



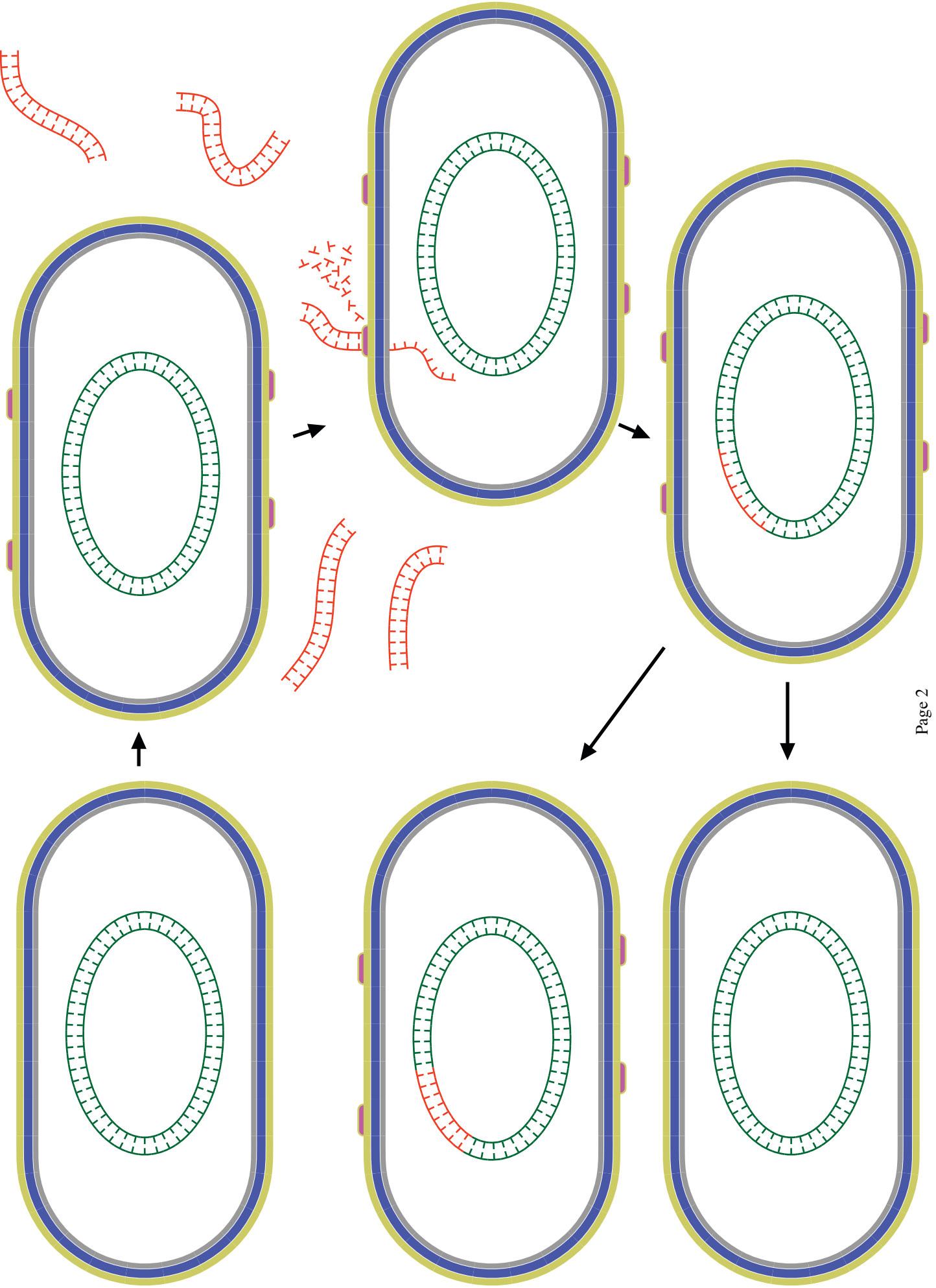
Bacterial Genetics

A Pictorial Guide to
Generalized and Restricted Transduction,
and the
Lysogenic and Lytic Cycles

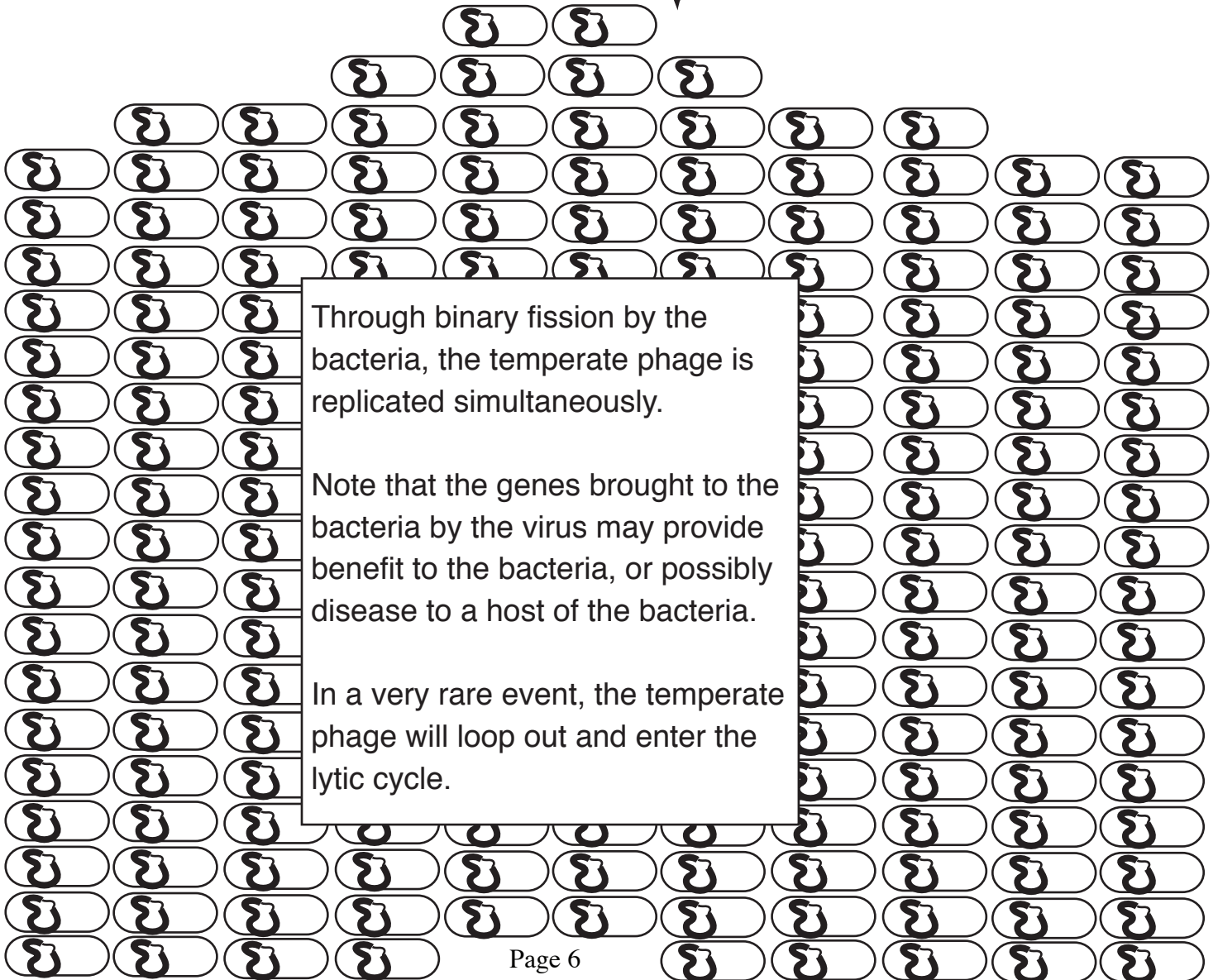
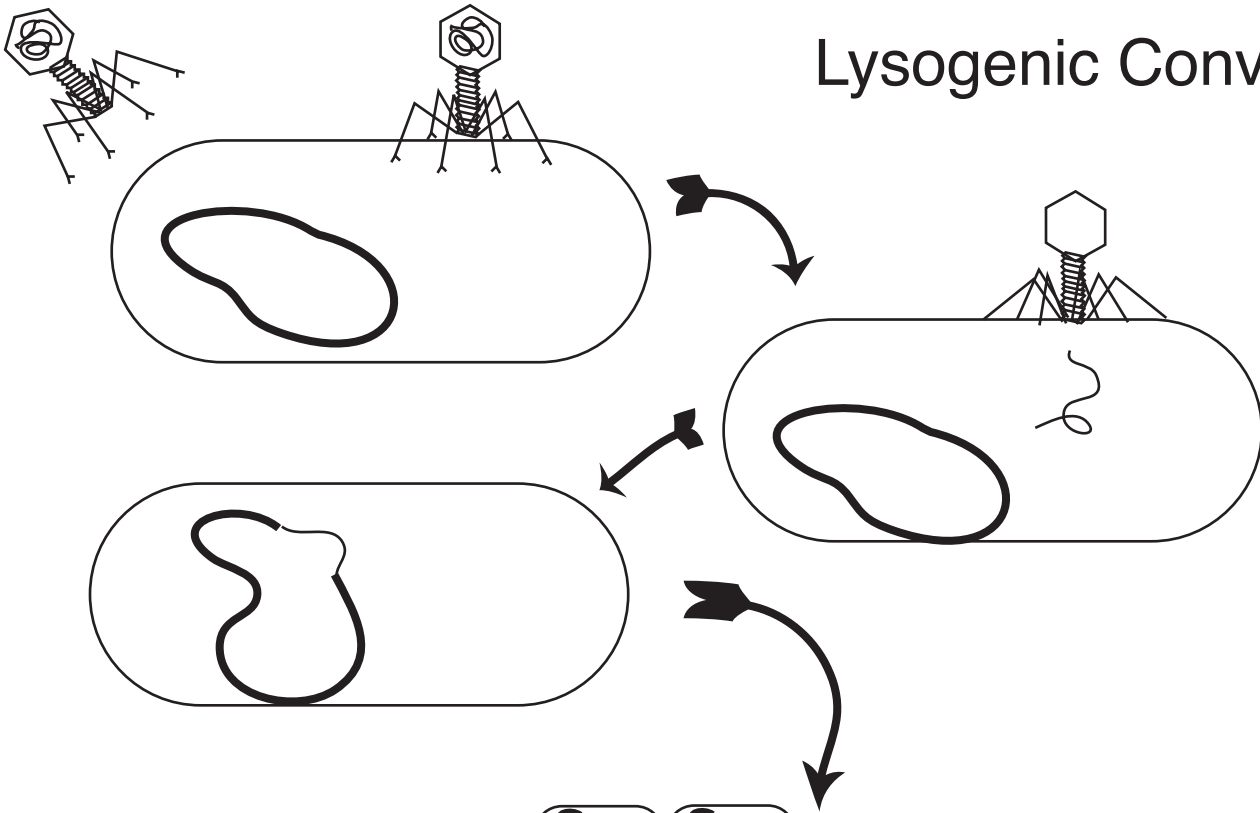


By Noel Ways

Transformation



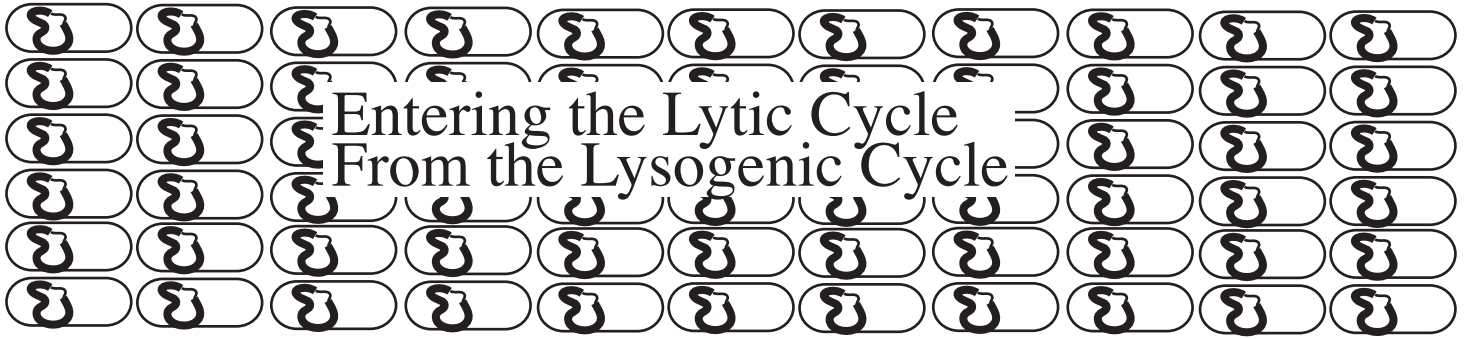
Lysogenic Conversion



Through binary fission by the bacteria, the temperate phage is replicated simultaneously.

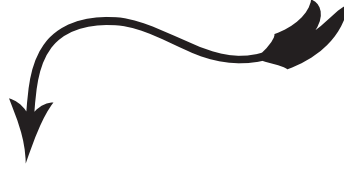
Note that the genes brought to the bacteria by the virus may provide benefit to the bacteria, or possibly disease to a host of the bacteria.

In a very rare event, the temperate phage will loop out and enter the lytic cycle.

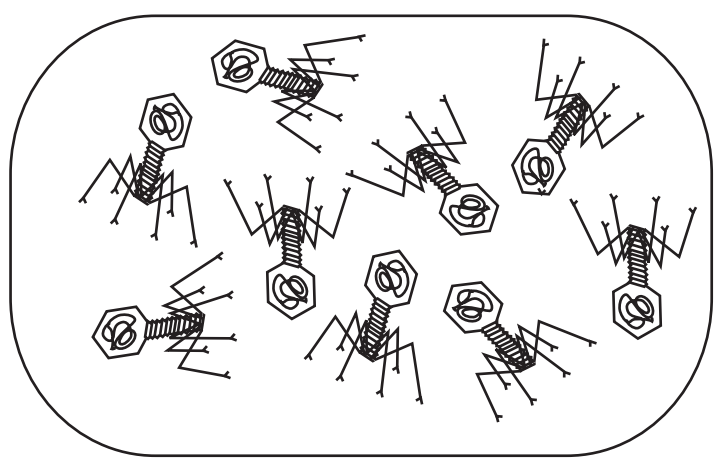
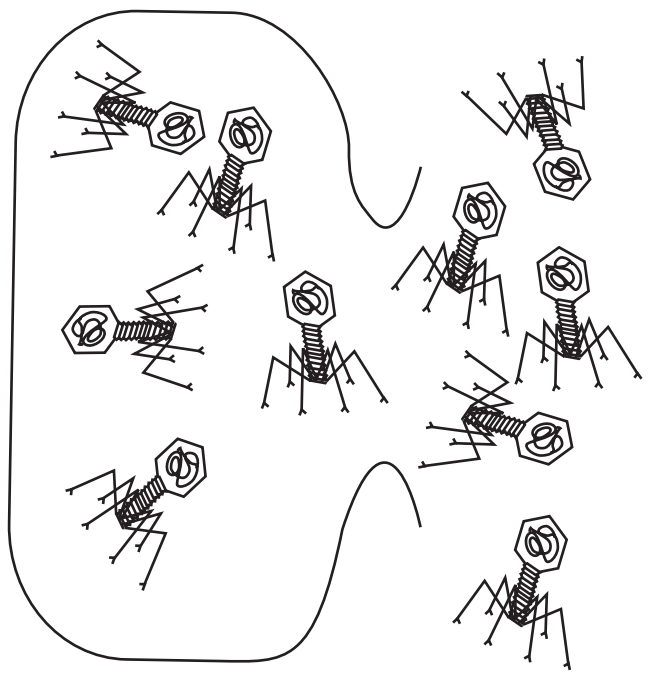
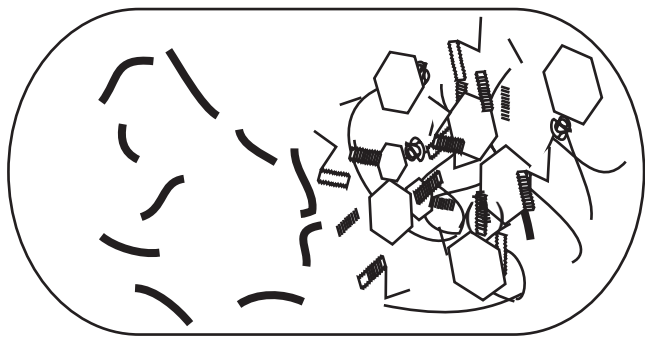
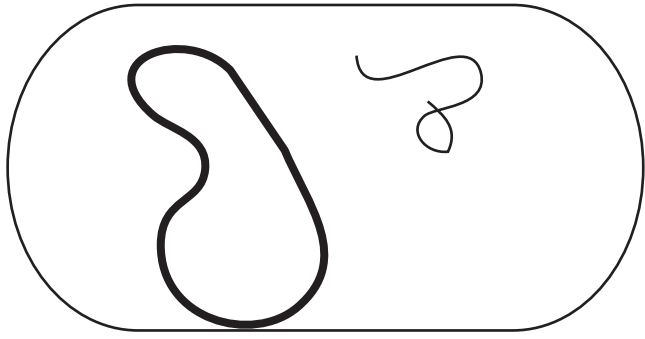
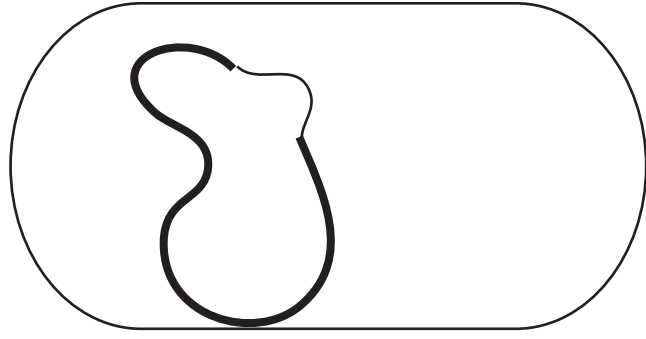


Entering the Lytic Cycle From the Lysogenic Cycle

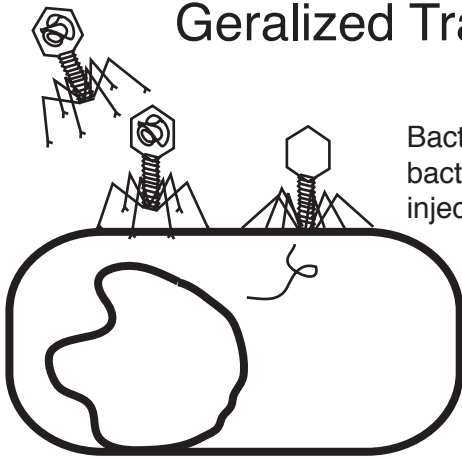
In a rare event, one of the temperate phages loops out and enters the lytic cycle



Most of these newly formed bacteriophages will enter the lytic cycle, some may enter the lysogenic cycle.



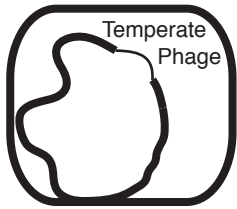
Generalized Transduction



Bacteriophage, lands on bacteria, "squats" and injects genetic material

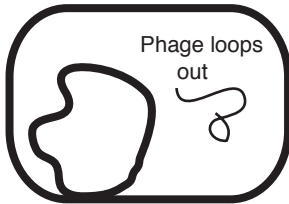


Virus DNA attaches to host cell DNA



Temperate Phage

Virus inserts into host cell DNA - becomes a Temperate Phage. The bacteria is said to have undergone a Lysogenic Conversion. By binary fission, the bacteria will multiply prolifically and multiply the temperate phage simultaneously.



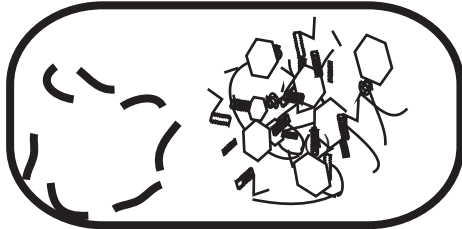
Phage loops out

Once in a "blue moon" a temperate phage loops out and enters the lytic cycle

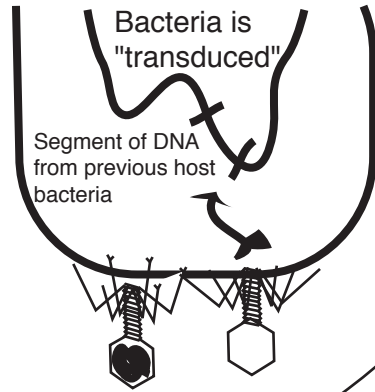
Replication of DNA and viral components.



Lytic enzymes also will be produced.



Bacterial DNA digested.

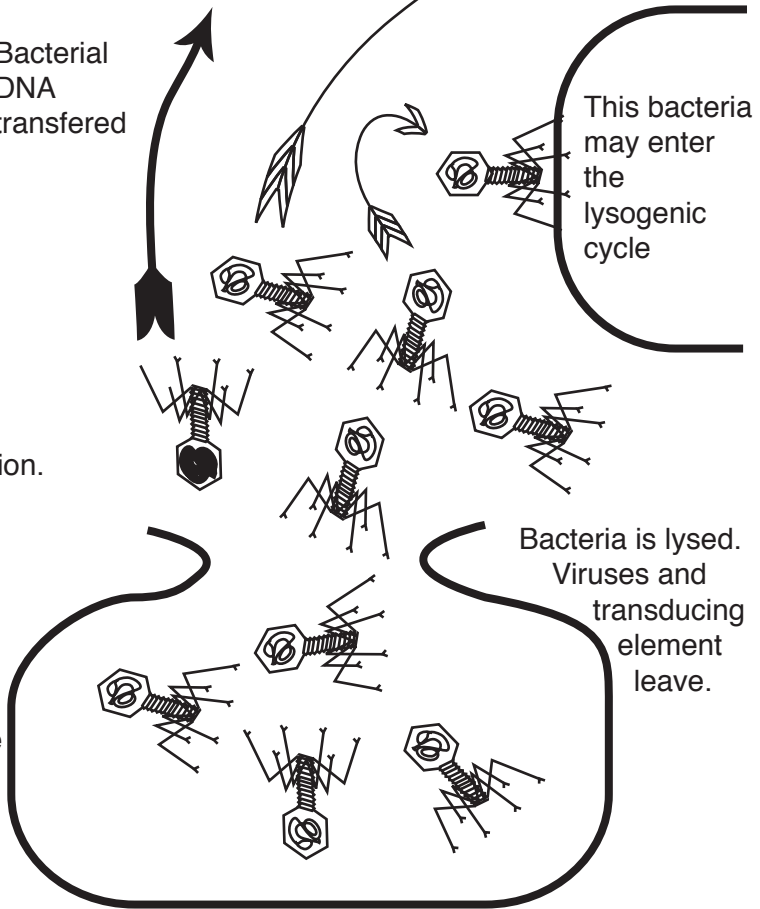


Bacteria is "transduced"
Segment of DNA from previous host bacteria

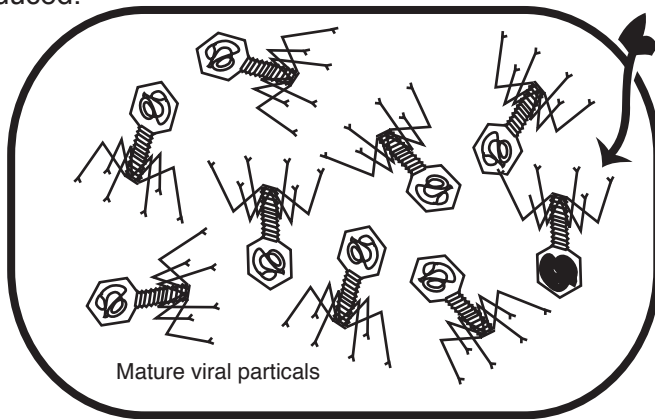
This bacteria may enter the lytic cycle

Bacterial DNA transferred

This bacteria may enter the lysogenic cycle



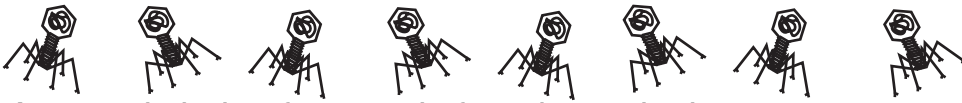
Bacteria is lysed. Viruses and transducing element leave.



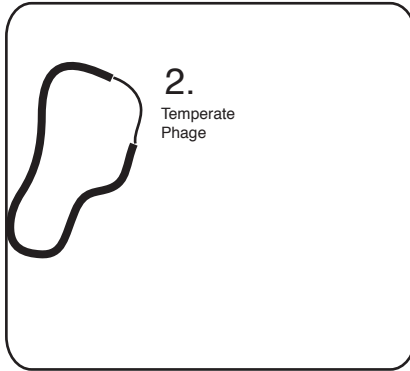
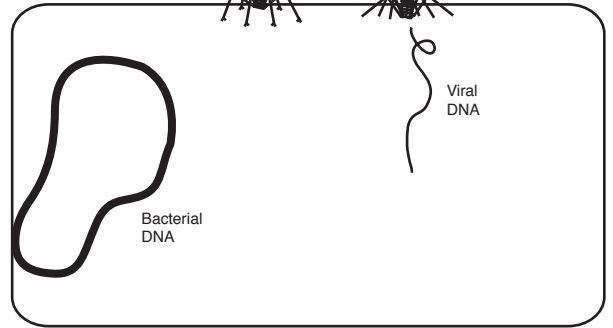
Mature viral particals

By mistake, bacterial DNA gets into a viral Partical. This is NOT a virus! But the virus "shell" will be used to transfer the bacteria DNA to another bacteria.

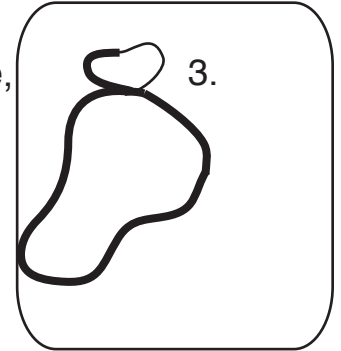
Restricted Transduction



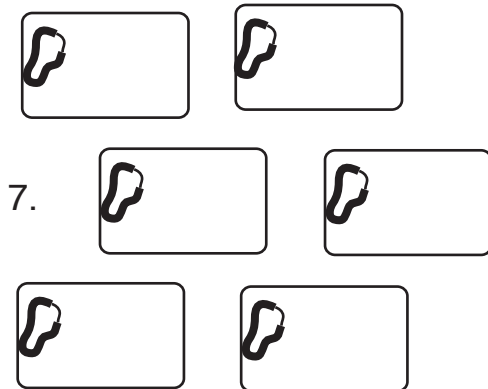
A normal chain of events is for a bacteriophage to enter the lytic or lysogenic cycle. Here, the lysogenic cycle results in a virus incorporating (2) into the host cell genome, and becoming a temperate phage. The bacteria has undergone a lysogenic conversion.



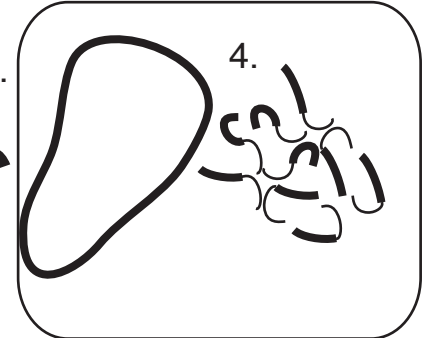
In restricted transduction, the temperate phage loops out and enters the lytic cycle, but it loops out incorrectly and it takes with it one or more of the bacterial genes that are immediately adjacent to it (3) (transduction is "restricted" to the genes on either side of temperate phage).



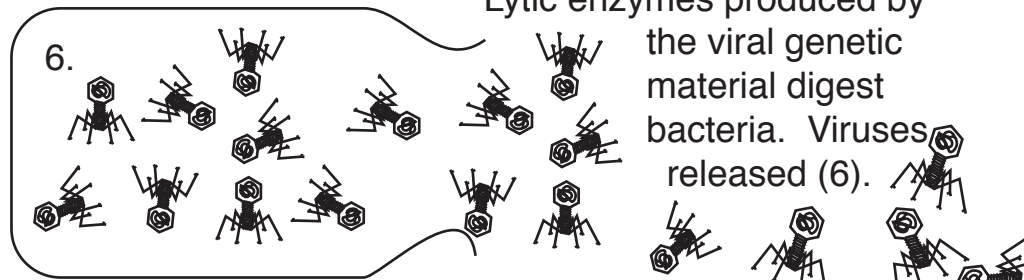
As the bacteria divides by binary fission, the temperate phage divides with it, as it is incorporated into host cell genome. Viral genes and their products are now available to the bacteria (7).



As the viral genetic material replicates itself it replicates the bacterial genes that it "mistakenly" took with it (4). Viral components made (5).



Viral components assemble, each of which contain the "hyjacked" bacterial genes. Lytic enzymes produced by the viral genetic material digest bacteria. Viruses released (6).



If the new viral particles infect and integrate into a new host bacteria, the new host bacteria will receive previous bacteria's genes. Here, the bacteria used restricted transduction to change their genome - possibly making it better able to survive in a hostile environment!