What is the Black queen hypothesis?

A. Selection for streamlined genomes will result in all members of a community producing only a subset of the required leaky goods.

B. Parasites are the first thing to evolve, after life springs up *de novo*.

C. Life is like an arms race, where all life forms have to run faster and faster just to stay in place.

D. DNA based organisms took over from the RNA world, after DNA was created by a virus in an act of genome warfare.

E. None of the above.

Two BLASTp hits have E-values of 0.0 and 1e-67. Which of these statements is true?

A) 1e-67 is a very large negative number, giving a highly significant match

B) E-values of 0 aren't possible

C) 1e-67 is a very small positive number, indicating a significant match

D) an unexpected intein probably corrupted the PSSM, and it zeroed out

E) these proteins almost certainly are ATPase subunits from an extinct Archaeon

F) you forgot to format the database first (makeblastdb), a common mistake

G) the only way to tell if these hits are significant is to look at the percent identity of the high-scoring segment pairs (HSPs)

H) 1e-67 looks like an isoelectric point, meaning that the query sequence is likely from an extremophilic organism living in deep-sea hydrothermal vents

I) these values should be interpreted as 0% and 67% homology, respectively, indicating that horizontal transfer occurred recently

What is it called when one strand of DNA has more Guanine than the other strand?

A. This is not possible, because G must equal C

B. Compositional heterogeneity

C. Strand bias

D. Among Site Rate Variation

E. HGT

Which of the following IS an example how a new gene can be created?

a) Through mutations in non-coding DNA

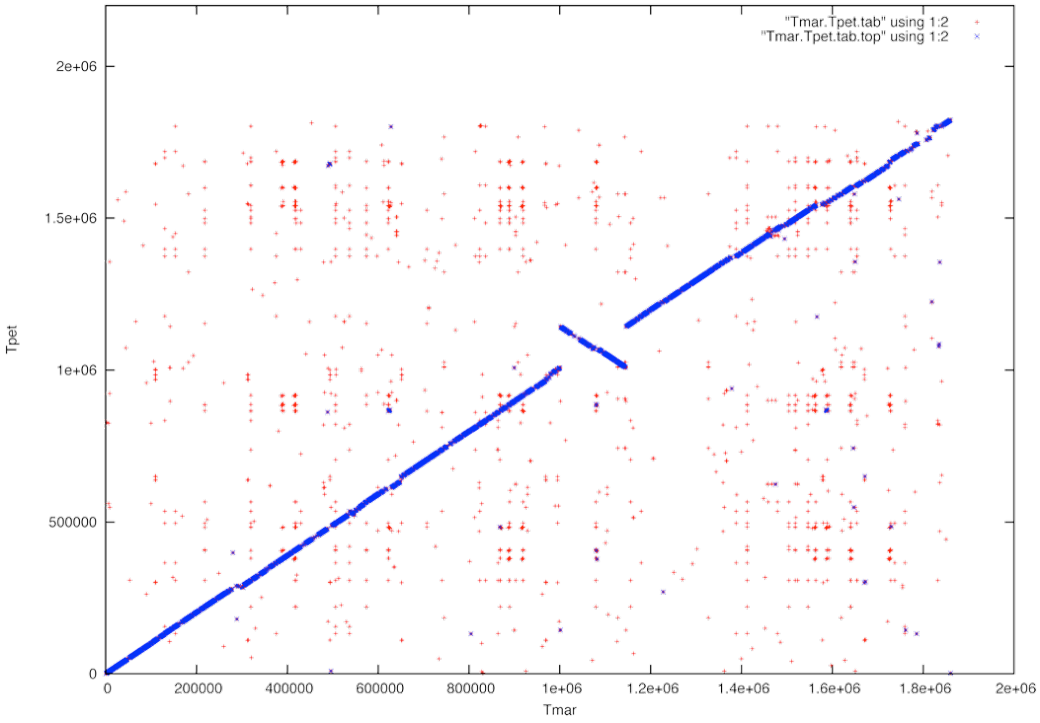
b) Left over DNA of viruses or other genetic parasite being repurposed

c) Genome rearrangement shuffling exons and bringing together existing domains into a new combination

d) Gene duplication followed by neofunctionalization

e) All of the above

Refer to the following gene plot. The axes give the genes locations in the Thermotoga maritima and Thermotoga petrophila genomes, respectively. R: all significant blast hits, blue top scoring blast hits only.



What mechanism is this graph depicting when blue dots appear on the downward sloping diagonal?

A. Recombination between two point in the genome leading to an inversion
B. Deletion or Insertion
C. Translocation
D. Paralogs
E. All of the above

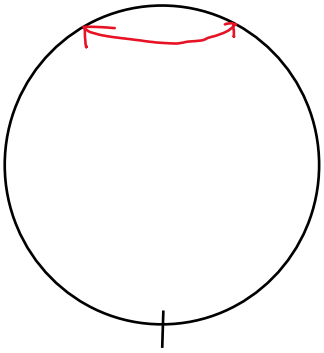
After plotting the blast hits from the two genomes, what does the blue line represent?

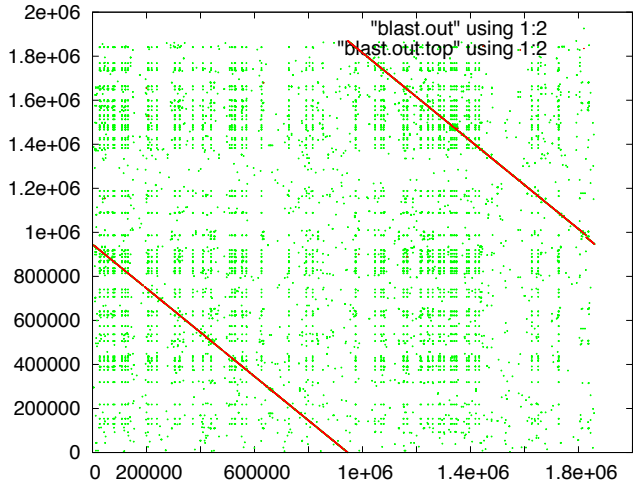
A. The location of all genes in one genome versus the location of the top scoring blast hit in the other genome
B. The location of all genes in one genome versus the location of ALL the blast hits in the other genome
C. The location of the gene in the environment
D. A and B
E. None of the above

What do the red dots represent?

A. False positives
B. False negatives
C. Partial matches
D. Paralogs in the genome
E. Orthologs in the genome

Map the genome rearrangement shown onto the circular genome below:





What might have happened in the genome plot given above?

A. One massive genome inversion, involving half of the genome

B. One round of whole genome duplication, so that every gene is present in one of the two genomes twice and only once in the other

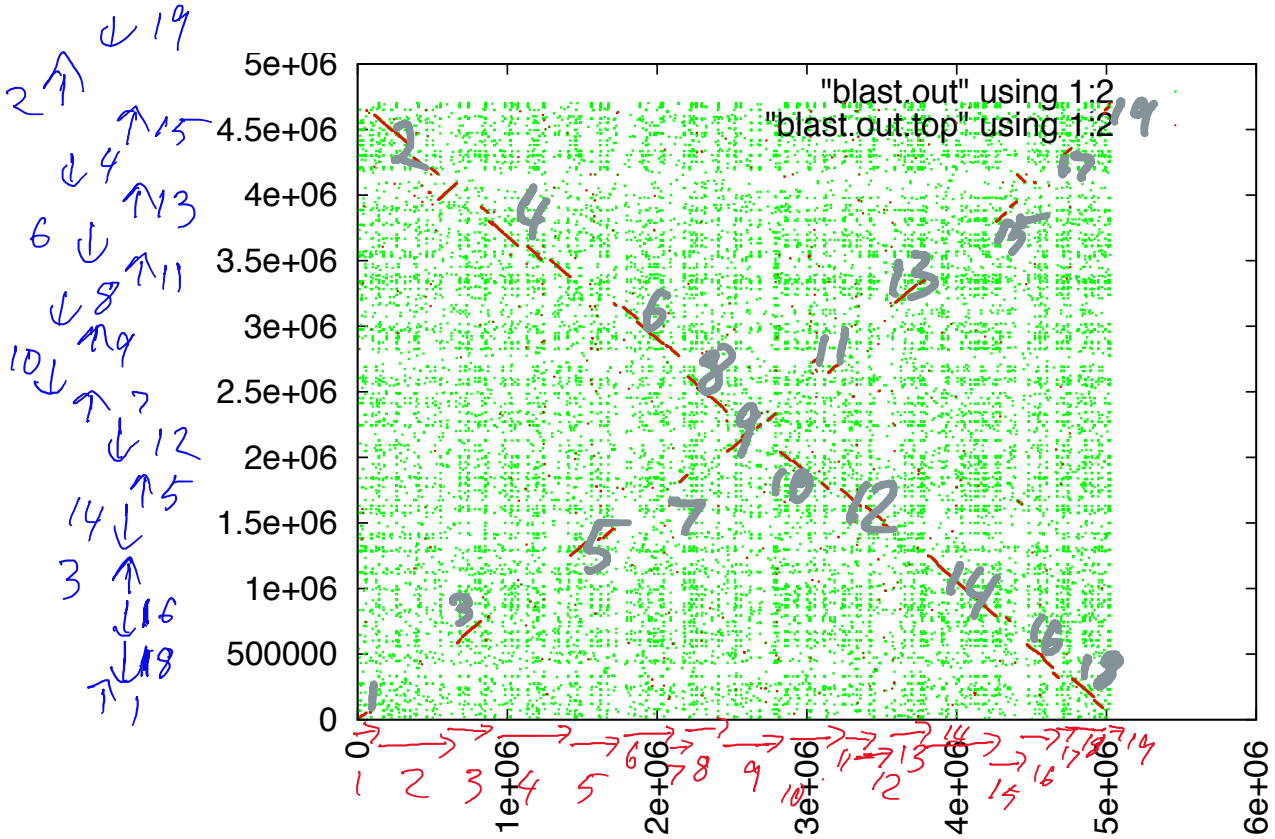
C. Two identical genomes were used, but the origin of replication was miscalled in one.

D. There is a strong strand bias.

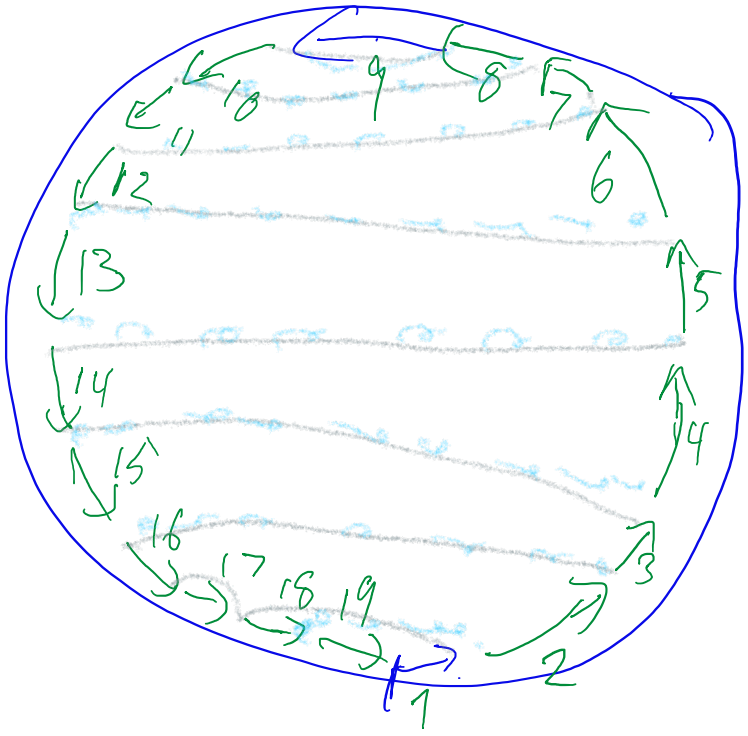
E. The forward strand of one genome was sequenced, while the reverse strand of the other was sequenced

How many genome rearrangement events are needed to produce the following graph?

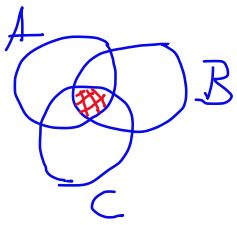
ori



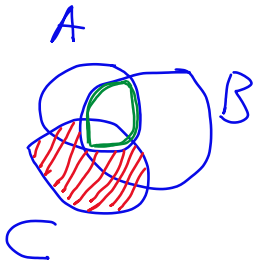
A. 1 B. 2 C. 3 D. 4 E. 5 F. 6 or more



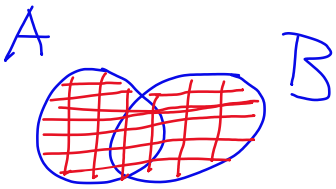
Draw Venn diagrams for the logical operators AND, NOT, OR



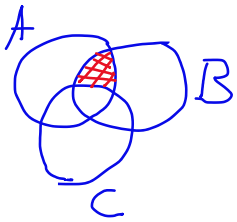
A and B and C



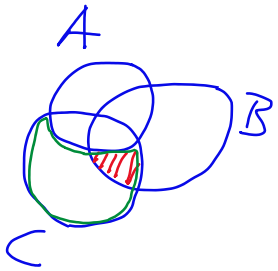
C not (A and B)



A or B



(A and B) not C



(C not A) and B