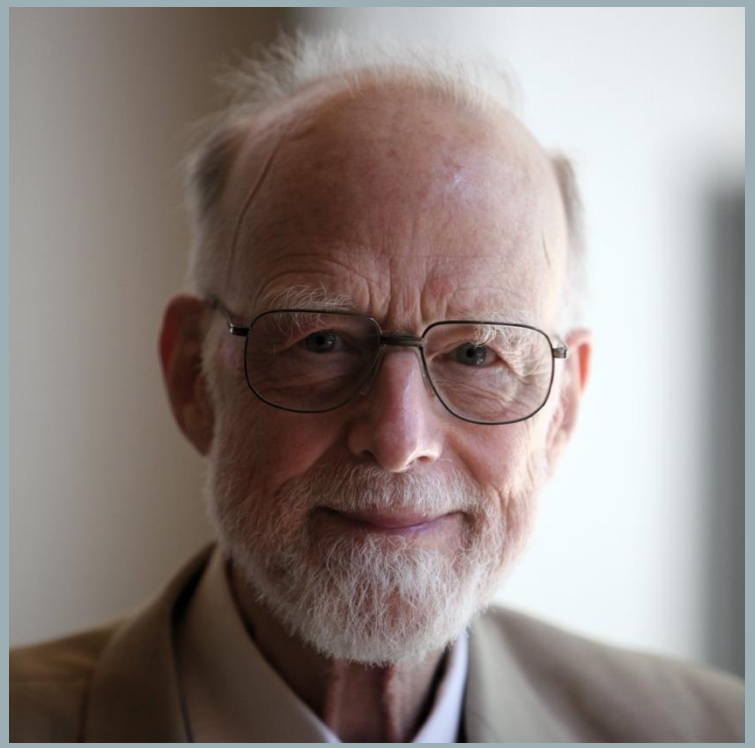
QUICKSORT

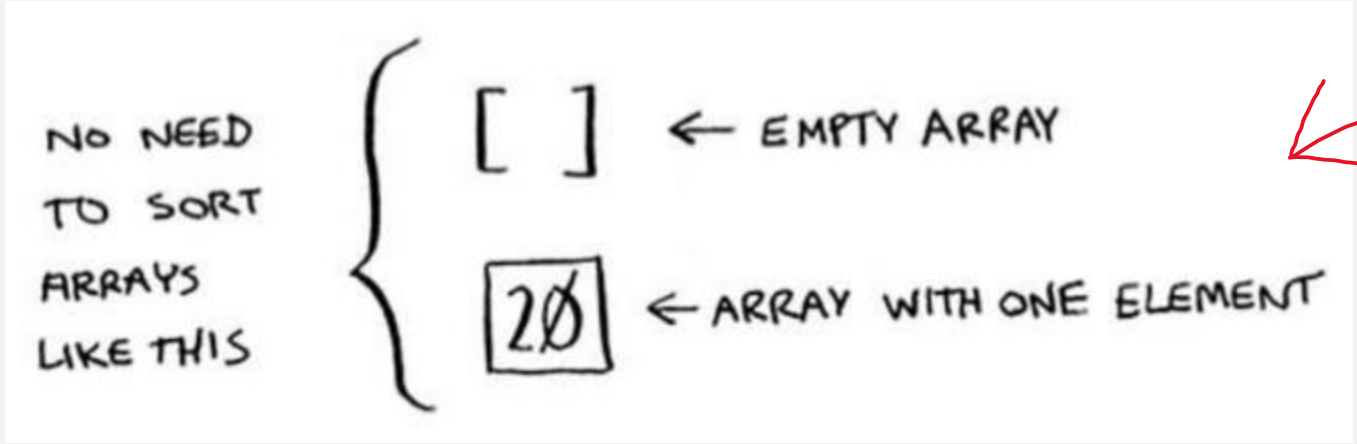
WHEN SOMEBODY USES BUBBLE/SELECTION/INSERTION SORT INSTEAD OF QUICK SORT !!!



Charles Anthony Richard Hoare

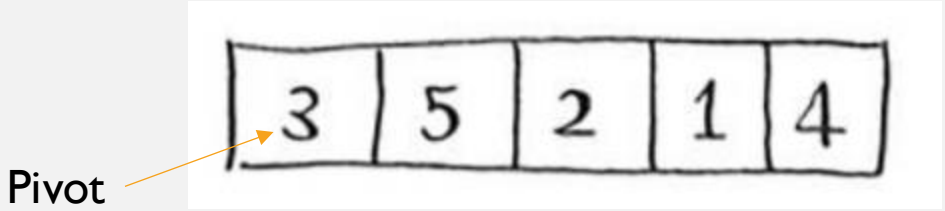
- Invented by Tony Hoare in 1959
- He needed to sort Russian words in sentences, to look them up in a Russian-English dictionary.
- And for that we would need something faster than Insertion Sort, since the dictionary was stored in a tape.

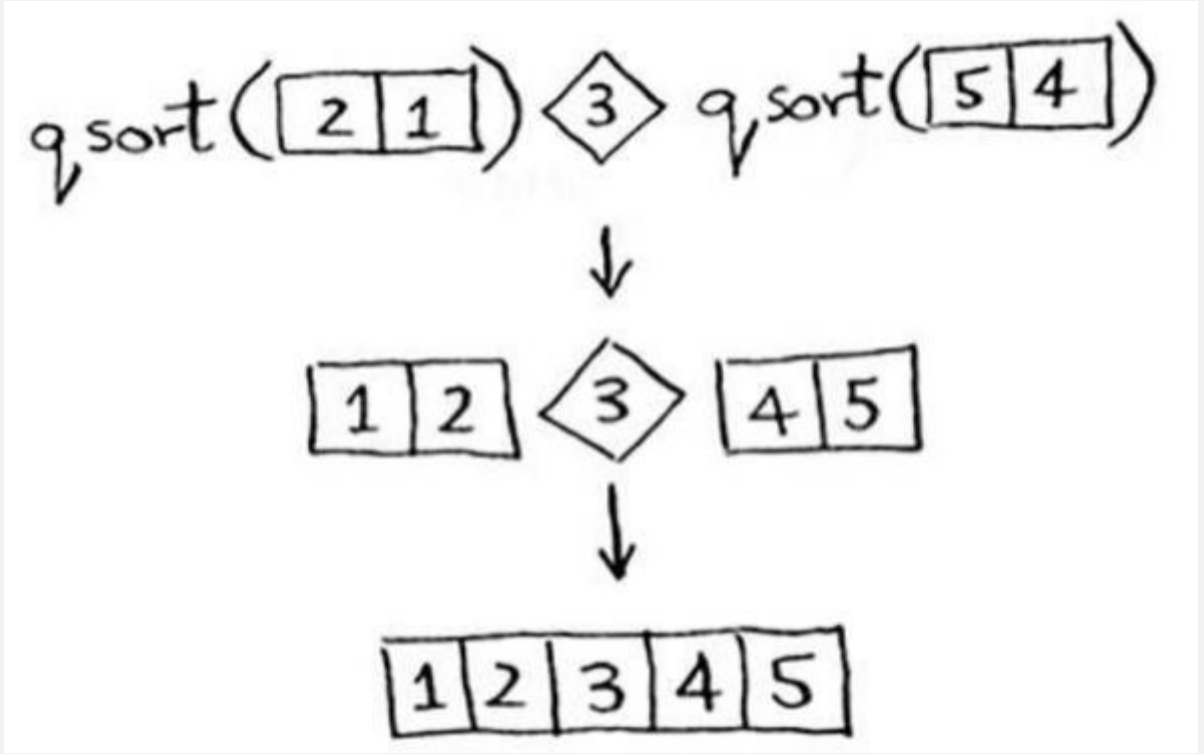
DIVIDE AND CONQUER



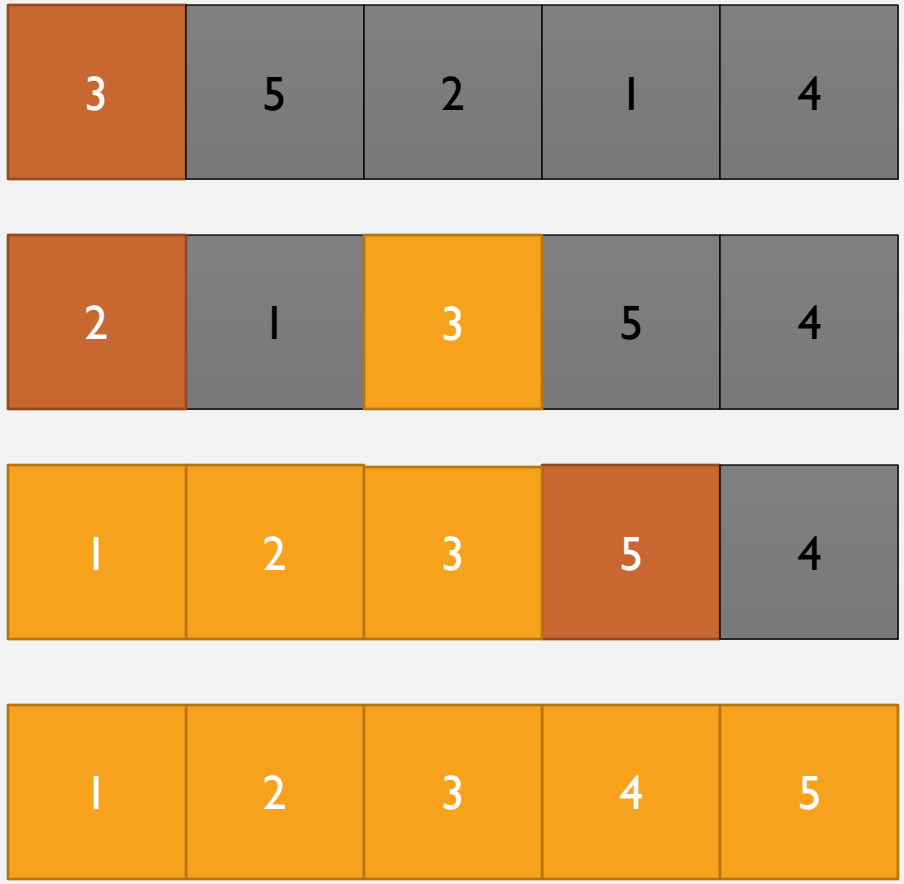
The base case

WHAT ABOUT LARGER ARRAYS?





DIVIDE AND CONQUER APPROACH



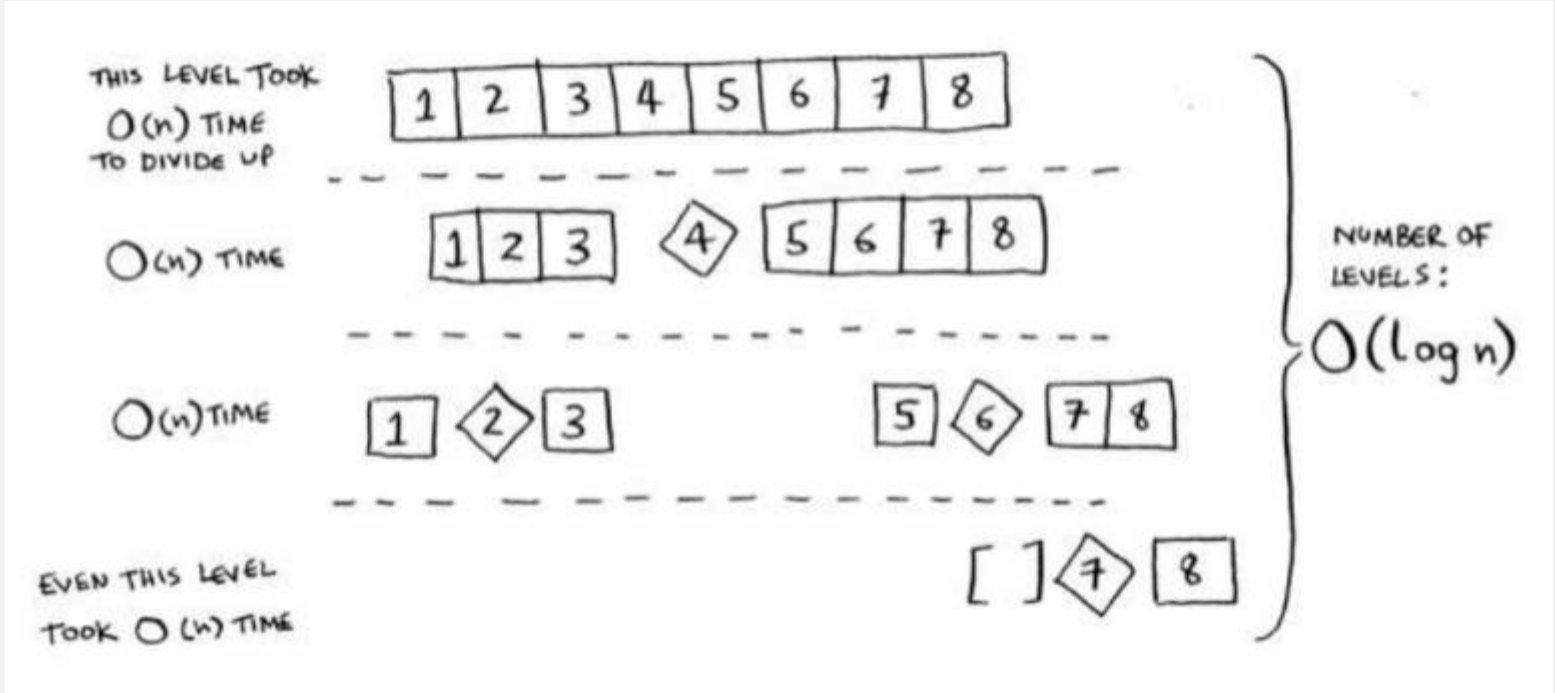
https://visualgo.net/en/sorting

"TALK IS CHEAP
SHOW ME THE CODE"

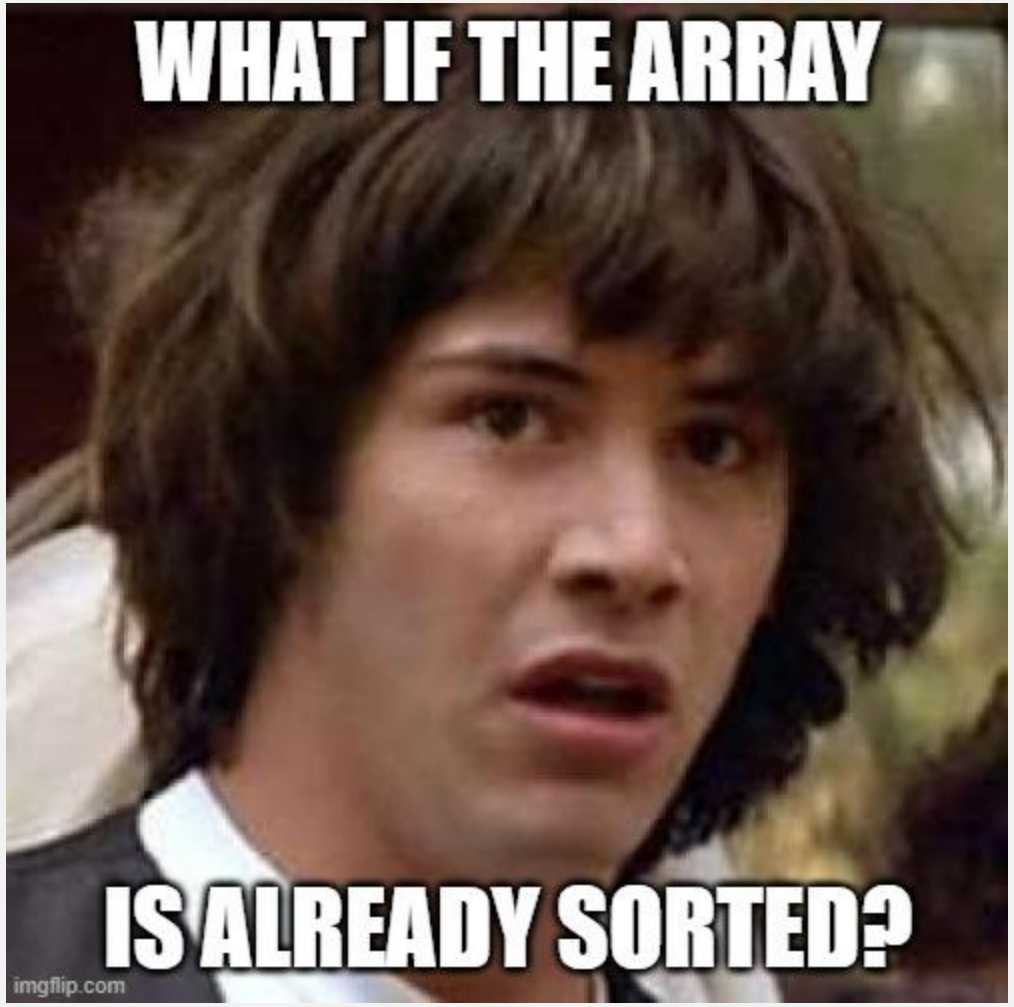
- Linus Torvalds


Cool! But…
How efficient is this?

O(N * LOG(N))



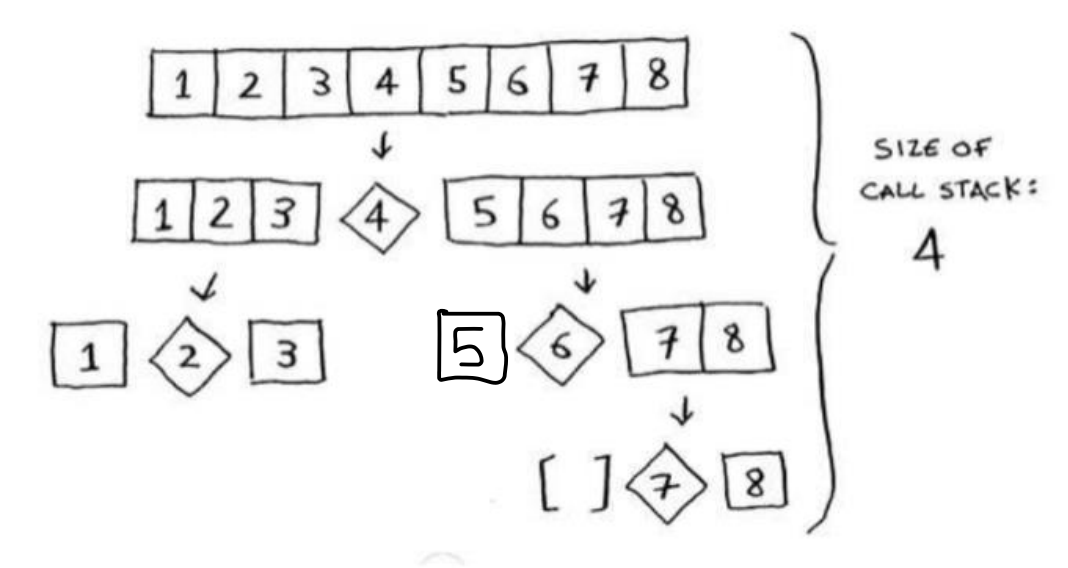
$$O(n) * O(\log(n)) = O(n * \log(n))$$



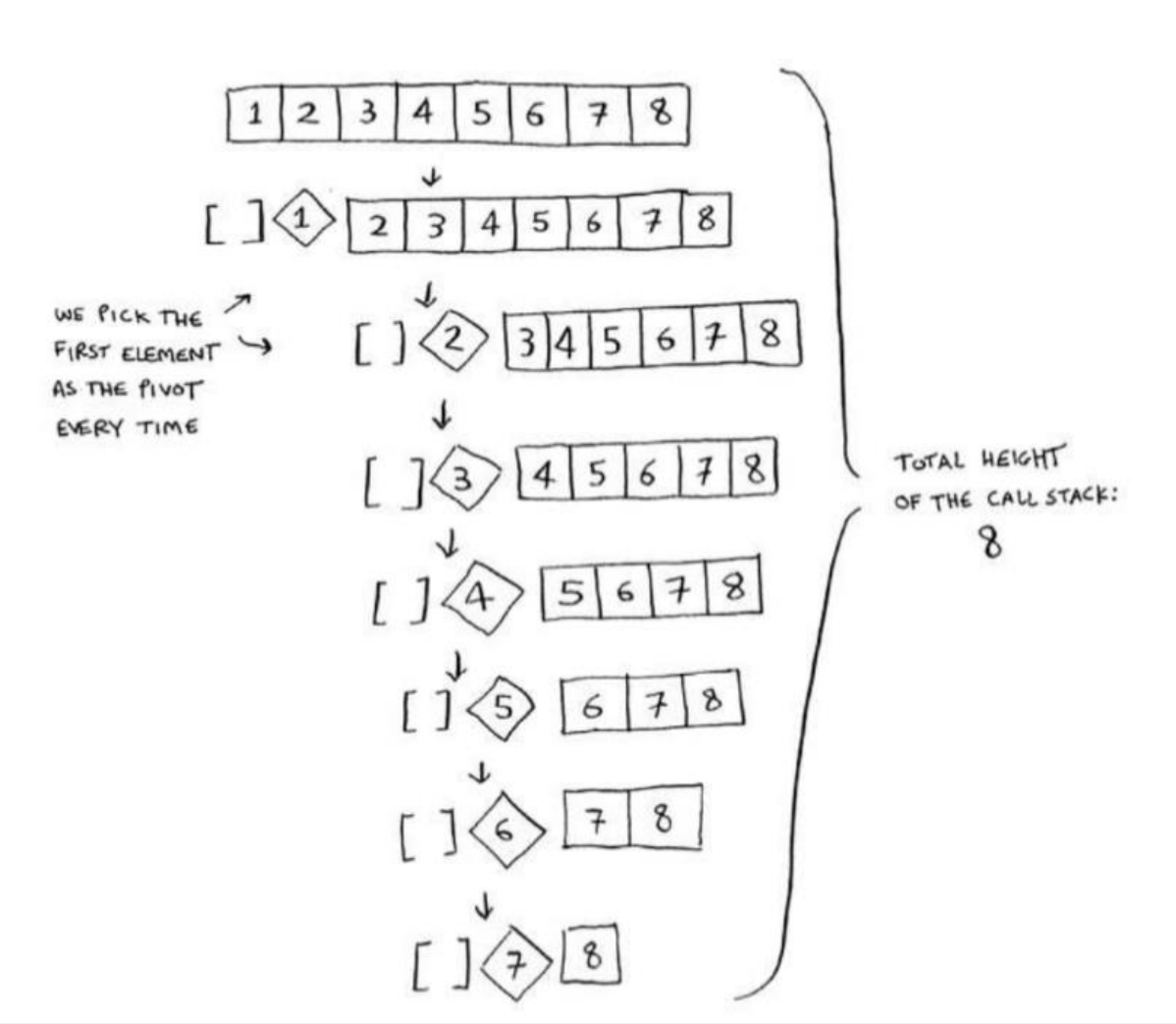
And what if we always pick the first element as the Pivot?

CHOOSE A PIVOT WISELY

Picking the middle element



Picking the first element



WHAT IS THE AVERAGE RUNTIME COMPLEXITY OF QUICKSORT?

- a) O(N)
- b) O(N * log(N))
- c) $O(N^2)$

AND IF THE ARRAY IS ALREADY SORTED?

… and we always pick the first element as pivot.

- a) O(1)
- b) O(N * log(N))
- c) $O(N^2)$

SAVE SPACE

- Code a new version of Quicksort in which the sorting is done in-place, this is, without the help of any other extra array.