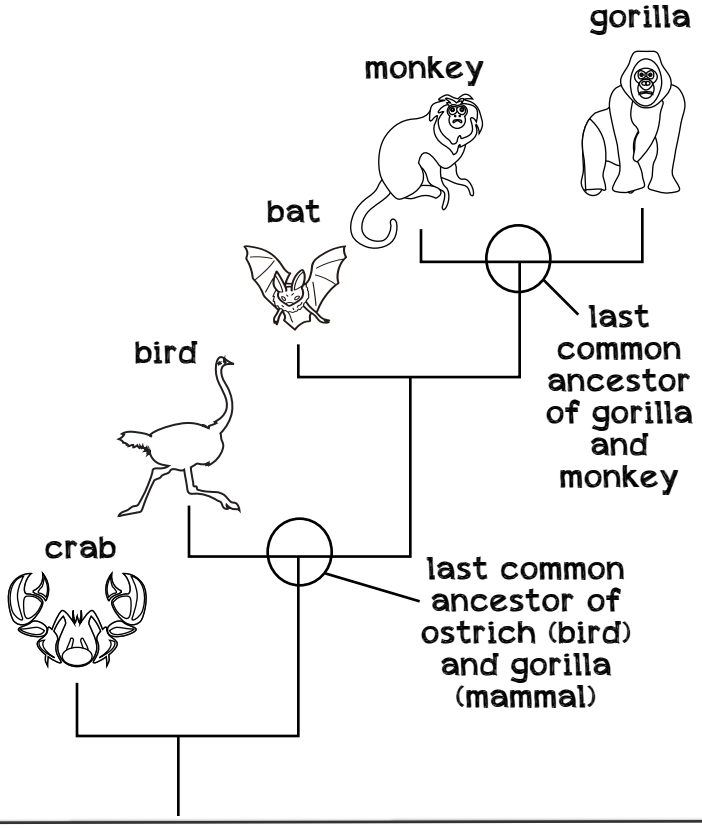
	U		C		A		G		
U	UUU	Phe	UCU	Ser	UAU	Tyr	UGU	Cys	U
	UUC		UCC		UAC		UGC		C
	UUA	Leu	UCA		UAA	*STOP*	UGA	*STOP*	A
	UUG		UCG		UAG	*STOP*	UGG	Trp	G
C	CUU	Leu	CCU	Pro	CAU	His	CGU	Arg	U
	CUC		CCC		CAC		CGC		C
	CUA		CCA		CAA	Gln	CGA		A
	CUG		CCG		CAG		CGG		G
A	AUU	Ile	ACU	Thr	AAU	Asn	AGU	Ser	U
	AUC		ACC		AAC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

Universal Genetic Code

- In almost all organisms on earth, the same codons are used to code for the same amino acids!
- This is evidence that there is a Last Universal Common Ancestor that used this coding system in its RNA or DNA to produce its proteins and ribosomes to do the translation process.
- It is thought that organisms that try to deviate from this universal code must have a big disadvantage, which is why very few species today are known to deviate from this code. Scientists don't yet understand why species haven't evolved away from using this code.

Similarity of Genomes

- As scientists sequence more and more genomes of organisms, they find that all organisms on earth share a certain degree of genetic similarity, suggesting they have a universal common ancestor.
- One of the genes that is highly conserved is the sequence of the ribosome. The ribosome seems to be a necessity for life.
- Scientists often take the genetic sequence of the ribosome in different organisms and compare how similar they are to each other.
- The similarity of the gene sequences in two species can be defined in a calculated value called genetic distance. The larger the genetic distance, the further back in time was the split in their ancestry that eventually produced the two species.
- Scientists can use phylogenetic tree diagrams to display their findings in their studies of genetic distance between different organisms.



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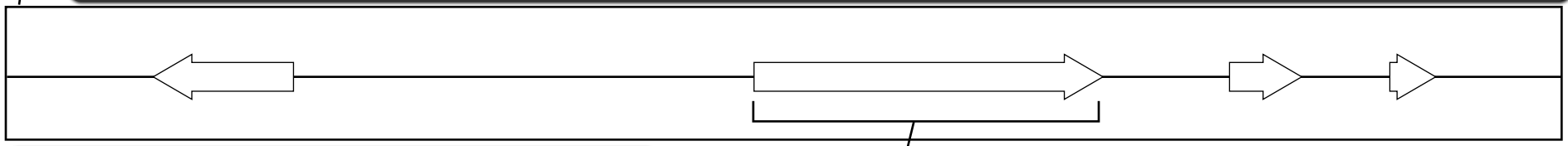
Comparative Genomics

Coding Regions

• Coding regions in the genome are symbolized by arrows. These are the regions in the genome that are transcribed into RNA and those RNAs are in turn translated into a protein. Coding regions are often conserved between different related species.

• In less complex organisms, a high percentage of the genome is made of coding regions. In more complex organisms, a low percentage of the genome is made of coding regions.

• In humans, coding regions are estimated to take up only 2% of the human genome.



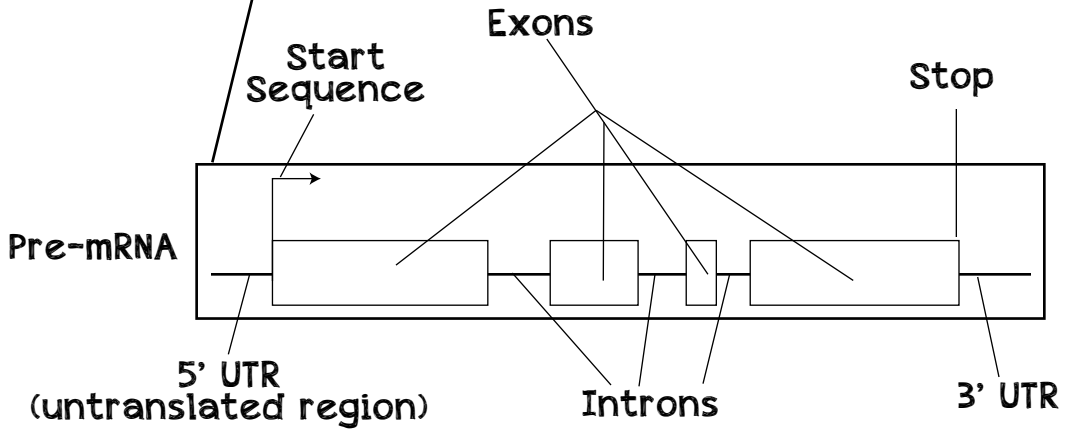
Noncoding regions

• Noncoding regions are shown on genome diagrams as lines in between the arrows.

• Some noncoding DNA is transcribed into functional RNA molecules (like transfer RNA, ribosomal RNA, and regulatory RNAs)

• In the human genome, 98% of DNA is noncoding. Scientists don't know how much of that 98% is useful or "junk DNA".

• Pseudogenes are also present in noncoding DNA. These are the nonfunctional remnants of genes that scientists think used to function in our ancestors.



• Introns are noncoding regions that are found inside of genes and are cut out (spliced) at the mRNA modification stage.

• Noncoding regions tend to be less conserved between different species.

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Parts of a Genome