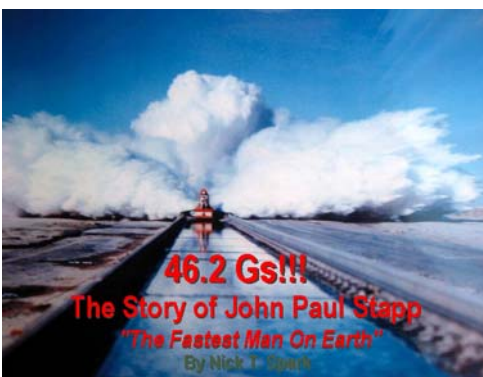
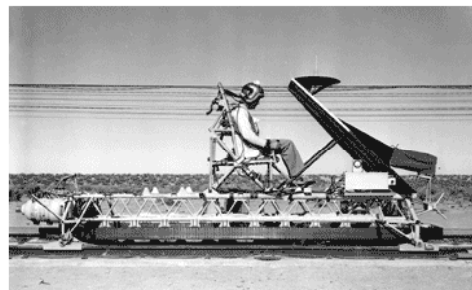


## Murphy's Laws

## Murphy's Laws

- Things are more complex than they seem to be.
- Things take longer than expected.
- Things cost more than expected.
- **If something can go wrong, it will.**



## Programming Errors

- **Lexical errors** – occur whenever Reeborg reads a word that is not in his vocabulary.

Example in English: We are giving directions on how to get to Portland and we write:  
“fadt jdhpq hqngprps ggssi sgr ghgh grmplhms?”  
In English these are spelling errors.

Example for Reeborg: We want Reeborg to turn left and we write `turn_to_the_left()`

- **Syntactic error** – when we use incorrect grammar or inaccurate punctuation.

Example in English: Suppose we are giving instructions to a lost motorist and we say “for keep hundred just miles going eight.” These errors are grammatical errors in English.

Example in Reeborg: Suppose we wish Reeborg to turn left and we write `()turn_left`

- **Execution errors** – This is caused in a Reeborg program when Reeborg is unable to execute an instruction successfully and is forced to perform an error shutoff.

For example, we ask Reeborg to move and he is facing a wall.

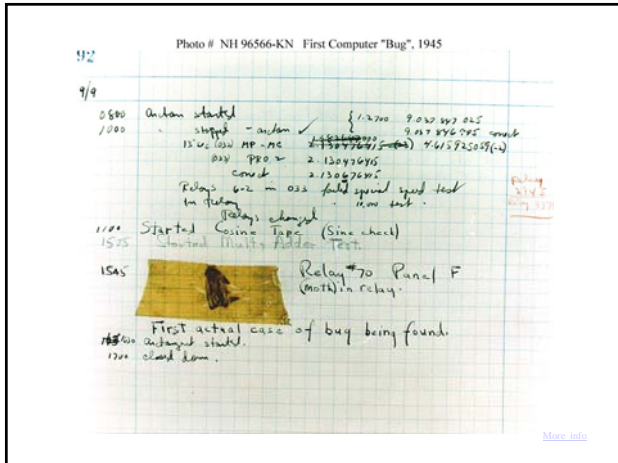
- **Logic (or Intent) errors** – This happens when Reeborg performs a different task than his assigned task. This means that the program is incorrect for the task, but not so incorrect that Reeborg can discover the error.

For example, we wish for Reeborg to go get his newspaper and come back to bed. However, we forget to issue a `pick_beeper()` command so when he gets back to bed, he has not completed his assigned task.

All types of errors are known as bugs.

Debugging is the name that programmers give to the activity of removing errors from a program.

(Origin of the term “debugging”.)



## Good Programming Style

- A program that works perfectly is not considered a good program; it is simply a working program. To write a good robot program you must follow these guidelines:
  - a program must be easy to read and understand
  - a program must be easy to debug
  - a program must be easy to modify to solve a variation of the original task

## Maintenance

- Maintenance occurs whenever we modify or change a program.
- Three types of maintenance:
  - Corrective
  - Adaptive
  - Perfective