

Introduction to Biology. Lecture 11

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- 1 Where we are?
 - How to be a cell
- 2 Sexual process
 - Prokaryotic sex
- 3 Basics of ecology
 - Ways of life
 - Ecological interactions



Outline

- 1 Where we are?
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Where we are?

How to be a cell



Main duties

- Making energy
- Making proteins
- Digesting food and constructing body
- Multiplying
- Making sex



How to make proteins III

- RNA synthesized from DNA is a *messenger RNA* (mRNA)
- It comes into ribosome, and ribosome translates every three letters (triplets) into amino acid
- mRNA moves within ribosome, and new amino acids are joining into growing protein
- Translation rules are known as “genetic code”
- There are 64 possible triplets and only 20 amino acids—genetic code is *redundant*



Translation rules: “genetic code”

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



Sexual process

Prokaryotic sex



How to make sex

- If DNA will stay unchanged, cells cannot evolve
- To make evolution possible, there are processes which modify DNA:
 - Mutations
 - Recombinations
- Sexual process allows DNA recombination
- Prokaryotic cells simply connect and exchange pieces of DNA (“bacterial conjugation”)



Basics of ecology

Ways of life



Ways of life

- How to obtain energy?
 - Ⓐ From sun light: **phototrophy**
 - Ⓑ From chemical reactions with inorganic matter (“rocks”): **lithotrophy**
 - Ⓒ From breaking organic molecules into inorganic (typically, carbon dioxide and water): **organotrophy**
- How to obtain building blocks?
 - Ⓐ From assimilation of carbon dioxide: **autotrophy**
 - Ⓑ From other living beings: **heterotrophy**



Six life styles

	Phototrophs	Lithotrophs	Organotrophs
Autotrophs
Heterotrophs



Basics of ecology

Ecological interactions



Two-species model

- Species I and species II may influence each other differently
- For example, species I may facilitate the increase the number of species II individuals (+ interaction)
- At the same time, species II could be neutral to species I (0 interaction)



Six basic ecological interactions

	+	0	-
+	mutualism	commensalism ¹	exploitation ²
0	...	neutralism	amensalism
-	interference ³

¹ Includes phoresy (transportation), inquilinism (housing) and “sponging”

² Includes predation, parasitism and phytophagy

³ Includes competition, allelopathy and aggression



Summary

- Prokaryotic cells are simplest cells. They produce energy, obtain monomers, synthesize polymers, e.g. proteins from DNA and RNA, and sometimes also make monomers themselves (with photosynthesis), divide and even perform a sexual process (recombine DNA between cells).
- Sexual process is the requirement for evolution.



For Further Reading



Genetic code.

http://en.wikipedia.org/wiki/Genetic_code



Bacterial conjugation.

http://en.wikipedia.org/wiki/Bacterial_conjugation

