts.
- How science policy at international, national, and local scales will affect careers.
- How to get involved in and influence policy



# Future Training Needs

Redefine the graduate experience so as to preserve the demonstration of individual competence in knowledge and original scholarship, **but do so within the growing trend of team science.**



Graph from King 2013

# Marine Science Is Interdisciplinary



Scientists must work together to save the world. A special issue asks how they can scale disciplinary walls.

“ To solve the grand challenges facing society — energy, water, climate, food, health — scientists and social scientists must work together.”

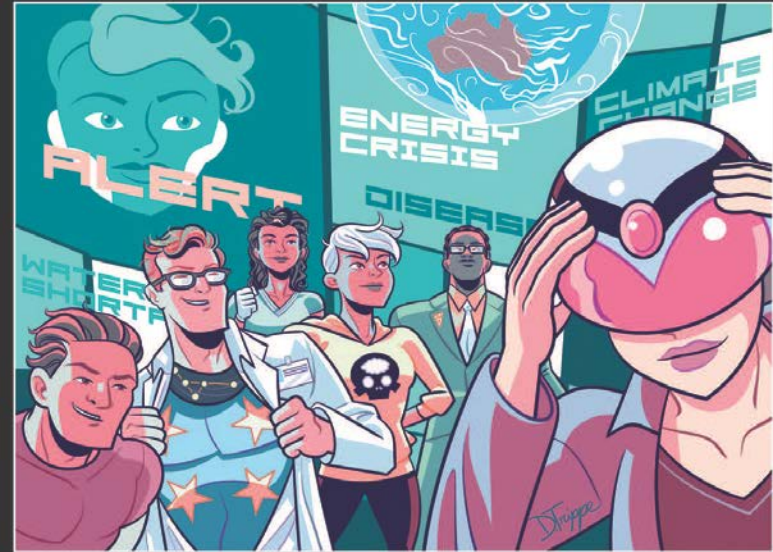
Nature 17 Sept. 2015

# Team Mentoring?



SPECIAL  
ISSUE

Scientists must work together to save the world. A special issue asks how they can scale disciplinary walls.



## TEAM SCIENCE

Interdisciplinarity has become all the rage as scientists tackle society's biggest problems. But there is still strong resistance to crossing borders.

BY HEIDI LEDFORD

Asking for US\$40 million is never easy, but Theodore Brown knew his pitch would be a particularly tough sell. As vice-chancellor for research at the University of Illinois at Urbana-Champaign in the early 1980s, Brown had been tasked with soliciting a major donation from wealthy chemist and entrepreneur Arnold Beckman, a graduate of the university. Beckman was hesitant, believing that the university should receive most of its support from the state. So Brown decided to devise a project like nothing he had ever seen before.

In 1983, he and his colleagues put together a proposal for an institute that had little chance of being funded through normal channels. It would defy the powerful disciplinary cartography that defines many modern universities, bringing together members of different departments and inducing them to work together on common projects. Brown argued that it would allow faculty members to tackle bigger scientific and societal questions than they normally could.

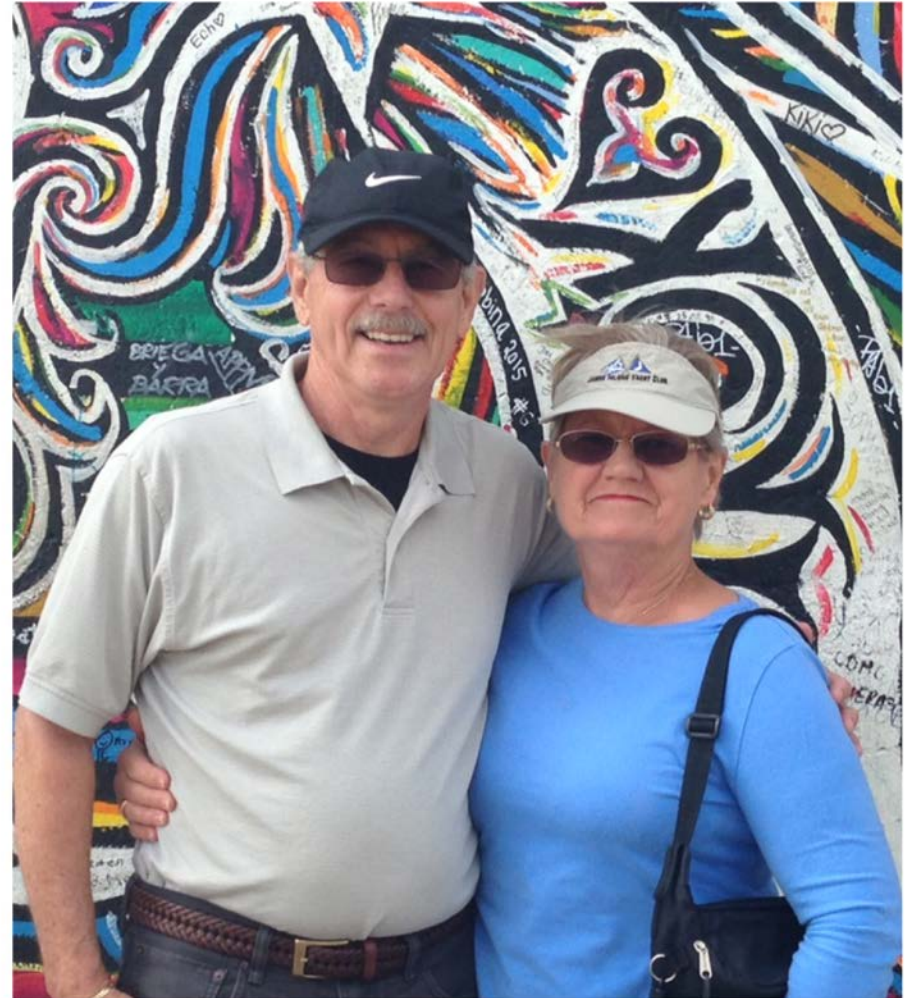
"The problems challenging us today, the ones really worth working on, are complex, require sophisticated equipment and intellectual tools, and just don't yield to a narrow approach," he says. "The traditional structure of university departments and colleges was not conducive to cooperative, interdisciplinary work."

It was an early example of the push for interdisciplinary research that is now sweeping universities around the globe. Although Brown was not completely alone — the interdisciplinary Santa Fe Institute in New Mexico was founded around the same time — he was advocating crossing boundaries before it

# Thank you VIMS and Happy 75<sup>th</sup> Thus far, it's been a heck of a ride!

Nov 1971

Aug 2015



# Questions?

VIMS Mission for the next 75 years:  
Help save the world!





# Advice for Students

- Take advantage of your major advisor, committee members, and other faculty and researchers. They can teach you a lot that you won't get in formal courses.
- Volunteer and get noticed in a good way.
- Recognize that your thesis/dissertation and degree are only tickets to get you in the game.
- Murphy's Law is alive and well and so is Serendipity – be prepared for both.
- Take some time to have a life!

- It helps- a lot- to have a hero!
- Sen. Ernest F. “Fritz” Hollings

