Future Directions in Ocean Science and Implications for UNOLS

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President, National Academy of Sciences

The National Academies of
SCIENCES · ENGINEERING · MEDICINE

Trends

- Affordable access to space
- Engagement of citizens in real science
- Cheap internet everywhere
- Power of big data/low cost of computing
- Rise of robotics and AI
- Development of miniature biomedical sensors
- Changing demographics of workforce: “Embrace diversity or face extinction”

Genes behind embryonic aneuploidy *pp. 160 & 235*

Closing the Central American Seaway early *pp. 166 & 226*

Chemical imaging of membrane lipids *p. 211*

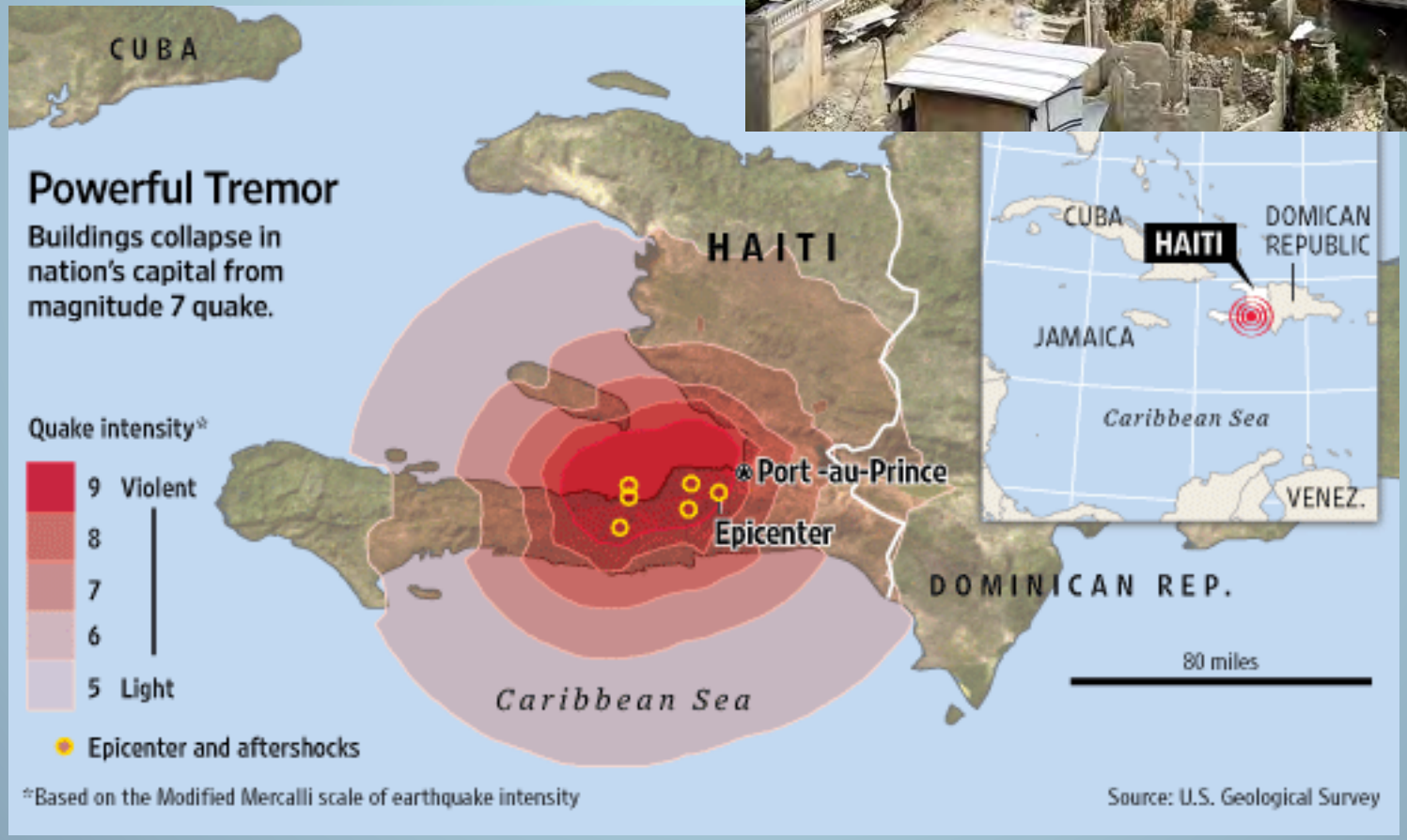
Science

$10
10 APRIL 2015
sciencemag.org
AAAS

CubeSats take flight

Cheap, miniature satellites democratize space *p. 172*

TED


CUBA
Powerful Tremor
Buildings collapse in nation's capital from magnitude 7 quake.
HAITI
Port -au-Prince
Epicenter
DOMINICAN REP.
Caribbean Sea
80 miles
CUBA
HAITI
DOMICAN REPUBLIC
JAMAICA
Caribbean Sea
VENEZ.
Quake intensity*
9 Violent
8
7
6
5 Light
Epicenter and aftershocks
*Based on the Modified Mercalli scale of earthquake intensity
Source: U.S. Geological Survey

Did You Feel It?

M6.0 earthquake
Central California
Sept. 28, 2004

M5.8 earthquake
Central Virginia
Aug. 23, 2011

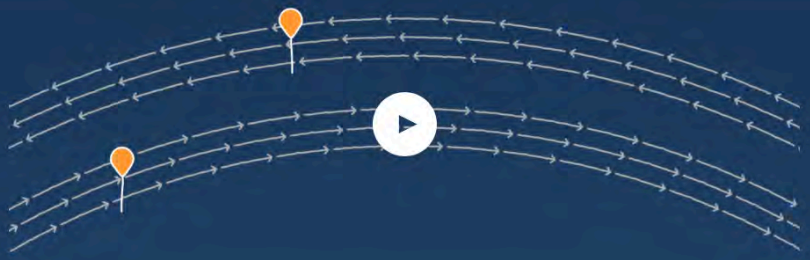
Stars show epicenters and dots show where people reported at least weak shaking.

USGS
science for a changing world

ROJECT LOON

WHAT IS PROJECT LOON | TECHNOLOGY | JOURNEY | ENGLISH

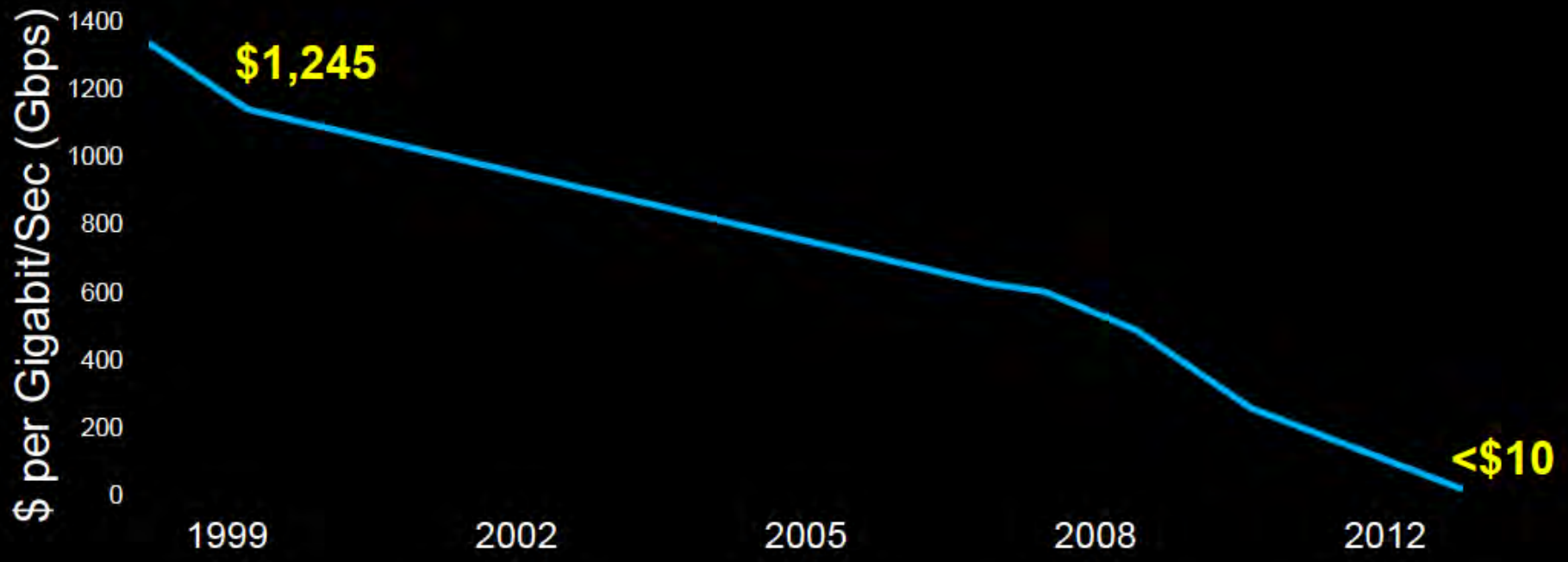
Project Loon



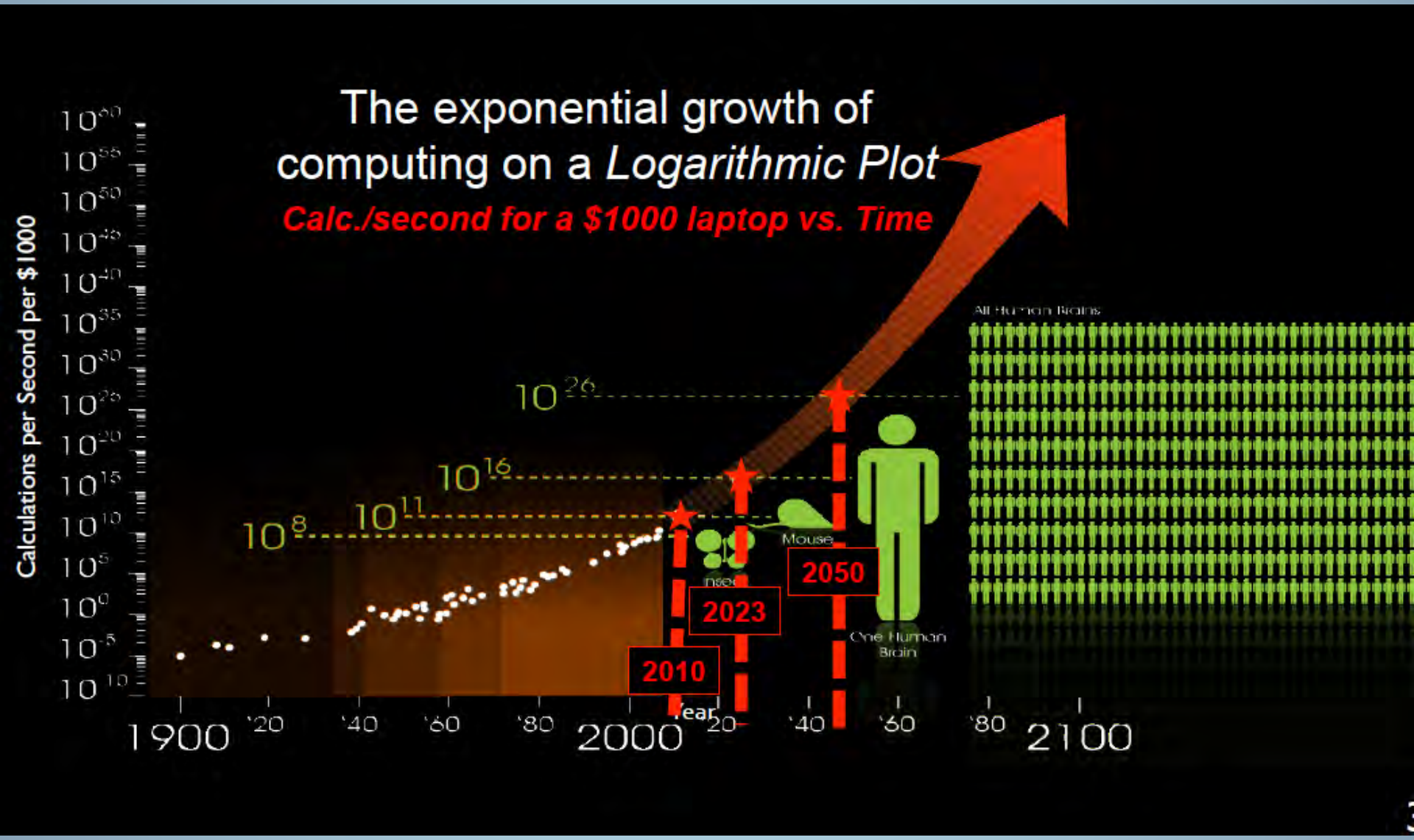
CONNECTING

Project Loon is partnering with telecommunications companies to extend connectivity into rural and remote areas so that people everywhere will be able to access the Internet directly from their phones and other LTE-enabled devices. Wireless internet signal is transmitted up to the nearest balloon from our telecommunications partner on the ground, relayed across the balloon network, and then sent back down to people in rural and remote areas. Each balloon has a coverage area of 5000 square kilometers.

Bandwidth Cost-Performance (1999-2012)



Source: Deloitte University Press



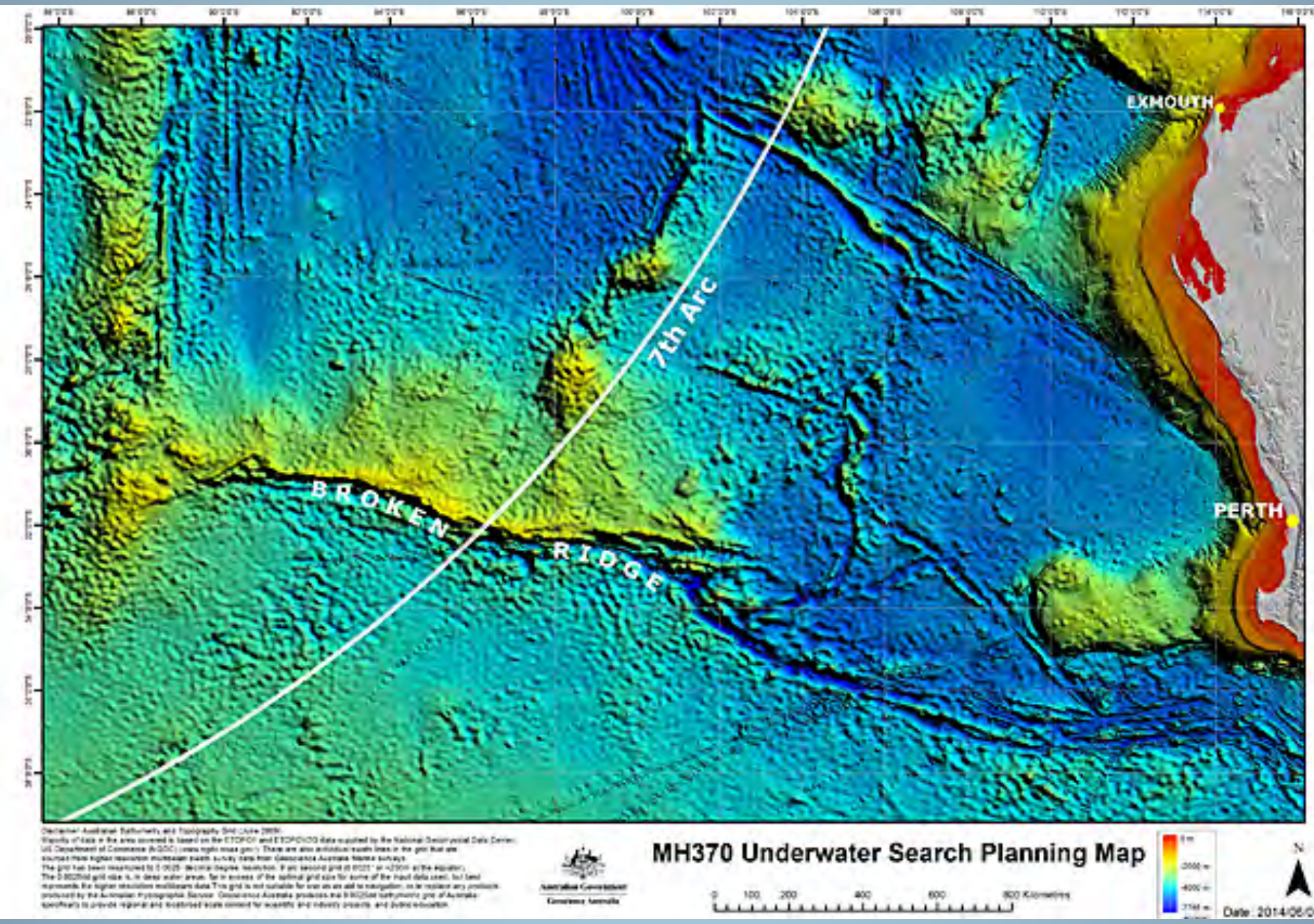
From Peter Diamandis: *Abundance: the Future is Better Than You Think*

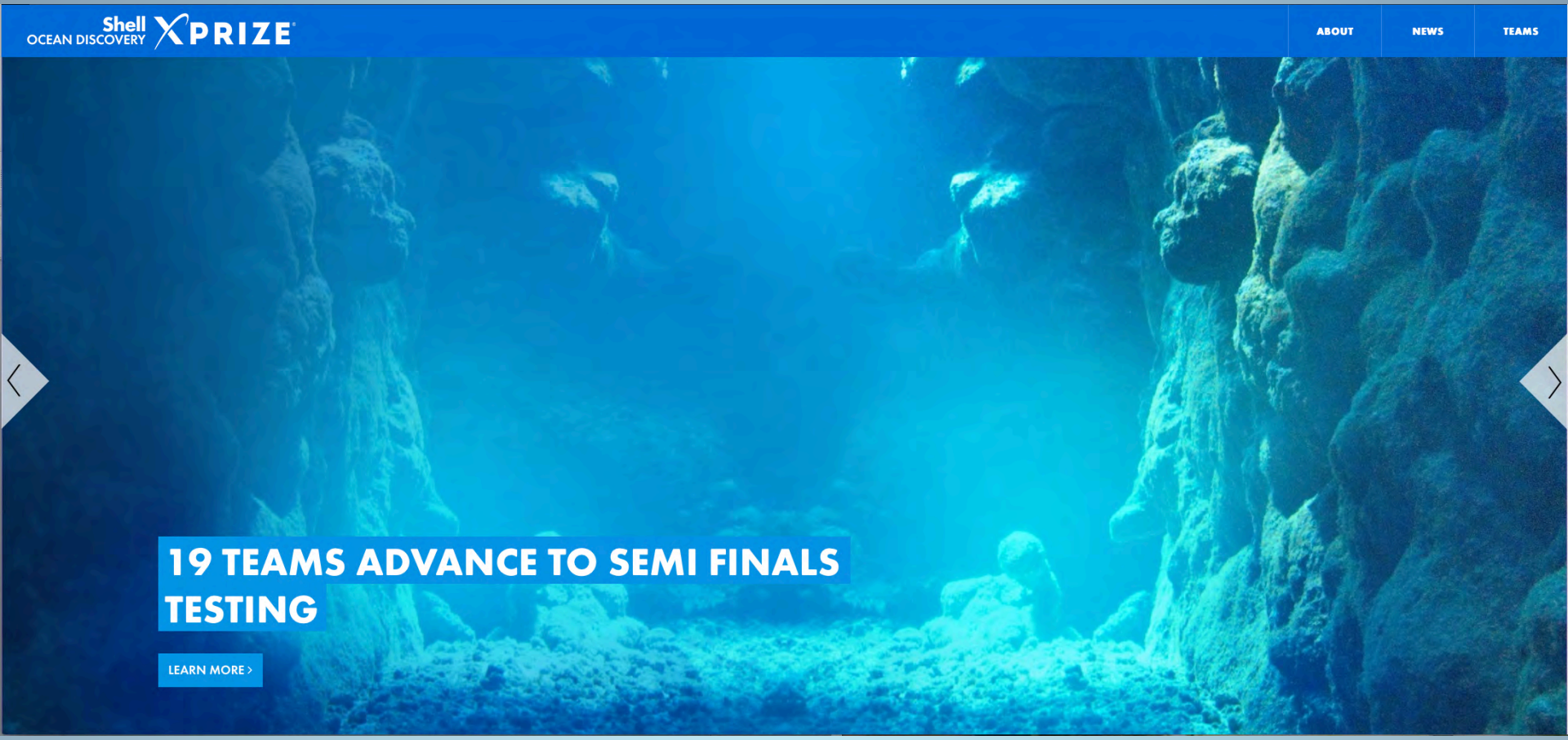
Self-driving ships could be ready in three years

A boat capable of autonomous navigation makes its way around Boston Harbor. (Steven Senne / Associated Press)

- Cargo/container ships
- Ferries
- Tugboats

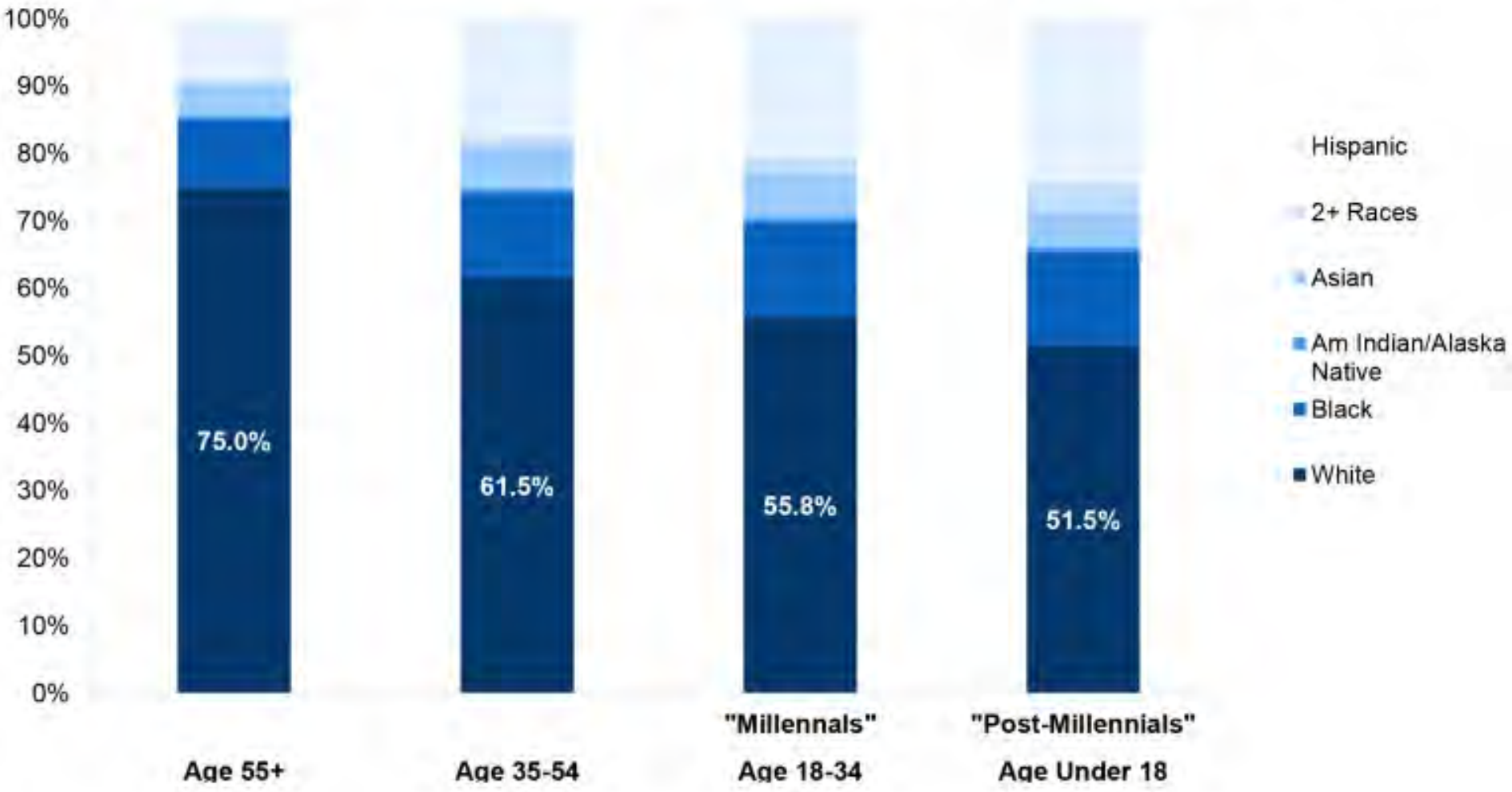
- Boring jobs
- Dangerous jobs
- Long-endurance jobs


EXMOUTH
PERTH
7th Arc
BROKEN RIDGE
MH370 Underwater Search Planning Map
0 100 200 400 600 800 Kilometres
N
Date: 2014/06/05



X-PRIZE: Ocean Mapping

Figure 1: US Race-Ethnic Profiles for Age Groups, 2015



Source: William H Frey analysis of Census Bureau Estimates released June 23, 2016

Metropolitan Policy Program at BROOKINGS

Hypothesis:

If the ocean sciences are not welcoming to women, it is not reasonable to expect that the field will be viewed as welcoming to other minority groups (e.g., non-white males and females).

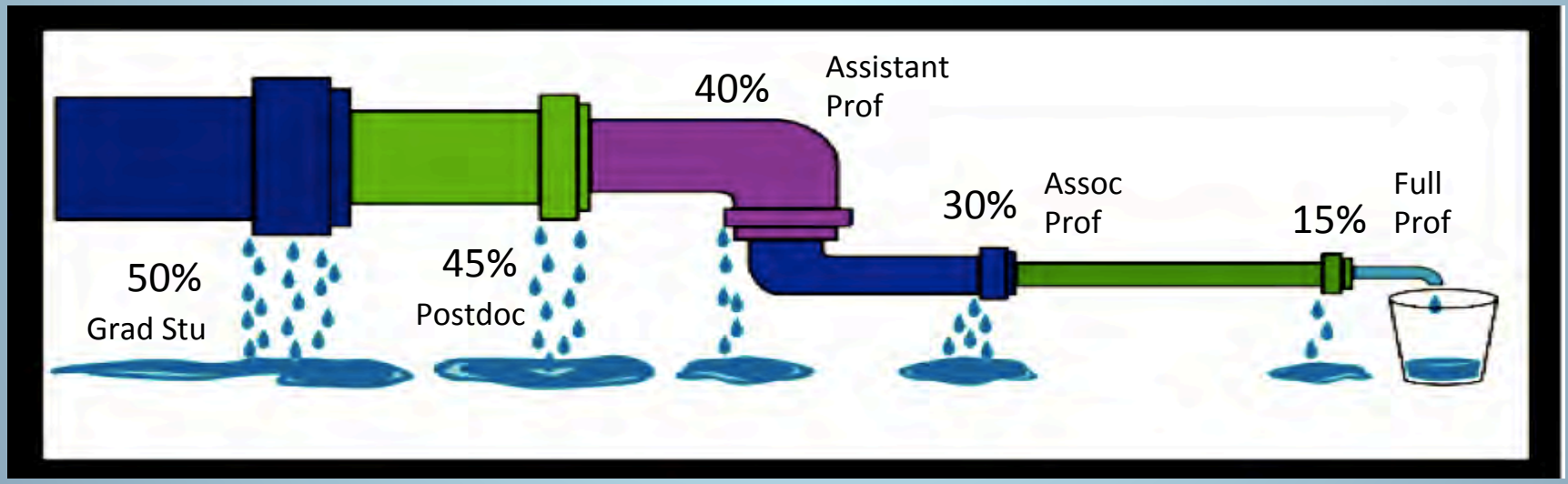
Corollary:

Actions taken to make a more inclusive environment for women will have broader benefits.

Leaky Pipeline Costs Everyone

Leaky pipeline costs the taxpayers, the advisors, and may not be the most direct career path for the students.

Source: Orcutt, B.N., and I. Cetinić. 2014. Women in oceanography: Continuing challenges. Oceanography 27(4) supplement:5–13, http://dx.doi.org/10.5670/oceanog.2014.106.



Why Science Has a Special Problem

- Women under-represented, especially as PIs
- “Indentured servant” model of student/advisor
- Frequently away from normal 9-to-5: field work, meetings, workshops
- Students dependent long-term on more senior mentors: they shape career advancement
- Complaints, investigations, outcomes kept confidential

The Research Vessel Setting

- Isolated
- “Unreal”
- Women outnumbered (including crew/techs)
- Sometimes women do not have cabinmates
- Normal recourses for reporting not available
- Complaining jeopardizes funding situation now
- Being viewed as a victim impacts career prospects

Are we selecting for
“the best and brightest”
or
“the toughest and
most determined”?

UNOLS Actions

UNOLS
UNIVERSITY-NATIONAL OCEANOGRAPHIC LABORATORY SYSTEM

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IMPROVING THE GENDER CLIMATE AT SEA

HOME / IMPROVING THE GENDER CLIMATE AT SEA

FEATURED INFORMATION

UNOLS, the Federal agencies, and ship operating institutions are committed to ensuring a positive sea-going experience, which is a climate free from any forms of harassment.

Articles

- *Women Scientists at Sea* (MPOWIR) (Interview between Dr. Lisa Beal and Captain Kent Sheasley)
- *Many Women Scientists Sexually Harassed During Fieldwork* (Nature)
- *I've faced sexual assault, harassment and discrimination as a female scientist. My complaints were*

University of California Policy

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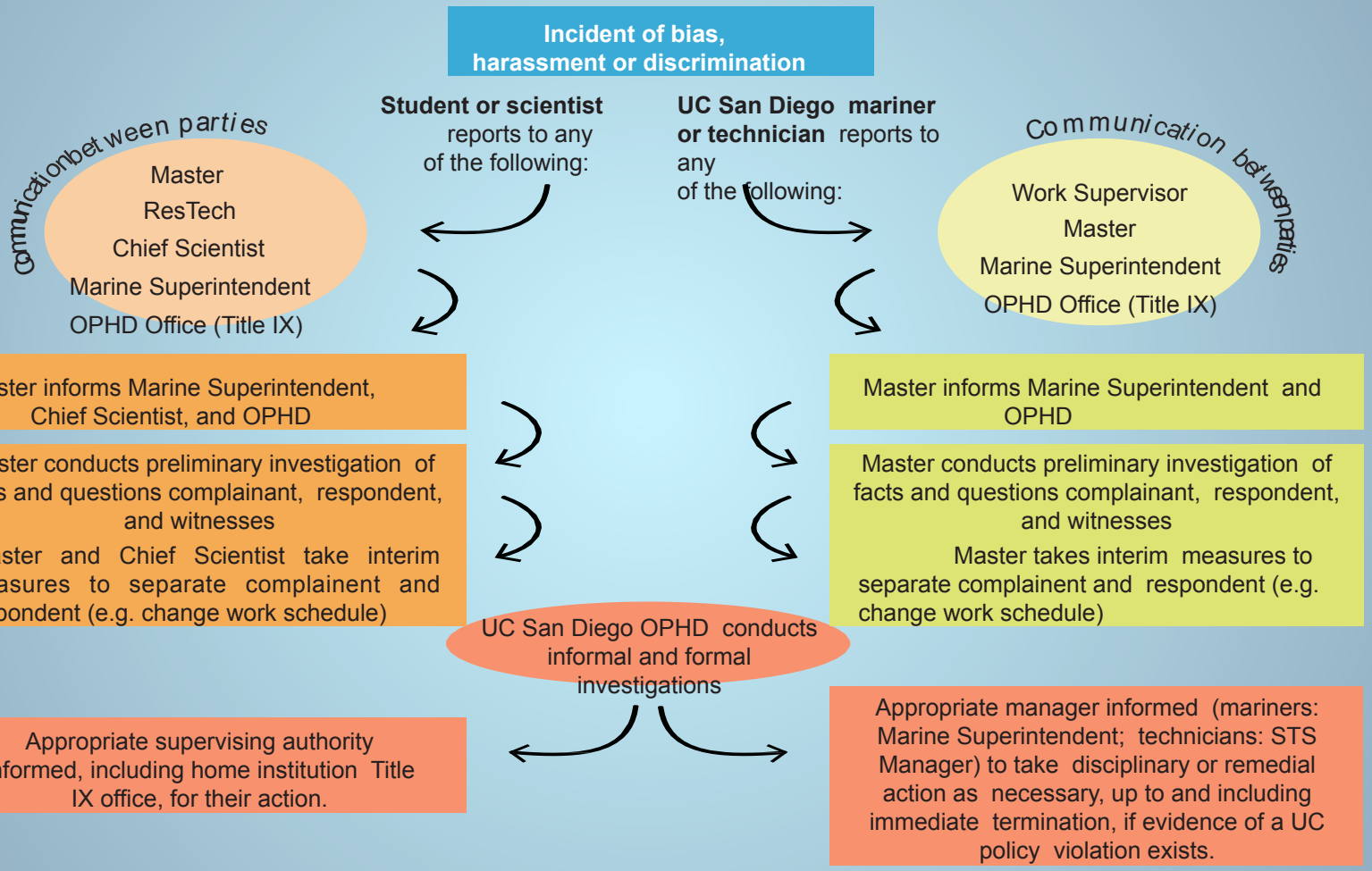
SCRIPPS INSTITUTION OF OCEANOGRAPHY
UC San Diego

UC San Diego
SCRIPPS INSTITUTION OF OCEANOGRAPHY UC San Diego

HARASSMENT PREVENTION AND RESPONSE GUIDE 2016

Preventing Harassment & Discrimination at Sea: Complaint Resolution Flow Chart



OPHD
Office for the Prevention of Harassment & Discrimination

UC San Diego

How to Handle a Shipboard Offender?

- Share information with the employing institution?
- Involve law enforcement?
- Ban from future expeditions…
  - On same ship?
  - All institutional vessels?
  - All fleet vessels?

National Academies' Study

From Committee on Women in Science, Engineering, and Medicine

18-month consensus study

Statement of Task:

- Review research on the extent to which women in the fields of science, engineering, and medicine are victimized by sexual harassment on college and university campuses, in research labs and field sites; at hospitals/medical centers; and in other academic environments;
- Examine information on the extent to which sexual harassment in academia negatively impacts the recruitment, retention, and advancement of women pursuing scientific, engineering, technical, and medical careers, with comparative evidence drawn from other sectors, such as the military, government, and the private sector.
- Identify and analyze policies, strategies, and practices that have been the most effective in addressing sexual harassment in these settings

Institutional Solutions

- Adopt a zero tolerance policy
- Require training for all staff plus training for special facilities, including outside users
- Be transparent about sanctions against proven offenders (don't "kick the can" down the road)
- Provide clear, confidential routes for complaints and **protect whistleblowers**
- Empower and promote women

Your Advice?

1. What information, data and ideas do you have that I can take back to our study committee?

2. In your experience, what works in effectively combatting sexual harassment in our discipline?

3. Are there institutional policies and practices at your institution that seem to be effective in creating a more supportive climate for female students and faculty: in reducing sexual harassment, in retaining women, and in attracting the best and brightest? (Tough and determined is fine as well!)

Acknowledgements

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