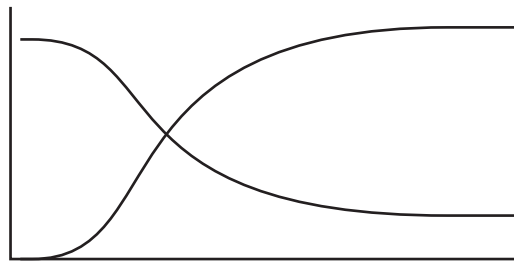


Growth Curves

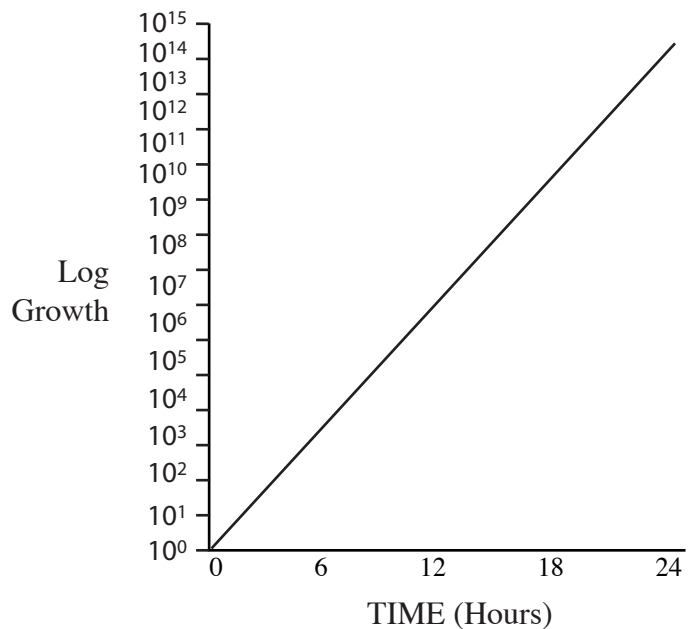
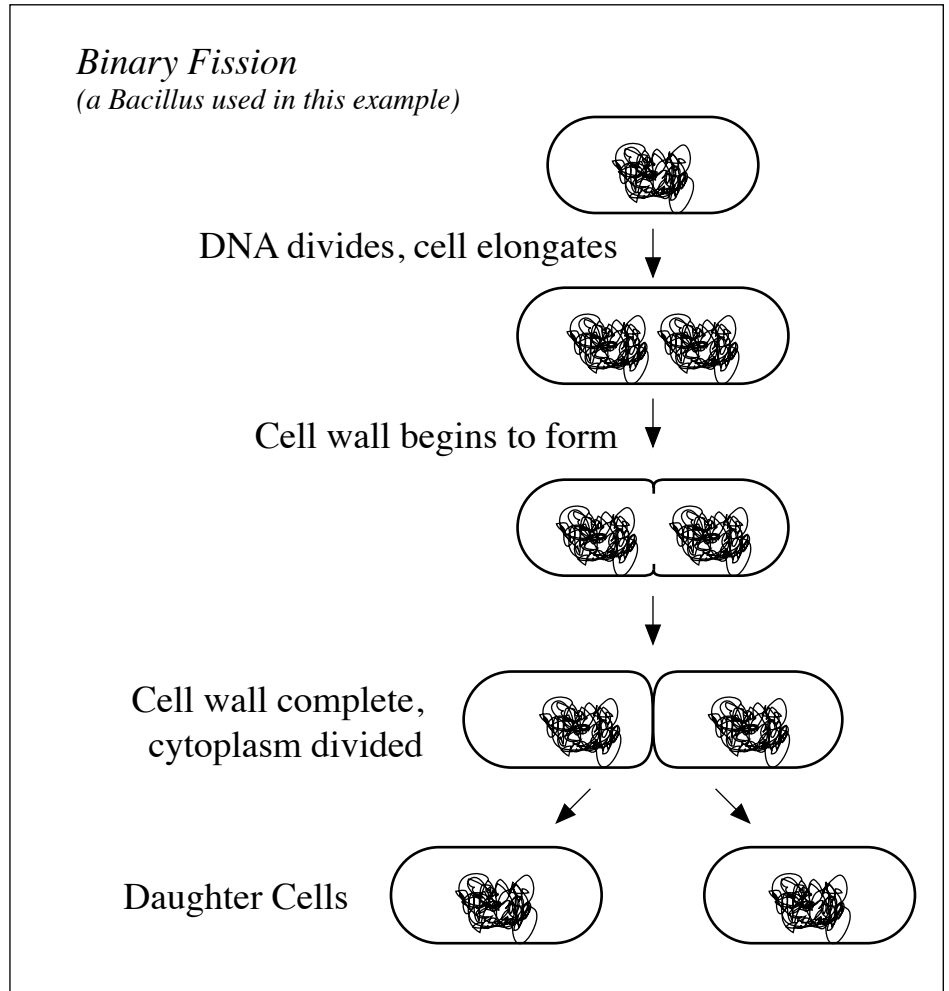
Generalized
Growth Curves
to Accompany Lecture



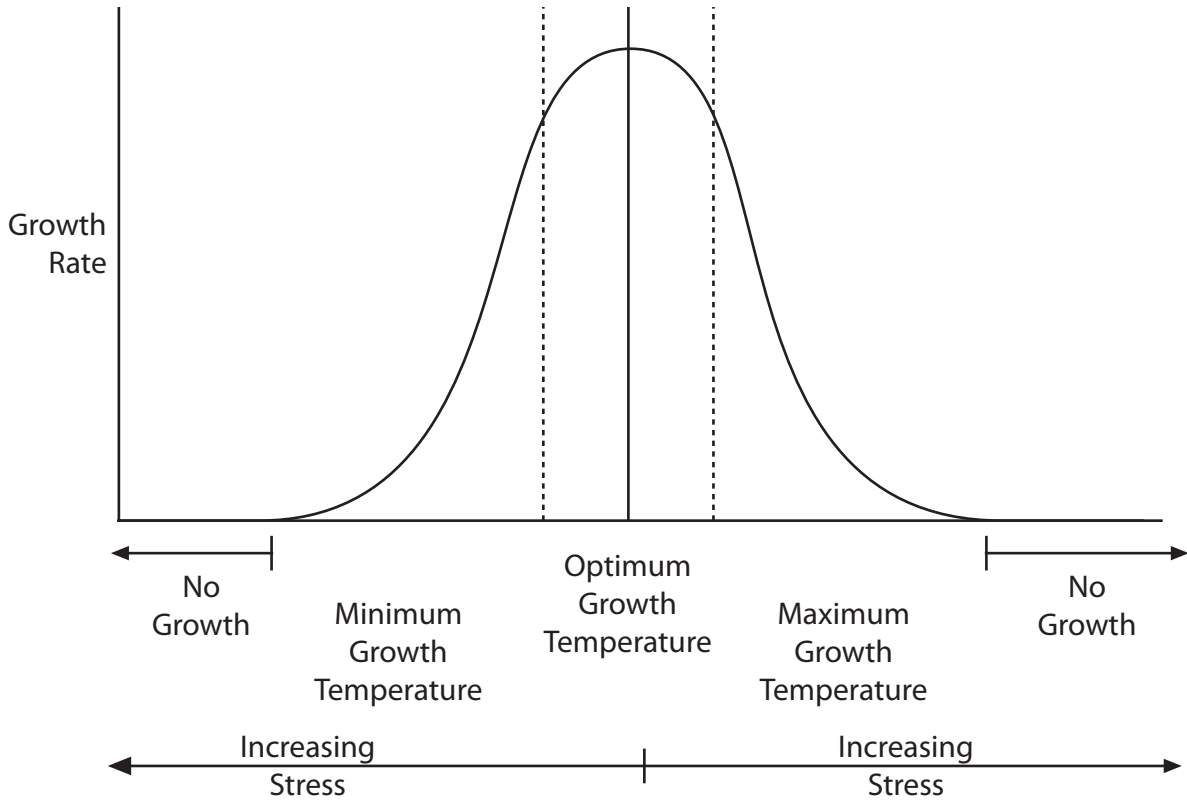
By Noel Ways

Bacterial Growth of *Staphylococcus aureus* over a 24 hour period (Generation Time: 30 minutes)

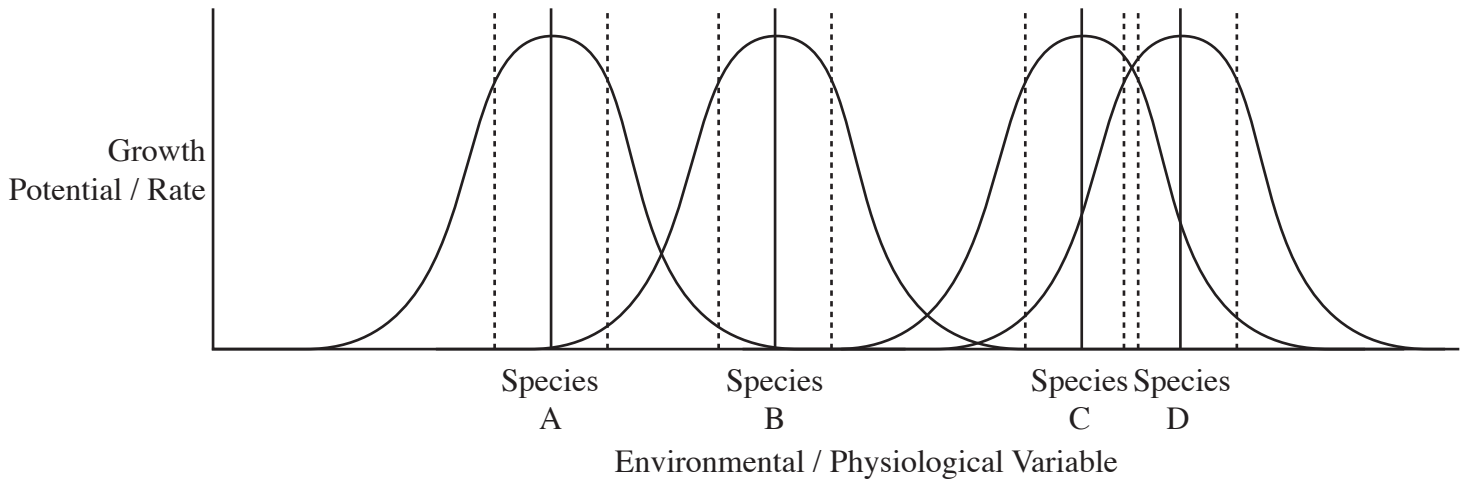
0	1
0.5	2
1.0	4
1.5	8
2.0	16
2.5	32
3.0	64
3.5	128
4.0	256
4.5	512
5.0	1,024
5.5	2,048
6.0	4,096
6.5	8,192
7.0	16,384
7.5	32,768
8.0	65,536
8.5	131,072
9.0	262,144
9.5	524,288
10.0	1,048,576
10.5	2,097,152
11.0	4,194,304
11.5	8,388,608
12.0	16,777,216
12.5	33,554,432
13.0	67,108,864
13.5	134,217,728
14.0	268,435,456
14.5	536,870,912
15.0	1,073,741,824
15.5	2,147,483,648
16.0	4,294,967,296
16.5	8,589,934,592
17.0	17,179,869,184
17.5	34,359,738,368
18.0	68,719,476,736
18.5	137,438,953,472
19.0	274,877,906,944
19.5	549,755,813,888
20.0	1,099,511,627,776
20.5	2,199,023,255,552
21.0	4,398,046,511,104
21.5	8,796,093,022,208
22.0	17,592,186,044,416
22.5	35,184,372,088,832
23.0	70,368,744,177,664
23.5	140,737,488,355,328
24.0	281,474,976,710,656



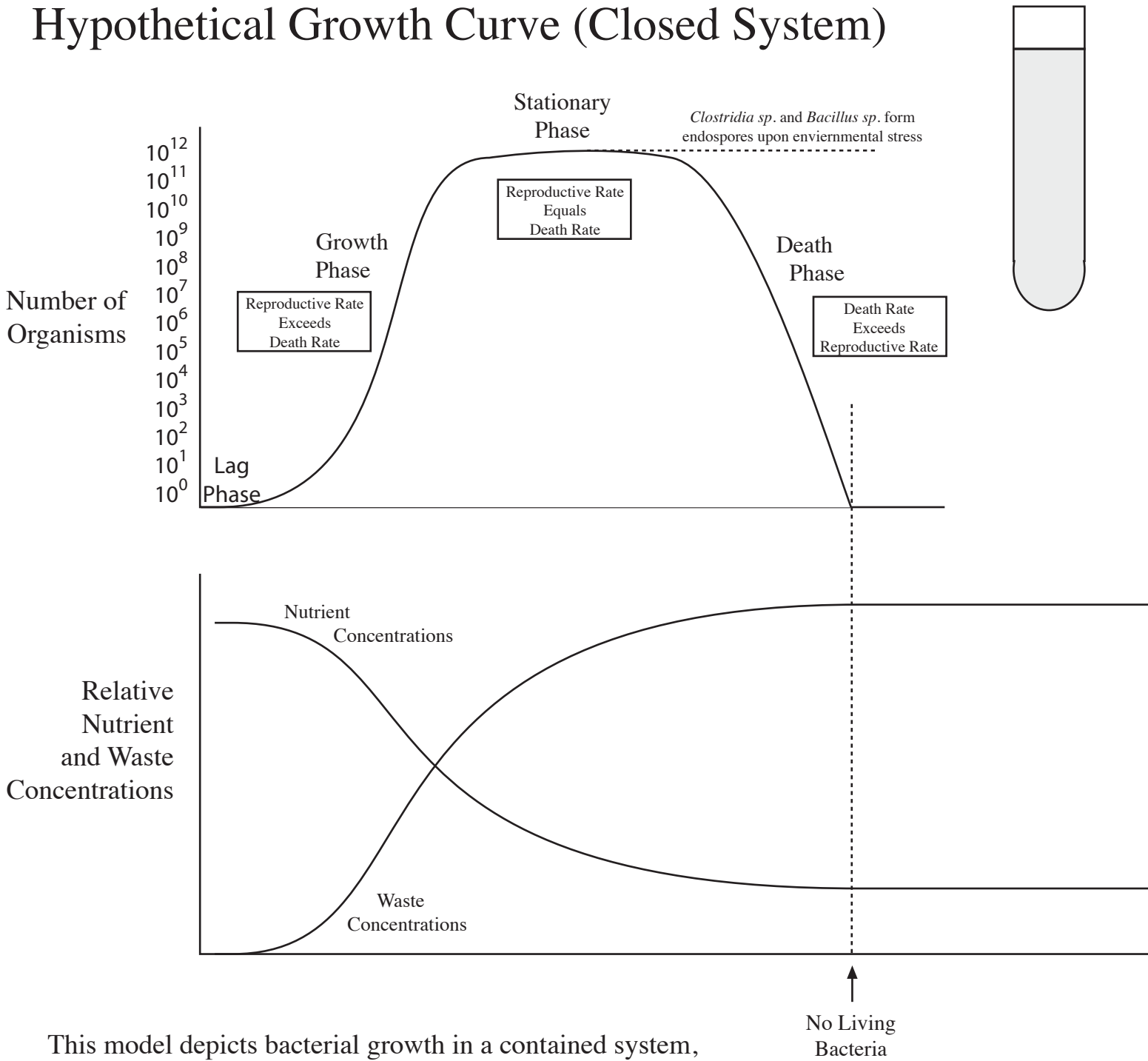
A General Growth Curve



Effect of variations in physiological variables. Examples of such variables are Temperature (shown here) but also pH, osmotic pressures, oxygen concentrations etc etc.



Hypothetical Growth Curve (Closed System)

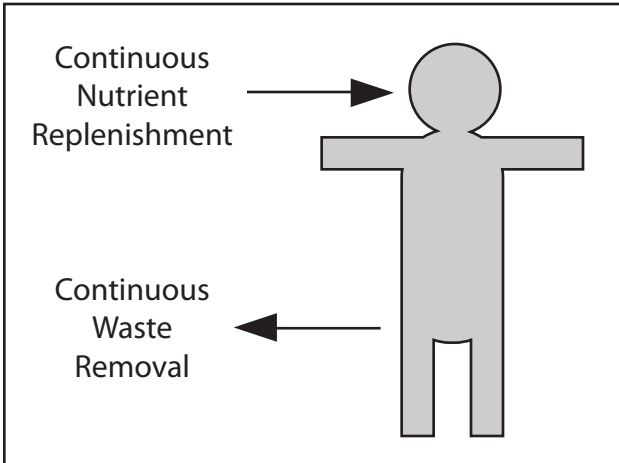


This model depicts bacterial growth in a contained system, such as a test tube. Note the effect of the bacterial growth on nutrient and waste concentrations; and then as these concentration change, their effect on bacterial growth.

Note that during the stationary phase, bacteria are still alive and therefore nutrients continue to decline and waste continues to increase. This will continue until there are no living bacteria.

Due to endospore forming capabilities, *Clostridia sp.* and *Bacillus sp.* do not have a death phase.

Hypothetical Growth Curve (Open System)



This model depicts an open system where there is a continuous replenishment of nutrients and a continuous removal of waste products. In such case, extinction of the bacterial does not occur, but the population stabilizes. Population size will reflect the relative nutrient supply and waste removal as well as many other environmental factors. This is the typical scenario that occurs in nature.

