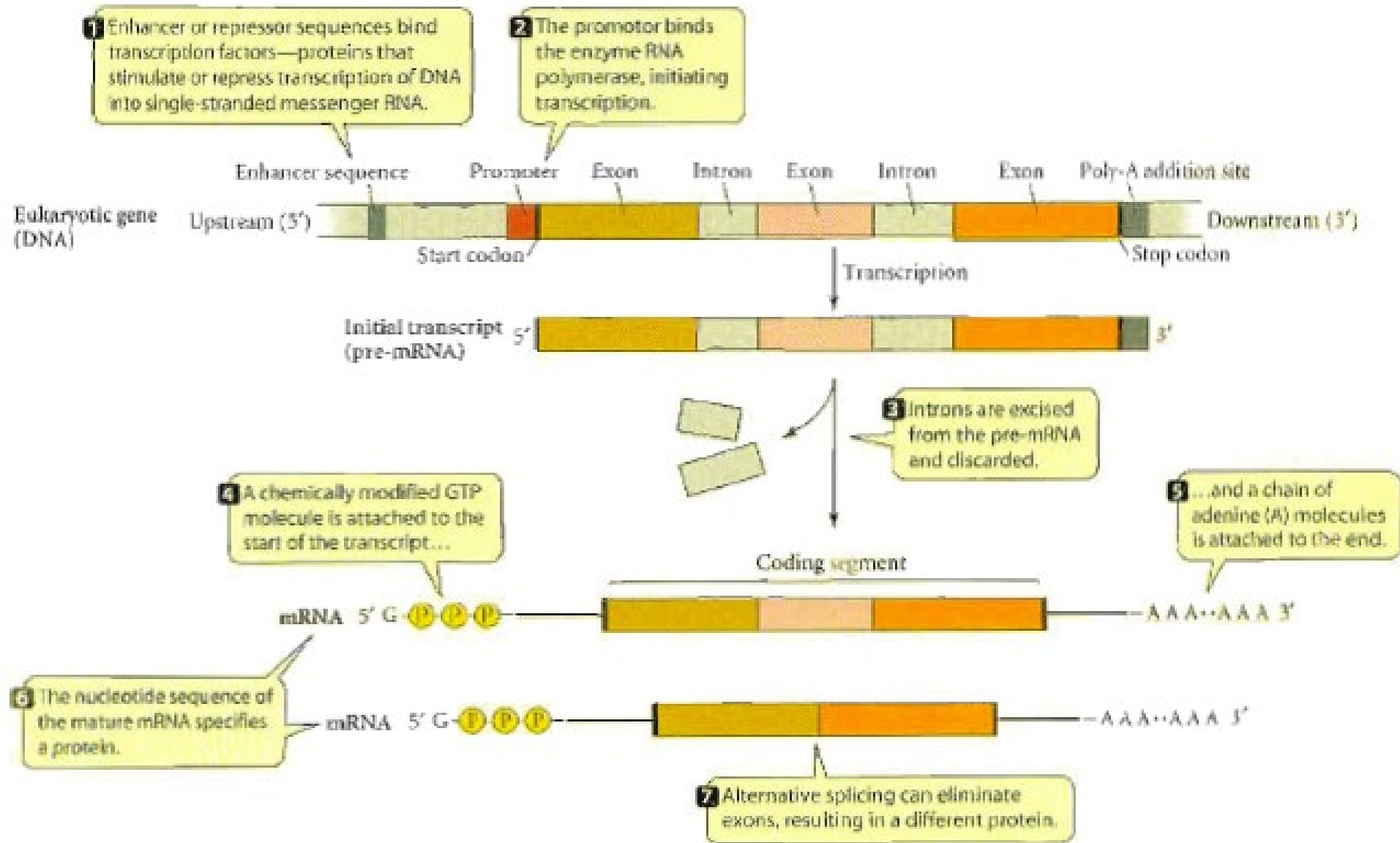


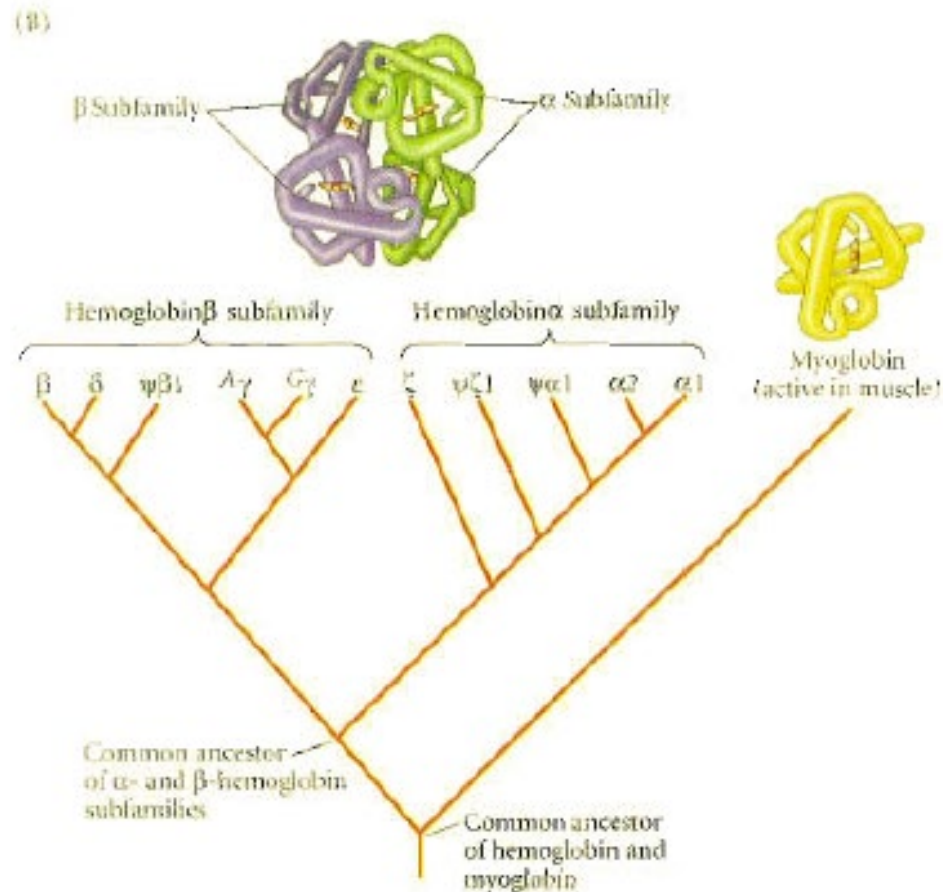
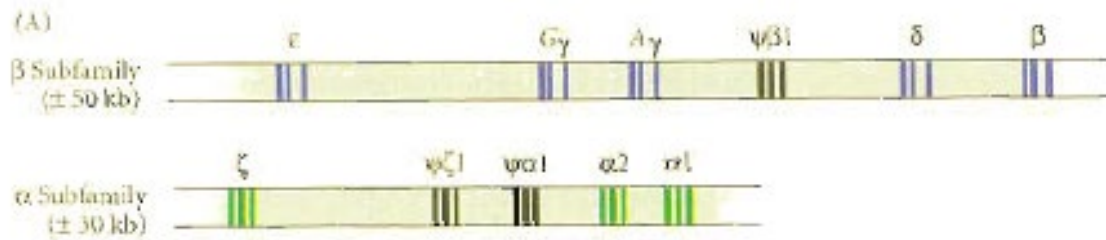
8. Kalıtsal Çeşitliliğin Kökeni



		Second nucleotide					
		U	C	A	G		
First nucleotide	U	UUU } Phe UUC } UUA } Leu UUG }	UCU } Ser UCC } UCA } UCG }	UAU } Tyr UAC } UAA Stop UAG Stop	UGU } Cys UGC } UGA Stop UGG Trp	U C A G	Third nucleotide
	C	CUU } Leu CUC } CUA } CUG }	CCU } Pro CCC } CCA } CCG }	CAU } His CAG } CAA } Gln CAG }	CGU } Arg CGC } CGA } CGG }	U C A G	
	A	AUU } Ile AUC } AUA } AUG Met	ACU } Thr ACC } ACA } ACG }	AAU } Asn AAC } AAA } Lys AAG }	AGU } Ser AGC } AGA } Arg AGG }	U C A G	
	G	GUU } Val GUC } GUA } GUG }	GCU } Ala GCC } GCA } GCG }	GAU } Asp GAC } GAA } Glu GAG }	GGU } GGC } Gly GGA } GGG }	U C A G	

TABLE 8.1 The amino acids

Amino acid	One-letter abbreviation	Three-letter abbreviation	Biochemical properties (affect protein folding)
Polar, charged			
Positive charge (basic)			
Arginine	R	Arg	Electrically charged side chains attract water (are hydrophilic) and oppositely charged ions.
Histidine	H	His	
Lysine	K	Lys	
Negative charge (acidic)			
Aspartic acid	D	Asp	Electrically charged side chains attract water (are hydrophilic) and oppositely charged ions.
Glutamic acid	E	Glu	
Polar, uncharged			
Uncharged polar side chains tend to form weak hydrogen bonds with water and with other polar or charged substances; mostly hydrophilic.			
Serine	S	Ser	Uncharged polar side chains tend to form weak hydrogen bonds with water and with other polar or charged substances; mostly hydrophilic.
Threonine	T	Thr	
Asparagine	N	Asn	
Glutamine	Q	Gln	
Tyrosine	Y	Tyr	
Nonpolar			
Nonpolar hydrocarbon side chains (hydrophobic) cluster toward center of protein, away from aqueous environment of cell cytoplasm.			
Alanine	A	Ala	Nonpolar hydrocarbon side chains (hydrophobic) cluster toward center of protein, away from aqueous environment of cell cytoplasm.
Phenylalanine	F	Phe	
Leucine	L	Leu	
Isoleucine	I	Ile	
Methionine	M	Met	
Tryptophan	W	Trp	
Valine	V	Val	
Special cases			
Glycine	G	Gly	Smallest amino acid; side chain a single hydrogen atom.
Proline	P	Pro	Modified amino group "ring" limits hydrogen-bonding and rotational abilities.
Cysteine	C	Cys	Can form a disulfide bond with another cysteine.



Direction of transcription →

Original sequence:

DNA:	AGA	TGA	CGG	TTT	GCA
RNA:	UCU	ACU	GCC	AAA	CGU
Protein:	Ser	Thr	Ala	Lys	Arg

Base pair substitutions

Transition (A → G)

GGA	TGA	CGG	TTT	GCA
CCU	ACU	GCC	AAA	CGU
Pro	Thr	Ala	Lys	Arg

Frameshifts

Insertion (T)...

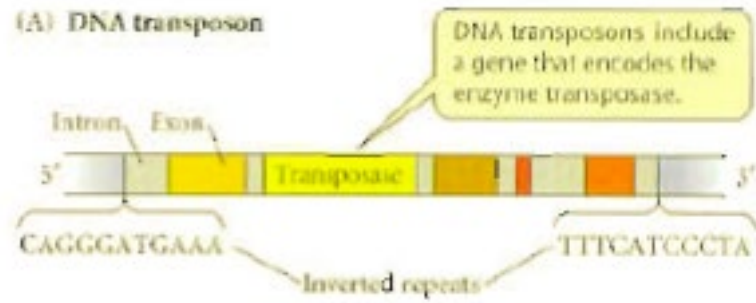
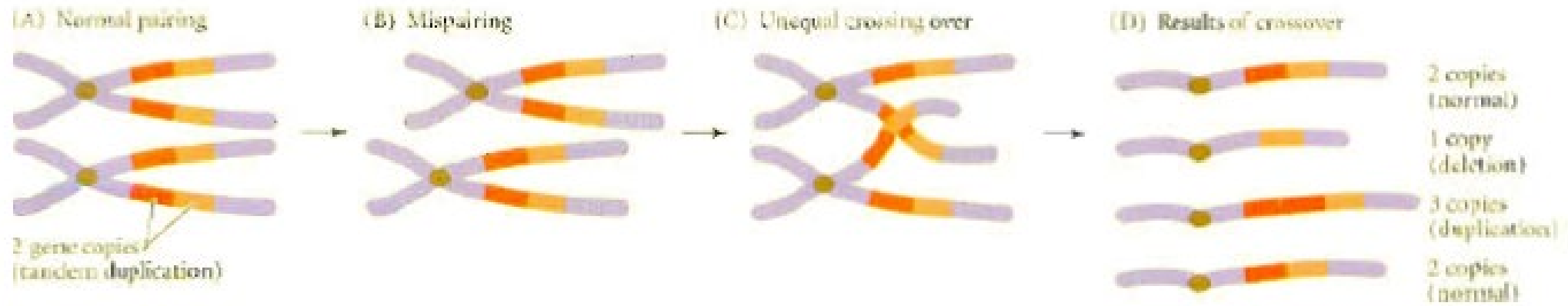
AGT	ATG	ACG	GTT	TGC	A
UCA	UAC	UGC	CAA	ACG	
Ser	Tyr	Cys	Gln	Thr	

Transversion (A → T)

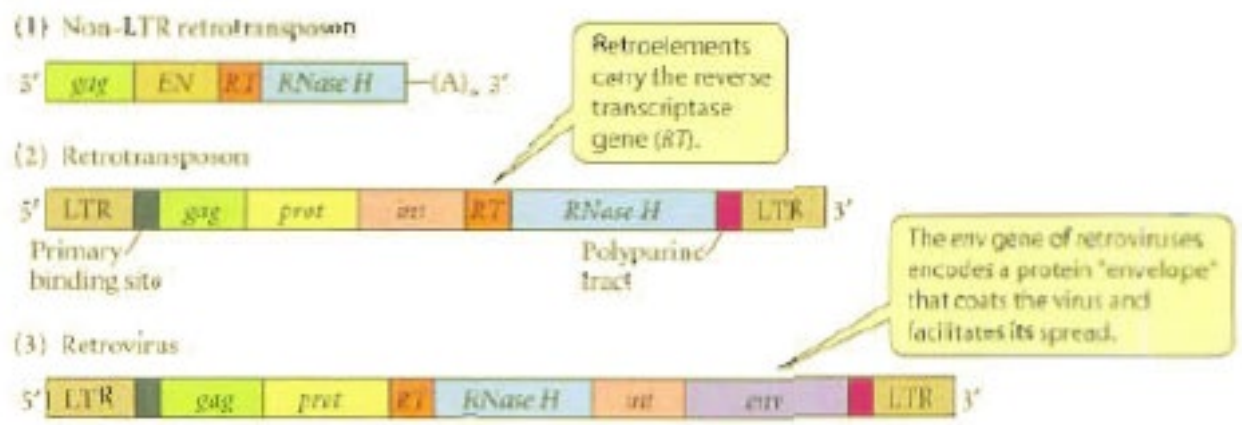
TGA	TGA	CGG	TTT	GCA
ACU	ACU	GCC	AAA	CGU
Thr	Thr	Ala	Lys	Arg

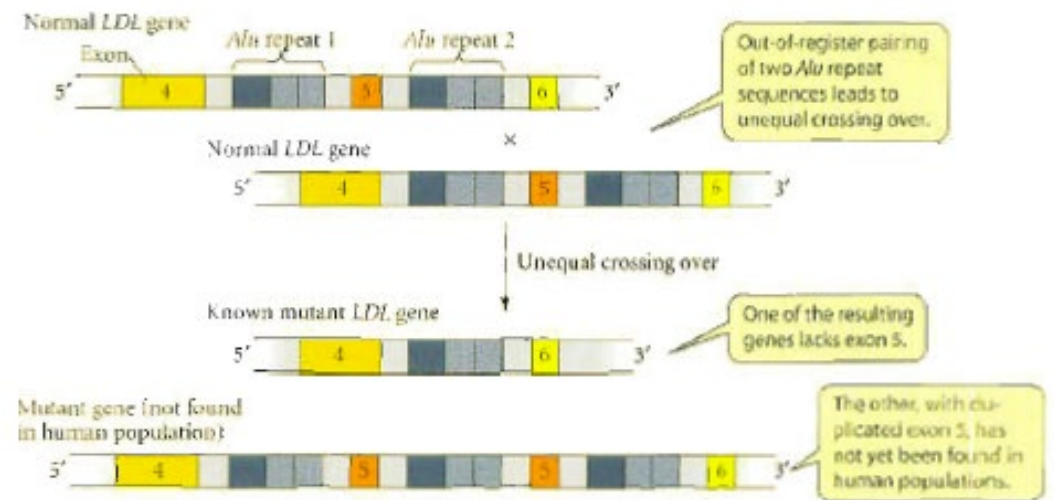
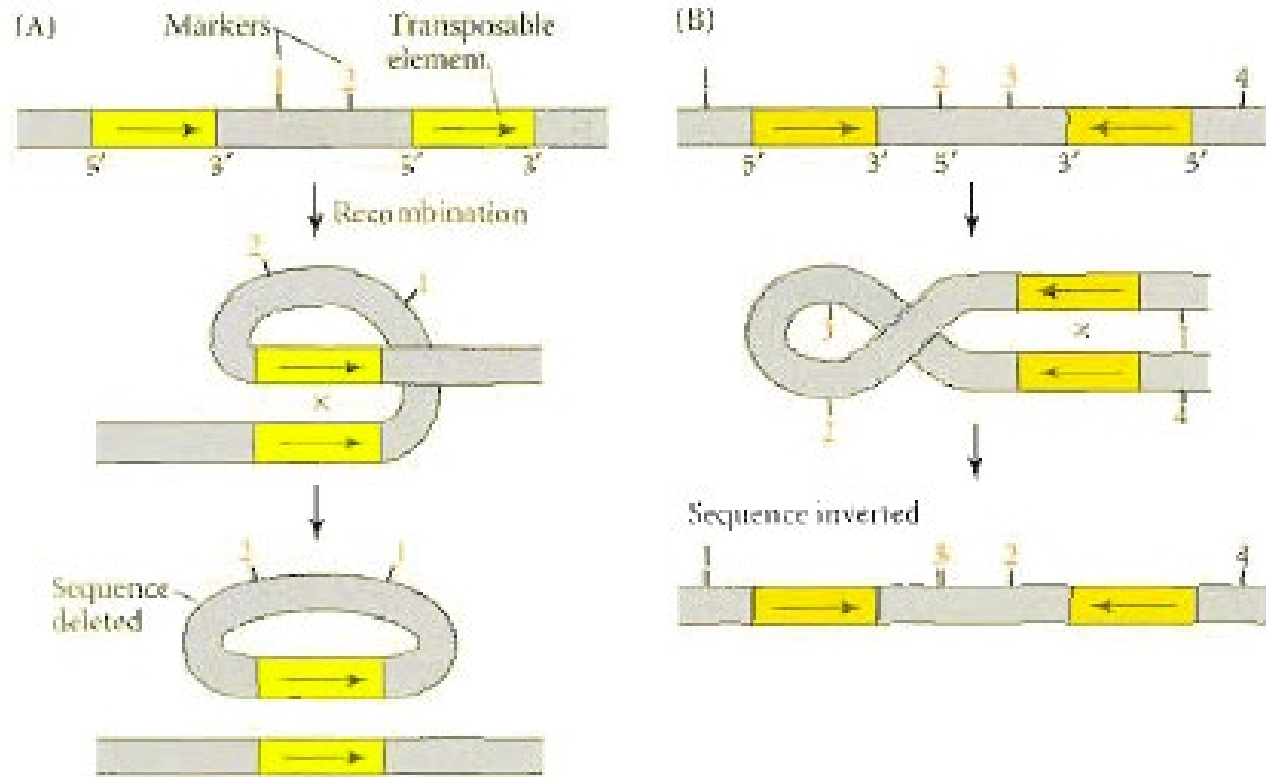
...followed by deletion (T)

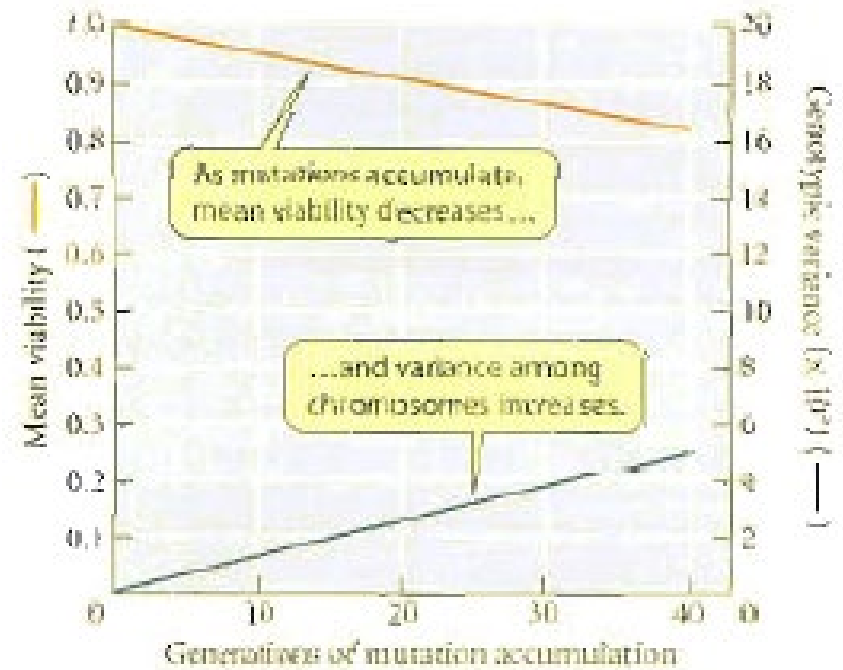
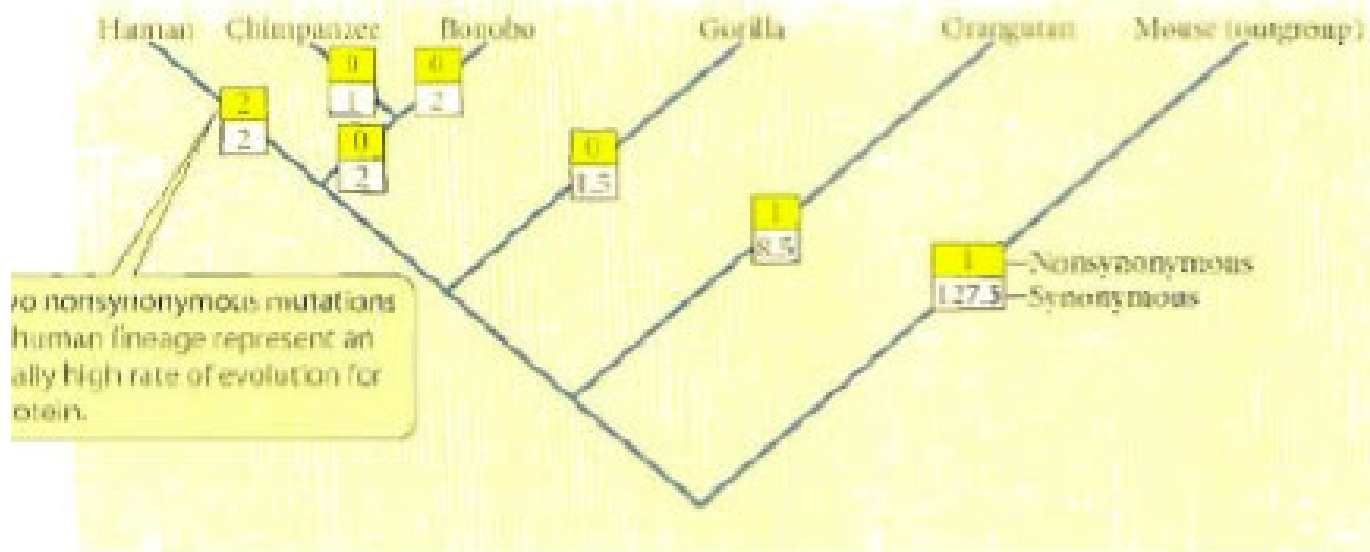
AGT	ATGA	CGG	TTT	GCA
UCA	UCU	GCC	AAA	CGU
Ser	Ser	Ala	Lys	Arg

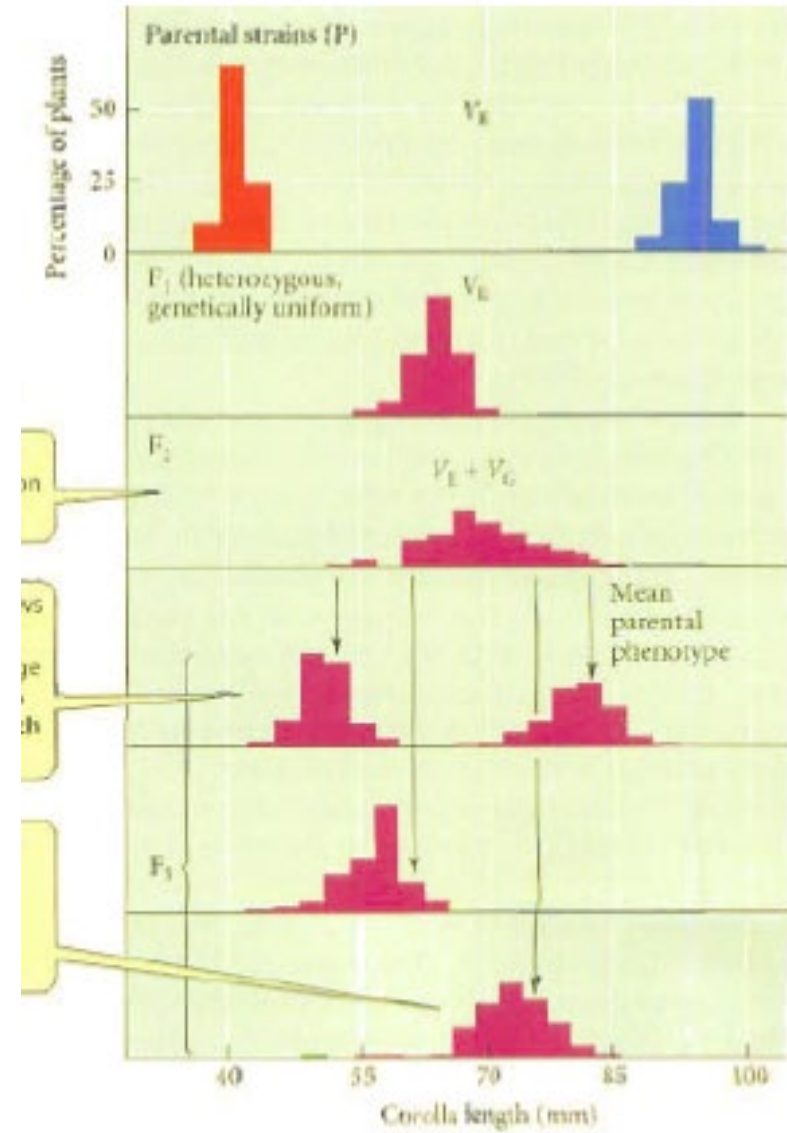
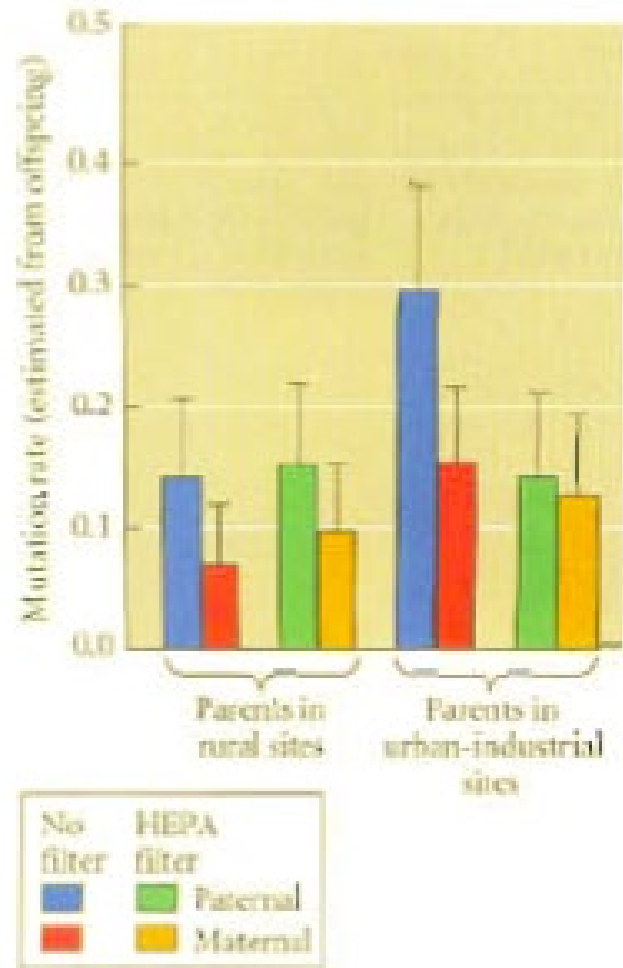


(B) Retroelements

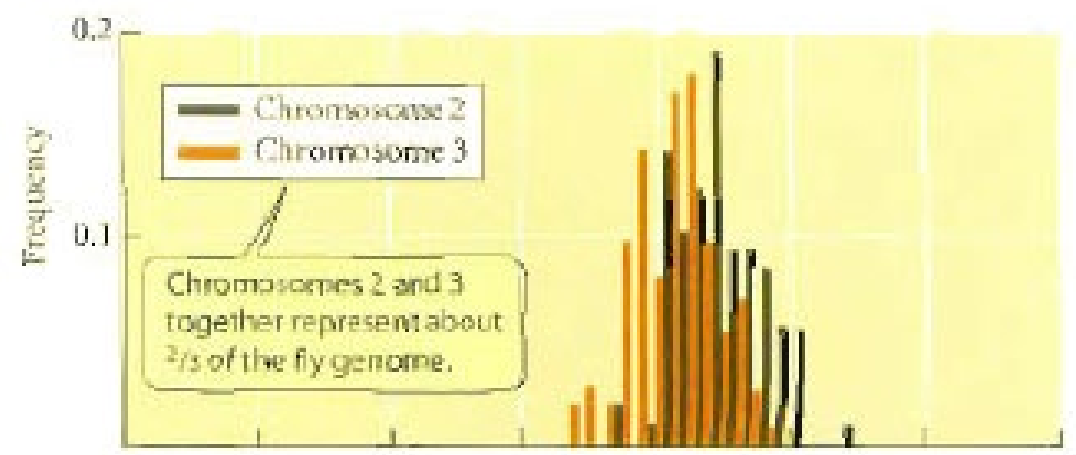




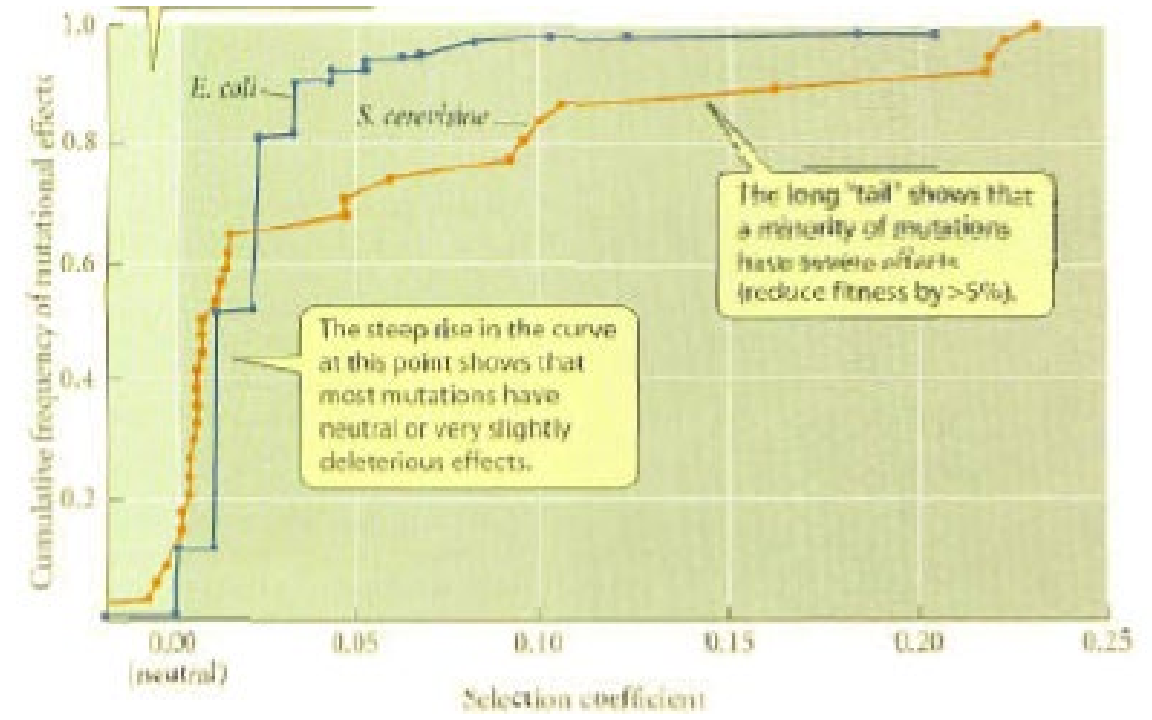
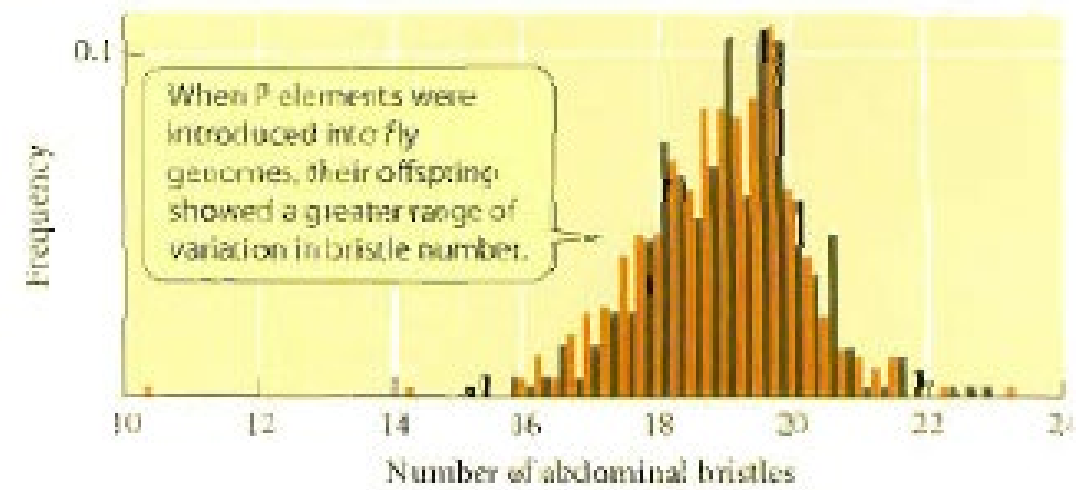


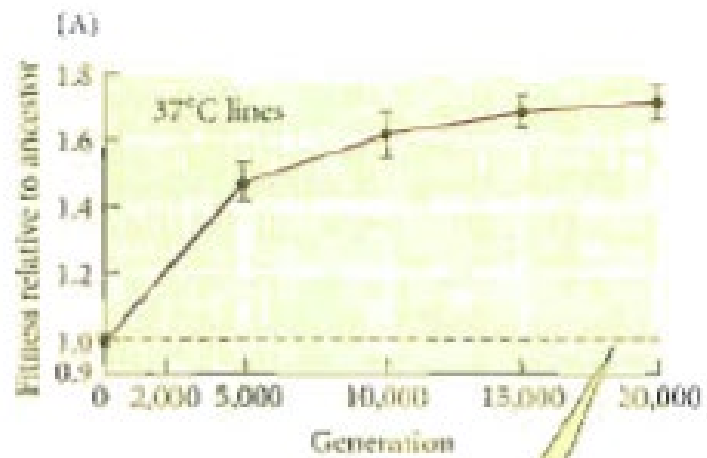


(A) Control



(B) Transposable elements introduced





The population's fitness was measured as its growth rate relative to that of the ancestor, set at 1.

