

## Condition Variable

Wait for some condition to be true

Under the hood, a CV is just a list of waiting threads

\* wait(): takes you off the CPU and adds to list of waiting threads

\* notify\_one(): unblocks arbitrary thread from the list

\* notify\_all(): unblocks any waiting thread



color is currently red

set color to green

CV.notify\_all()

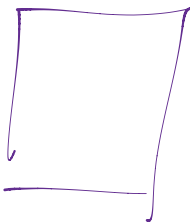
wait on CV



cond var:



## while loops w/ CVs



- car 0 waits on CV

- traffic light changes to green

- notify\_all()

⇒ car 0 is moved to ready queue

- traffic light changes back to red

- mutex is required

- car 0 will proceed on a red light

- Mutex: <sup>ensures only</sup> restricts one thread does something at a time
  - Semaphore: "bucket of balls"
    - max  $n$  threads doing something at a time
    - producer/consumer (handoff)
  - CV: wait for some condition to be true
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Race conditions: why care?

- If your software is used enough, low probability events will happen
- Bugs compound
- These are the worst bugs to debug
  - "Heisenbugs": bug that disappears when you are looking for it

There is no such thing as a "benign data race"