

Teaching tree thinking with forensic applications

Outline

1. A famous example
 2. A software-based tutorial
 3. Additional case studies
- <http://faculty.washington.edu/~herronjc>

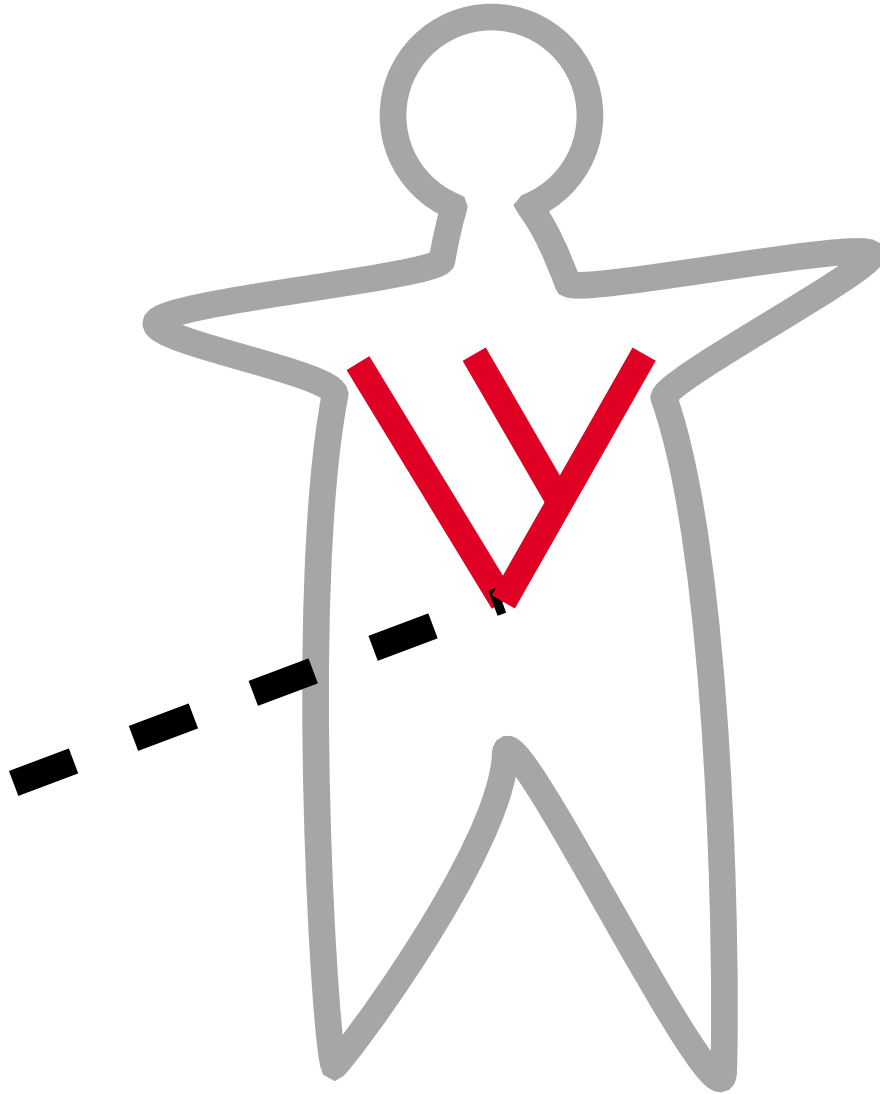
The Florida dentist

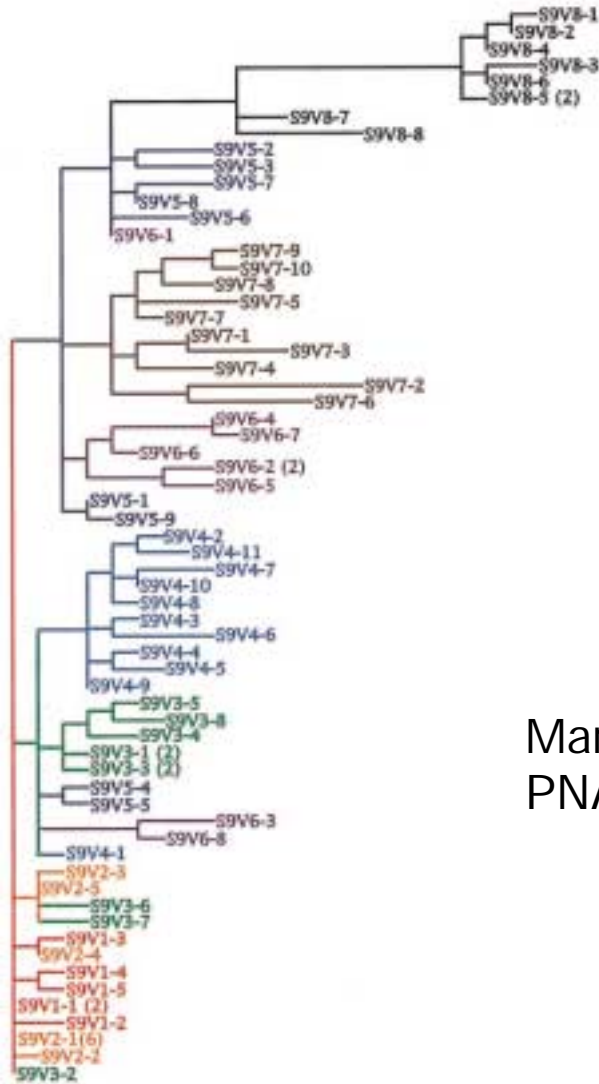
- In 1986 dentist tested positive for HIV; later AIDS.
- Continued general dentistry for 2 years.
- Patient with no risk factors discovered she had HIV
- Dentist publicly urges other patients to take test
- 10 of 1100 patients are HIV+

Did the dentist pass HIV to his patients?

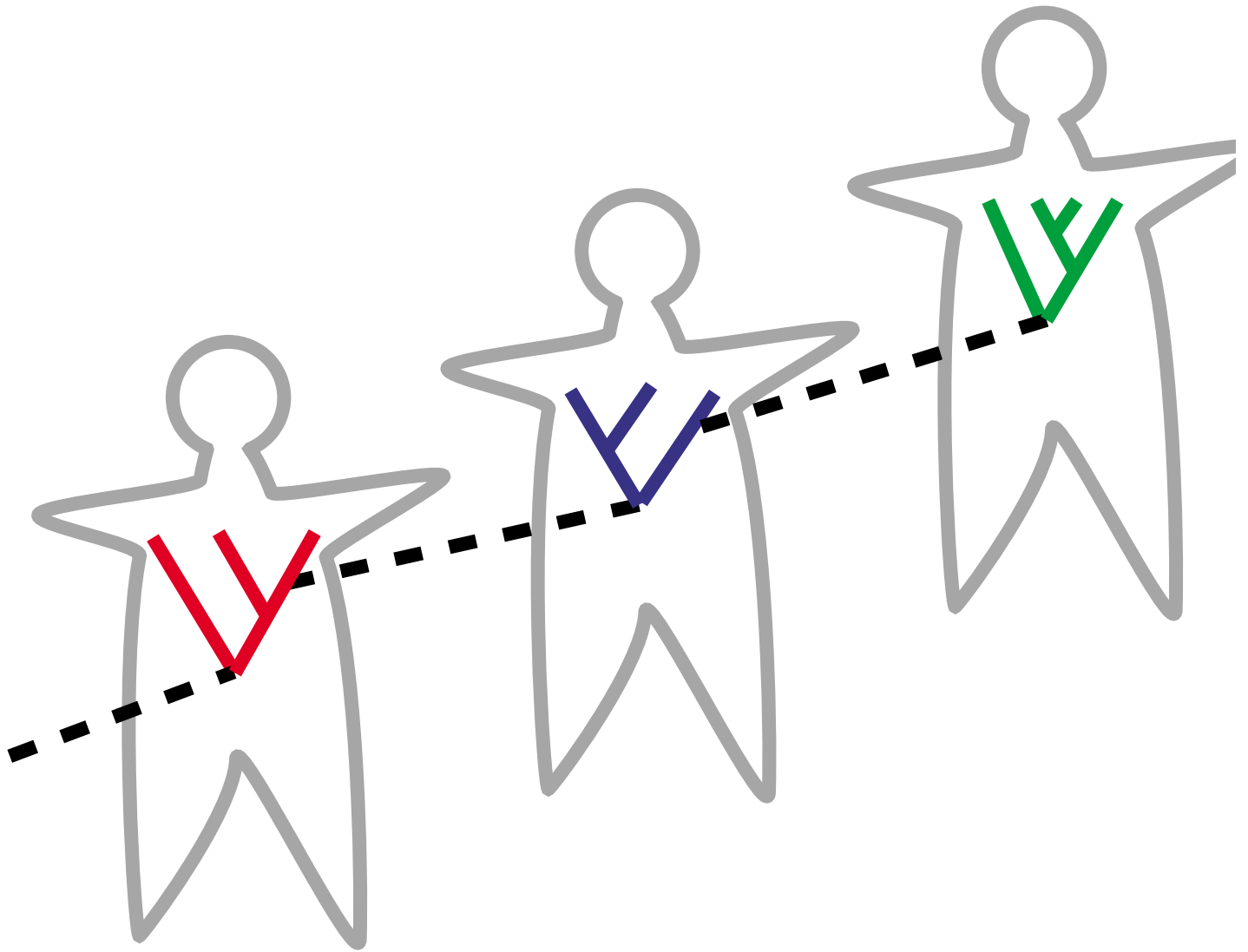
Objectives for students

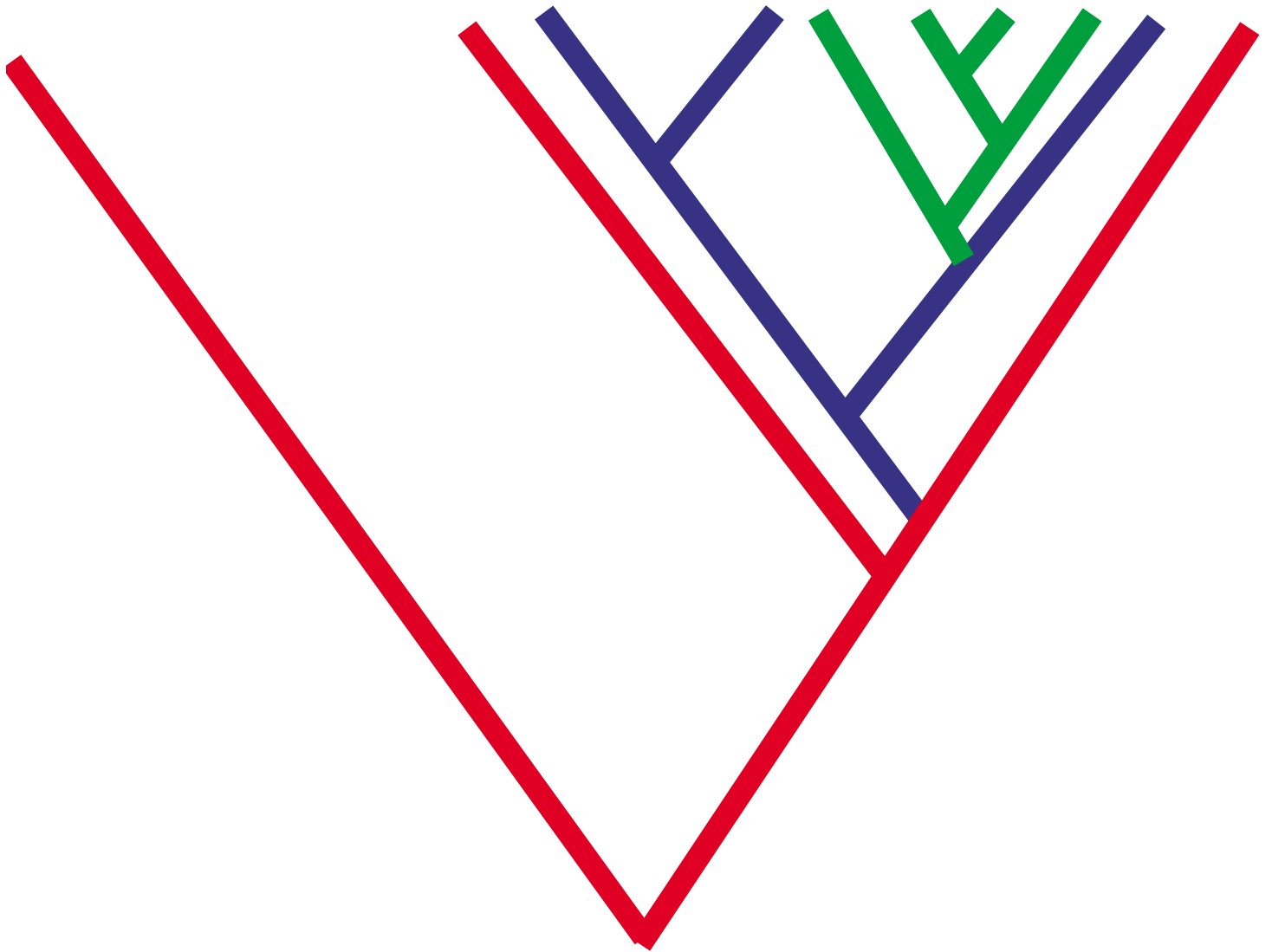
- Describe the logic of a phylogenetic analysis that would answer the question
- Predict the results if the dentist did/did not infect his patients
- Use UPGMA to analyze small datasets
- Correctly interpret the published phylogeny

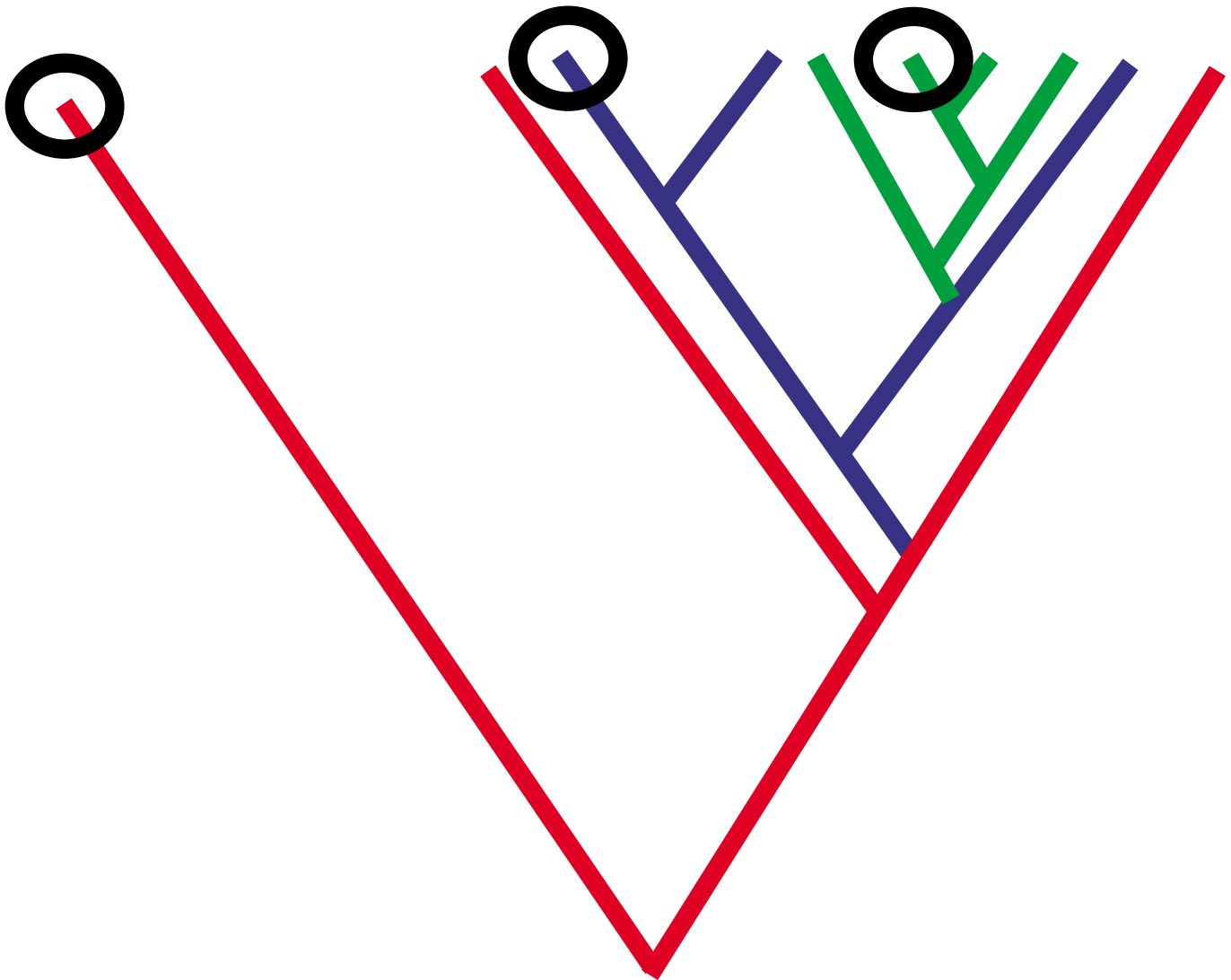


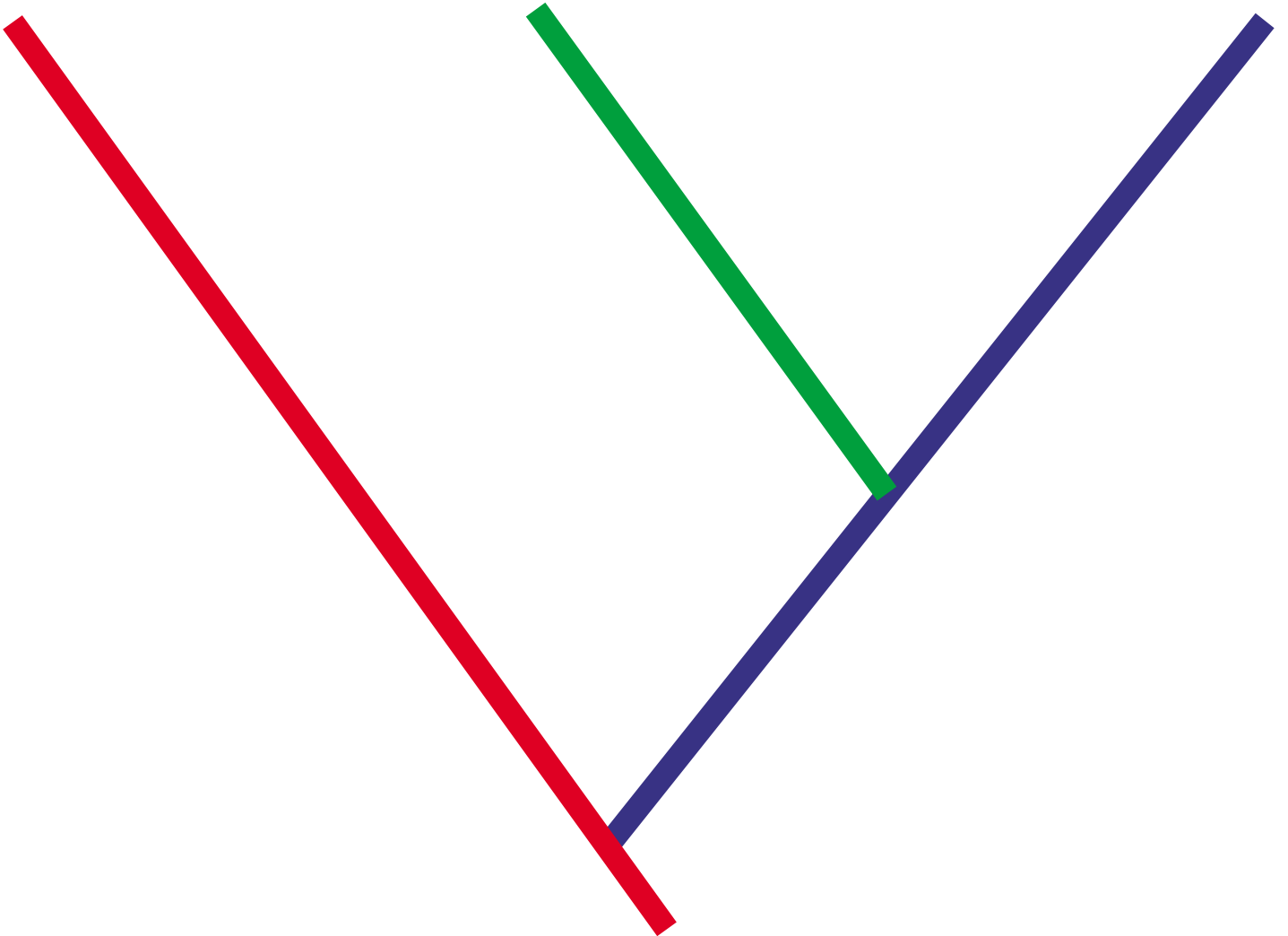


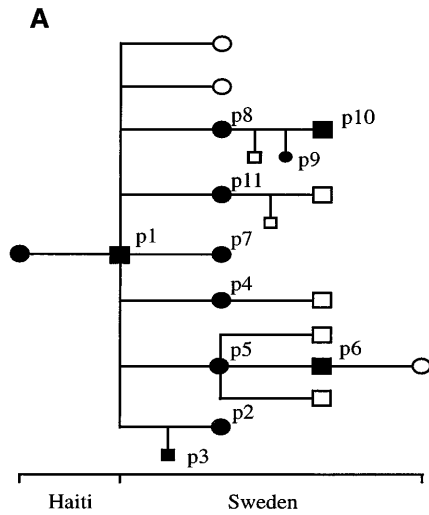
Markham et al. 1998
PNAS 95: 12568



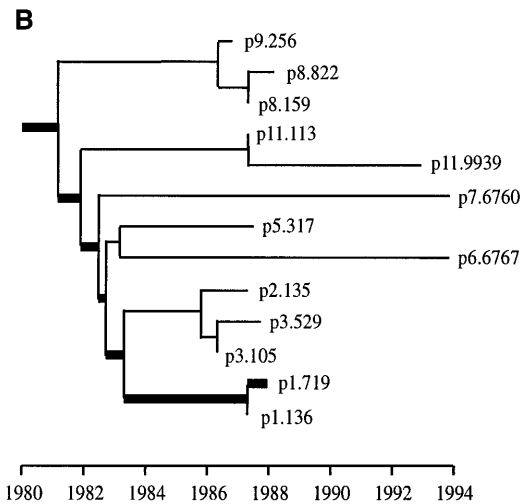




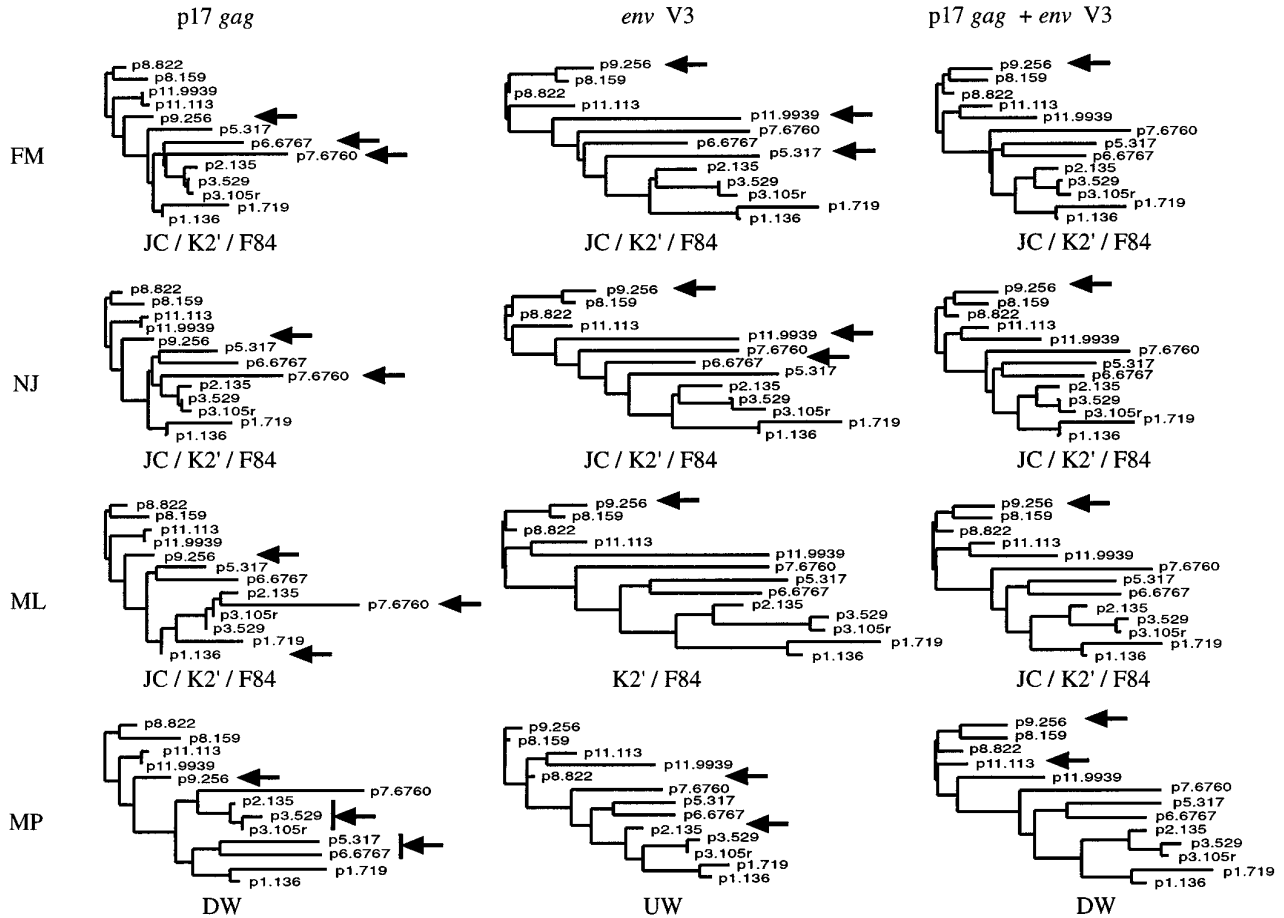


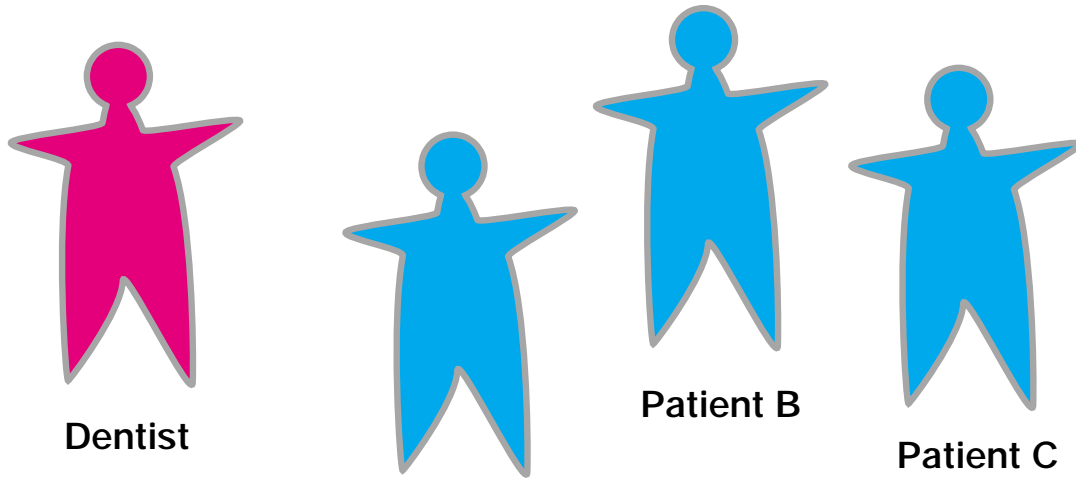


Leitner et al. 1996
PNAS 93: 10864



Method



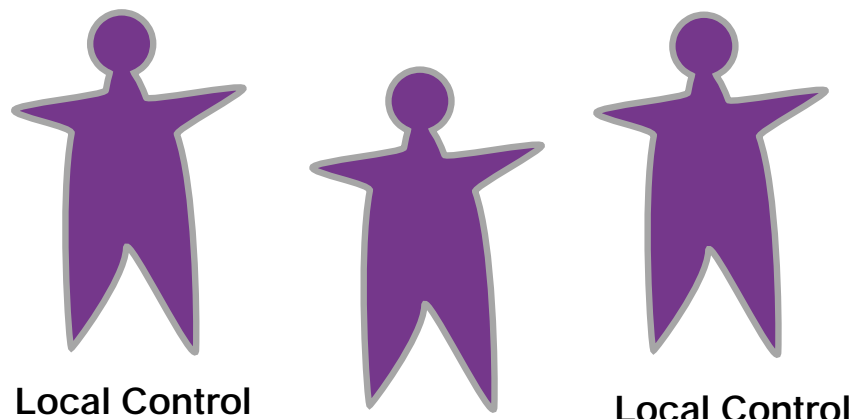


Dentist

Patient A

Patient B

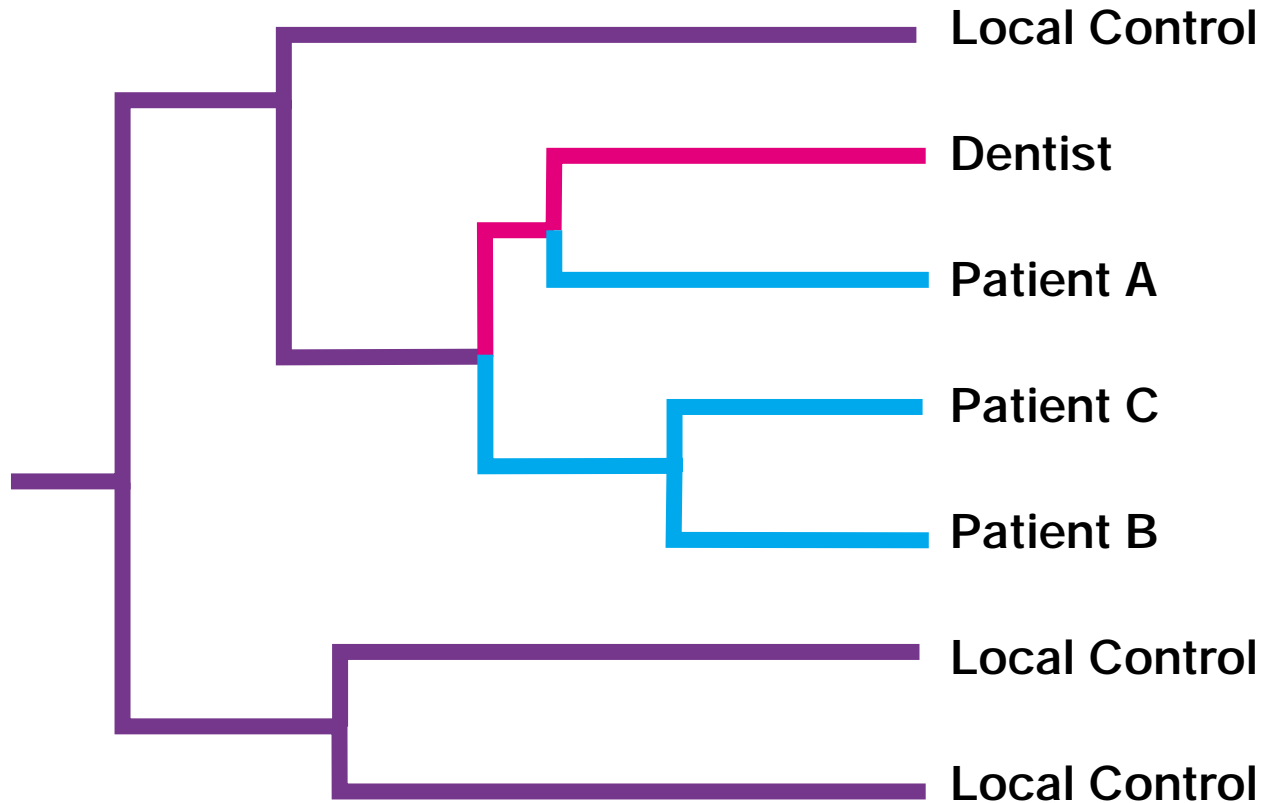
Patient C

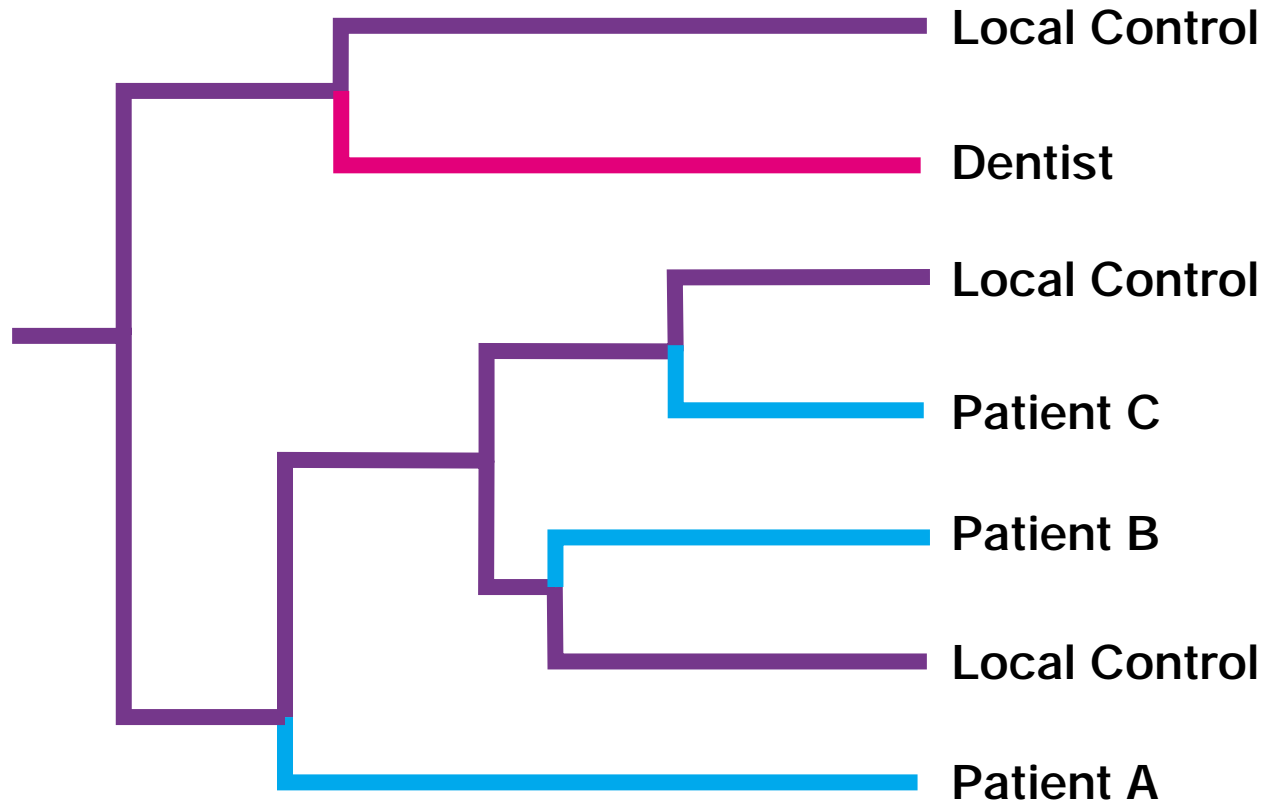


Local Control

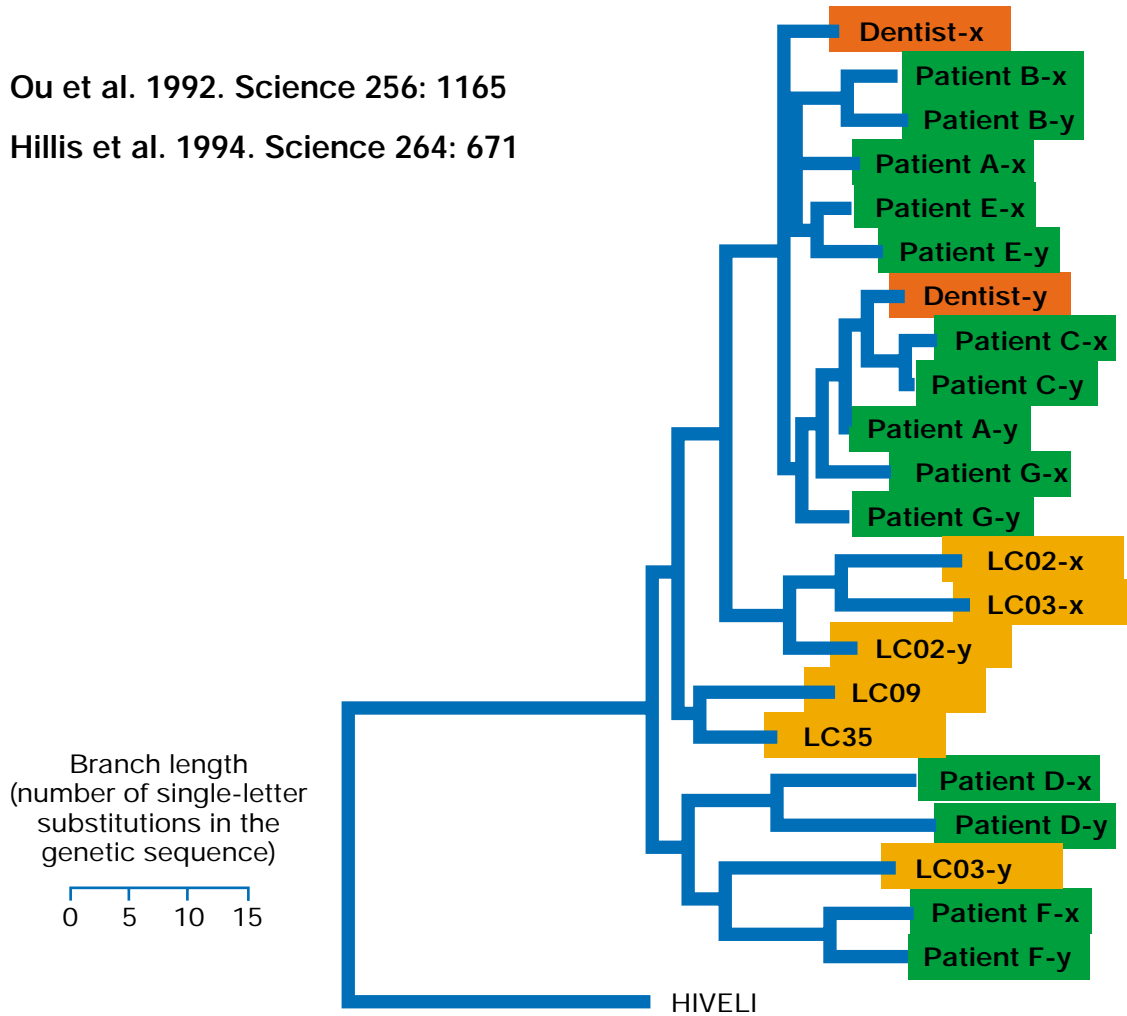
Local Control

Local Control





Ou et al. 1992. Science 256: 1165
Hillis et al. 1994. Science 264: 671



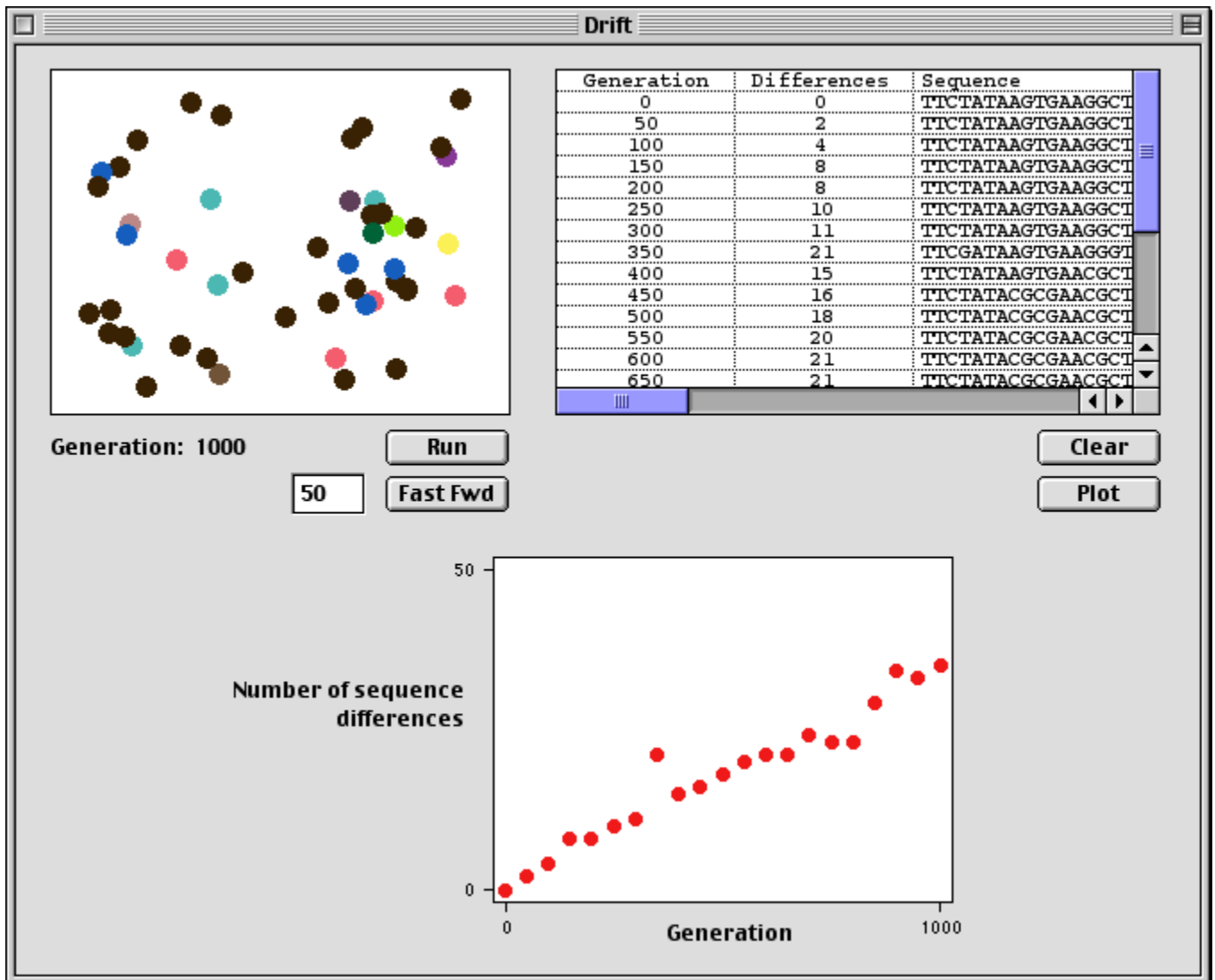
Phylogenetic Analysis Indicates Transmission of Hepatitis C Virus From an Infected Orthopedic Surgeon to a Patient

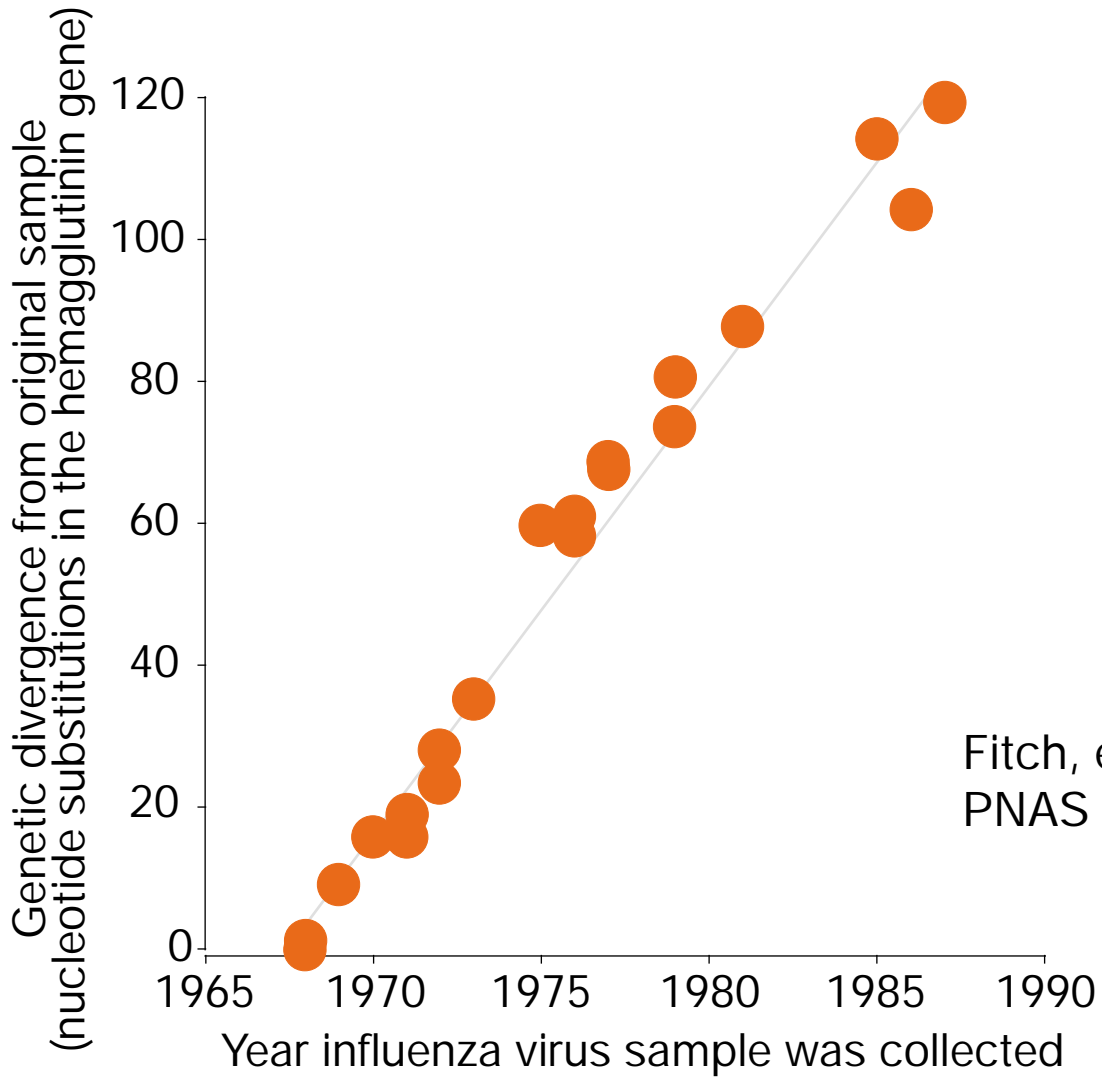
R. Stefan Ross,* Sergei Viazov, and Michael Roggendorf

Institute of Virology, National Reference Centre for Hepatitis C, University of Essen, Essen, Germany

A recent issue of the Journal of Medical Virology contained a paper about a German surgeon who handled orthopedic cases in the emergency room. In July of 2000, the surgeon disclosed to his hospital that he was infected with Hepatitis C Virus (HCV). HCV infects the liver, and is spread by contact with the blood of an infected person. Although many infected individuals are asymptomatic, some patients suffer serious liver damage.

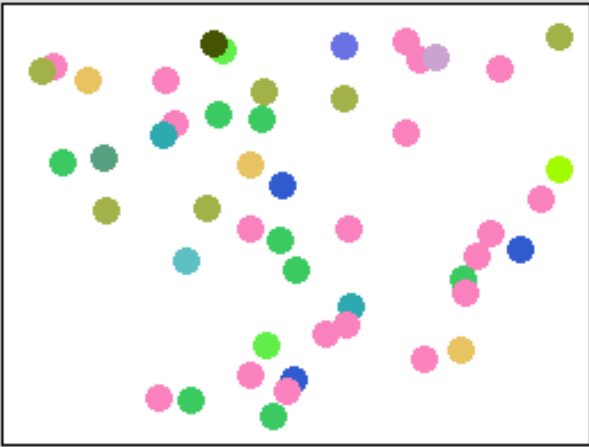
Upon learning of the surgeon's infection, the hospital performed blood tests on 207 of the surgeon's former patients. Three tested positive for HCV. The question: Did these patients get HCV from the surgeon, or from someone else?



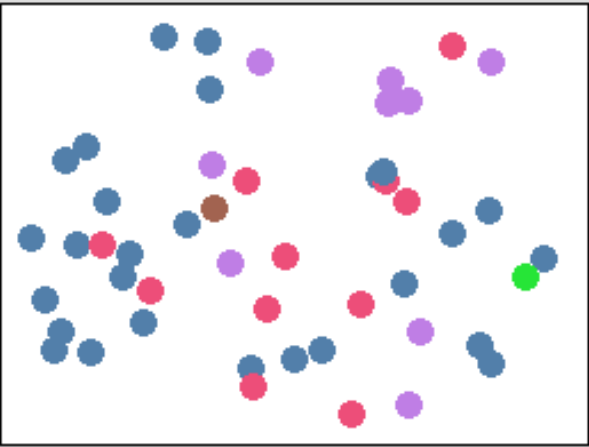


Fitch, et al. 1991
PNAS 88: 4270



Divergence




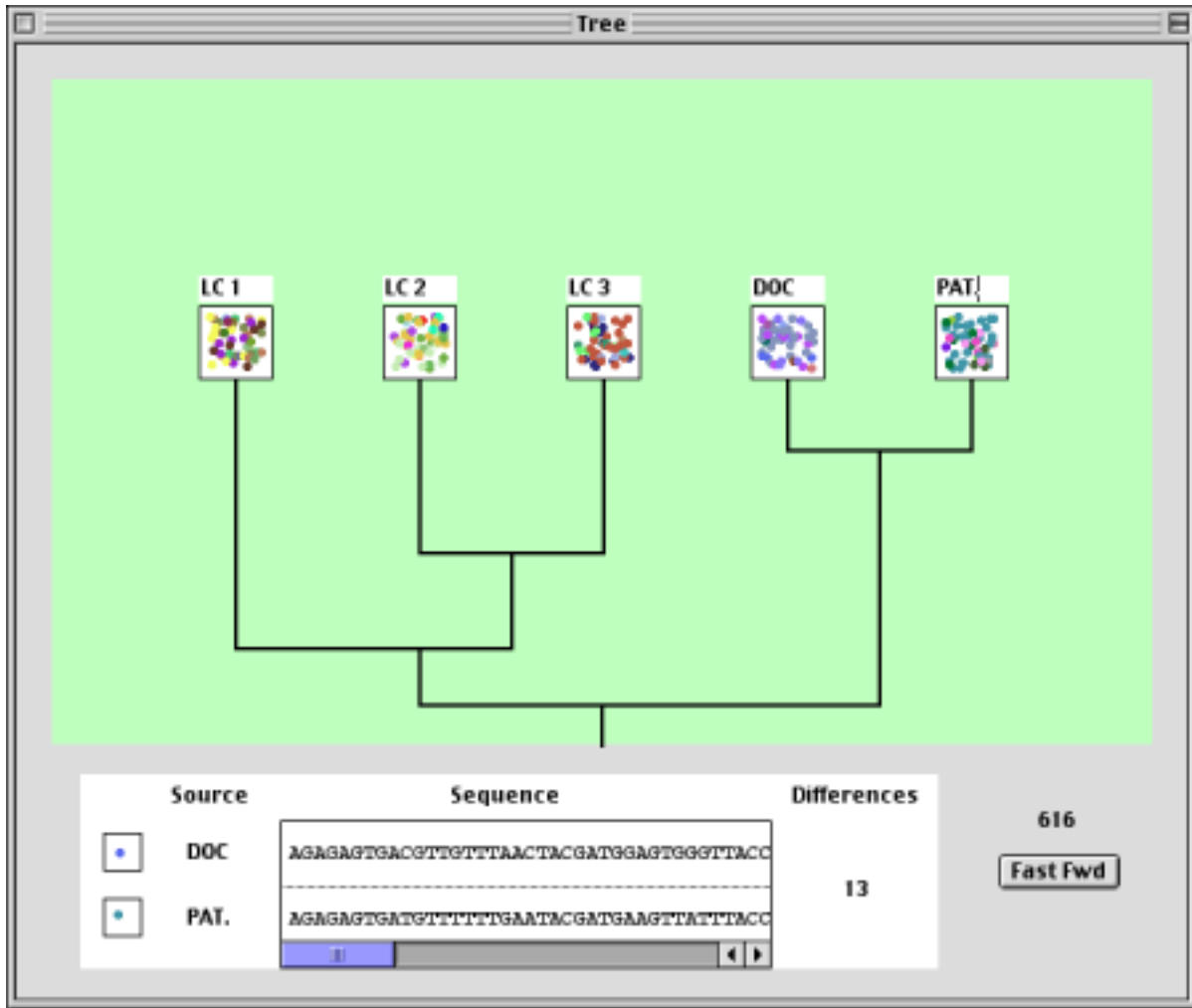
Generation: 500



Generation: 500

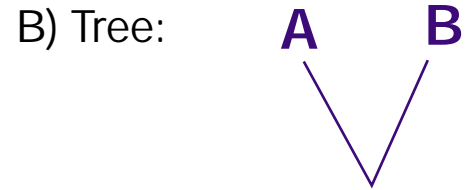
Source	Sequence	Differences
 Left	CTCCGCGGCGAATCACTCAAGCCGAACGCGCAAAGAAAAG	35
 Right	CTCTGCTGCATATCAGTCAATCGAGGGGTGAAAAGAATT	





A)

	B	C	D	E
A	6	26	35	29
B	 	29	29	29
C	 	 	29	29
D	 	 	 	29



C)

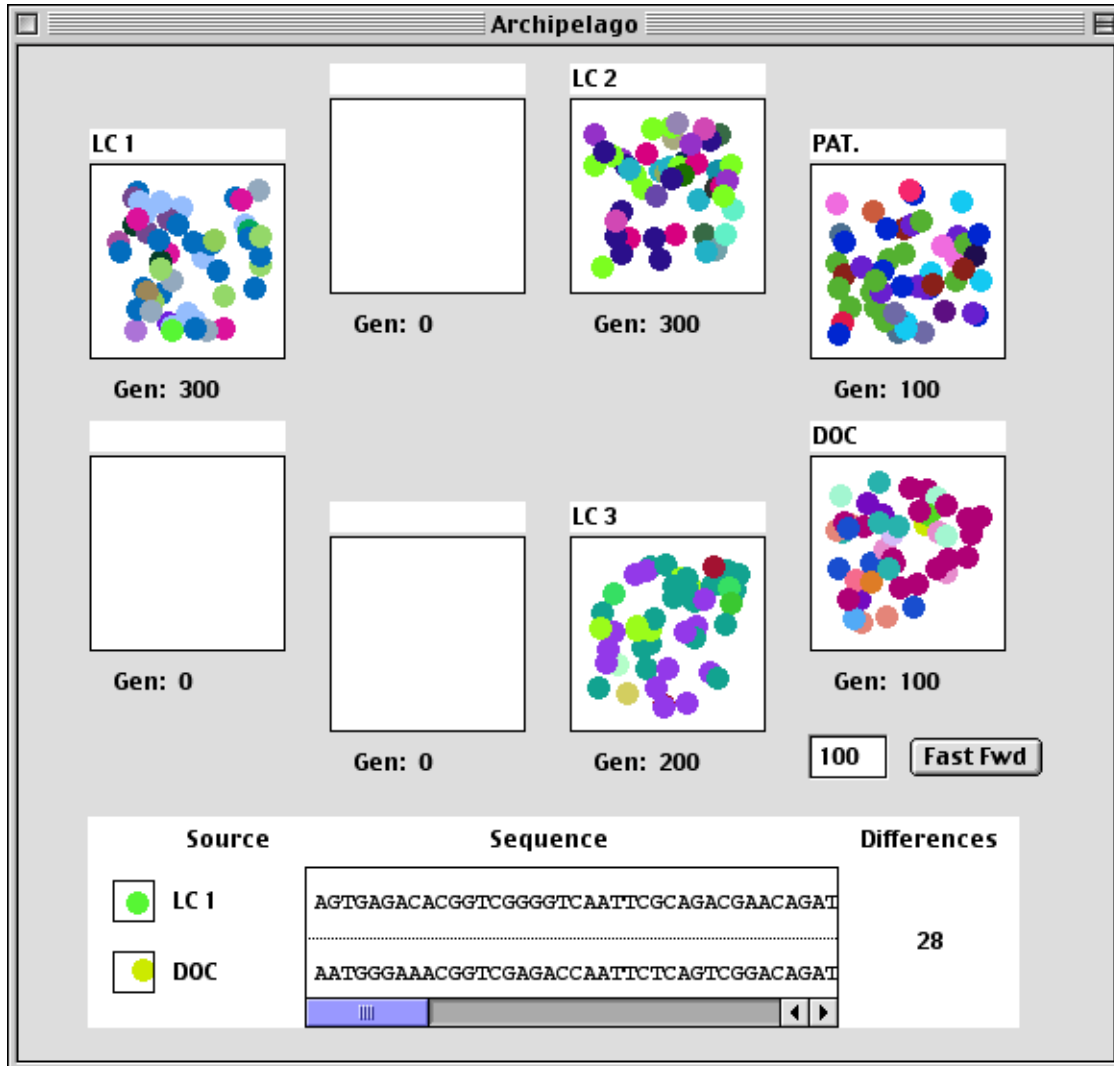
	C	D	E
AB	28.5		
C	 		
D	 	 	

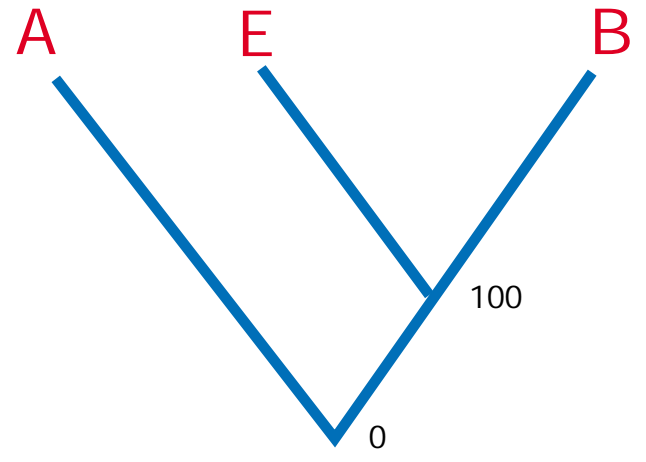
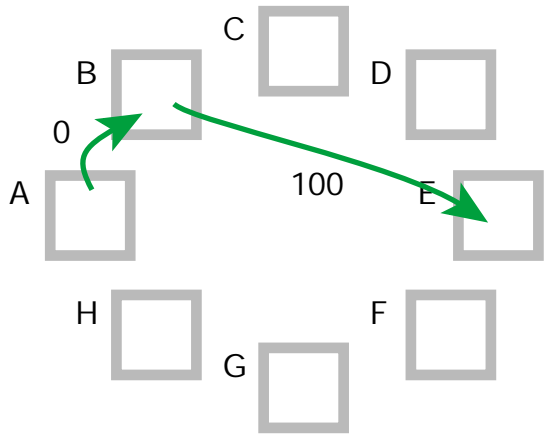
D) Tree:

E)

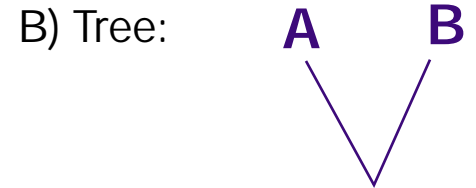
F) Tree:





A)

	B	C	D	E
A	6	26	35	29
B	 	29	29	29
C	 	 	29	29
D	 	 	 	29



C)

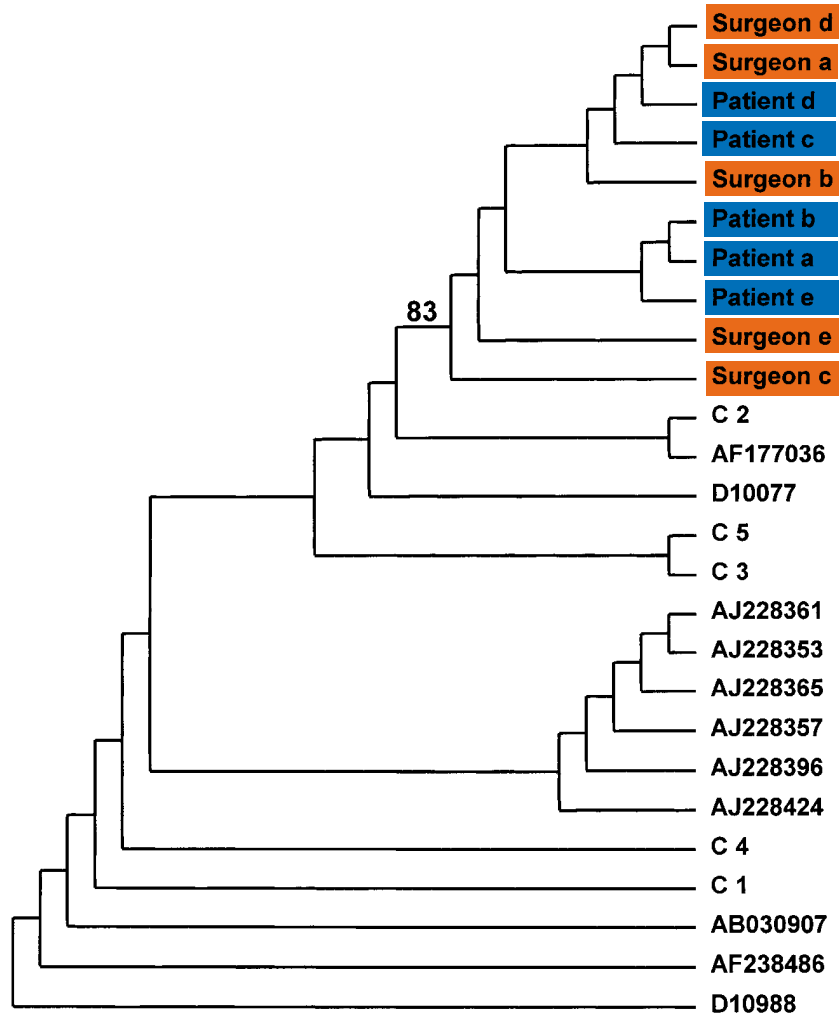
	C	D	E
AB	28.5		
C	 		
D	 	 	

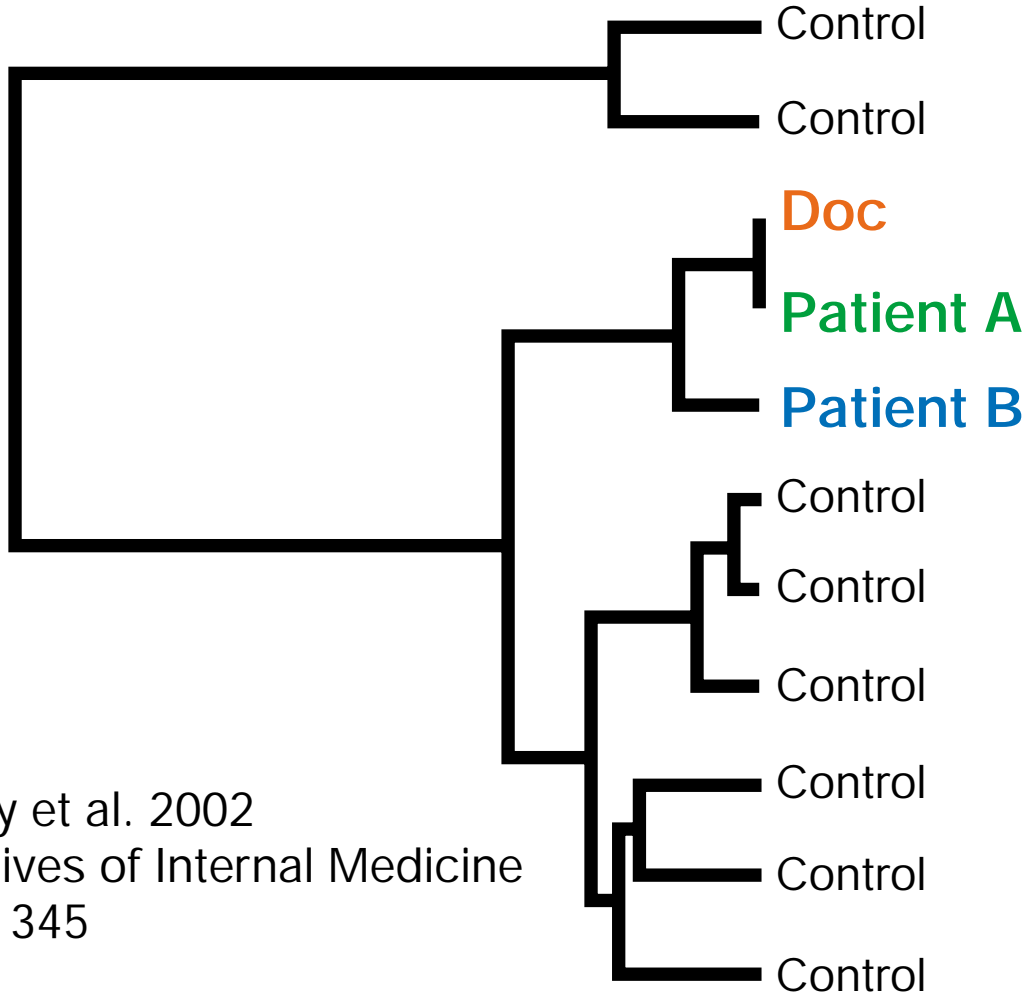
D) Tree:

E)

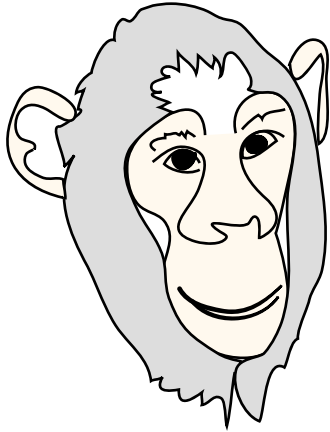
	 	

F) Tree:





Cody et al. 2002
Archives of Internal Medicine
162: 345



SIVcpz

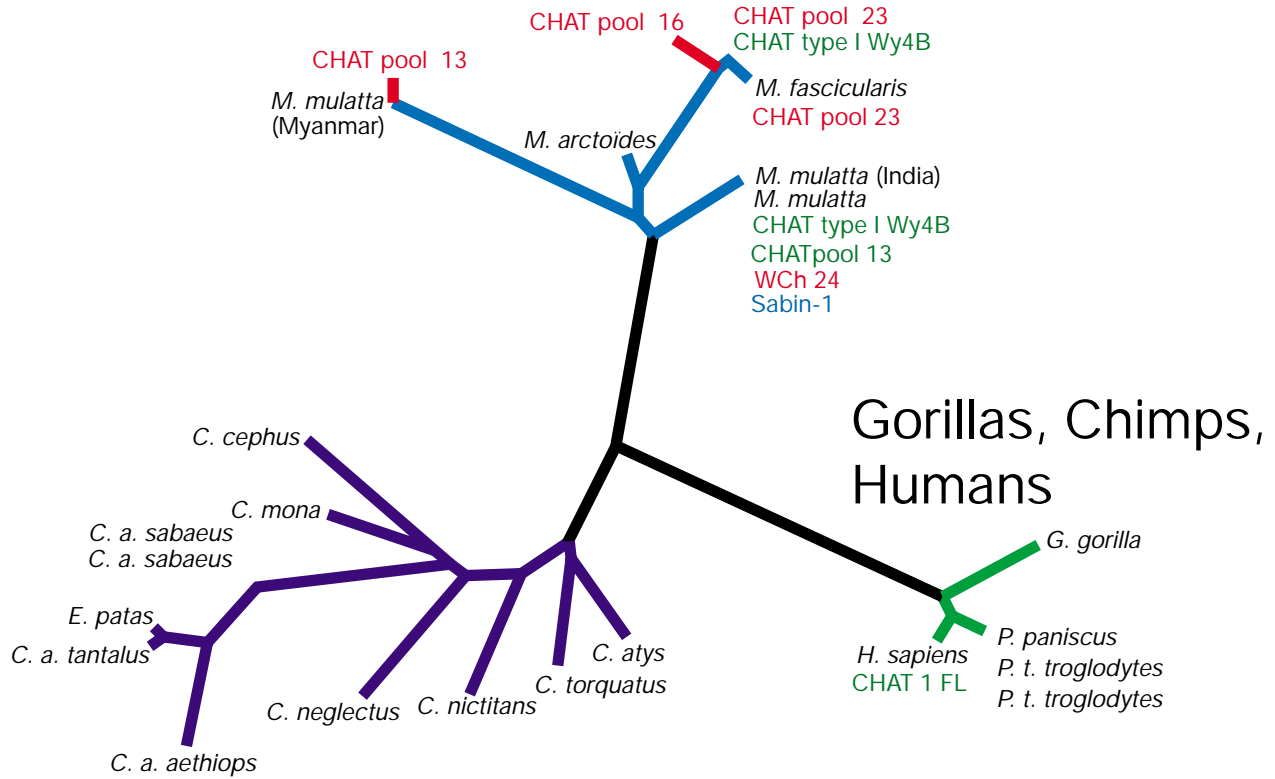
Oral polio vaccine
prepared in cultured
kidney cells from
chimpanzees



HIV-1

Edward Hooper. 1999. The River.

Macaques

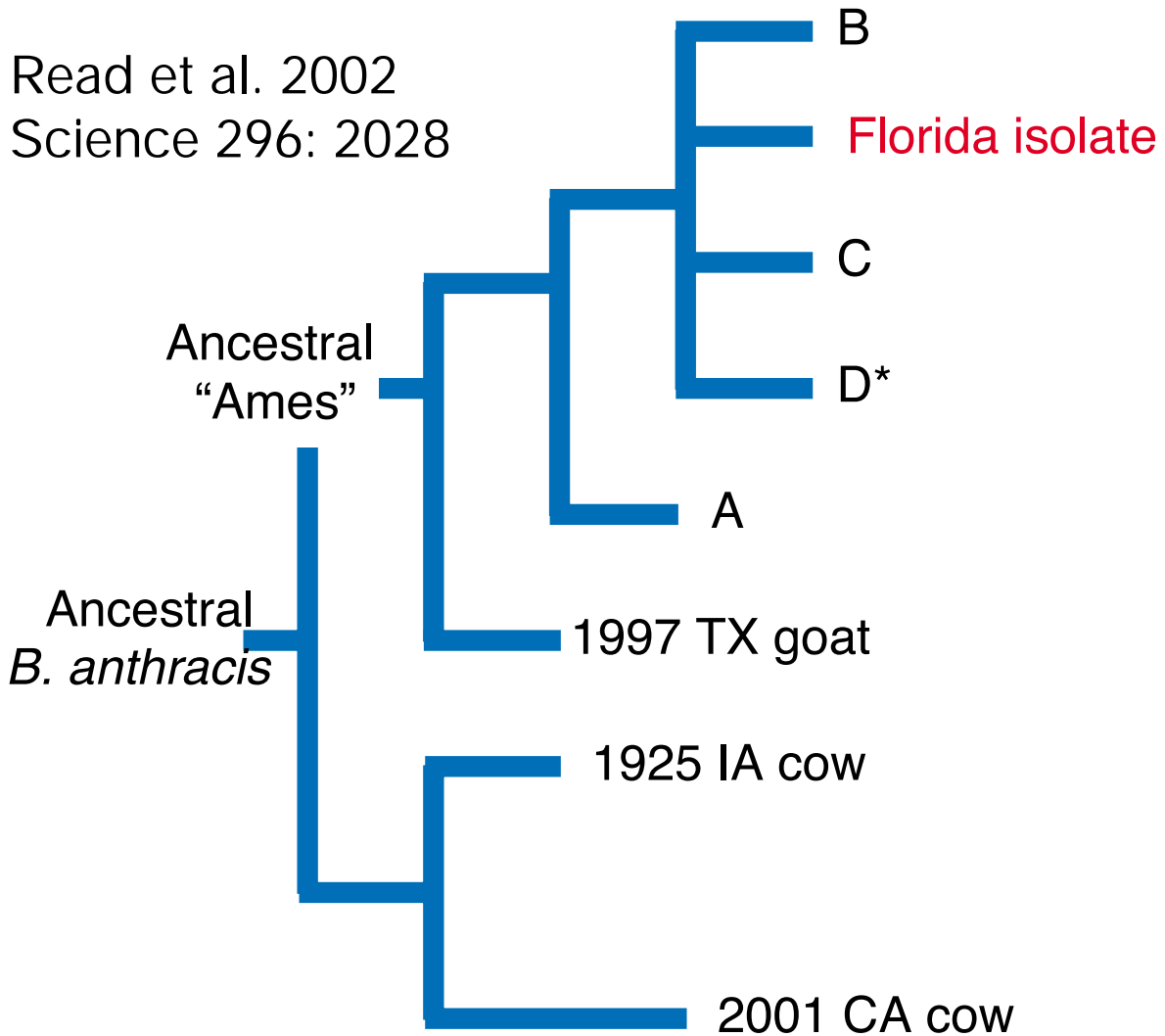


Gorillas, Chimps, Humans

Other primates

0.10

Blancou et al. 2002. Nature 410: 1045



Acknowledgments

- Eli Meir, University of Washington
- Joel Kingsolver, University of North Carolina
- Susan Maruca, Derek Stahl