Scientific Misconduct & Research Integrity

Historical Background,

Current Global Challenges and Initiatives

Nicholas H. Steneck, PhD
University of Michigan

First Brazilian Meeting on Research Integrity, Science and Publication Ethics

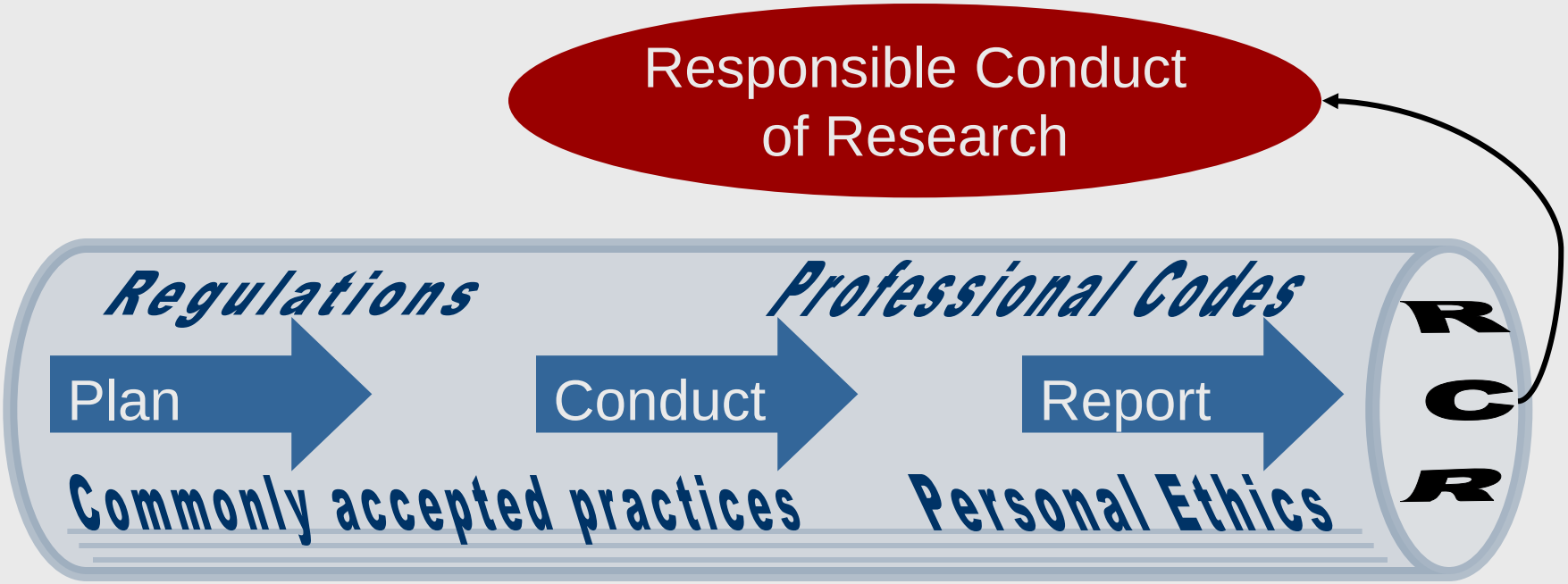
December 14, 2010

nsteneck@umich.edu

What is research misconduct?

nsteneck@umich.edu

Definitions



Practices that deviate from RCR:

- ✓Major offenses = ***Research Misconduct***
- ✓Lesser offenses = ***Questionable Research practices*** (QRP)

nsteneck@umich.edu

What should be done when RM occurs?

ORI = Office of Research Integrity
PHS = Public Health Service (HHS)
NSF = National Science Foundation
OSTP = Office of Science and Technology Policy

nsteneck@umich.edu

History of misconduct discussions in US

- Late 1970s, several major cases of misconduct
  - Congressional hearings (1980)
  - Congressional mandates (1985)
  - Executive Branch response (1986 ff)
    - Misconduct definitions
    - Offices established (ORI) or authorized (NSF) to respond
- 1990s, recognize importance of RCR education
  - NIH, Training Grant Requirement (1990, NSF follows 1997)
  - NIH, Human subjects research training requirement (2000)
  - NSF, RCR training requirement (2010, American Competes Act)
- 2000, OSTP government-wide misconduct policy

nsteneck@umich.edu

1981-1985: Pre-policy period

- Major events:
  - 1981, Congressional hearings, Fraud in Biomedical Research
  - 1985, 2nd round of Congressional hearings
- Characteristics:
  - Researchers ~ system is working, misconduct is rare and kept in check by self-regulation
  - Congress ~ system is not working, reforms needed
  - Main focus ~ how to respond to reports of misconduct (fraud) in research
- Result: 1985, Health Research Extension Act,
  - Government agencies must define misconduct and establish procedures for investigations
  - Government must require research institutions to have similar policies

nsteneck@umich.edu

1986-1993: Policy formation

- Major events:
  - 1986, Public Health Service (PHS) agency guidelines
  - 1987, National Science Foundation misconduct policy
  - 1990, PHS institutional policy (misconduct policy)
  - 1990, National Institutes of Health (NIH) training grant requirement
  - 1991, PHS Advisory Committee on Research Integrity formed
  - 1993, Office of Research Integrity (ORI) created (combine OSI and OSIR)
- Changes:
  - PHS & NSF establish/indentify offices, procedures, and definitions
  - Research institutions must have misconduct policies and provide reports
  - New issue raised: preventing misconduct through education

nsteneck@umich.edu

1994-2000: Rethinking policy

- Major events:
  - 1995, Ryan Commission Report
  - 1999, Reorganization of ORI
  - 2000, Office of Science and Technology Policy Definition
- Issues:
  - Research Community objected to definition
    - other practices that seriously deviation from normal practice….
  - Too much government authority
- Outcome:
  - ORI looses investigative authority, more emphasis placed on prevention and education

> …additional analysis conducted by the Office of Research Integrity (ORI) in its oversight review…

nsteneck@umich.edu

Official government definition (2000)*

- Research misconduct is defined as fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results
- Standards of proof
  - Significant departure from accepted practices
  - Committed intentionally or knowingly or recklessly
  - Proven by a preponderance of the evidence
  - Excludes honest error or differences of opinion

**** Office of the President, Office of Science and Technology Policy***

nsteneck@umich.edu

Key terms

- FFP
  - **Fabrication** is making up data or results and recording or reporting them.
  - **Falsification** is manipulating research materials, equipment, or processes, or changing or omitting data or results such that the research is not accurately represented in the research record
  - **Plagiarism** is the appropriation of another person's ideas, processes, results, or words without giving appropriate credit.
- Research record
  - The research record is the record of data or results that embody the facts resulting from scientific inquiry, and includes, but is not limited to, research proposals, laboratory records, both physical and electronic, progress reports, abstracts, theses, oral presentations, internal reports, and journal articles.

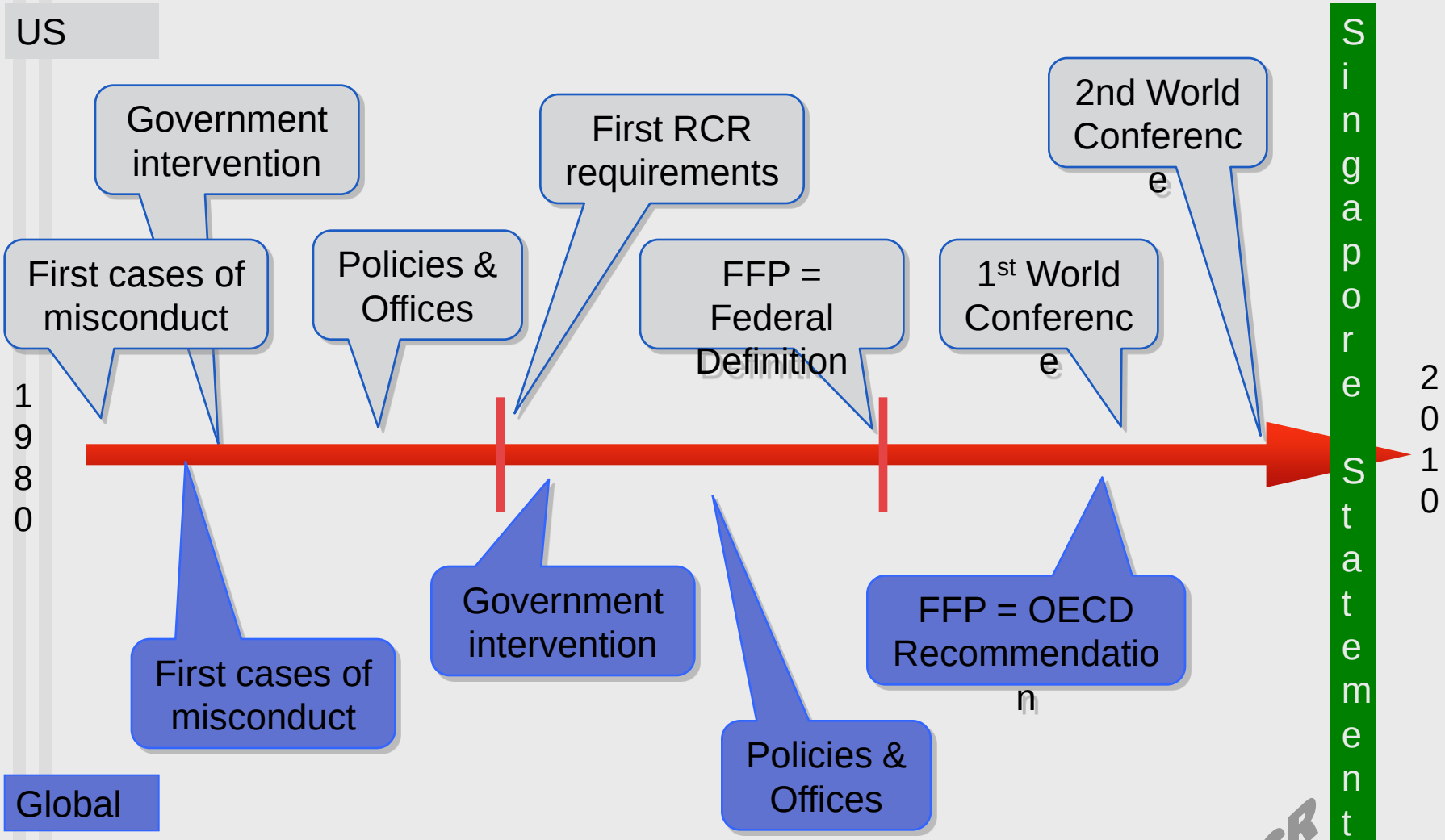
nsteneck@umich.edu

Responding to misconduct

- Process:
  - Three-stage response:
    - inquiry
    - Investigation
    - adjudication
  - Must maintain confidentiality, protect whistleblower
- Primary responsibility lies with research institutions:
  - Must have policies
  - Must conduct inquiries and investigations
  - Must report
- Applies only to federally funded research

nsteneck@umich.edu

US vs. Global Response



nsteneck@umich.edu

Singapore Statement

- 4 Principles:

www.singaporestatement.org

  - Honesty in all aspects of research
  - Accountability in the conduct of research
  - Professional courtesy and fairness in working with others
  - Good stewardship of research on behalf of others

nsteneck@umich.edu

14. Responsibilities

1. Integrity
2. Adherence to Regulations
3. Research Methods
4. Research Records
5. Research Findings
6. Authorship
7. Publication Acknowledgement
8. Peer Review
9. Conflict of Interest
10. Public Communication
11. Reporting Irresponsible Research Practices
12. Responding to Irresponsible Research Practices
13. Research Environments
14. Societal Considerations

The value and benefits of research are vitally dependent on the integrity of research. While there can be and are national and disciplinary differences in the way research is organized and conducted, there are also principles and professional responsibilities that are fundamental to the integrity of research wherever it is undertaken.

___ Yes? ___ No?

nsteneck@umich.edu

Assessment of the US approach

nsteneck@umich.edu

Effectiveness depends on objectives!

- Three reasons for adopting misconduct policies:
  - Establish guidelines/rules and mechanisms for responding to misconduct in research
  - Protect research from fabrication, falsification and plagiarism
  - Protect the public's investment in research from improper or unprofessional behaviors that undermine the reliability of the research record, endanger lives, or waste public funds
- How does US misconduct policy measure up?
  1. Moving toward, but not achieved a uniform policy US **(B+**)
  2. Majority of FFP not reported and investigated **(D)**
  3. Restriction to FFP probably excludes most harmful behaviors **(F)**

nsteneck@umich.edu

Definition has been narrowed over time

- 1986-HHS:
  - (1) serious deviation, such as fabrication, falsification, or plagiarism, from accepted practices in carrying out research or in reporting the results of research; or (2) …
- 1987 NSF:
  - (1) fabrication, falsification, plagiarism, or other serious deviation from accepted practices in proposing, carrying out, or reporting results from research; (2) …
- 2000 OSTP
  - Research misconduct is defined as fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results
  - [must be a] significant departure from accepted practices of the relevant research community

nsteneck@umich.edu

Policy paradox (US)

Definition of misconduct has narrowed

- Serious deviation from accepted practice … to
- FFP that deviates from accepted practice

Evidence of scope of misbehavior has broadened

- 1980s, major cases dominated the news and policy making
- Today, importance of other common “questionable research practices” is recognized

nsteneck@umich.edu

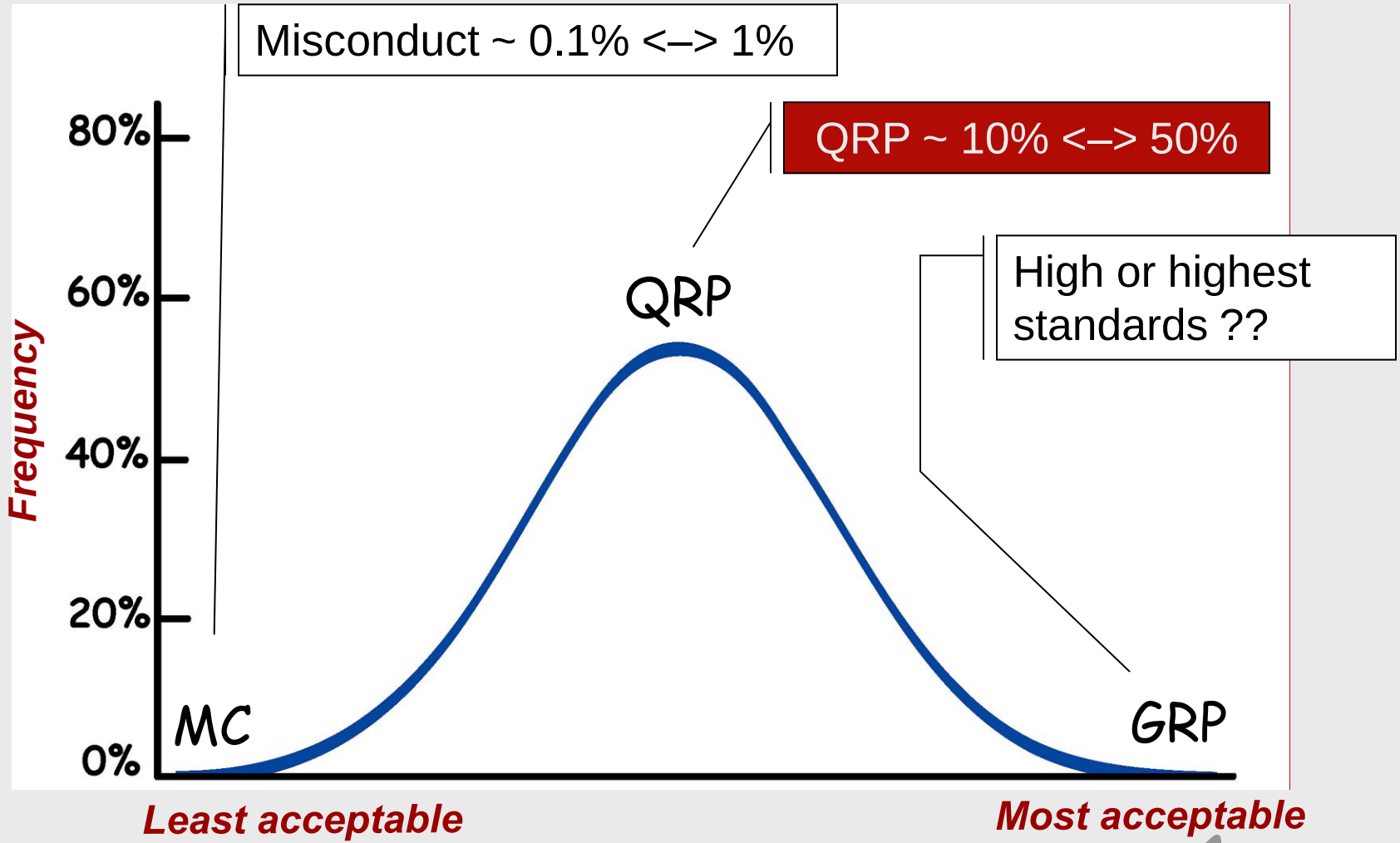
Definition excludes QRP

- 1992, National Academies report:
  - Questionable research practices are actions that violate traditional values of the research enterprise and that may be detrimental to the research process. (NAS, Responsible Science, 1992, p. 28)

- US does not regulated QRP
  - ... this definition does not include certain types of possibly inappropriate practices that should be of concern to scientists everywhere but do not necessarily call for Federal action. These include, for example, co-authorship practices, recognition of collaborators, and multiple publication. (PHS, Policies and Procedures for Dealing with Misconduct in Science, 1986, p. 2)

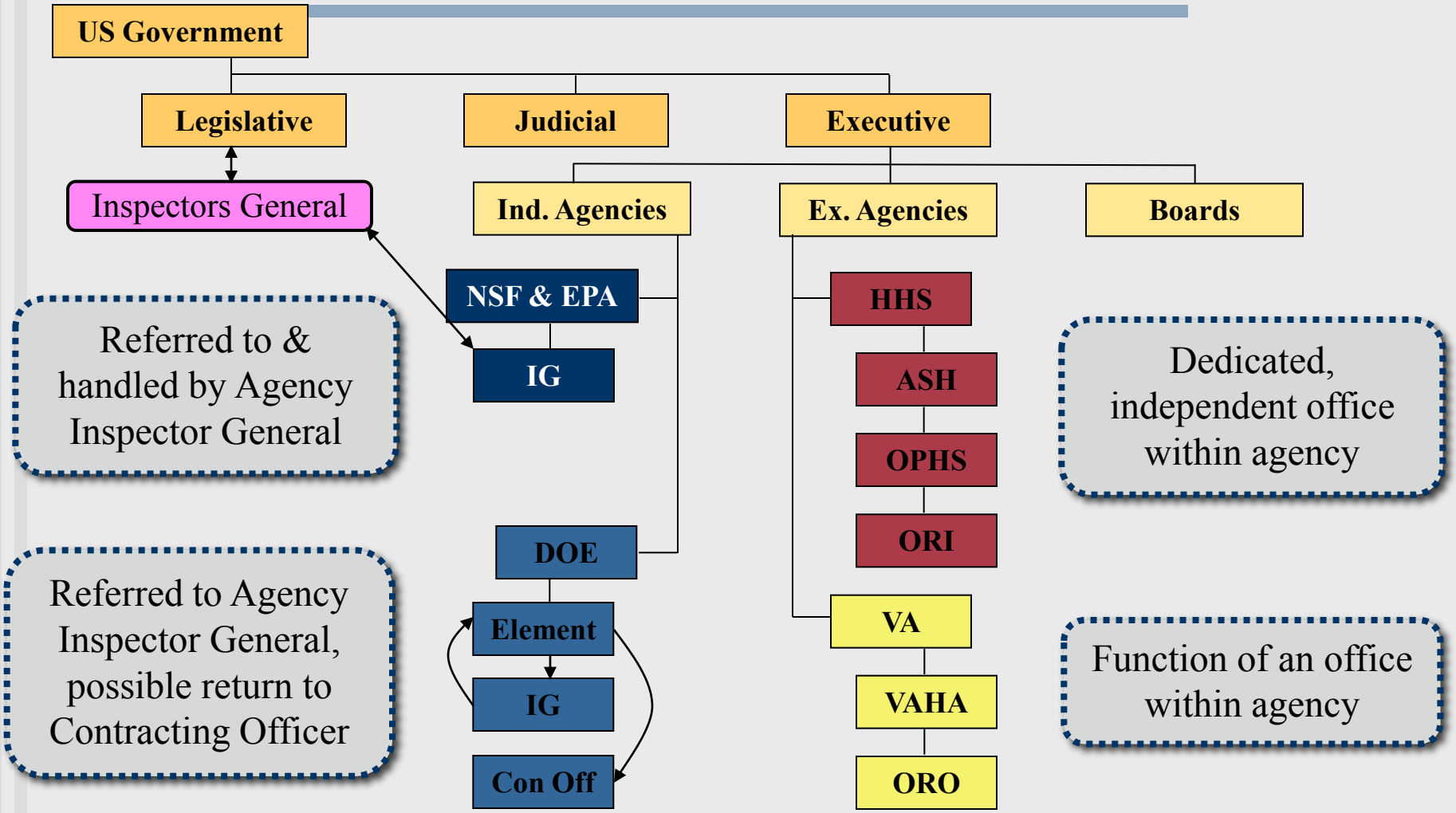
nsteneck@umich.edu

Most misbehavior is not covered by policy



nsteneck@umich.edu

Uneven implementation



nsteneck@umich.edu

Most misconduct is not reported

- HHS
  - $30B, 350,000 researchers
  - Average 10 cases/year ~ should average 100 –>1,000 cases
  - 35 cases = 1 in 10,000 ~ researchers self report 1 in 1,000 –> 100
- NSF
  - $5B, 75,000 researchers
  - Average ca. 5 cases (2x HHS cases)
  - Most cases P, less FF

- Conclusion: reporting is the weak link in current research misconduct policies in worldwide

nsteneck@umich.edu

Can research misconduct be prevented?

nsteneck@umich.edu

Often argued that RM cannot be prevented

1. Serious misconduct in research is rare
2. Self-regulation keeps improper behavior in check
3. Research misconduct is difficult to detect
4. Research misconduct cannot be prevented
5. Apart from misconduct, standards for integrity in research are high

- Are these assumptions correct?

nsteneck@umich.edu

1. Scientific misconduct is not rare

Scientists behaving badly

To protect the integrity of science, we must look beyond falsification, fabrication and plagiarism, to a wider range of questionable research practices, argue **Brian C. Martinson**, **Melissa S. Anderson** and **Raymond de Vries**.

- Martinson, *Nature* (June 2005)
  - Goal: factors that influence research behavior
  - Method:
    - Developed peer-based list of major offenses
    - Survey to 6,000+ researchers (3,000+ response)
    - Major question: "have you done … in last three years?"
- Results
  - Major offenses, ca. 0.3%
  - Questionable Research Practices (QRP) ca. 5-15% or higher

nsteneck@umich.edu

Data from other recent studies

- JM Ranstam, *Control Clin Trials* (2000)
  - Survey, 442 biostatisticians, 37% response
  - 51% knew about fraud in medical research
    - 26% involved FF
    - 31% directly involved in projects with misconduct
  - Estimates of rate, .69% –> .80% (.25% standard)
- Geggie, *J Med Ethics* (2001)
  - Survey, 305 new medical consultants, 64% response
    - 55.7% observed misconduct (FF lower)
    - 5.7% committed misconduct in the past
    - 18% would commit in future
    - 17% had research ethics training

nsteneck@umich.edu

Studies continued

- Gardner, Contemporary Clinical Trials (2005)
  - Authors pharmaceutical clinical trials (64% response)
  - 1% reported target article misrepresented the research
  - 5% reported fabrication in a study they had participated in over the last 10 years
  - 17% knew personally of fabrication in a study over the last 10 years
- Rossner, Journal of Cell Biology
  - 8 in 800 papers had serious improper digital image manipulation

boston.com

Technology seen abetting manipulation of research

The Boston Globe

By Gareth Cook, Globe Staff | January 11, 2006

An explosion of new digital image technology has left many of the world's top biology journals vulnerable to fraud, scientists say.

Is misconduct rare?

Confirmed: 20 cases / 1M res.	1 / 50,000
Under-reporting, 50%	1 / 25,000
Empirical evidence	1 / 100
Rare disease	1 / 200,000

- Misconduct in research is not rare
- Prevalence is underestimated

nsteneck@umich.edu

2. Self-regulation has weaknesses

- Bell Labs/ Schön Case,
  - Co-authored dozens of papers on superconductivity
  - Other researchers could not *replicate* his results
  - Bell Labs appointed investigation committee
  - 16 papers found to have fraudulent data
    - *Science* retracted 7 papers, *Nature* retracted 8
- Self-regulation is weak in science
  - Schön's misconduct discovered by reviewers & readers, no co-authors
  - Failure to replicate raises questions; does not guarantee discovery

nsteneck@umich.edu

3. Misconduct is not difficult to detect

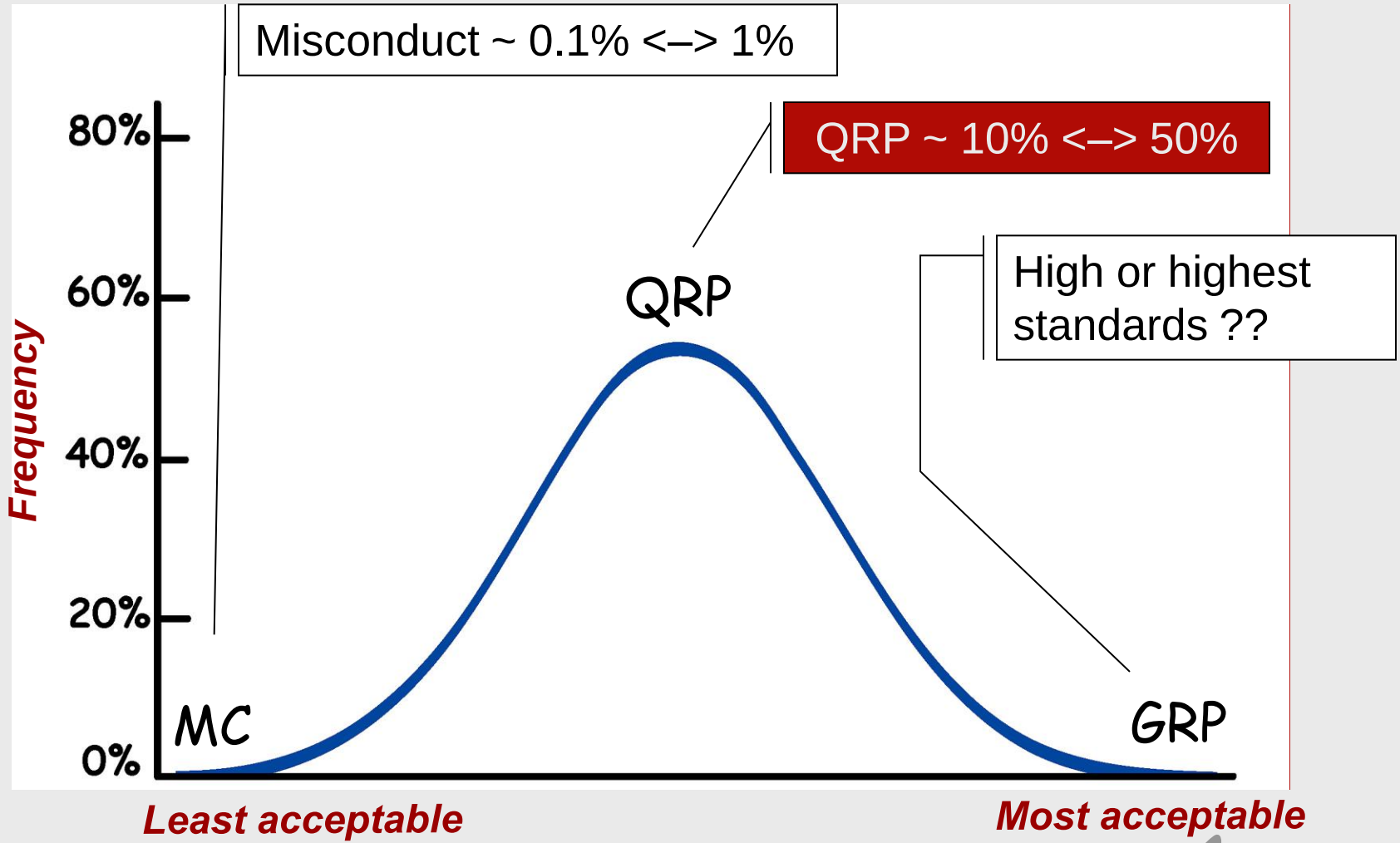
- Hwang case (South Korea)
  - … [Schatten] reported that he was told by Dr. Hwang in the middle of January, 2005 that some contamination of the cells had occurred.
  - Dr. Schatten did not extrapolate to conclude that if new cell lines had to be started in middle or late January there would not have been enough time to grow and analyze them by March 15, the date of the first manuscript submission." (Pittsburgh Report)
- Sudbo case (Norway)
  - Patients made up, personal data same for all patients
- Poehlman case (US)
  - Results inconsistent, no one questioned
  - MD who collected data did not check

4. Misconduct can be prevented

- Francis Collins / Amitav Hajra case
  - UM MD/PhD student, went to NIH with Collins
  - Fabricated/falsified data in 5 papers
  - Findings: NIH GUIDE, Vol. 26, Num. 23, July 18, 1997
- Collins role
  - “Collins was praised for the forthright way he handled the case of misconduct, which had been discovered by a reviewer of a paper that Hajra had submitted to the journal *Oncogene*.” (Cell, March 10, 2006)
- Might have been detected earlier if not prevented by regular checks of laboratory notes
  - “[the experience] caused me to become more skeptical, which is something I am not entirely happy about.”

nsteneck@umich.edu

5. Integrity in research is not otherwise high



nsteneck@umich.edu

Findings in the Martinson study

Ten Top Behaviors	All	Mid	Early
1. Falsifying or 'cooking' research data	0.3	0.2	0.5
2. Ignoring major aspects of human-subject requirements	0.3	0.3	0.4
3. Not properly disclosing conflict of interest	0.3	0.4	0.3
4. Relationships with students, research subjects or clients that may be interpreted as questionable	1.4	1.3	1.4
5. Using another's ideas without giving due credit	1.4	1.7	1.0
6. Unauthorized use of confidential information	1.7	2.4	0.8
7. Failing to present data that contradict one's own previous research	6.0	6.5	5.3
8. Circumventing minor aspects of human-subject requirements	7.6	9.0	6.0
9. Overlooking others' use of flawed data or questionable interpretation	12.5	12.2	12.8
10. Changing the design, methodology or results of a study in response to pressure from a funding source	15.5	20.6	9.5

= US Federal definition of misconduct

nsteneck@umich.edu

Martinson continued

Other behaviors	All	Mid	Early
11. Publishing the same data or results in two or more publications	4.7	5.9	3.4
12. Inappropriately assigning authorship credit	10.0	12.3	7.4
13. Withholding details of methodology or results in papers or proposals	10.8	12.4	8.9
14. Using inadequate or inappropriate research designs	13.5	14.6	12.2
15. Dropping observations or data points from analyses based on a gut feeling that they were inaccurate	15.3	14.3	16.5
16. Inadequate record keeping related to research projects	27.5	27.7	27.3

nsteneck@umich.edu

Al-Marsouki, *Cont Clin Trials* 26(2005)

Practices felt likely to occur and adversely impact research

• Over-interpretation of “significant" findings in small trials	83
• Selective reporting based on p-values	80
• Selective reporting of outcomes in the abstract	76
• Subgroup analyses done without interaction tests	75
• Negative or detrimental studies not published	68
• Putting undue stress on results from subgroup analysis	68
• Inappropriate subgroup analyses	64
• Selective reporting of (i) subgroups (ii) outcomes (iii) time points	64
• Selective reporting of positive results/omission of adverse events data	60
• Failure to report results or long delay in reporting	60
• Post-hoc analysis not admitted	59
• Giving incomplete information about analyses with non significant results	56
• Analysis conducted by the sponsor of the trial	54

nsteneck@umich.edu

Conflict of Interest Studies

- Bekelman (2003), *JAMA*
  - Meta-analysis of 37 COI studies (1,000s of trials)
  - Positive correlation (3.60 OR) , industry sponsorship & positive outcomes
- Lexchin (2003), *BMJ*
  - Meta-analysis of 30 COI studies
  - Positive correlation (4.05 OR), industry sponsorship & positive outcomes
- Friedman (2004)
  - 398 publications, *NEJM* and *JAMA*
  - Correlation (2.35-2.64 OR), industry/positive outcomes

nsteneck@umich.edu

Is integrity in research otherwise high?

nsteneck@umich.edu

What can/should be done?

- Establish standards for Good Research Practice
  - Government, research institutions, learned societies
- Teach Good Research Practice
  - Should be required by research institutions
  - Learned societies and government can help
- Improve peer review and quality control
  - Set standards for reviewers
  - Research institutions should promote quality control
- Foster research climates that promote integrity
  - Reasonable funding and publication expectations
  - Reward, not punish, those who identify problems

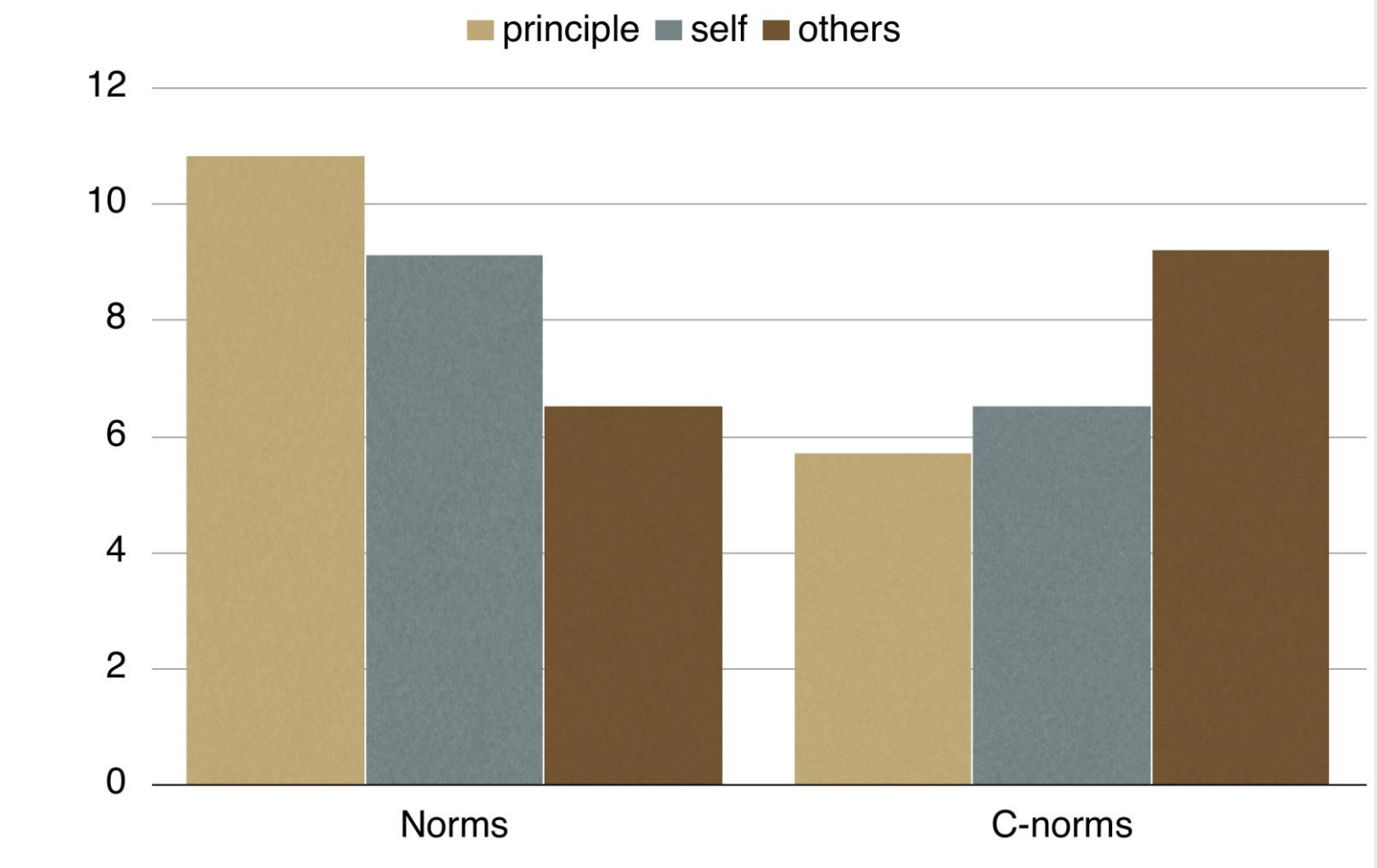
nsteneck@umich.edu

Research climate influences behavior

Norms	Counternorms
Share	Secret
Empirical	Personal
Advance science	Self-interest
Skeptical	Dogmatic

nsteneck@umich.edu

Adhering to Norms/CNs



nsteneck@umich.edu

Implications

- How can every researcher be better than her/his colleagues?
- How will researchers behave if they feel they have more integrity than their colleagues?

- Integrity is everyone's responsibility, not someone else's!

nsteneck@umich.edu

Thanks - Obrigado

nsteneck@umich.edu

nsteneck@umich.edu

For more information...

nsteneck@umich.edu

nsteneck@umich.edu