



Countermeasures to Perceptual Blindness

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Argonne National Laboratory

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Vulnerability Assessment Team (VAT)



A multi-disciplinary team of physicists, engineers, hackers, & social scientists.

The VAT has done detailed vulnerability assessments on hundreds of different security devices, systems, & programs.

The greatest of faults, I should say, is to be conscious of none.
-- Thomas Carlyle (1795-1881)

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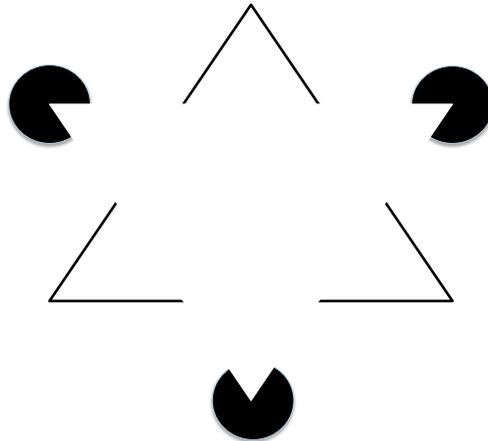
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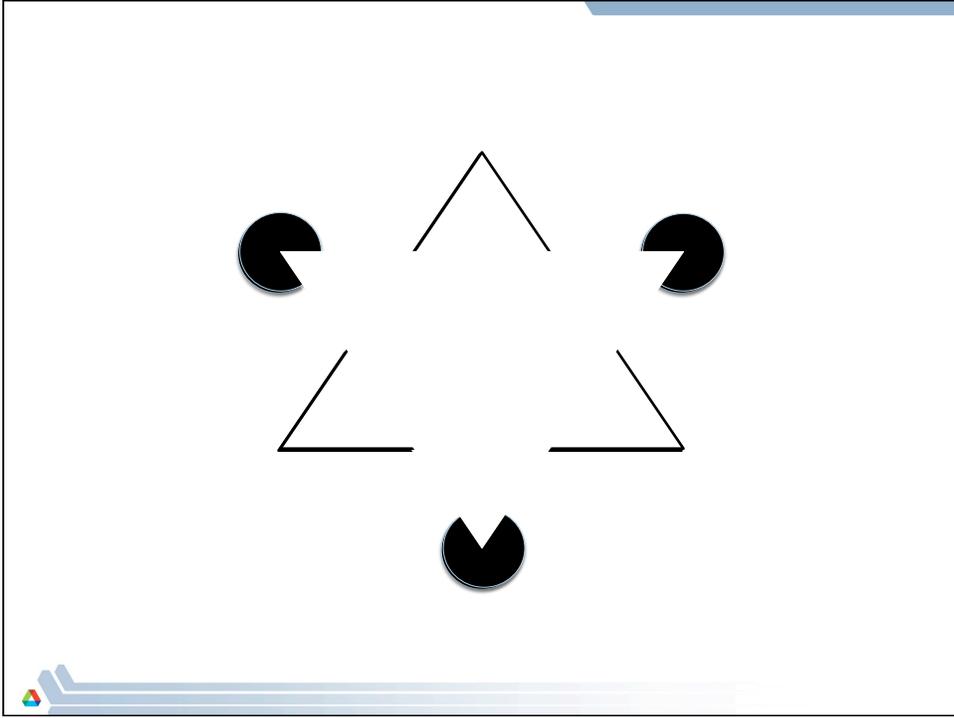


FINISHED FILES ARE THE RESULT OF YEARS OF SCIENTIFIC STUDY COMBINED WITH THE EXPERIENCE OF MANY YEARS

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Kanizsa Triangle





Countermeasures to Perceptual Blindness



What's red but smells like blue paint?

Stroop Effect

BLUE PURPLE RED
GREEN PURPLE GREEN

50 Years of Cognitive Psychology Research

- People are remarkably poor observers.
- They don't realize how bad they are.
- “Perceptual Blindness” = “Inattentional Blindness”: the phenomena of not being able to perceive things that are in plain sight, especially if you're focused on a particular visual task.
- “Change Blindness” (a kind of Perceptual Blindness): observers often fail to notice changes—including blatant ones—even when the changes are expected.



As a rule, we perceive what we expect to perceive.
The unexpected is usually not perceived at all.
-- Peter Drucker (1909-2005)

Consequences for Security

There are serious implications for security guards & safeguards inspectors, especially those who:

- ✓ check security badges
- ✓ watch video monitors
- ✓ make daily rounds
- ✓ inspect seals
- ✓ guard gates
- ✓ operate safeguards equipment
- ✓ etc.



We are never prepared for what we expect.
-- James Michener (1907-1997)

Countermeasures from Cognitive Psychologists

Although they don't have a lot of recommendations (or much research to back them) cognitive psychologists do suggest 2 countermeasures:



Countermeasure 1: Mental preparation. Security guards & safeguards inspectors can probably benefit from “what if?” exercises, and mental, physical, and visual rehearsals of a wide variety of different possible security incidents and scenarios.

Warning: these exercises must be fresh and frequent!

If you don't see it often, you often don't see it.
-- Jeremy Wolfe

Countermeasures from Cognitive Psychologists

Countermeasure 2: Security guards and inspectors should at least be aware of the concepts of perceptual blindness & change blindness. They should witness demonstrations of the phenomena, including exercises to reveal examples of their own perceptual/change blindness.



We don't see things as they are,
we see things as we are.
-- Anais Nin (1903-1977)

Our Proposed Countermeasures

(There is little research to support or negate these suggestions.)

Countermeasure 3: Conduct training to improve observational skills despite the likelihood that it will be only marginally beneficial for countering perceptual blindness. (Increased attention can actually make things worse!)

Countermeasure 4: Hire magicians to demonstrate misdirection and sleight-of-hand techniques. These can be used by an adversary to fool guards & inspectors.



Countermeasure 5: Use technology to help. Design security and safeguards strategies/procedures to minimize the need for accurate perception by human beings.

The eye sees only what the mind is prepared to comprehend.
-- Henri Bergson (1859-1941)

Our Proposed Countermeasures

Countermeasure 6: Implement countermeasures to groupthink, denial, cognitive dissonance, & wishful thinking. This may help to prepare the mind to see unexpected and unwelcome security incidents (and has other benefits).



Countermeasure 7: Try to minimize fatigue, boredom, stress, and jet lag for security guards and safeguards inspectors.

Countermeasure 8: Minimize highly specific, overly detailed assignments for security guards and safeguards inspectors.



I don't want any yes-men around me. I want everyone to tell me the truth—even if it costs him his job.
-- Samuel Goldwyn (1879-1974)

Our Proposed Countermeasures



Countermeasure 9: Choose one or more security guards or safeguards inspectors to be the generalist(s) to examine the overall scene without specific assigned detailed observational responsibilities. They should look for the unexpected and the rare.

Countermeasure 10: Find people who are good at avoiding perceptual blindness (and groupthink, denial, cognitive dissonance, & wishful thinking).

We are not ready for any unforeseen event that may or may not occur.
-- Dan Quayle

What We Need

1. More general research on countermeasures by cognitive psychologists and others.
2. More general research on security & safeguards issues by cognitive psychologists.
3. More research on human factors in security & safeguards.
4. More use of psychology (especially i/o psychology) and the social sciences in security & safeguards.

What We Need

Examples of human factors issues that are largely unstudied

- **two person rule**
- **security culture & climate**
- **mitigating the insider threat**
- **understanding seal inspection**
- **reducing security guard turnover**
- **applying security vulnerability assessments to safety**

I told my psychiatrist that everyone hates me. He said I was being ridiculous--everyone hasn't met me yet.
-- Rodney Dangerfield (1921-1997)



Selected VAT Security & Human Factors Publications

EG Bitzer, PY Chen, and RG Johnston, "Security in Organizations: Expanding the Frontiers of Industrial-Organizational Psychology", *International Review of Industrial and Organizational Psychology* 24, 131-150 (2009).

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RG Johnston, "Adversarial Safety Analysis: Borrowing the Methods of Security Vulnerability Assessments", *Journal of Safety Research* 35, 245-248 (2004).

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