Moving the Bar: Advancing Safety Culture in Academic Research Laboratories

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Overview

- Unique characteristics of large academic research organizations
- Case study of organizational approach to identify and advance safety culture within academic research community
- Current status and next steps

Characteristics of Universities

FACILITY

- Site is more like a city than a business
- Have virtually every regulatory issue that is present across all businesses
- Additional concerns and issues to manage relating to on-site residential populations and lands management
- Often a visible political target

ORGANIZATIONAL

- **Numerous and individual cultures:** akin to very different business units in one large corporation structure
- **Management structures**
  - Schools and units may have differing structures
  - often reflective of the type of work/research that they do
  - results in very wide span of control (i.e. flat structure with local authority/accountability(?))

Characteristics of Universities

LAB POPULATIONS

- **Role of Principal Investigator (Faculty)**
  - key to fostering safe and compliant attitude in laboratories; but this **role is not standardized and mostly self-defined**
  - **Significant intolerance** for doing something just because it is a mandate
- **Entrepreneurial spirit (resistance to central leadership)**
  - like “herding cats,” (BUT very smart cats!)
- **“Worker/researcher” population in labs**
  - relatively youthful, often their first ‘job’
  - increasingly diverse cultures: foreign languages; safety/compliance attitudes and practices developed in other countries
  - high turnover in lab researcher population - ~30% per year
  - concern by individual over professional future, if views vary from faculty member’s

Management Skills of Scientists

We spend years developing knowledge workers (scientists), but don't necessarily provide them with the skillsets to manage effectively once they have their own laboratory or facility!

- Must identify & generate research funding
- Hire and manage people
- Manage and certify finances of the research operation
- Manage safety and compliance
- Address myriad other administrative and operational issues

Academic Research Laboratory Safety Culture

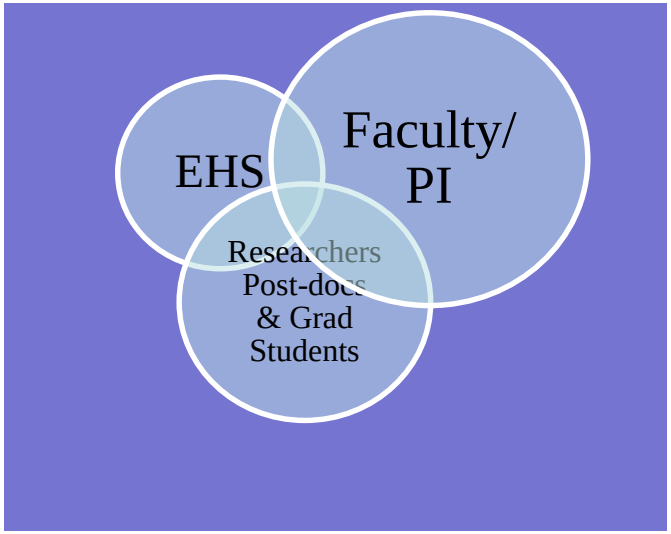
Over past 5 years:

- High consequence higher education incidents (UCLA, Yale, Texas Tech)
- Reviews by agencies with focus on research laboratory organizations (Cal/OSHA, CSB) - focus primarily on poor “safety culture” as underlying causal factor in incidents
- Recommendations for organizational and programmatic approaches for incident prevention and enhancement of academic research lab safety culture (CSB, ACS, NRC-NAS)

However, these recommendations did not look within the individual laboratory operation; imagined a traditional hierarchical top-down approach to managing safety in research.

Areas Needing More Focus to Advance Lab Safety Culture in Academic Research

- Ability to evaluate/measure lab safety climate/culture.
- Better understanding of the dynamics within the academic research laboratory – at the bench and within the research working group.
- Intersections and interactions and between PI/Lab Manager-Lab Researchers-EH&S.



Task Force for Advancing the Culture of Laboratory Safety at Stanford

Background and Motivation

- Scale of laboratory research activity
  - ~800 PI Labs
  - ~4000 Grad Students, Post-docs, research staff, etc. (with high turnover)
- Serious laboratory accidents (UCLA, Yale, Texas Tech)
  - Reviews by agencies focused on poor academic laboratory safety culture as a primary underlying causal factor
- Belief that Stanford's research and academic excellence should be mirrored by excellence in the safety culture of its research enterprise

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Charge: University Committee on Health and Safety in collaboration with the Dean of Research Office convened a Task Force:

- to report on the status of the existing laboratory safety culture, and
- to provide recommendations to advance a strong, positive culture of safety within academic research laboratories at Stanford.

Broad and Diverse Task Force Representation

Co-chairs

- Bruce Clemens, **Professor in the School of Engineering** and Chairman of the University Committee on Health and Safety
- Robert Waymouth, **Professor in Chemistry** and Professor, by courtesy, of Chemical Engineering
- P.J. Utz, **Professor of Medicine** (Immunology and Rheumatology) and Program Director for the Medical Scientist Training Program (MSTP, MD/PhD) and Stanford Institutes of Medical Research (SIMR) Summer High School Research Program

Members

- Anthony Appleton, recent **post-doctoral fellow** in Chemical Engineering at Stanford; currently Adjunct Faculty member at Ohlone College
- Persis Drell, **Professor of Particle Physics and Astrophysics** and of Physics and former **Director of SLAC National Accelerator Laboratory**
- Mary Dougherty, EHS Industrial Hygienist and University **Chemical Hygiene Officer**
- Curtis Frank, **Senior Associate Dean** for Faculty and Academic Affairs, School of Engineering
- Larry Gibbs, **Associate Vice Provost** for EH&S
- Linda Heneghan, **Facilities Manager**, Institute for Stem Cell Biology and Regenerative Medicine
- Loan Nguyen, Life Sciences **Research Assistant**, Department of Biology
- David Silberman, Director, Health and Safety Programs, School of Medicine; **University Safety Partner Representative**
- Nickolas van Buuren, **Postdoctoral Research Fellow**, Microbiology and Immunology
- Jessica Vargas, **PhD student in Chemistry**; Member, University Committee on Health and Safety

Safety Culture: What is it?

Robert Waymouth, Professor of Chemistry and Task Force Co-chair:

A “Culture of Excellence” pervades the Stanford experience.

“Culture is manifested in the daily habits, patterns of behavior, traditions and rituals that both reflect a common set of values and provide a means of passing those values down to the next generation.”

Safety is important to all of us, but is it richly reflected in our everyday activities?

The Laboratory Safety Culture Spectrum

Gibbs: Adapted from Hudson, P. Safety Management and Safety Culture: The Long, Hard and Winding Road (2001)

Task Force: Activities, Outreach and Input

- Task Force: 13 members with broad, diverse representation
- Task Force meetings (7 meetings over 6 months)
- Stakeholder meetings (8 town hall-style meetings over 4 month period)
  - Bench Researchers
  - EH&S and University Safety Partners
  - Faculty-Principal Investigators

- Task Force Website for online submittals (anonymous, if desired)
- Laboratory Safety Culture Surveys/Palo Alto Research Center (PARC)
  - Principal Investigators (n=97)
  - Researchers (n=364)
- Ethnography review & in-depth, detailed interviews with > 40 researchers and PIs from research laboratories (PARC)

Identification of Lab Safety Culture Attributes

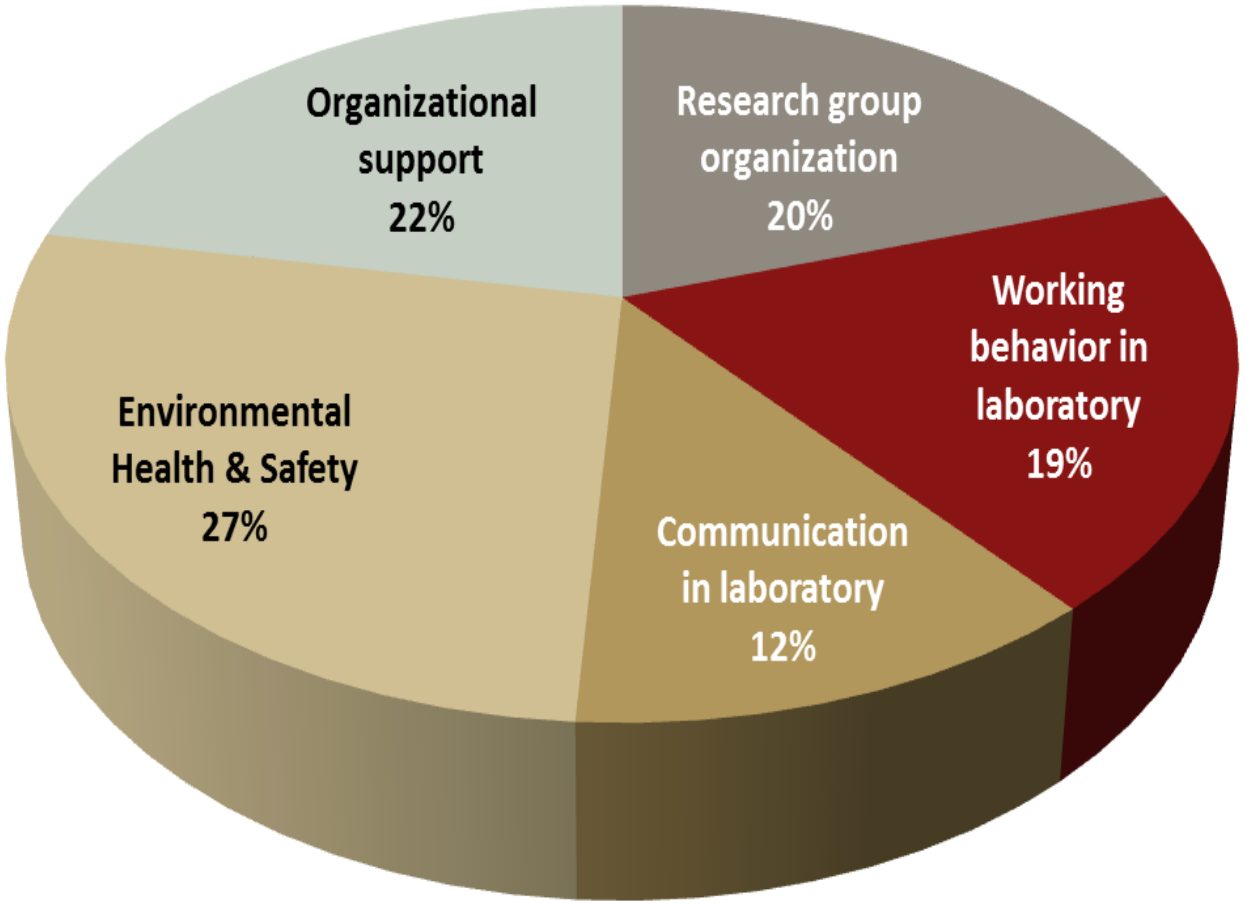
Good practices supporting a strong, positive lab safety culture

1. Laboratory research group organizational dynamics
2. Working behavior within the laboratory
3. Communication about safety within the laboratory
4. Environmental health and safety programs
5. Institutional and organizational attitudes about laboratory safety

STANFORD UNIVERSITY ENVIRONMENTAL HEALTH & SAFETY

Information and input review

Distribution of town hall and online submittal comments aligned by Laboratory Safety Culture Attribute category (N=383)

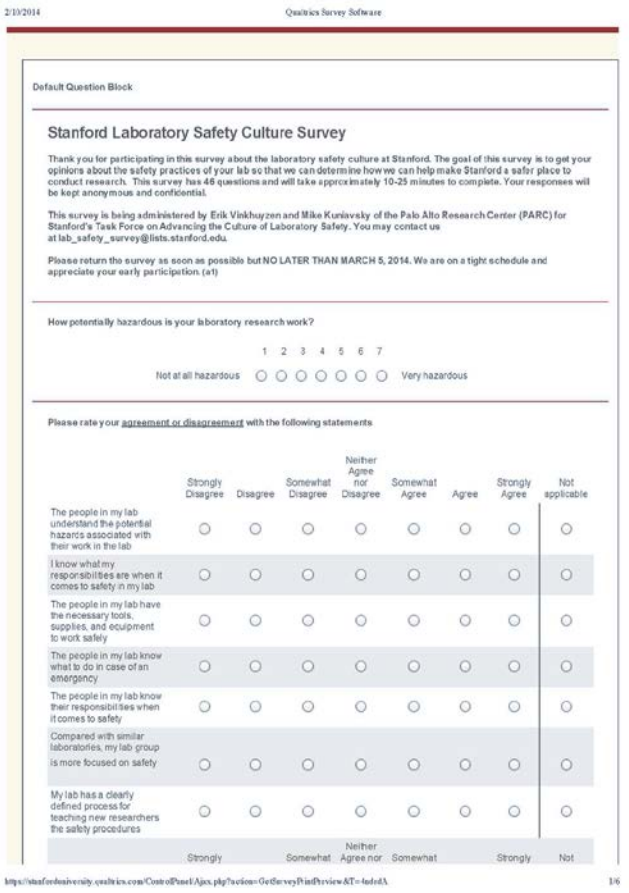


Major Findings from Town Hall Meetings and Submitted Comments

- Stanford does not have a single laboratory safety culture.
- Faculty-principal investigators (PIs) set the tone.
- Autonomy and Responsibility:
  - The autonomy of PIs defines the academic research culture.
  - Bench researchers also work with great autonomy.
  - Bench researchers determine their own level of risk exposure.
- Turnover of laboratory researchers is high.
- Poor communication - a major theme.
  - Incidents and near-miss reports are not effectively reported or shared.
- Training:
  - Classroom and online training is necessary but insufficient.
  - Hands-on, on-the-job training is most effective.

Stanford Lab Safety Culture Survey: Goals

- Track change or trending in the laboratory safety culture status
- Map survey response results to the lab safety culture attributes to identify areas for continued emphasis
- Aid in development of technologies and support tools to promote continued advancement of these attributes within the laboratory work groups and individuals



2/13/2014 Qualtrics Survey Software

Default Question Block

Stanford Laboratory Safety Culture Survey

Thank you for participating in this survey about the laboratory safety culture at Stanford. The goal of this survey is to get your opinions about the safety practices of your lab so that we can determine how we can help make Stanford a safer place to conduct research. This survey has 46 questions and will take approximately 10-25 minutes to complete. Your responses will be kept anonymous and confidential.

This survey is being administered by Erik Vinkhuyzen and Mike Kuniavsky of the Palo Alto Research Center (PARC) for Stanford's Task Force on Advancing the Culture of Laboratory Safety. You may contact us at lab_safety_survey@lists.stanford.edu.

Please return the survey as soon as possible but NO LATER THAN MARCH 5, 2014. We are on a tight schedule and appreciate your early participation. (a1)

How potentially hazardous is your laboratory research work?

1 2 3 4 5 6 7

Not at all hazardous ○ ○ ○ ○ ○ ○ ○ Very hazardous

Please rate your agreement or disagreement with the following statements

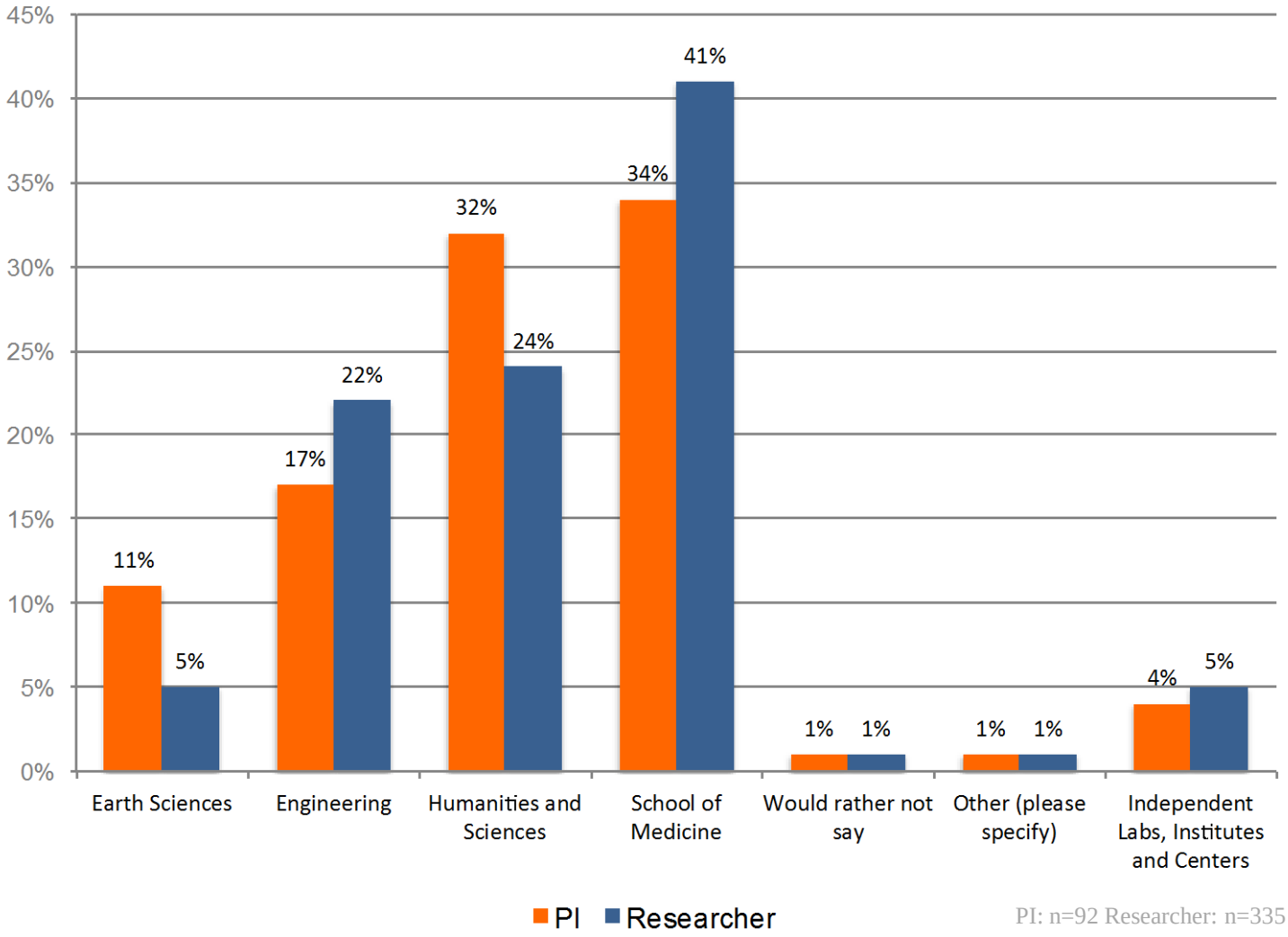
	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree	Not applicable
The people in my lab understand the potential hazards associated with their work in the lab	○	○	○	○	○	○	○	○
I know what my responsibilities are when it comes to safety in my lab	○	○	○	○	○	○	○	○
The people in my lab have the necessary tools, supplies, and equipment to work safely	○	○	○	○	○	○	○	○
The people in my lab know what to do in case of an emergency	○	○	○	○	○	○	○	○
The people in my lab know their responsibilities when it comes to safety	○	○	○	○	○	○	○	○
Compared with similar laboratories, my lab group is more focused on safety	○	○	○	○	○	○	○	○
My lab has a clearly defined process for teaching new researchers the safety procedures	○	○	○	○	○	○	○	○
	Strongly		Somewhat	Neither Agree nor	Somewhat		Strongly	Not

https://stanforduniversity.qualtrics.com/ControlPanel/Ajax.php?action=GetSurveyPrintPreview&T=4nfo6A 1/6

Stanford Lab Safety Culture Survey: Method

- Dates: **2/14/14-3/19/14**
- Data collection method: **Stratified random sample of opt-in responses to targeted email and newsletter invitations**
- Sample size: **461 total:**
  - **97 Principal Investigator (~14%)**
  - **364 Bench researchers (~11%)**
- Sample margin of error**: PI: ±9%, Researcher ±5%, for 95 percent confidence level.**
- Significant difference between PI and researcher populations determined using **Mann-Whitney U test.**

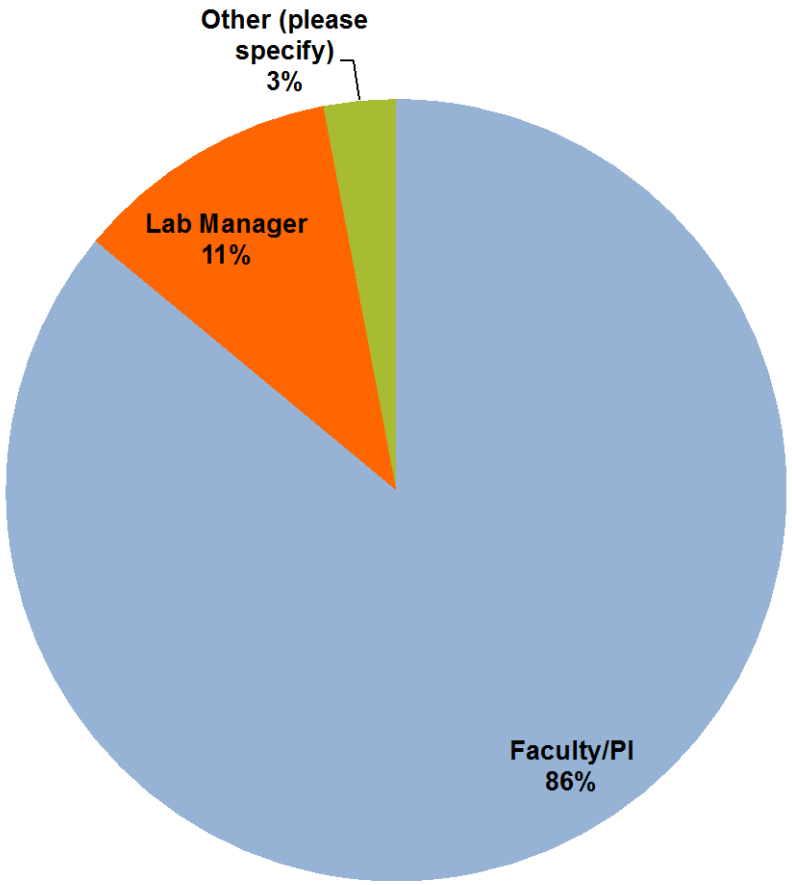
Respondent profile: by lab research school



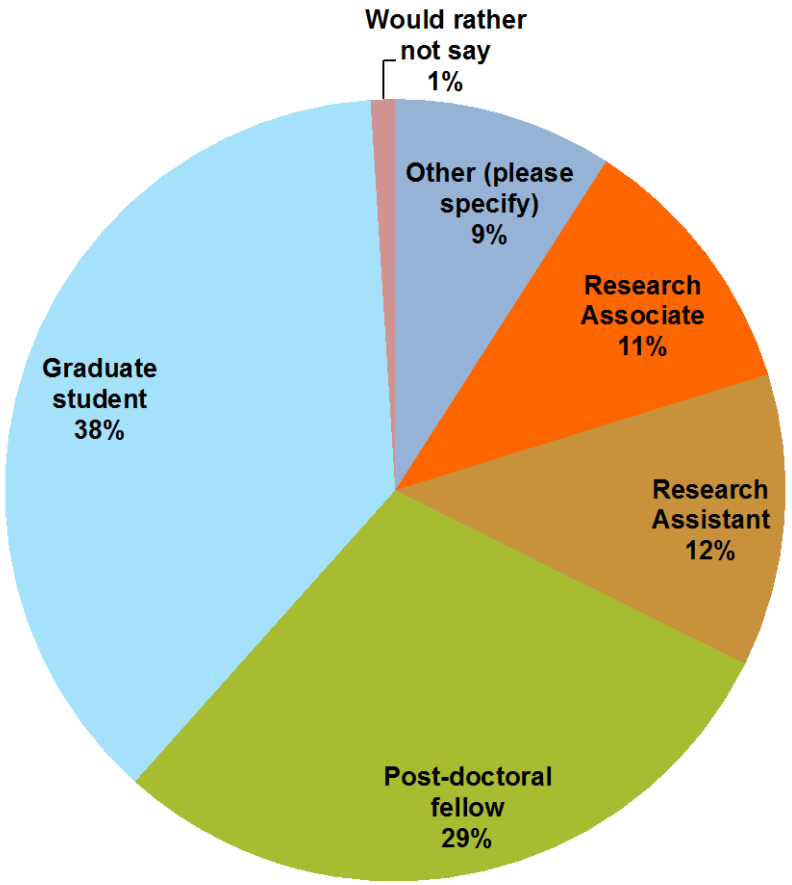
PI: n=92 Researcher: n=335

Q: In what school do you work? (If more than one, select primary)

Respondent profile: research role



PI survey

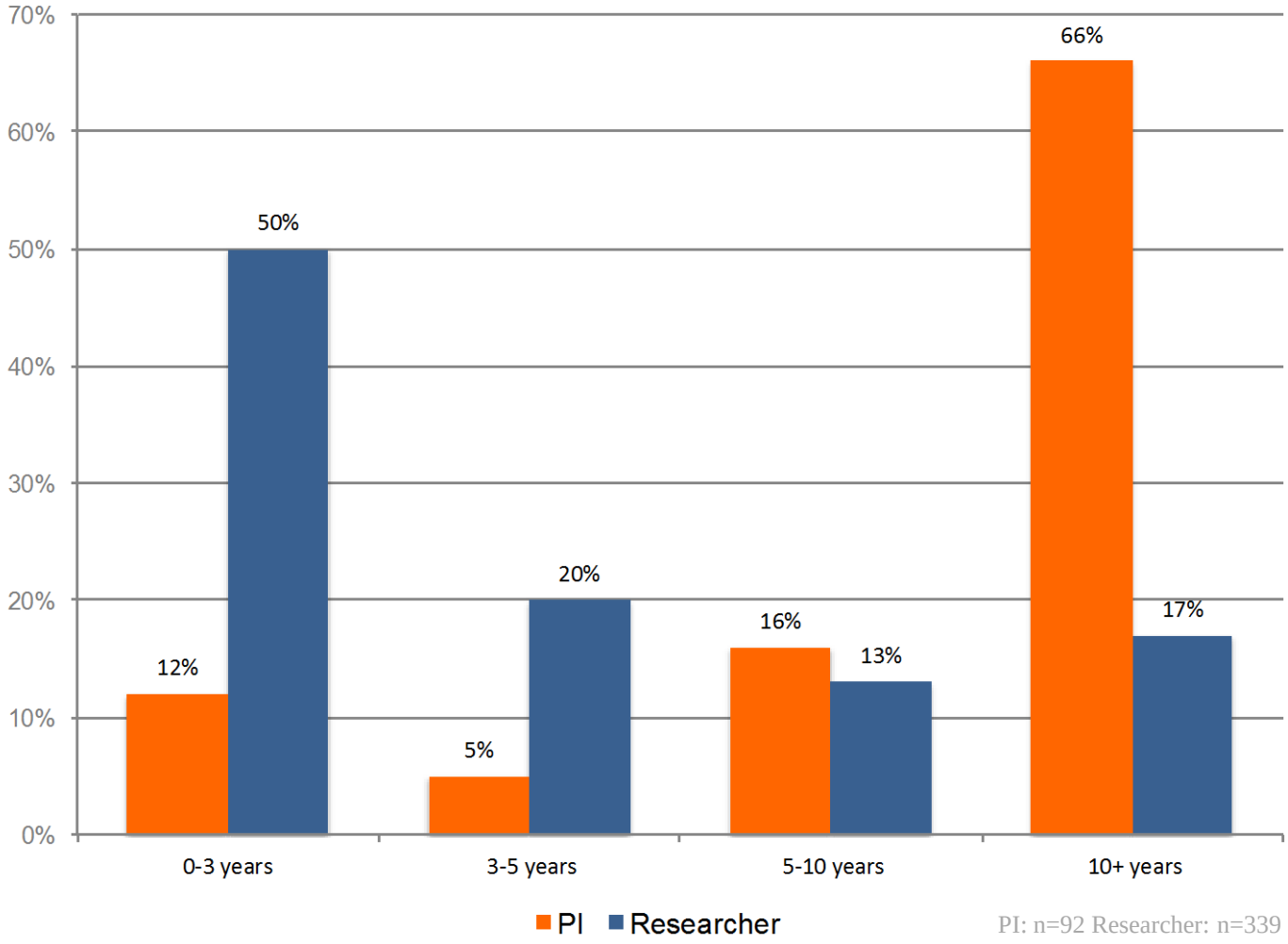


Researcher survey

Q: What is your role?

PI: n=91 Researcher: n=340

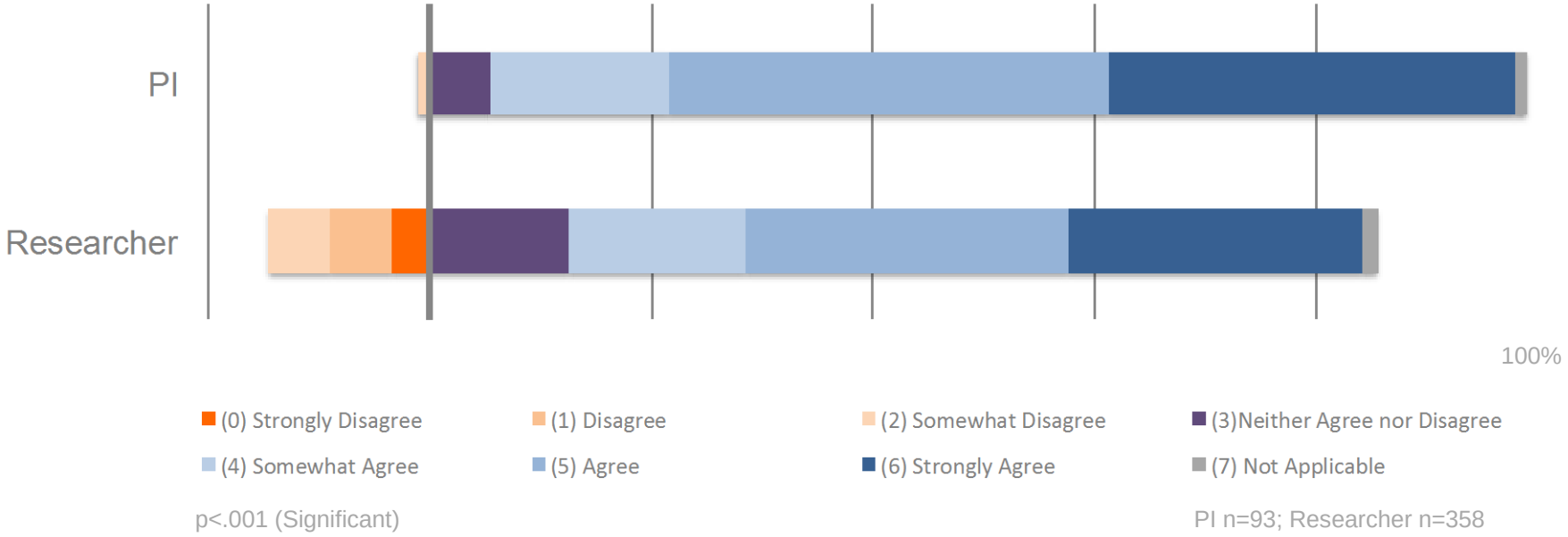
Respondent profile: years at Stanford



PI: n=92 Researcher: n=339

Q: How many years have you been at Stanford?

Nearly 30% of researchers said that safety is not the highest priority



p<.001 (Significant)

PI n=93; Researcher n=358

Analysis: The question was phrased exactly the same for both groups, and there is statistically significant difference between the two groups. While mostly positive, it should give us pause that 28% of the researchers do not "agree" with this statement, but answer neutral or disagree.

Q; In our lab, safety is the highest priority

Lab Safety Culture Surveys: Major Findings

Respondents (PIs and researchers) generally feel that they work safely and that their laboratory environment is safe. However:

- Approximate 5-10% of researchers disagree with the statement that safety procedures in their labs are adequate and that their PIs are concerned about safety.
- Nearly 30% of researchers disagreed with the statement “In our lab, safety is the highest priority” compared to <5% of PIs
- A proportionally small, but significant number of researchers say there is pressure to finish a project even though safety may be compromised.

Findings from PI and Lab Researcher Ethnography Interviews

- PIs receive no education on “how to run a safe group”; most perpetuate practices from the lab culture where they learned.
- Even PIs who make safety a priority in their lab often do not enforce safety on a daily basis, and lab practices can be far from optimal.
- Laboratories with permanent research staff (often lab managers) have an easier time managing day-to-day safe laboratory practices.
- In most groups, researchers work with great autonomy and do not call each other out on safety violations when observed.
- While EH&S is seen by many as helpful, it does not regularly enforce safe practices locally or determine laboratory safety culture.
- Infrastructure—layout, space, desk/bench space location—has an undeniable impact on the safety practices in a building; in many newer buildings safety seems to have been an afterthought.
- The EH&S website is widely viewed as in need of overhaul!

Findings and Recommendations

Research Laboratory Group

1. Faculty/PIs are the single most important element for defining and sustaining laboratory safety *culture*.

2. Lab safety coordinators (preferably a senior, experienced researcher) are critical to supporting the lab safety culture.

3. Communication is critical. Safety communications need to be a regular part of lab group meetings and interactions.

Institutional Policy and Initiatives

4. Stanford leadership must promote laboratory safety culture as a core element in the Responsible Conduct of Research.

5. Best safety design practices must be incorporated in research laboratory design at Stanford.

6. Centralized funding is recommended to promote laboratory safety in individual laboratories.

Recommendations

Environmental Health and Safety

7. Identify, communicate and share best practices in laboratory safety culture with laboratory research units.

8. Implement a proactive and consultative lab safety review program that includes laboratory personnel participation and provides feedback and recommendations for laboratory safety improvements/lab safety culture development

Technology Solutions to Support Research Lab Safety

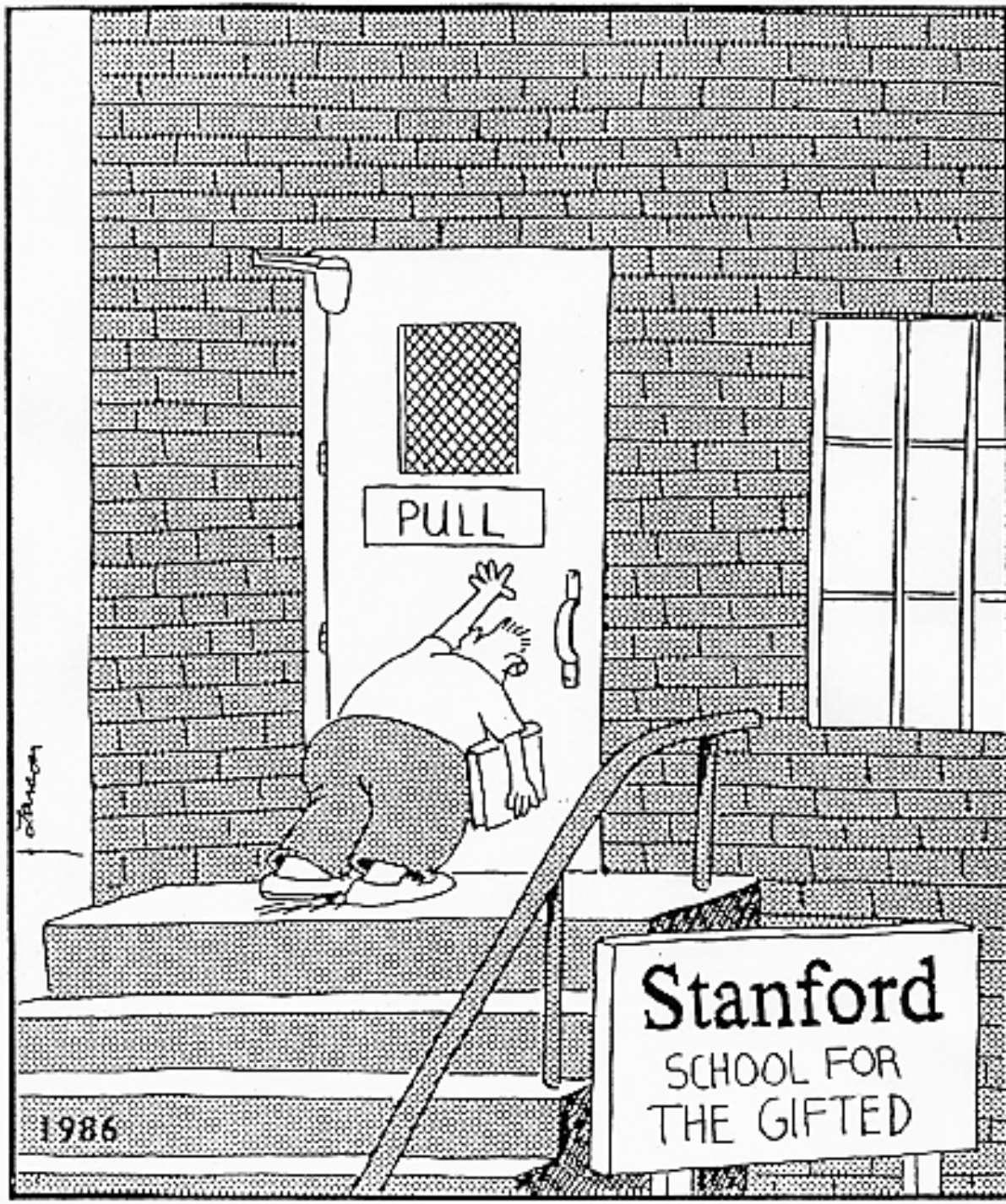
9. Identify, develop and apply existing or new technology solutions to streamline and provide for better communication, and readily make laboratory health and safety information and data available to laboratory researchers.
10. Reconstitute the EH&S website in a technology paradigm that is useful, easily accessible and searchable on all platforms by Stanford laboratory researchers and other constituencies, and provides ready access to valuable health and safety information.

Addressing the Lab Safety Culture Challenge

- Identify where on the safety culture spectrum of your organization/laboratory currently resides
- Set a goal to advance the culture forward/upward
- Understand barriers: provide helpful tools to assist the laboratory leaders (scientists) in moving safety up the value ladder
- Provide an EH&S support system that integrates positive learning from incidents as opposed to solely punitive reaction system into the safety management program
- Demonstrate that safety is integrated as a core organizational value throughout the institution (integrate within management systems such as IA and HR)

Sage Advice

Although the task may appear to be daunting, never give up the struggle to improve!



Summary

Stanford is a world leader in scientific research. This culture of excellence is not as evident in the habits and behaviors that define Stanford's Lab Safety Culture.

Safety is critical to the responsible conduct of research

- Education – next generation of problem solvers and thought leaders
- Faculty – robust safety culture keeps minor incidents minor
- Stanford – accidents are not common, but can be devastating

"This will be an ongoing effort–this report is solely the start of a conversation!"

Robert Waymouth, Task Force Co-Chair

Task Force Report to Stanford Faculty Senate

Safety Leadership within the Laboratory

"Don't worry that [students]
never listen to you;
Worry that they are always
watching you!"

Robert Fulghum

Task Force Report

https://web.stanford.edu/dept/EHS/cgi-bin/lsctf/