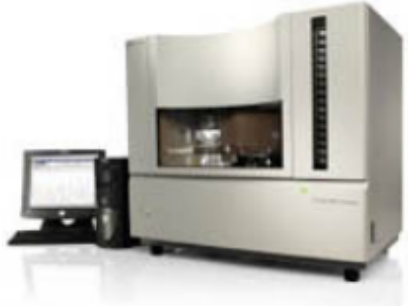
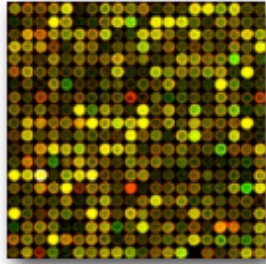


Next generation sequencing

Steven Salzberg



Sanger DNA
sequencing
1977-1990s



DNA Microarrays
Since mid-1990s



2nd Generation
DNA Sequencing
Since ~2007



3rd Generation
& single molecule
Sequencing
Since ~ 2010

T
A
C
A
C
C
A
G
G
G

Single-stranded DNA
Template

Free nucleotides

A
T
C
G
G
C

+

+

DNA Pol

=

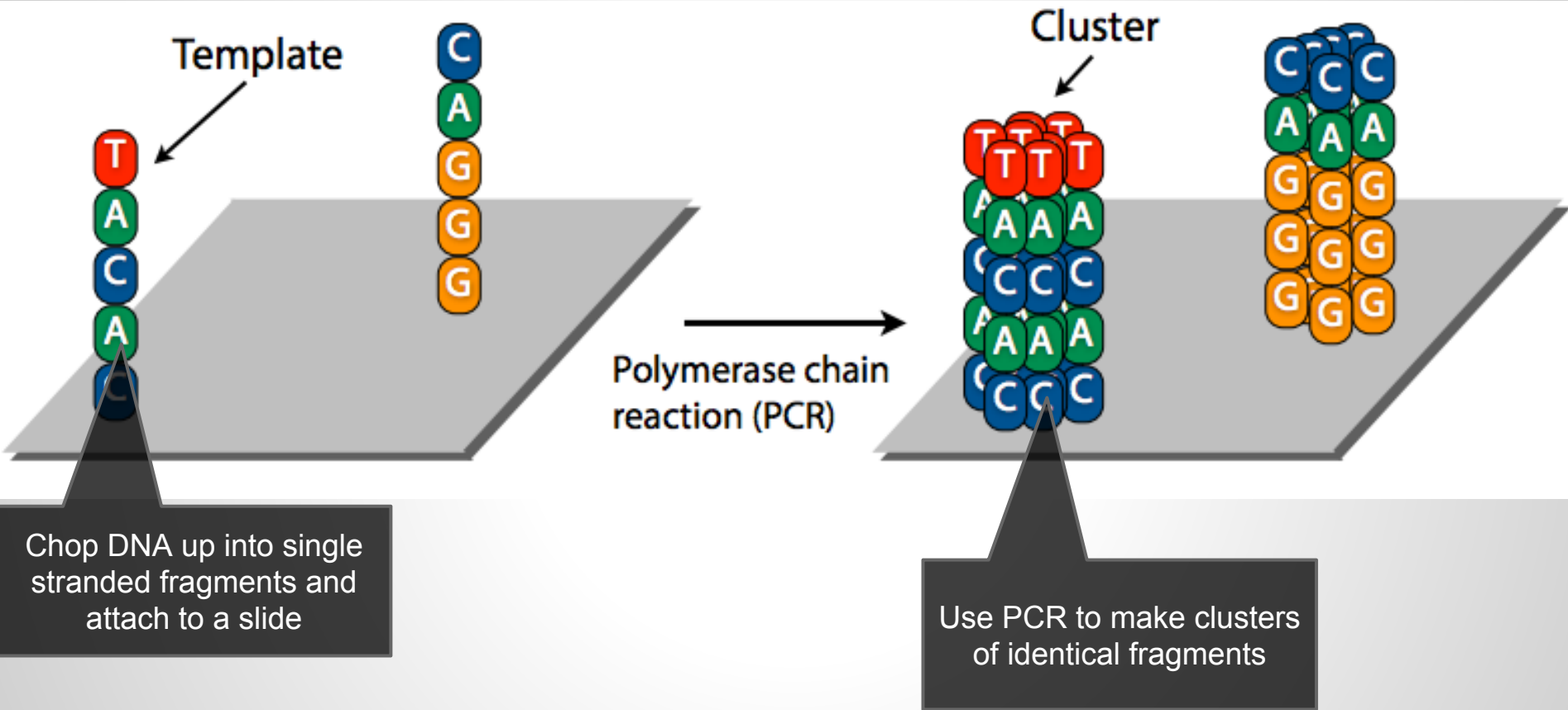
DNA Polymerase

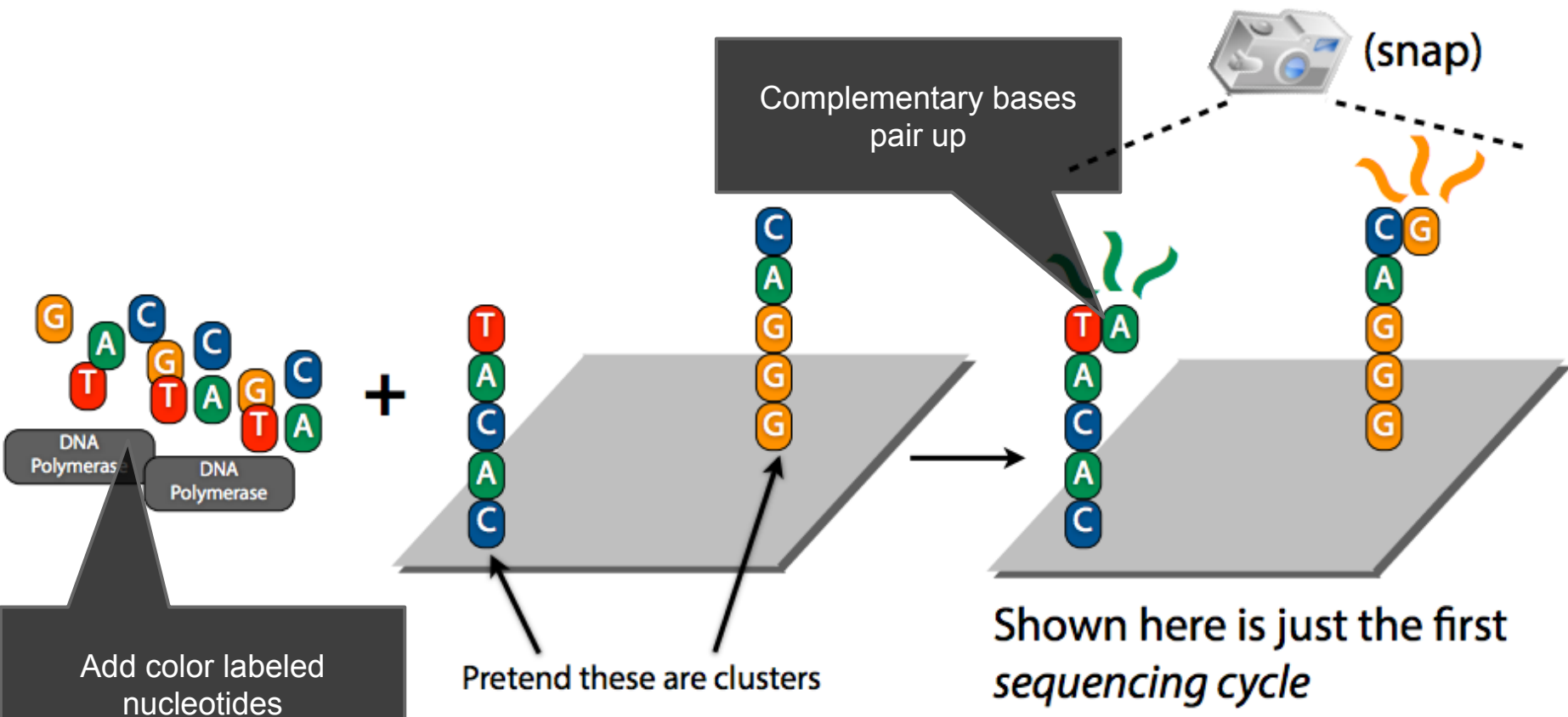
Strand synthesis

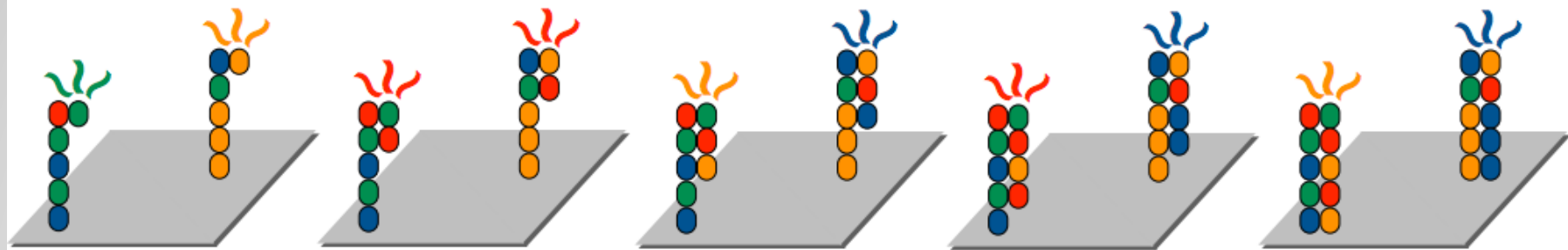
T
A
C
A
C
C
G
A
T
G
C
G
C
G
C
3' 5'

zip!

Slide adapted from Ben Langmead







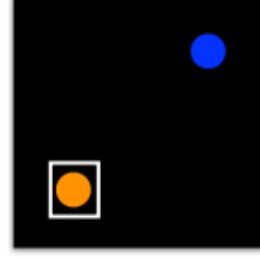
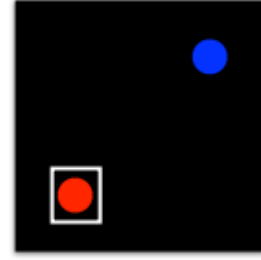
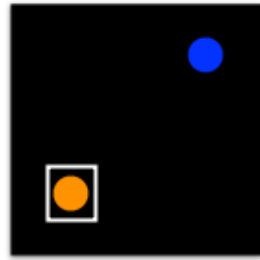
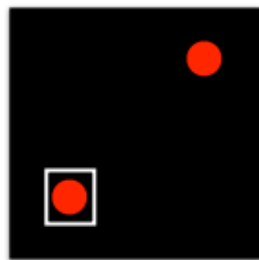
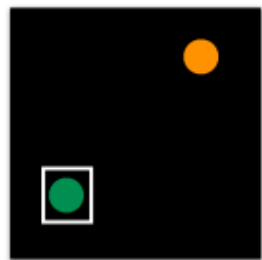
Cycle 1

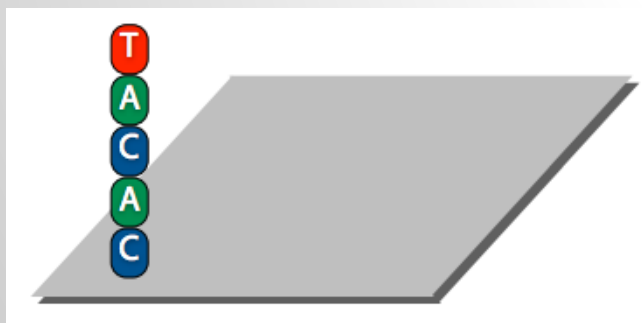
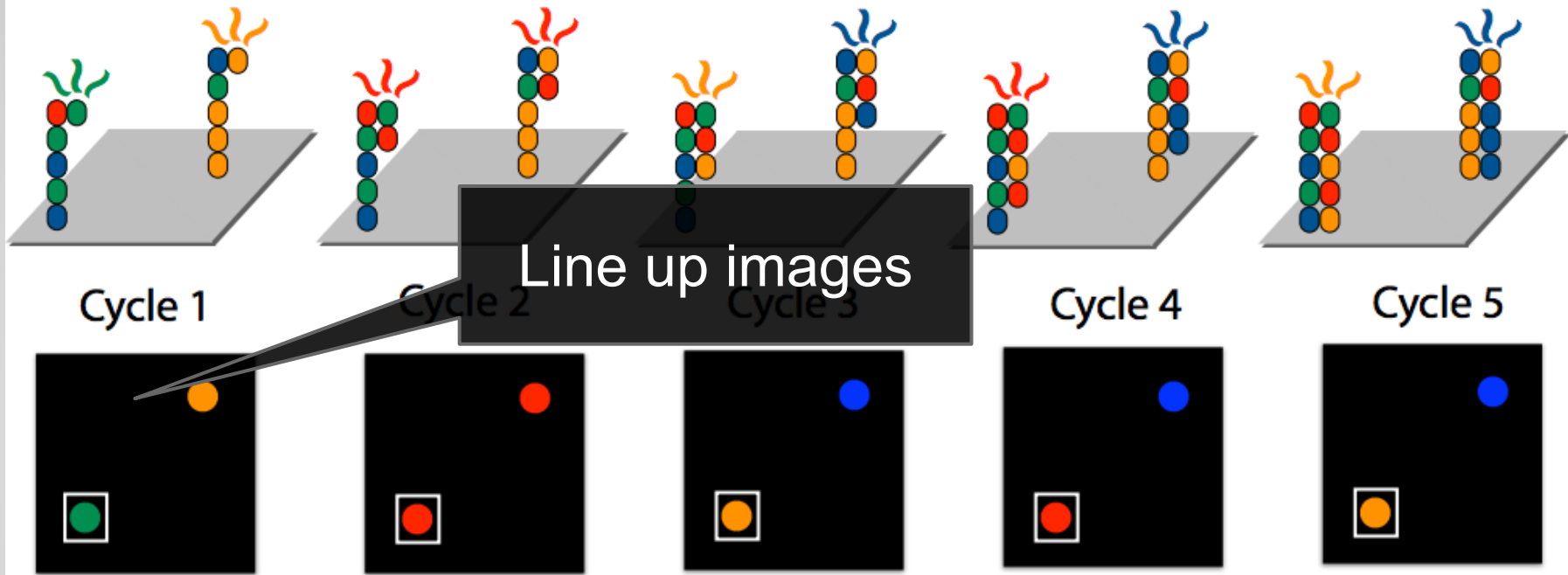
Cycle 2

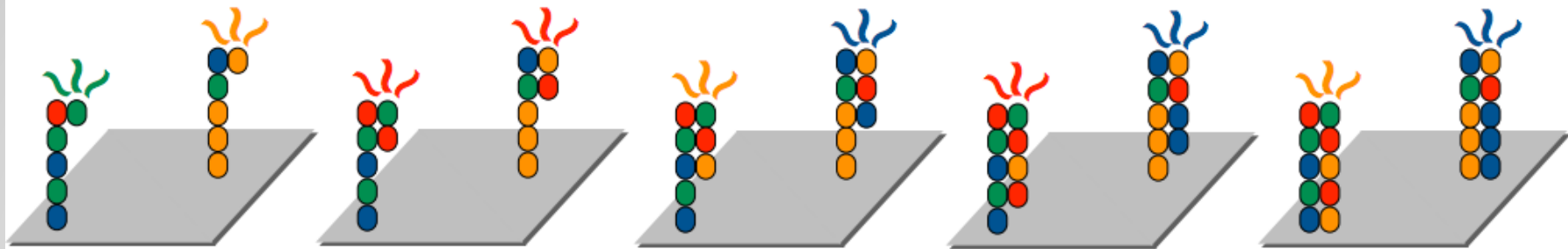
Cycle 3

Cycle 4

Cycle 5







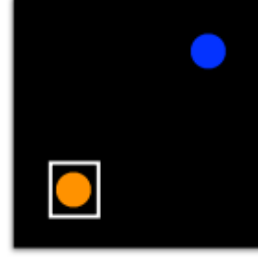
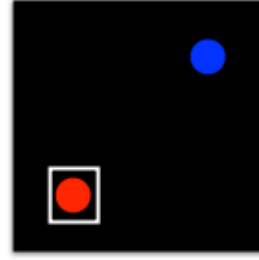
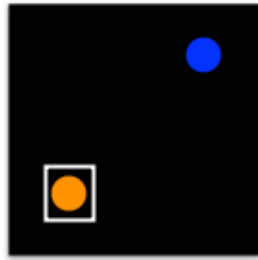
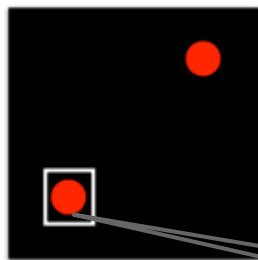
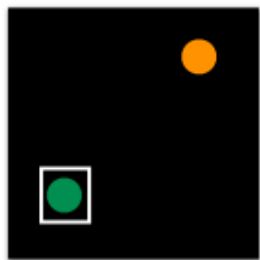
Cycle 1

Cycle 2

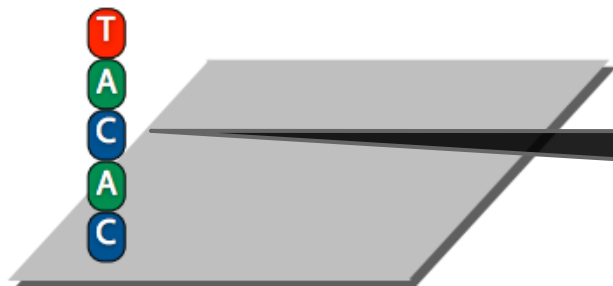
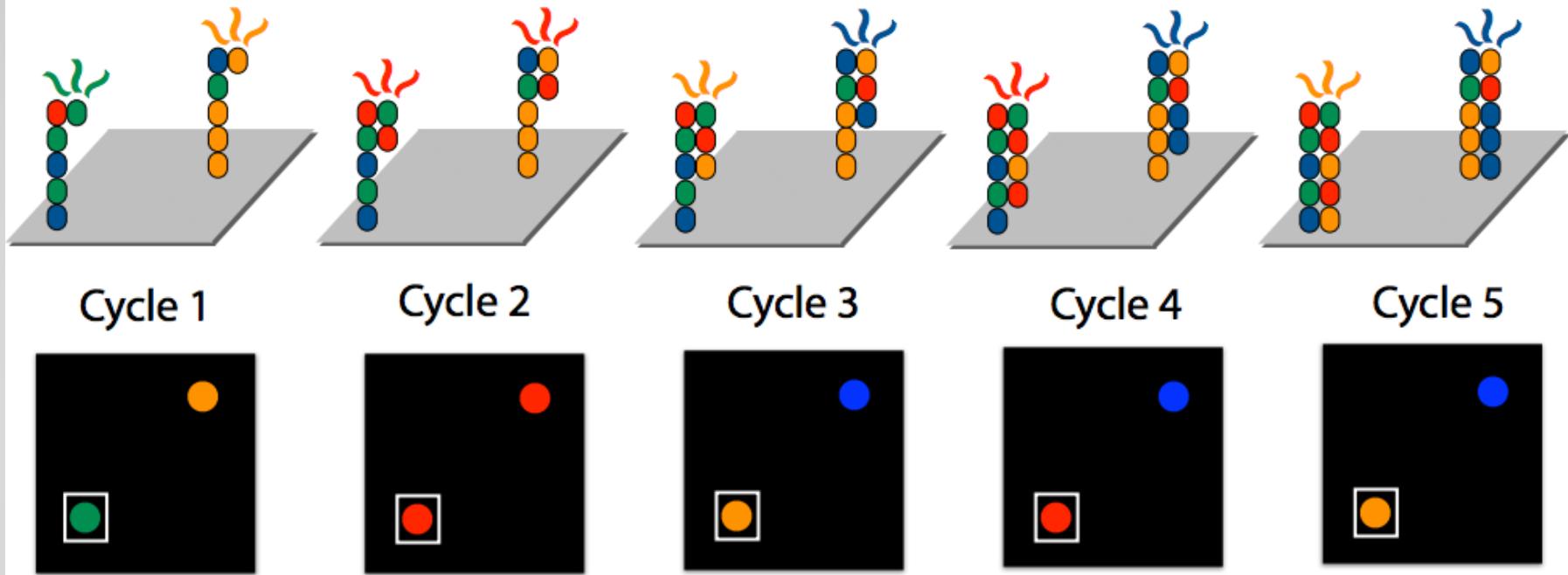
Cycle 3

Cycle 4

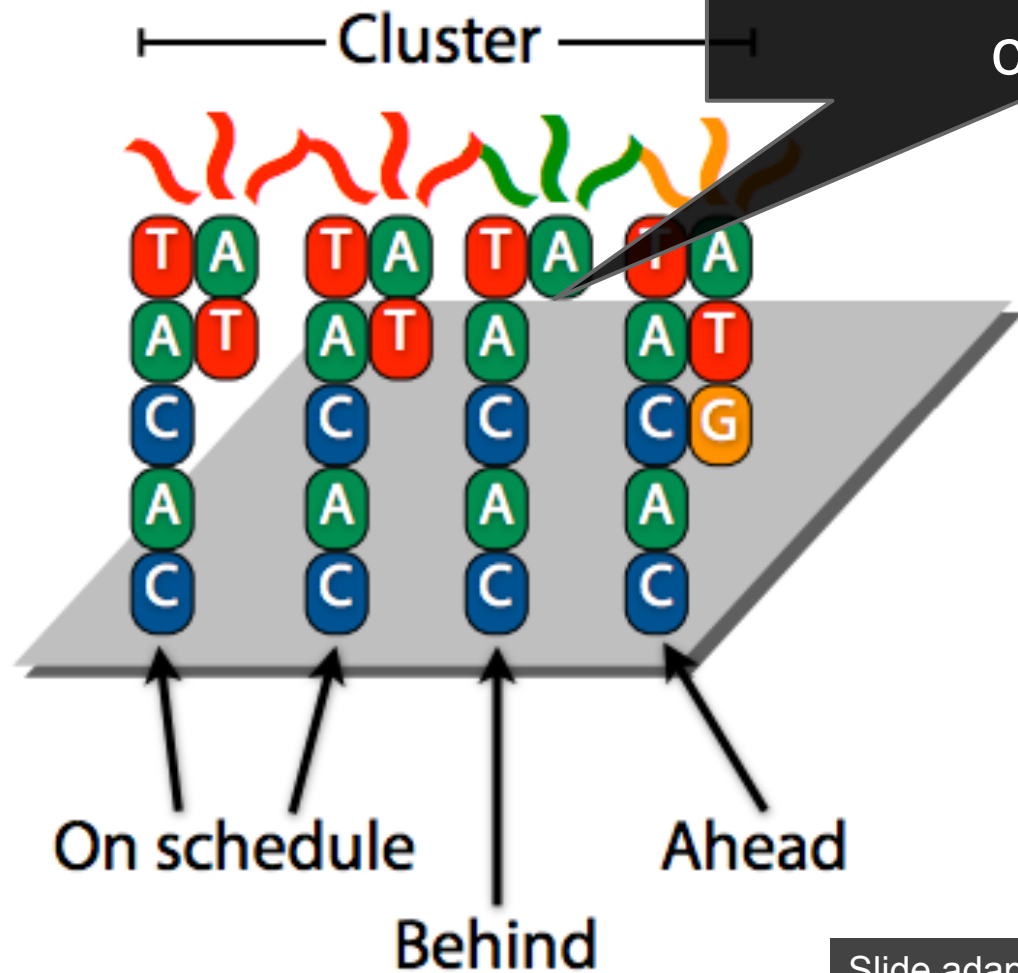
Cycle 5



Look at sequence of
colors at same spot



Call complementary
bases



[illegible][illegible]