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
```

```
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 acquired
      - car 0 will proceed on a red light
```
- Mutex: restricts one thread doing 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

Race conditions: why care?
- If your software is used enough low probability events will happen
- Bugs compound
- These are the worst bugs to debug
  - "Heisenbug": bug that disappears when you are looking for it

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