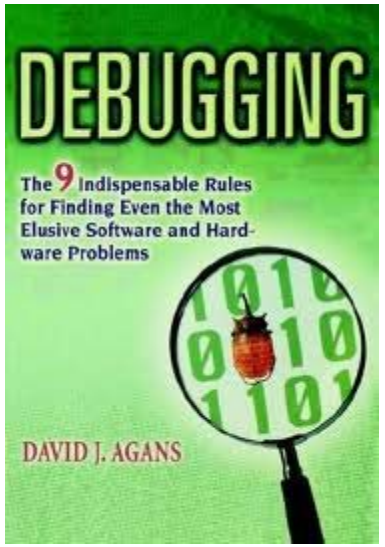
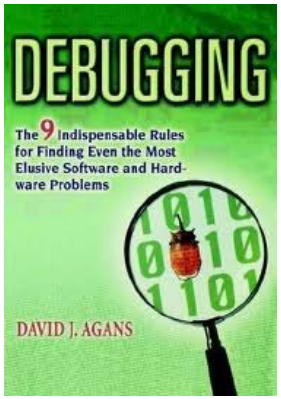
David Agans' *Debugging*

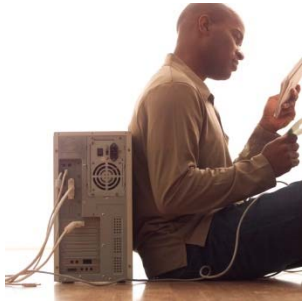
- Short book on general principles of debugging
- Structured around a set of simple rules that really are a good idea



David Agans' *Debugging* Rules



- Rule #1: "**Understand the System**"



  - "READ THE MANUAL"

- Debugging something you don't understand is pointlessly hard
- Just as with testing, subject knowledge matters – here you need knowledge of the source code as well

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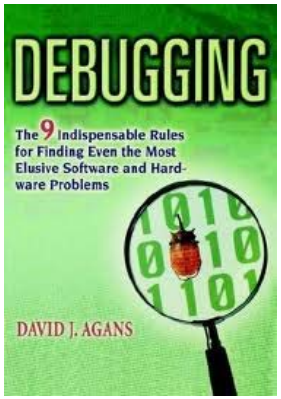

- Rule #2: "**Make It Fail**"

- You can't debug what you can't produce
- Find a way to reliably make a system fail

- Record everything, and look for correlation
  - Don't assume something "can't" be a cause

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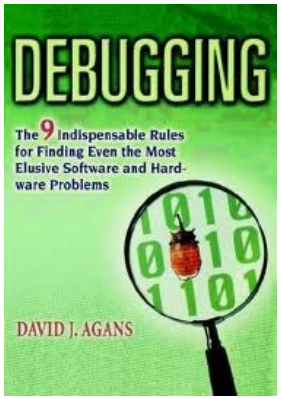

- Rule #3: "**Quit Thinking and Look**"

- Don't hypothesize *before* examining the failure in detail – examine the evidence, *then* think
- Engineers like to think, don't like to look nearly as much (instrumentation and running a debugger both look like *work*)
- "If it is doing X, must be Y" – maybe
  - Check

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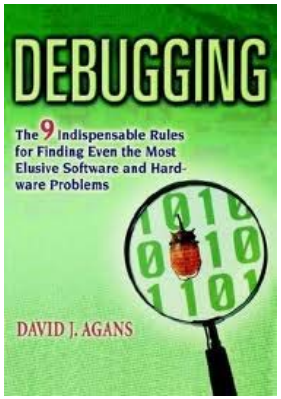

- Rule #4:

  "Divide and Conquer"

- *This rule is the heart of debugging*
  - Heart of delta-debugging
  - Narrow down the source of the problem
  - "Does it still fail if this factor is removed?"
  - Use a debugger to check system state at checkpoints; if everything is ok, you're before the problem

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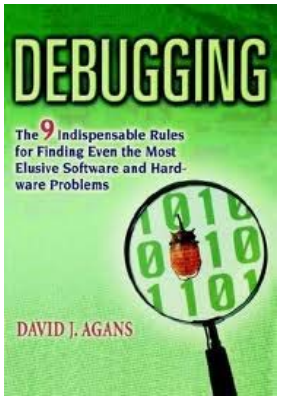

- Rule #5: "**Change One Thing at a Time**"

RIFLES NOT SHOTGUNS

- A common very bad debugging strategy:
  - "It could be one of X, Y, Z. I'll change all three, and run it again."
- Isolate factors, because that's how you get experiments that tell you something
- If code worked before last checkin, maybe you should look at *just those changes*

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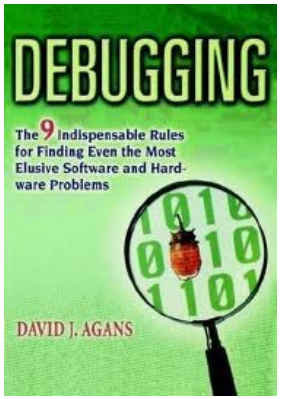

- Rule #6: "**Keep an Audit Trail**"

Dear debugging diary...

- Don't rely on your perfect memory to remember everything you tried
- Don't assume only you will ever work on this problem
- Rule of thumb: 20 minutes

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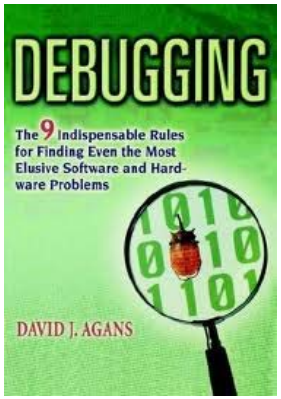
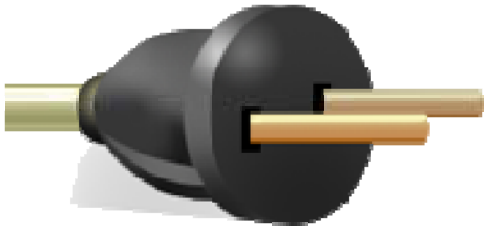


- Rule #7: "**Check the Plug**"



- Question assumptions
- Don't always trust the debugger
- Don't trust your tests

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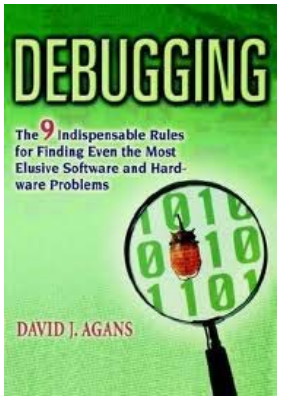

- Rule #8: "**Get a Fresh View**"

- It's ok to ask for help
- Experts can be useful
- Explain what happens, not what you think is going on

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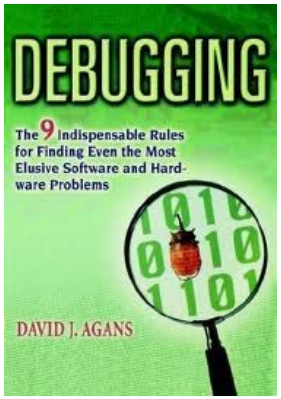

- Rule #9: "**If You Didn't Fix It, It Ain't Fixed**"

- Once you "find the cause of a bug" confirm that changing the cause actually removes the effect
- A bug isn't done until the fix is in place and confirmed to actually fix the problem
  - You might have just understood a symptom, not the underlying problem