Bottom-up mergesort
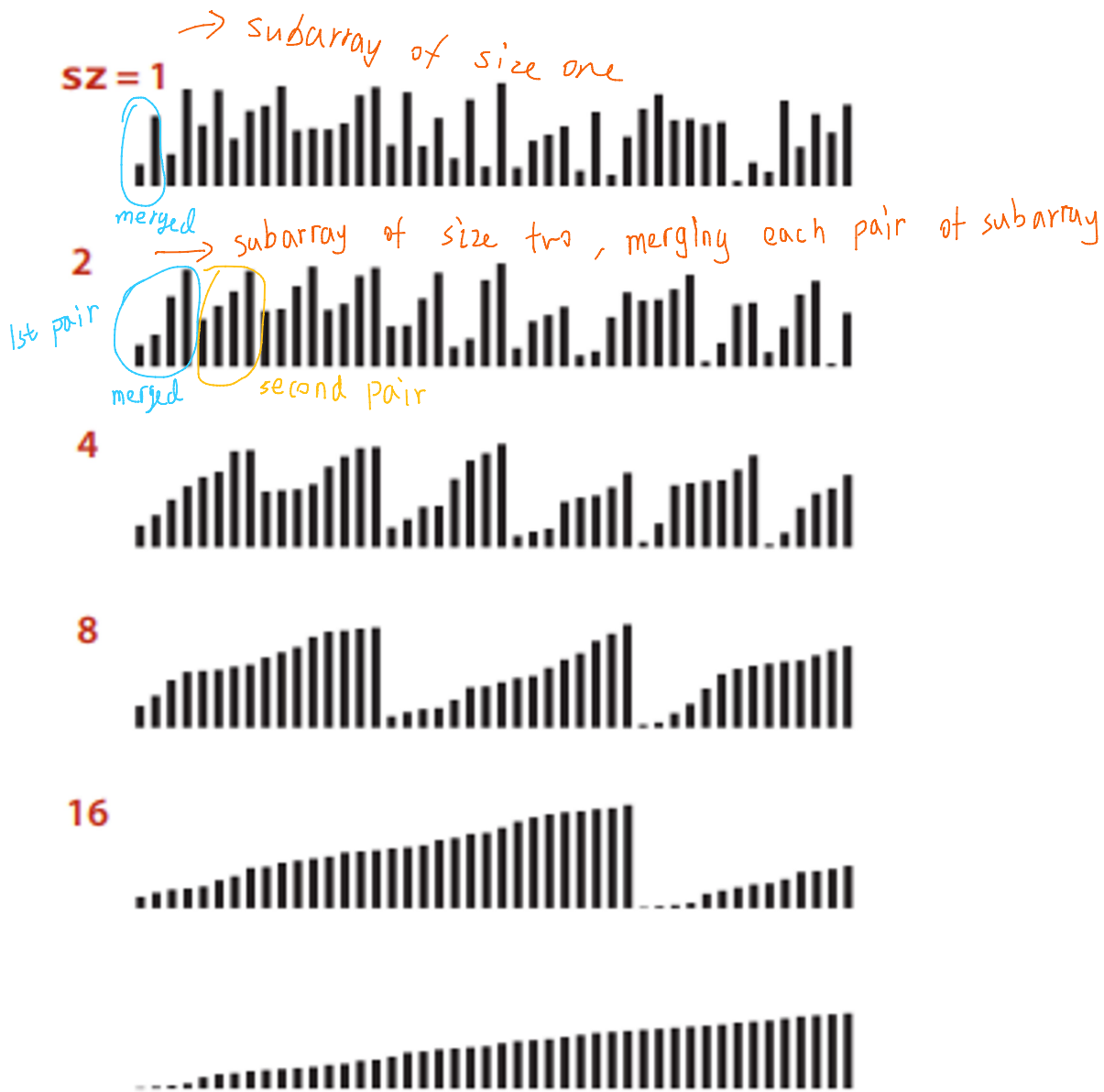
Bottom-up mergesort do all the merges of tiny subarrays on one pass, then do a second pass in pairs,and so forth, continuing until the last pair of subarray is merged

Visual trace of bottom-up mergesort

Bottom-up mergesort

```java
public class MergeBU
{
    private static Comparable[] aux;      // auxiliary array for merges

    // See page 271 for merge() code.

    public static void sort(Comparable[] a)
    {   // Do lg N passes of pairwise merges.
        int N = a.length;
        aux = new Comparable[N];
        for (int sz = 1; sz < N; sz = sz+sz)          // sz: subarray size
            for (int lo = 0; lo < N-sz; lo += sz+sz)  // lo: subarray index
                merge(a, lo, lo+sz-1, Math.min(lo+sz+sz-1, N-1));
    }
}
```

→ doubling the size every pass

Bottom-up mergesort consists of a sequence of passes over the whole array, doing sz-by-sz merges, starting with sz equal to 1 and doubling sz on each pass. The final subarray is of size sz only when the array size is an even multiple of sz (otherwise it is less than sz).

								a[i]								
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	M	E	R	G	E	S	O	R	T	E	X	A	M	P	L	E
sz = 1																
merge(a, 0, 0, 1)	E	M	R	G	E	S	O	R	T	E	X	A	M	P	L	E
merge(a, 2, 2, 3)	E	M	G	R	E	S	O	R	T	E	X	A	M	P	L	E
merge(a, 4, 4, 5)	E	M	G	R	E	S	O	R	T	E	X	A	M	P	L	E
merge(a, 6, 6, 7)	E	M	G	R	E	S	O	R	T	E	X	A	M	P	L	E
merge(a, 8, 8, 9)	E	M	G	R	E	S	O	R	E	T	X	A	M	P	L	E
merge(a, 10, 10, 11)	E	M	G	R	E	S	O	R	E	T	A	X	M	P	L	E
merge(a, 12, 12, 13)	E	M	G	R	E	S	O	R	E	T	A	X	M	P	L	E
merge(a, 14, 14, 15)	E	M	G	R	E	S	O	R	E	T	A	X	M	P	E	L
sz = 2																
merge(a, 0, 1, 3)	E	G	M	R	E	S	O	R	E	T	A	X	M	P	E	L
merge(a, 4, 5, 7)	E	G	M	R	E	O	R	S	E	T	A	X	M	P	E	L
merge(a, 8, 9, 11)	E	G	M	R	E	O	R	S	A	E	T	X	M	P	E	L
merge(a, 12, 13, 15)	E	G	M	R	E	O	R	S	A	E	T	X	E	L	M	P
sz = 4																
merge(a, 0, 3, 7)	E	E	G	M	O	R	R	S	A	E	T	X	E	L	M	P
merge(a, 8, 11, 15)	E	E	G	M	O	R	R	S	A	E	E	L	M	P	T	X
sz = 8																
merge(a, 0, 7, 15)	A	E	E	E	E	G	L	M	M	O	P	R	R	S	T	X

first pass (inner loop) — brace spanning the sz = 1 merges

Trace of merge results for bottom-up mergesort