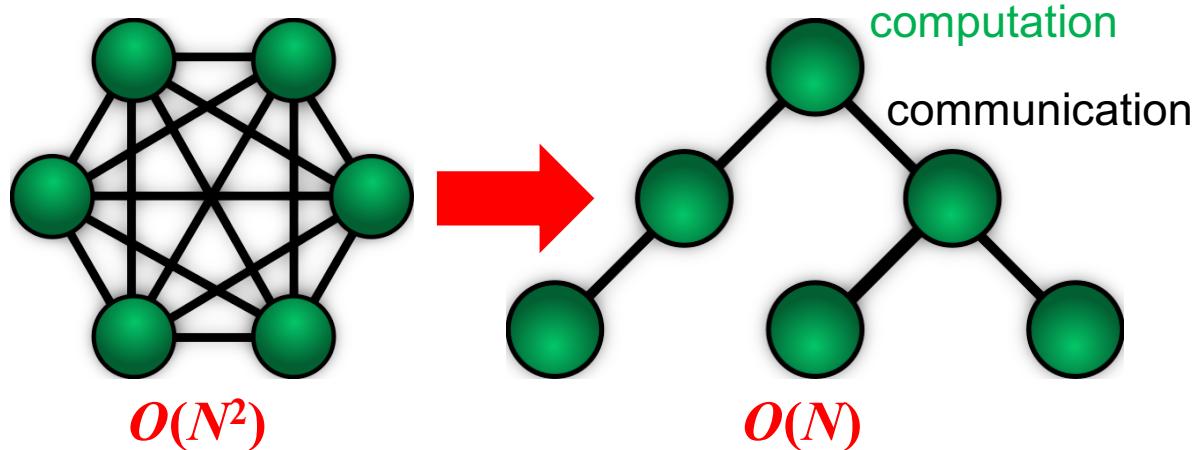
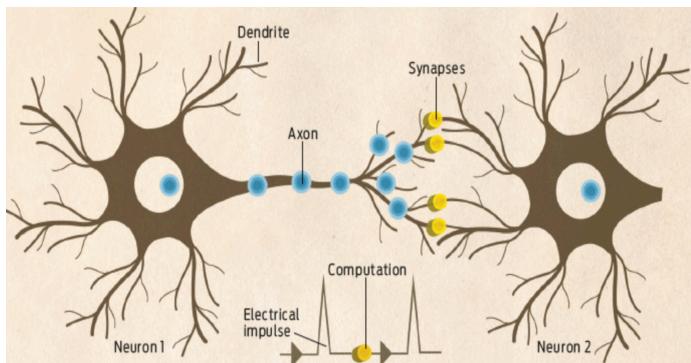


Why Supercomputer?

- Q.** If supercomputers use the same processors as laptops & cell phones, could we just use cloud-computing resources to do the same?
- A.** No. Emergent properties arising from many interacting entities (e.g., life) could only be studied as a whole [“More is different,” P. W. Anderson, *Science* 177, 393 ('72) <https://aiichironakano.github.io/cs596/Anderson-MoreIsDifferent-Science72.pdf>]. This would require innovative hardware & software solutions to tightly couple massive computations:
- Hardware:** Ultrafast network interconnect among billions of processing elements, *cf.* human brain has 10^3 synapses per neuron.
- Software:** Communication-minimizing divide-conquer-recombine algorithms that accurately describe many-body interaction.



Why Assignments Are Too Easy?

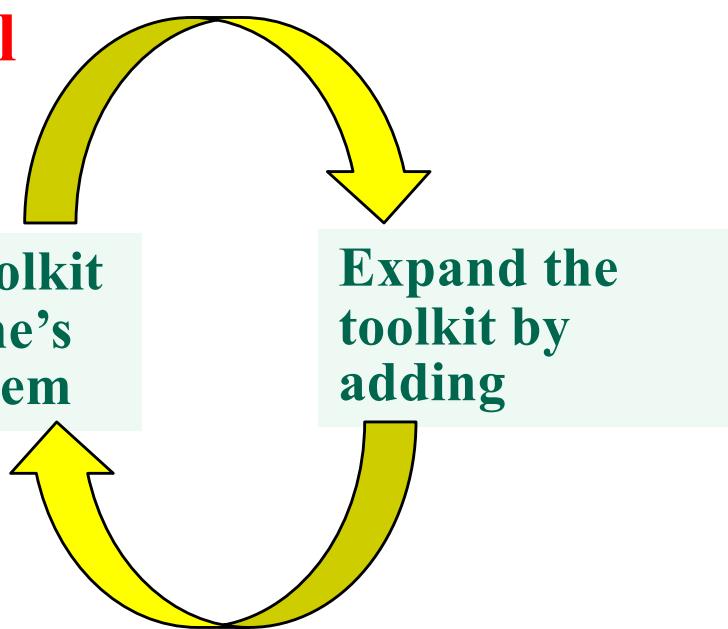
A: It's intentional. To provide hands-on seeds for start using tools (MPI, OpenMP, CUDA, DPC++, etc., or other mathematical & engineering tools at large) in a self-sustained use-learn cycle

Most effective way to learn a new tool

Understand
the smallest set
of essential
mechanisms
by reading a
minimalist
program

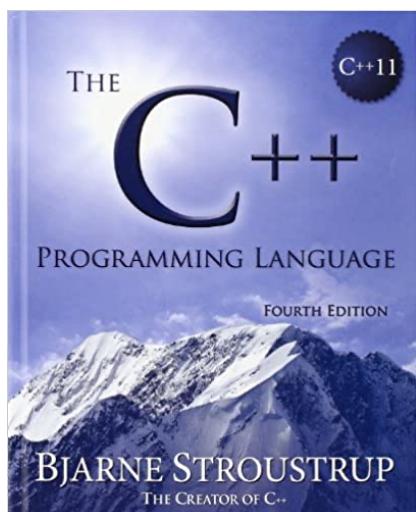


Use the toolkit
to solve one's
own problem



Expand the
toolkit by
adding

Self-sustained
Use-learn cycle



Start the cycle in your final project

Alternative way

“You bought a 1300+ page (480K+ word) book for \$40 or \$60, not a subscription service. How much support do you expect?”