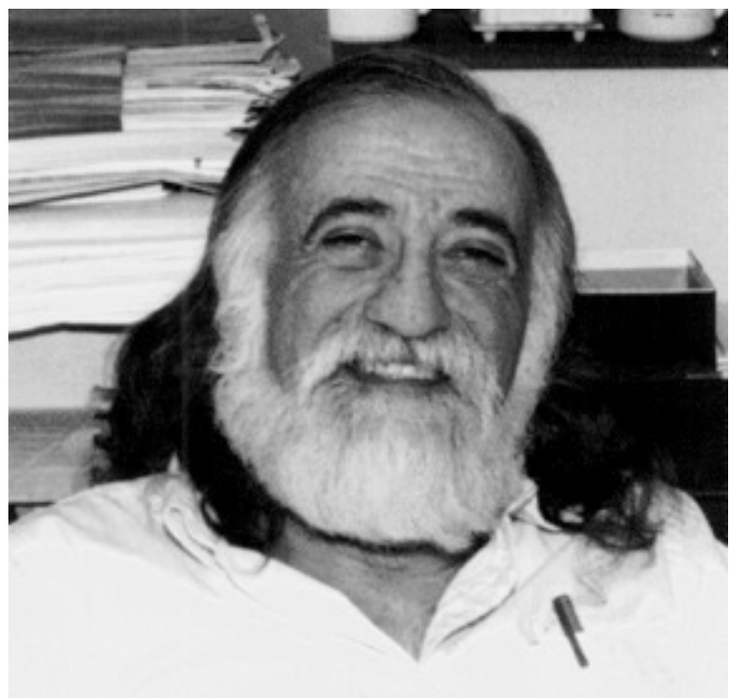
# Bottom-Up Multicore Programming

# Bottom-Up Approach Inspiration



# Bottom-Up Approach Inspiration

- Robert Lee Moore
  - Mathematician
    - Penn (1911-1920)
    - U. of Texas (1920-1969)
  - Developed "Moore Method" or "Texas Method"
    - A unique style of teaching mathematics
    - Start with axioms, have class build up the framework during the semester
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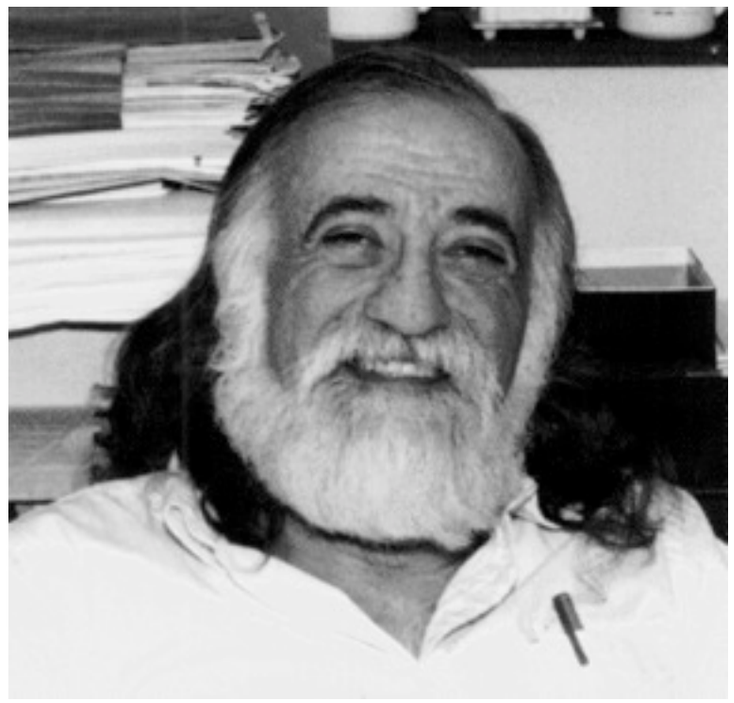

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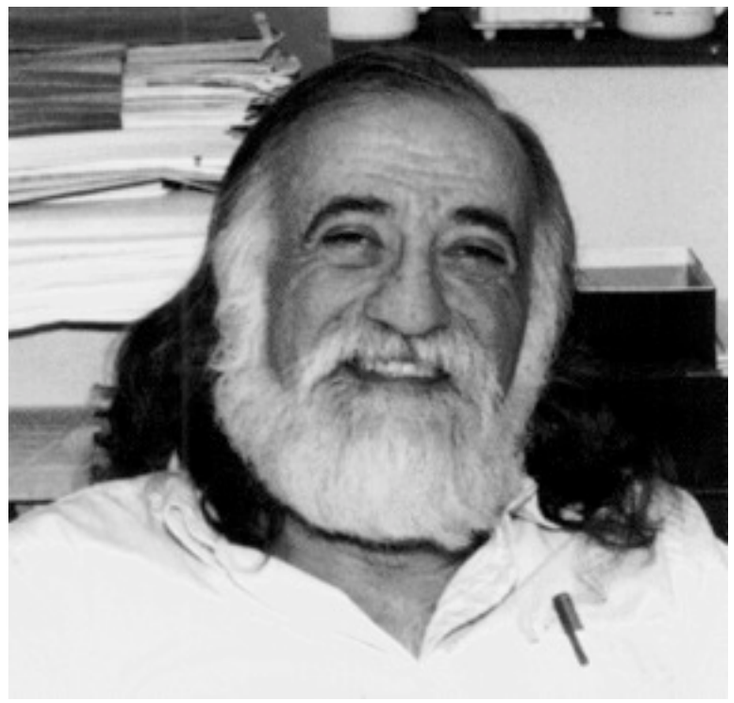
- Yale Patt
  - Computer Architect
  - Renowned teacher and researcher
  - "Bits and Bytes to C and Beyond" textbook



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- Discard alternative #2: "top-up"

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- Need to "forget" (for now) some things
  - Put aside any thoughts of higher-level constructs
  - Forget anything you might know of
    - **TBB**, **Cilk**, **OpenMP**, Blocks, Grand Central Dispatch, Ct, Java JSR-166, ZPL, NESL, Fortress, X10, Chapel, StreamIT, Brook, CUDA, **OpenCL**, **memory consistency**, etc.

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- Less spoon-feeding, more self-learning
- Best way I know how to teach this course

# Simple Parallel Work Decomposition

# Static Work Distribution

- Sequential code
  - for (int i=**0**; i<**SIZE**; i++):
    - calculate(i, …, …, …)
- Parallel code, for each thread:
  - void each_thread(int thread_id):
    - segment_size = SIZE / number_of_threads
    - assert(SIZE % number_of_threads == 0)
    - my_start = thread_id * segment_size
    - my_end = my_start + segment_size
    - for (int i=**my_start**; i<**my_end**; i++)
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  - int counter = 0  **// global variable**
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      - int i = **atomic_add**(&counter, 1)
      - if (i >= num_segments)
        - return
      - my_start = i * GRAIN_SIZE
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- Dynamic load balancing with lower (adjustable) overhead