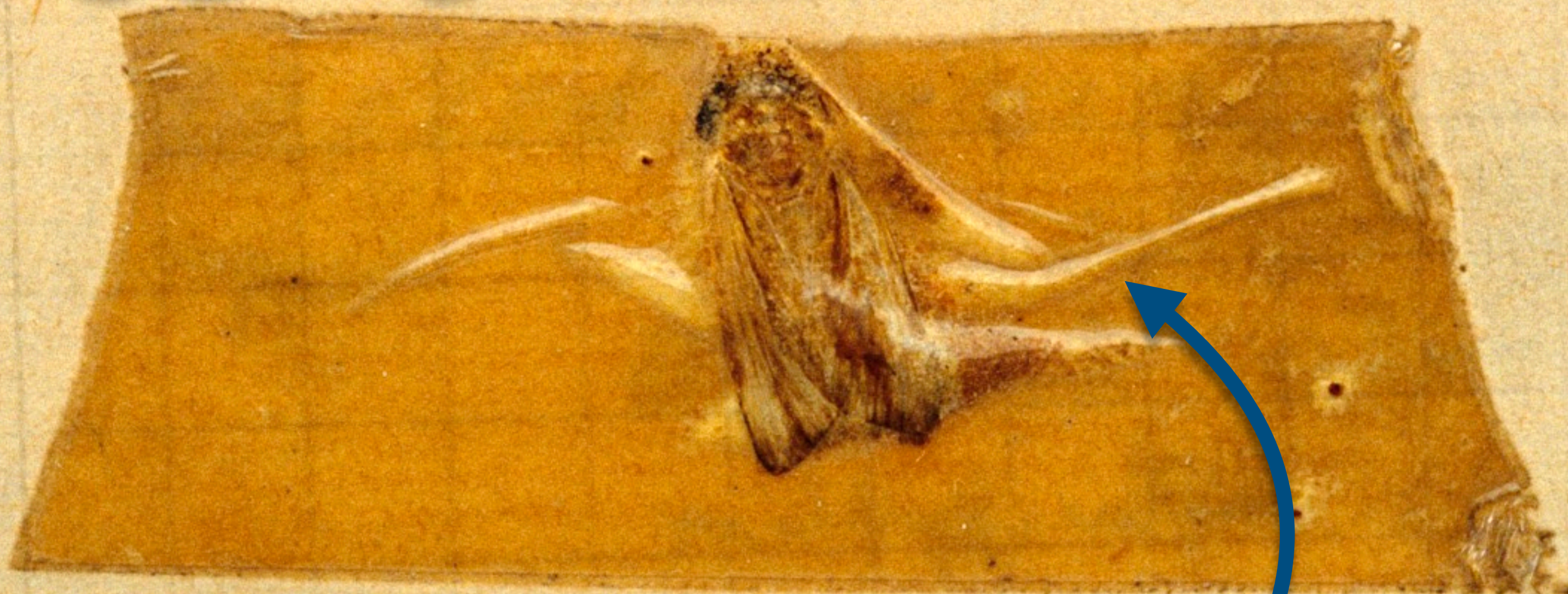


Debugging

1100 Started Relays changed
Cosine Tape (Sine cl
1525 Started Mult + Adder Test.

1545



Relay #70
(moth) in re

First actual case of bug

~~1630~~ 1630 Antangent started.

COMPASS 2023

1700

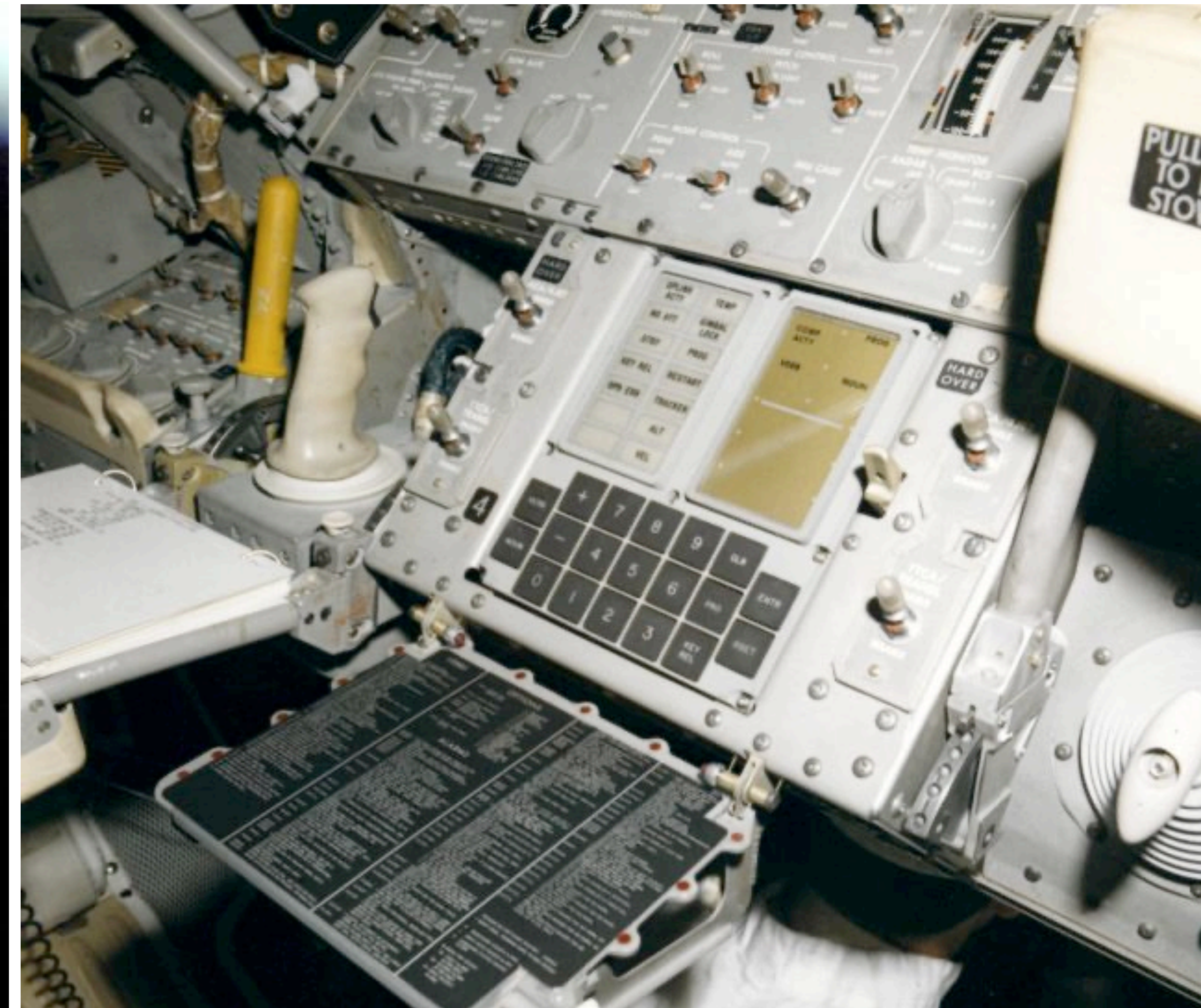
closed down.

(This bug is on display at the Smithsonian!)

Core Debugging Principles

- Computers are deterministic machines: every problem has a cause
- Methodically eliminating possibilities will eventually determine cause
- Checking the program state narrows down where to search.
 - Add print statements of variable values
 - Study error messages closely

Famous Error Message: Apollo 11 1202 & 1201 alarm



Error Messages

- Very helpful for diagnosing problems
- Are always *downstream* of the real issue
- Often, they *do not* identify the root problem

Printing variables and reading error messages let you bracket where the error could be

What to look for

- **Syntax errors:**
bracket or parenthesis mismatch,
incorrect form if/elif/else,
missing commas,
misspelt keyword,
incorrect indentation level
- **Wrong operator used** (example: ^ instead of **)
- **Misspelt variable or function name**
- **Incorrect function usage**
- **Logic error in program design**

What to do when you get stuck

- Take a breath
- Slow down: understanding the code more important than a quick fix
- Online search for issue / ask for help
- Explain the issue to a rubber duck!
“Rubber duck debugging” helps you understand the issue better and solve it!

en.wikipedia.org/wiki/Rubber_duck_debugging

Exercises: tinyurl.com/compassdebug

