

## "I Wouldn't Have Seen It If I Hadn't Believed It: Confirmation Bias in Testing"

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## Testing is About Making Sure That People Aren't Being Fooled

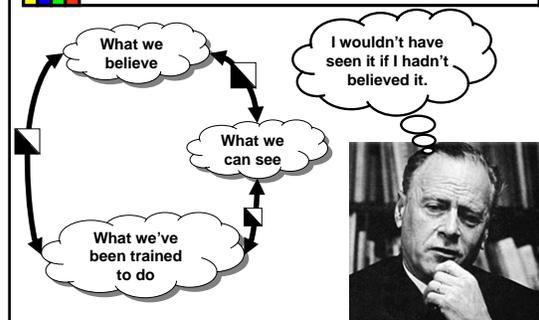
...and we have to start with ourselves

## The Big Theme of This Workshop

**A tester is someone who knows that things can be different.**

• Jerry Weinberg

## Feedback Loop: Perception & Conception



## Confirmation Bias

The tendency to  
 see believe behave  
 filter test investigate interpret  
 choose evaluate  
 in ways that fit with your  
 hypotheses goals  
 expectations predictions biases  
 preconceptions beliefs  
 rather than challenging them.

## Confirmation Bias: Variations

availability bias anchoring bias  
 Pollyanna principle congruence heuristic  
 belief perseverance valence effect  
 survivorship bias bandwagon effect  
 endowment effect selection bias recency bias  
 concurrency bias congruence bias  
 choice-supportive bias assimilation bias  
 experimenter bias  
 and, for today's talk...

## Positive Test Strategy

- “A tendency to test cases that are expected (or known) to have the property of interest rather than those expected (or know) to lack that property.”
- “...can be a very good heuristic for determining the truth or falsehood of a hypothesis under realistic conditions.”
- It can, however, lead to systematic errors or inefficiencies.

• Klayman and Ha, 1987

## Positive Test Strategy

- “When concrete, task-specific information is lacking, or cognitive demands are high, *people rely on the positive test strategy as a general default heuristic.*” BUT...
- “emphasis on the sufficiency of one’s actions is enhanced when one is rewarded for each individual success rather than only for the final rule discovery.” • Klayman and Ha, 1987

**which means...**

## The Great Traps of Test Cases

If you want to know  
how the system works,

**a focus on  
counting test cases  
is a really bad idea.**

## Escaping Confirmation Bias

- Practice the skill of factoring
- Change a factor in your description
  - Change one of the nouns to something else
  - Be more specific
  - Add adjectives to your description
  - Consider the opposite
- Manage the focus of your attention
  - Alternate between focusing and defocusing
  - Reverse figure and ground

## Factoring: Dimensions of Interest

- Factoring is the process of analyzing an object, event, or model to determine the elements that comprise it.
- When we factor for the purposes of test design, we identify elements that we may need to observe or control during a test. We call those *factors*.
- Factors may be
  - intrinsic or relational
  - variable or static

## Managing Attention

- To test for *anticipated* problems...
- To test a *simple* product, or *part* of a complex product very thoroughly...
- To *pinpoint* an observed problem...
- To *confirm* that a fix has been made...
- To maximize test integrity...
- To stay in grooves...

**FOCUS!**

## Focusing Heuristics

- Start the test from a known, clean state
  - reset the system; observe established pre-conditions
- Prefer simple, deterministic actions
  - focus on a relatively small number of tests
- Vary **One Factor At a Time** (OFAT)
- Develop and test to a specified model
  - trace test steps to that model
- Follow established and consistent lab procedures
- Make specific predictions, observations and records
  - test to observe that the system fits the patterns
- Make the test easy to reproduce
  - automated input may help

## Managing Attention

- To find *unexpected* problems...
- To find *elusive problems* in sustained field use...
- To *test* whether a fix has broken something else...
- To discover new dimensions of the product or the testing mission...
- To get out of ruts...

**De-focus!**

## Defocusing Heuristics

- Start from a variety of different states
  - not necessarily clean; don't *necessarily* reset the system
- Prefer complex, challenging actions
  - considering perform a huge number of tests
- Vary **Many Factors At a Time** (MFAT)
- Generate tests from a variety of models
  - or without reference to a conscious model
- *Question* your lab procedures and tools
- Try to see things with open expectations
  - let the patterns come to you
- Make the test hard to pass, instead of easy to reproduce
  - automatic logging and screen recording may help

## Reverse Figure and Ground



## Heuristic: A vs. THE

**When trying to explain something,  
prefer "a" to "the".**

- Example: "A problem..." instead of "THE problem..."
- Using "A" instead of "THE" helps us to avoid several kinds of critical thinking errors
  - single path of causation
  - confusing correlation and causation
  - single level of explanation

## Heuristic: Unless...

**Try adding "unless..."**

- To test your description, try adding "unless..." to it, and performing a test based on that

## Heuristic: The Rule of Three

- Special case of the Rule Of At Least Three:

***If you can't think of  
at least three explanations  
for something, you probably  
haven't thought about it enough.***

## Readings

- Klayman, Joshua; Young-Won Ha (1987). "Confirmation, Disconfirmation and Information in Hypothesis Testing". <http://www.stats.org.uk/statistical-inference/KlaymanHa1987.pdf>
- Tools of Critical Thinking (Levy)
- Exploring Requirements (Weinberg)
- Perfect Software and Other Illusions About Testing (Weinberg)
- Lessons Learned in Software Testing (Kaner, Bach, and Pettichord)
- Quality Software Management, Vol. 1: Systems Thinking (Weinberg)
- Quality Software Management, Vol. : First-Order Measurement (Weinberg)

## Readings

- How To Lie With Statistics (Huff)
- The Black Swan (Taleb)
- An Introduction To General Systems Thinking (Weinberg)
- Measuring and Managing Performance in Organizations (Austin)
- Software Testing as a Social Science (Kaner)
  - <http://www.kaner.com/pdfs/KanerSocialScienceSTEP.pdf>
- How To Solve It (Polya)
- Politics and the English Language (Orwell)