

DNA Mixture Interpretation Webcast

April 12, 2013

<http://www.nist.gov/oles/forensics/dna-analyst-training-on-mixture-interpretation.cfm>

<http://www.cstl.nist.gov/strbase/mixture.htm>

Updating SOPs & improving the lab process

Bruce J. Heidebrecht

Maryland State Police,
Forensic Sciences Division

SWGAM Interpretation Guidelines for Autosomal STR Typing

Interpretation Guidelines for Autosomal STR Typing

DNA com

A universal strategy to interpret DNA profiles that does not require a definition of low-copy-number

Re

Peter Gill^{a,b,*}, John Buckleton^c

P. Gill^{a,*}, C.H. Brenner^b, J.S. Buckleton^c, N. Me...

Interpretation of complex DNA profiles and a method to measure

Peter Gill^{a,*}, James Curran^b, Cedric Neufuss^c, Tim Clayton^c, Jonathan Whitaker^c

Biology, Technol
Bruce Budowle,¹ Ph.D.; Angelo Della Morte,² M.S.; Jennifer C. Lu...

Towards understanding the effect of uncertainty in the number of contributors to DNA stains

John S. Buckleton^a, James M. Curran^{b,*}, Peter Gill^c

Mixture Interpretation for Guidelines

A discussion of the merits of ratio and likelihood ratios

John Buckleton^{a,*}, James Curran^b

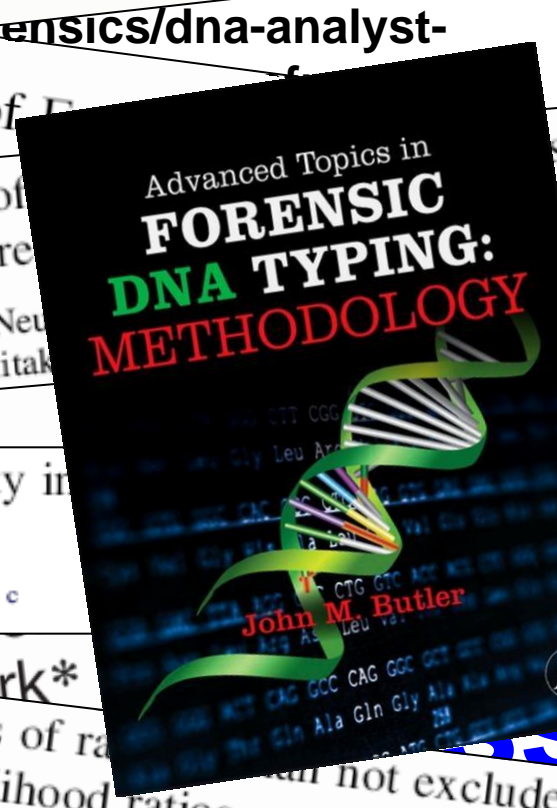
Recommendations on the evaluation of STR typing results that include drop-out and/or drop-in using probabilistic methods

P. Gill^{a,b,*}, L. Gusmão^c, H. M. Prinzⁱ, H. Schneider^j, P....

Mixture Interpretation (Interpretation of Mixed DNA Profiles with STRs Only)

BJ Heidebrecht, Maryland State Police, Forensic Sciences Division, Pikesville, MD, USA

Published by Elsevier Ltd.



Maryland State Police DNA casework SOP

Year 2008 Year 2012

**Half of the growth of the SOP
in the last 4 years
has been as a result
of implementing advances in
interpretations and statistics**

Total pages in SOP

Total pages in
analysis and stats
sections of SOP

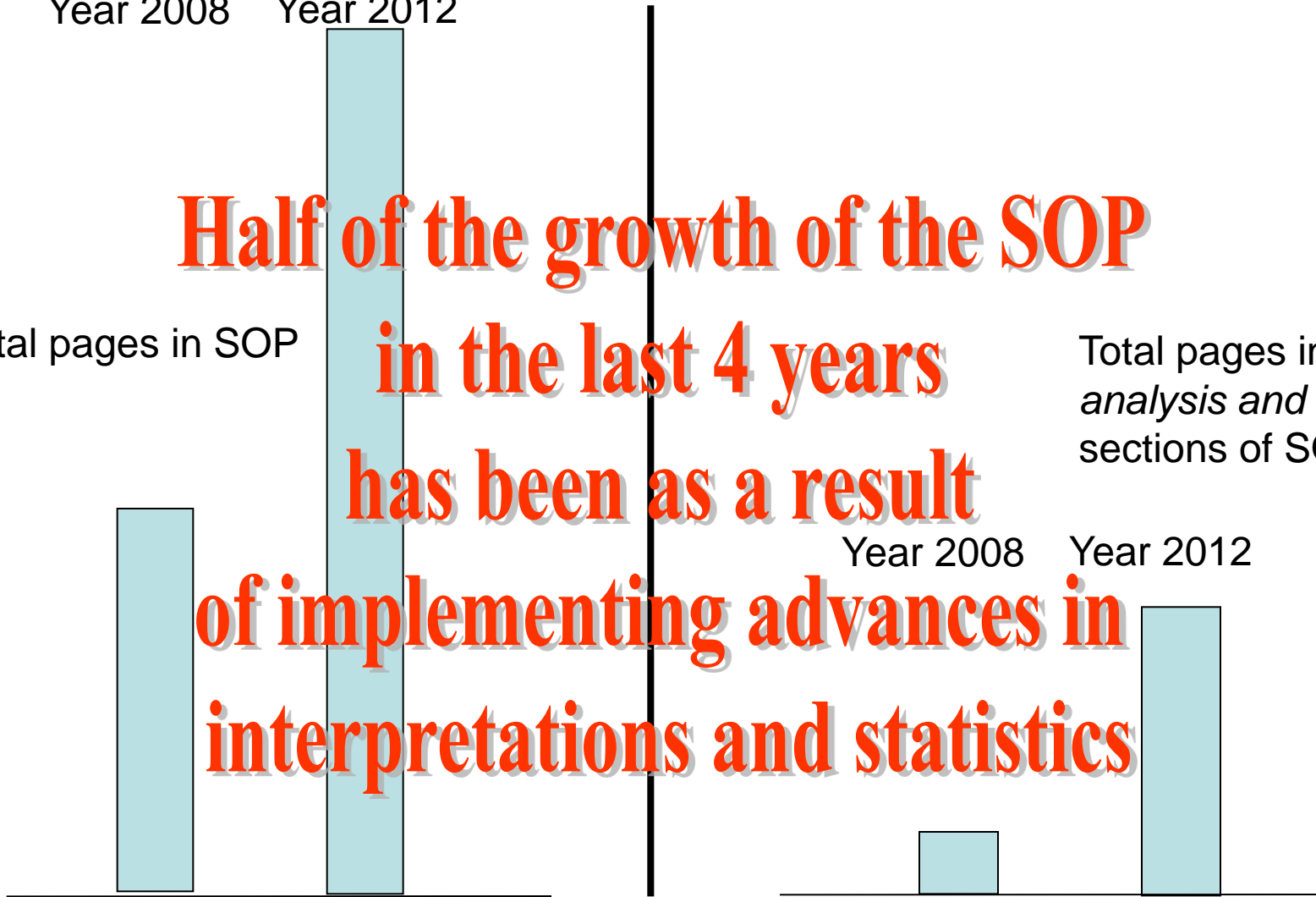
Year 2008 Year 2012

94
pages

201
pages

14
pages

67
pages



Attitude towards change



“When I go back to my lab with these changes the analysts are going to come at me with pitchforks!”

Attitude towards change



“It’s going to be difficult...

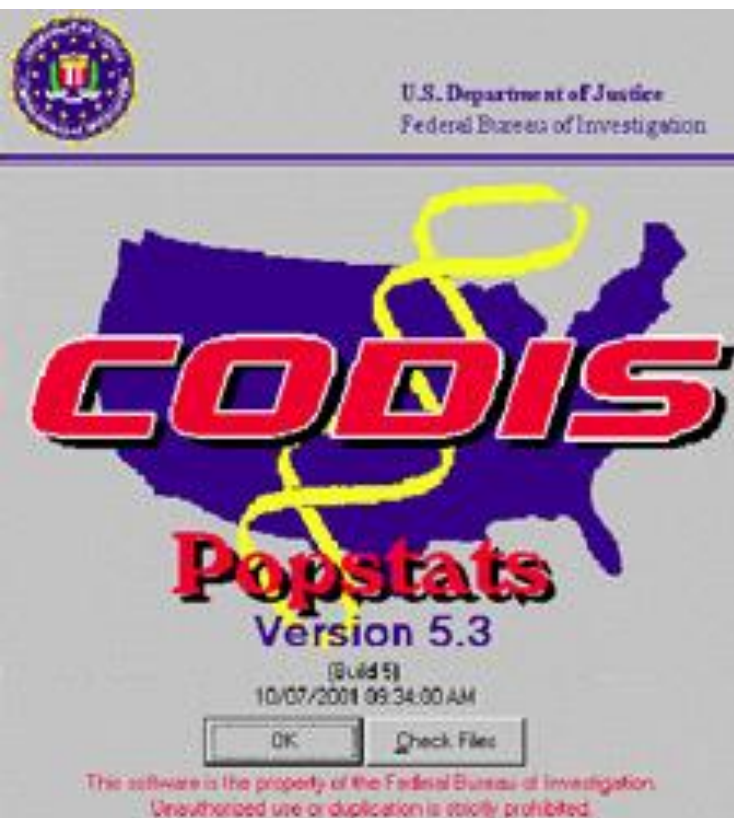
But we know that we’ll be better analysts.”

Meetings, not just articles



- Forensic scientist meetings:
AAFS, LAFS, MAAFS, MAFS,
NEAFS, NJAFS, NWAFS,
SAFS, SWAFS, etc.....
- DNA Technical Leader
Summit to be held
November 20-21, 2013.
(hopefully.....\$\$\$\$\$\$\$\$)

Know your software



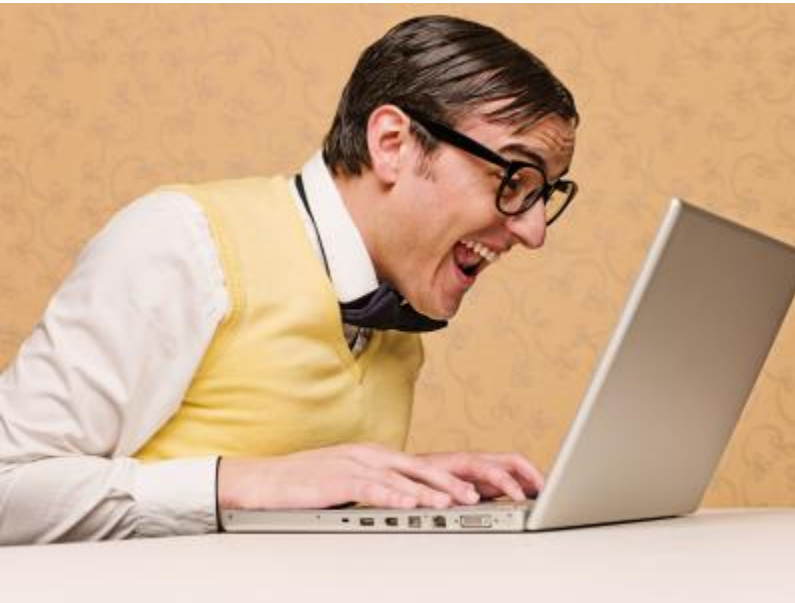
- Popstats is not programmed to perform Likelihood Ratio stats that include the possibility of undetected data.
- Popstats is not programmed to perform Likelihood Ratio stats that include peaks “indistinguishable from stutter”.
- Popstats is not programmed to perform Restricted Likelihood Ratios.

Purchase your software



- Be aware of what the software can and cannot do.
- Be aware of system requirements between the CE instrument software, interpretation or stats software, and computer operating system.

Create your own software



- MDSP created our own Excel spreadsheets for ULR stats that can incorporate both dropout and IFS.
- Created our own Excel workbook for mixture deconvolution.

Transition period



- Most labs are not allowed to shut down in order to have time to learn new procedures.
- Analysts have to learn new procedures while issuing reports under current policies.
- This transition period can be very frustrating.

Transition period



- Hold regular meetings to discuss known mixtures and/or interesting casework mixtures.
- Learn from each other.
- Ask “Why?”



Greg Matheson on Forensic Science Philosophy

- The CAC News – 2nd Quarter 2012 – p. 6
“Generalist vs. Specialist: a Philosophical Approach”
<http://www.cacnews.org/news/2ndq12.pdf>
- If you want to be a technician, performing tests on requests, then just focus on the policies and procedures of your laboratory. If you want to be a scientist and a professional, learn the policies and procedures, but go much further and learn the philosophy of your profession. **Understand the importance of why things are done** the way they are done, the scientific method, the viewpoint of the critiques, the issues of bias and the importance of ethics.

Writing an SOP



- Involve the analysts in the SOP review process to gather feedback before implementation.
- Review other labs' protocols and report writing guidelines
 - STRBase as a resource



**“Have no fear of perfection,
you’ll never reach it”**

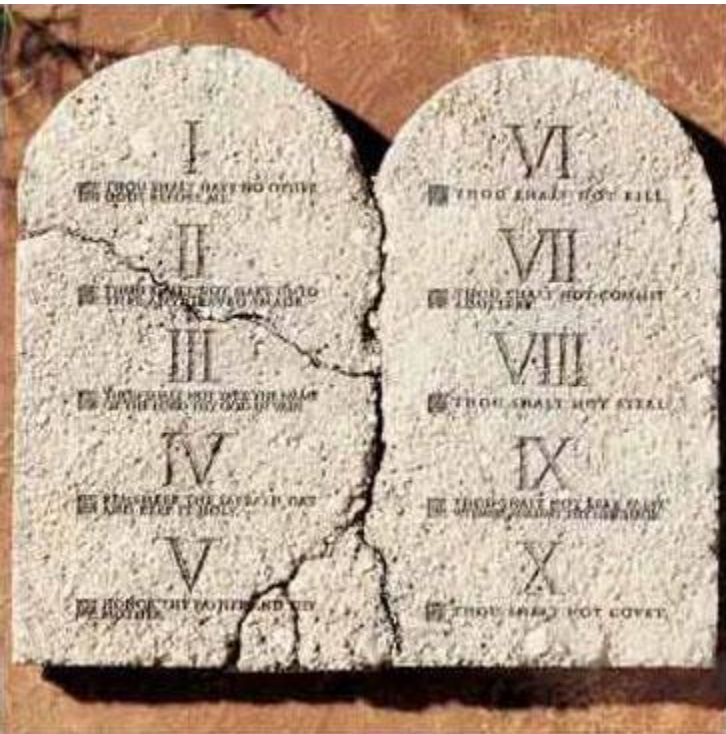
- Salvador Dali

DNA Technical Leader from another lab:

“Thanks for doing this workshop. It will help me make a perfect SOP.” ...

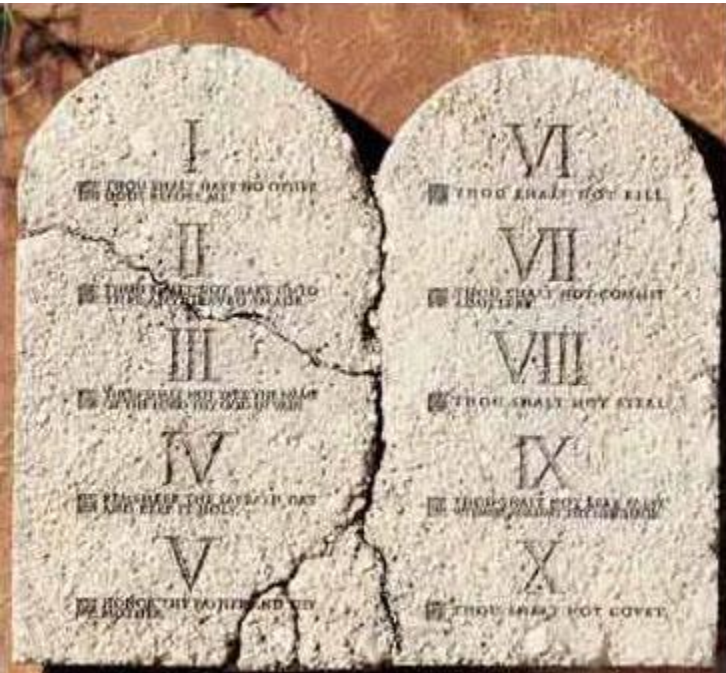
“It will help me make a better SOP.”

Writing an SOP



- The interpretation of results in casework is a matter of professional judgment and expertise.
- Not every situation can or should be covered by a pre-set rule.
- However, it is important that the laboratory develops and adheres to minimum criteria for interpretation of analytical results.
- These criteria are based on validation studies, literature references, and casework experience and are developed with maximum input from analysts.

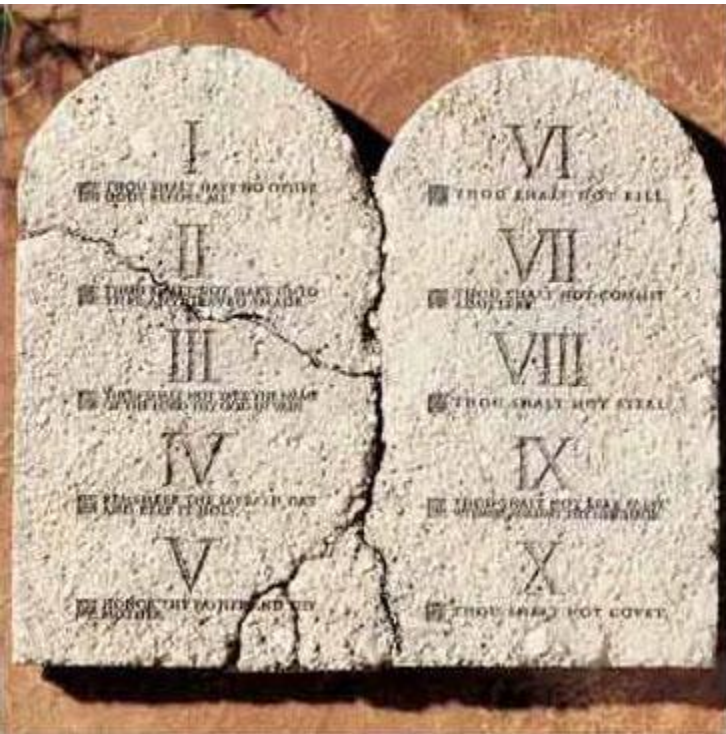
Updating an SOP



- Alleles in stutter positions (“N-1” repeat positions) with a ratio (RFU of the “N-1” peak divided by the RFU of the “N” peak) equal to or below the following stutter guidelines will be designated as stutter **and no conclusions will be drawn from these stutter peaks.**
- Peaks in stutter positions (“N-1” repeat positions) with a ratio (RFU of the “N-1” peak divided by the RFU of the “N” peak) equal to or below the following stutter guidelines will be designated as stutter, **or may be designated as “indistinguishable from stutter” in the case of mixtures based upon the criteria in Sections**

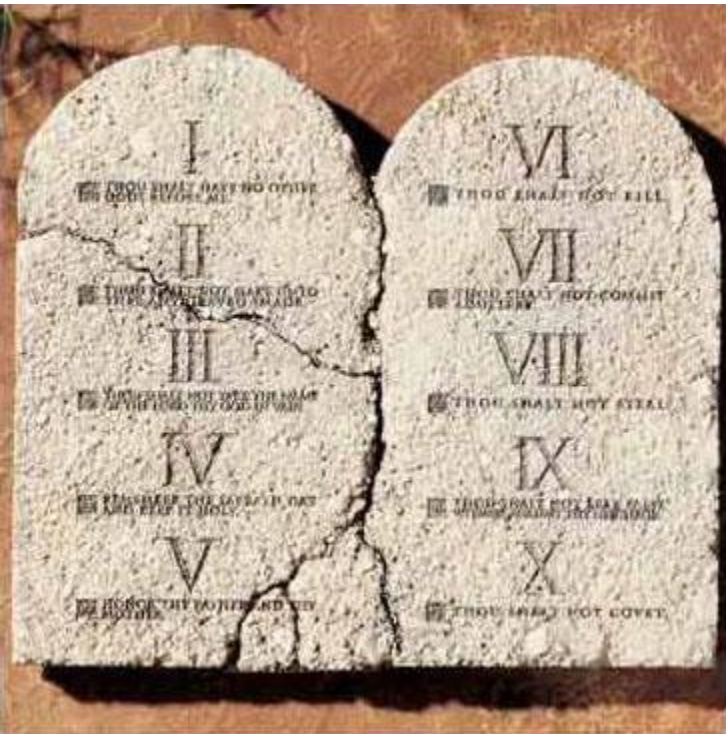


Reviewing a case



- The interpretation of results in casework is a matter of professional judgment and expertise.
- As long as expert opinion is a part of interpretation there will be some amount of differences between analysts.
- The goal of the rules in the SOP should be to minimize interpretation differences between analysts.
- Reviewers need to be aware of what is wrong and what is professional judgment.

Reviewing a case



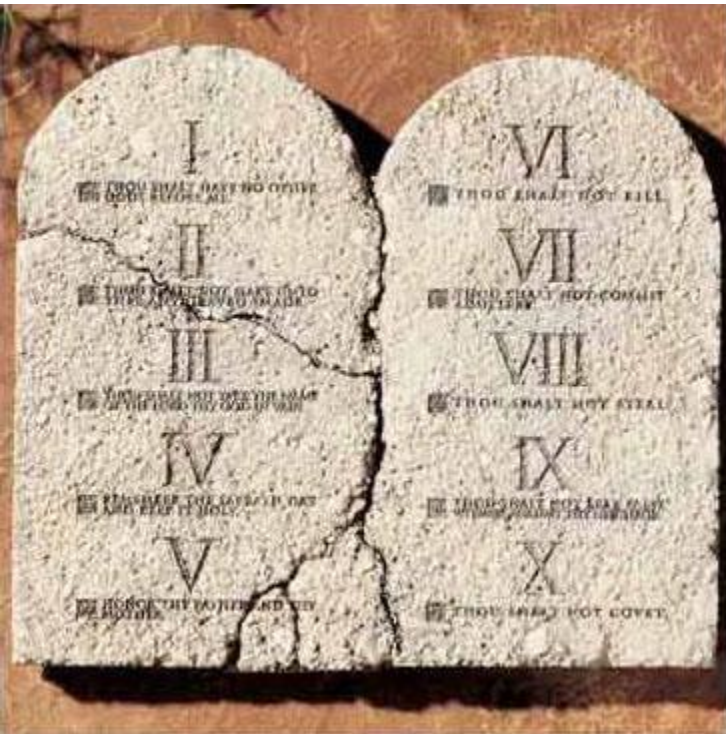
- Reviewers need to be aware of what is wrong and what is professional judgment.

SOP states that a minimum of 5 loci needed to be able to declare a match.

Analyst declares a match using only 3 loci.

SOP violation.

Reviewing a case



- Reviewers need to be aware of what is wrong and what is professional judgment.

SOP states that both mixture deconvolution with RMP stat and likelihood ratio are appropriate to use for a given mixture.

While analyst could declare an RMP match with a stat of 1 in a billion, they decide to use LR with a stat of 10 million to 1.

Professional judgment.

Thank you

- All the members of SWGDAM who have helped further my knowledge of mixture interpretation.
- Maryland State Police for allowing me time to participate in a variety of workshops.
- NIST for hosting this event.
- Dr. Butler for inviting me to participate.
- To Howard Wolowitz, who proves that a guy with a Master's degree can be included along with a group of PhD's!

