

# Биология за 1 пару

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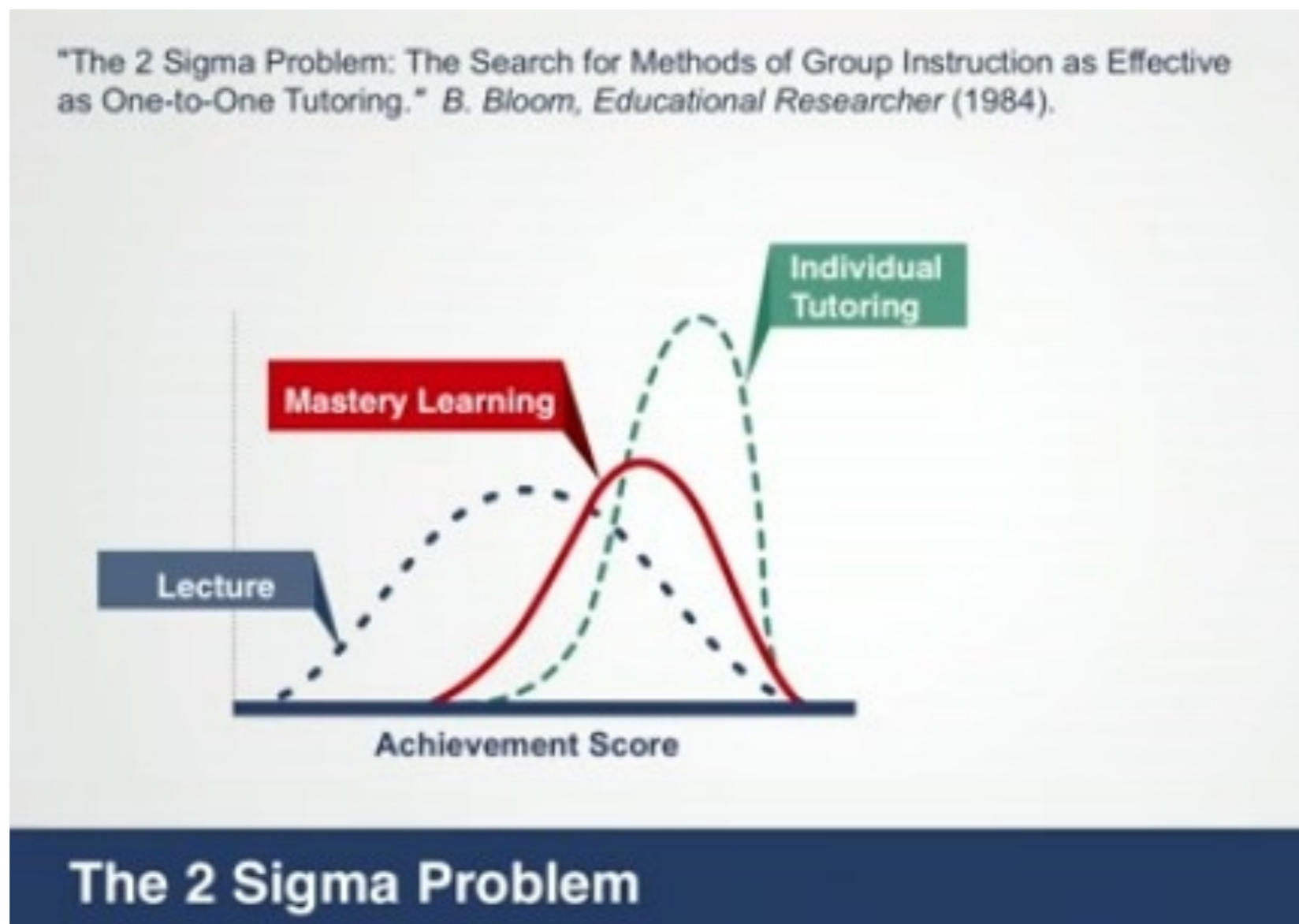
Computer Science Club  
Санкт-Петербург, 2013



**Институт  
Биоинформатики**



# Формат обучения



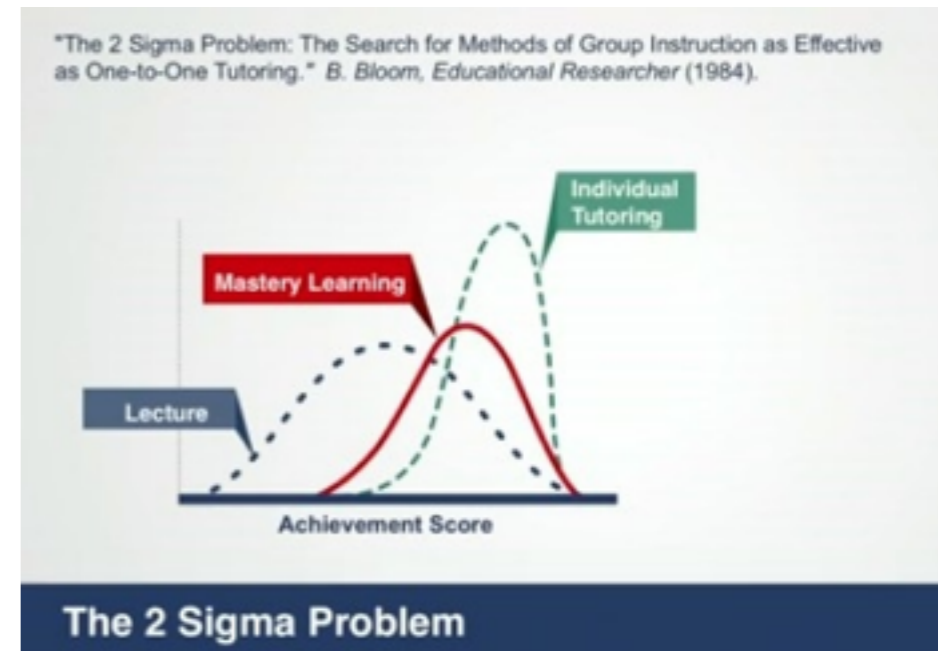
# Формат обучения

12 лекций по воскресеньям

Квизы для самопроверки

Домашние задания и вопросы онлайн

<http://rosalind.info/classes/enroll/ff45302de4/>



# Сьогодні

ДНК

РНК

Белки

Геномика

Протеоміка



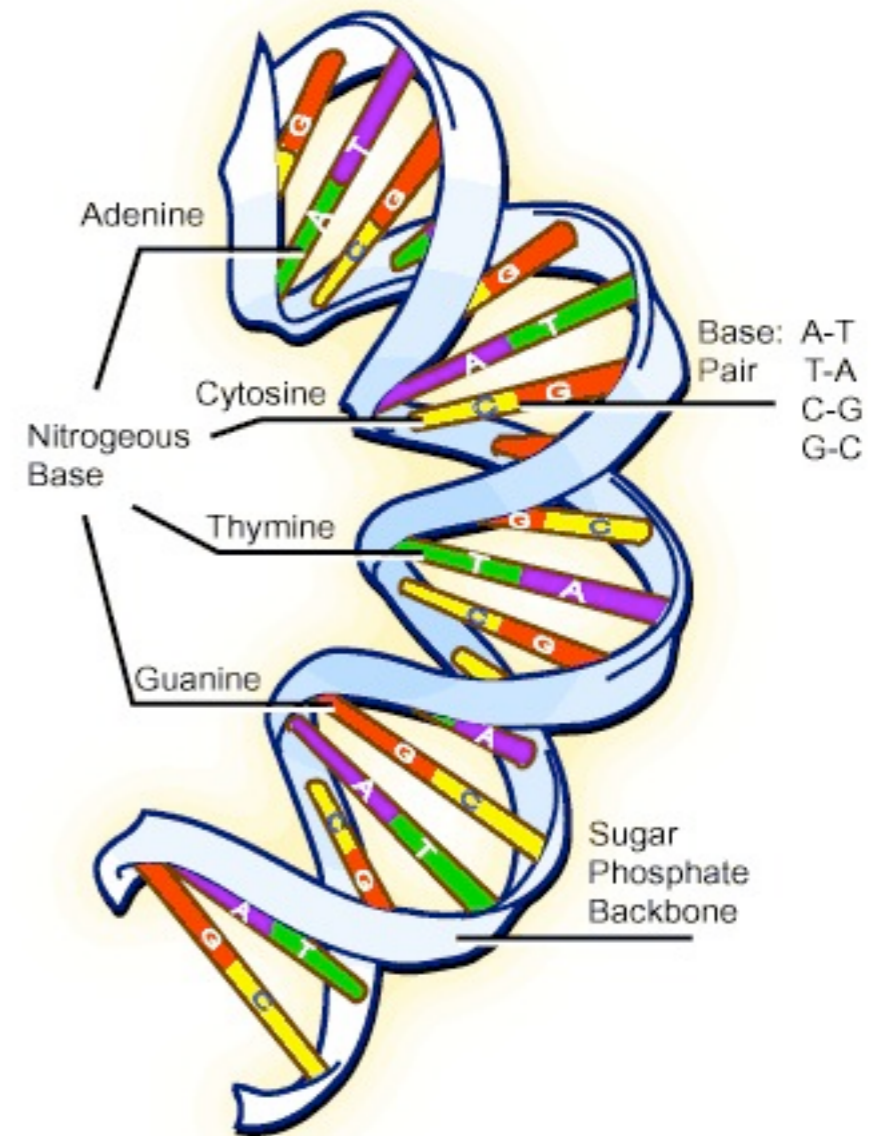
# ДНК

Двойная спираль

Нуклеотиды:

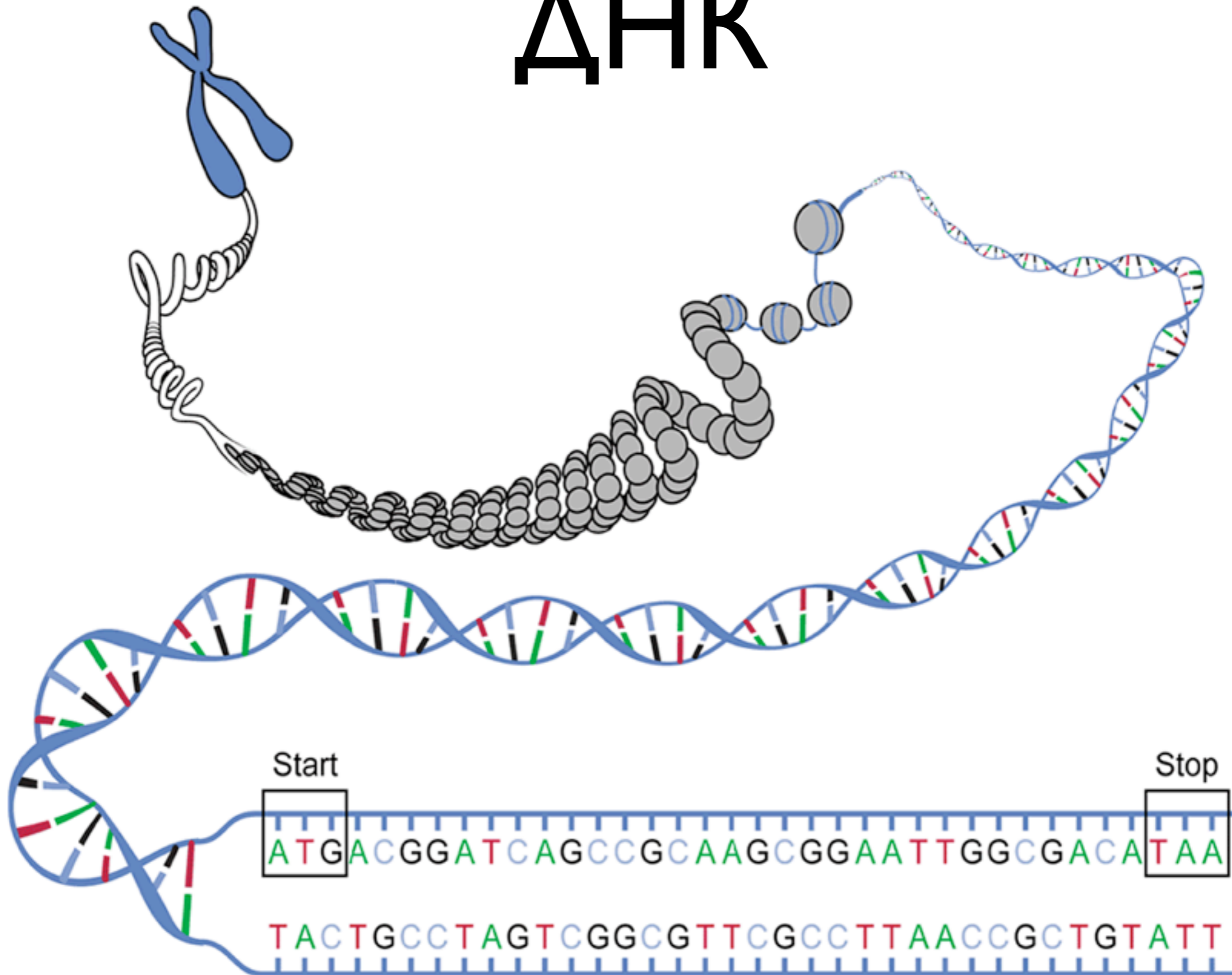
**A** = **T**

**C** ≡ **G**



Мера длины: bp (base pair)

# ДНК



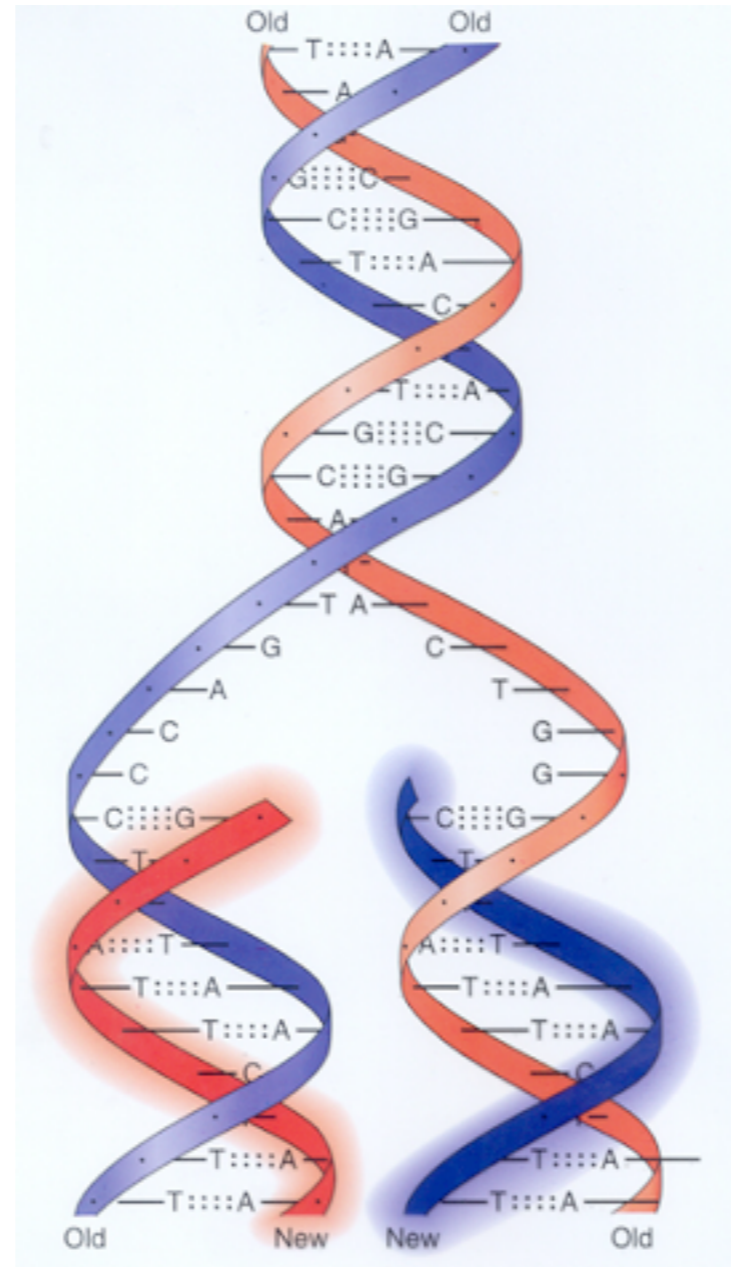
# Направление ДНК

→ **CCCAAGAACTGAGATCAAT** →





# Репликация



ДНК → 2 x ДНК

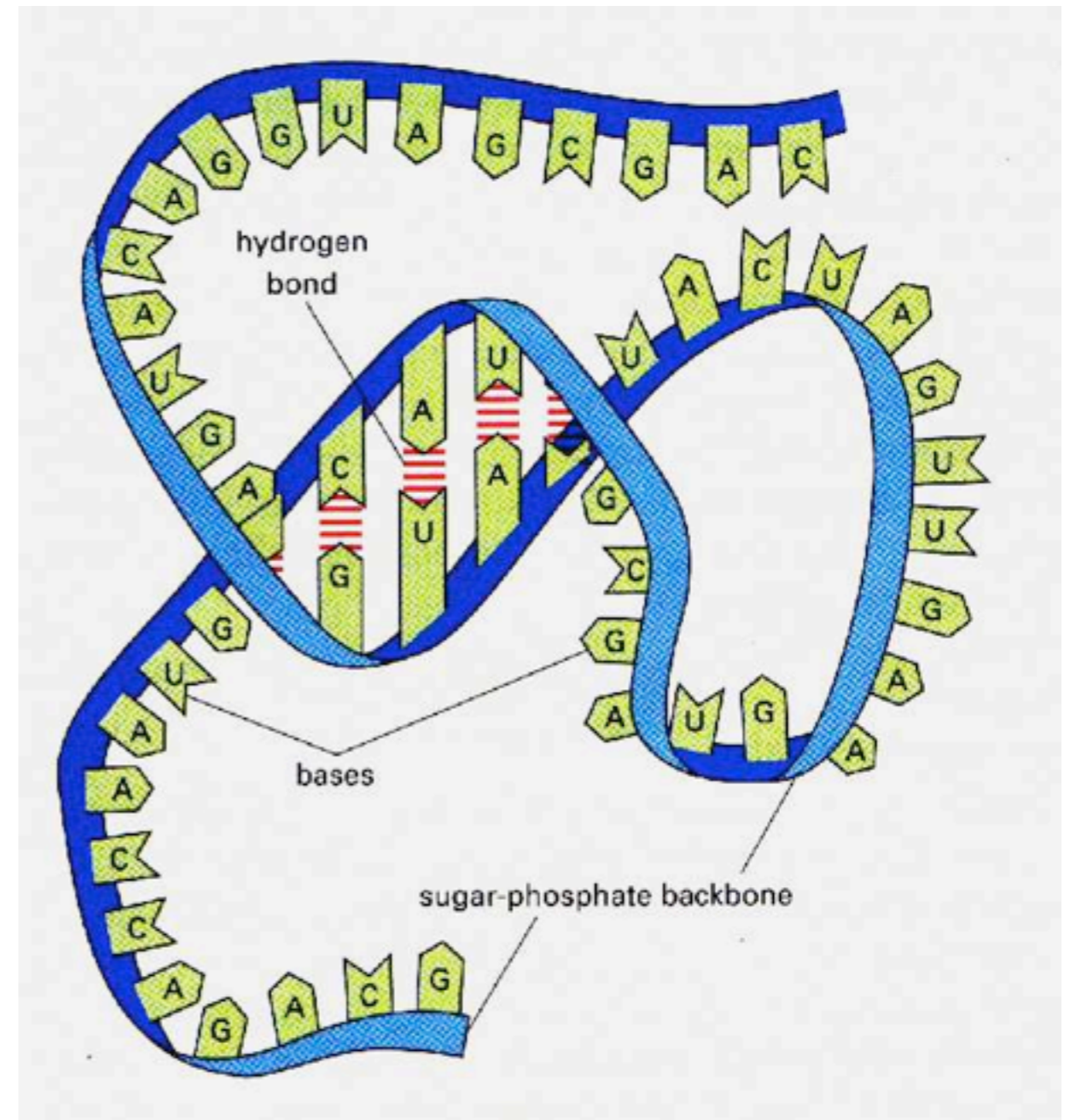
# РНК

Одна цепь

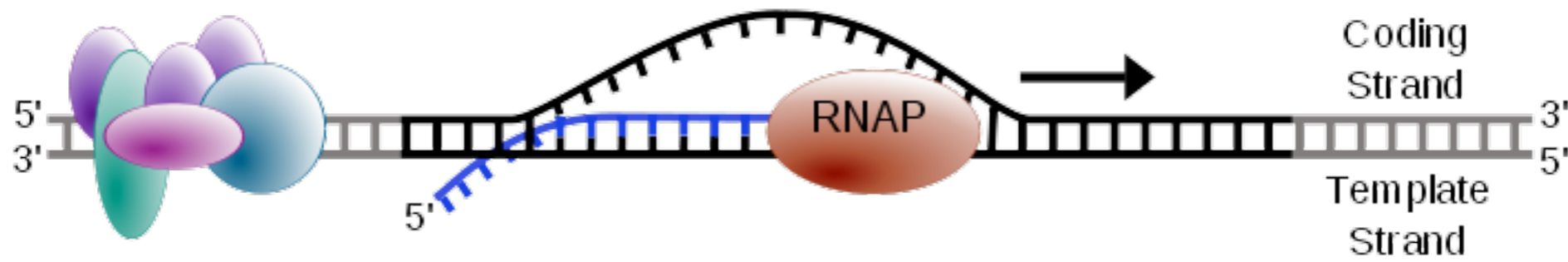
Рибонуклеотиды:

**A** = **U**

**C** ≡ **G**



# Транскрипция



ДНК → РНК

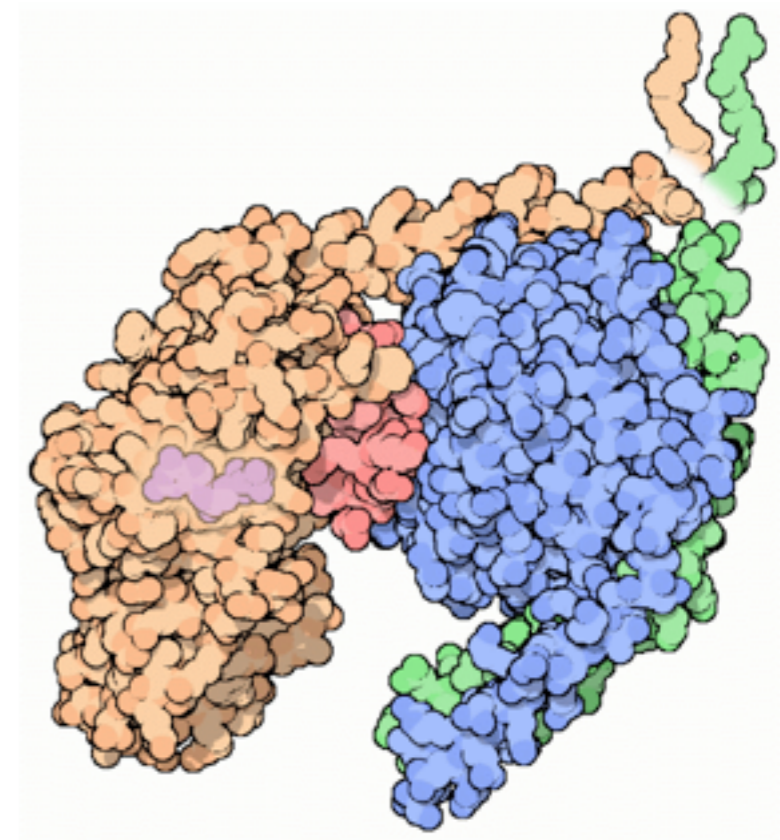
**T** → **U**

# Белки / Протеины

Аминокислоты (20):

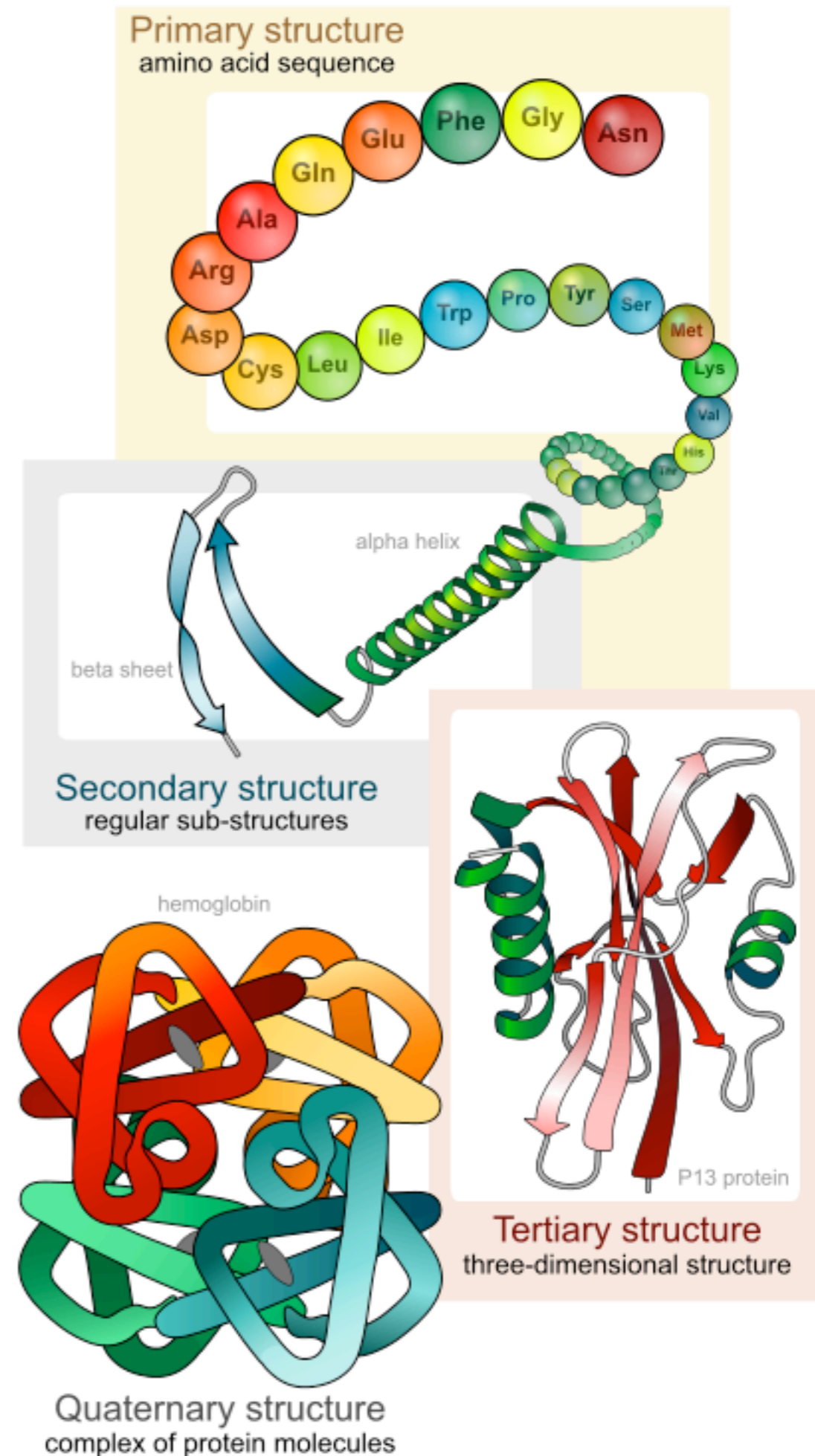
**ACDEFGHIKLMNPQRSTVWY**

**Функции:** структурная,  
ферментативная, рецепторная,  
гормональная, транспортная,  
сократительная, защитная.



# Структура белка

1. Последовательность
2.  $\alpha$ -спираль /  $\beta$ -лист
3. Трёхмерная структура
4. Комплекс



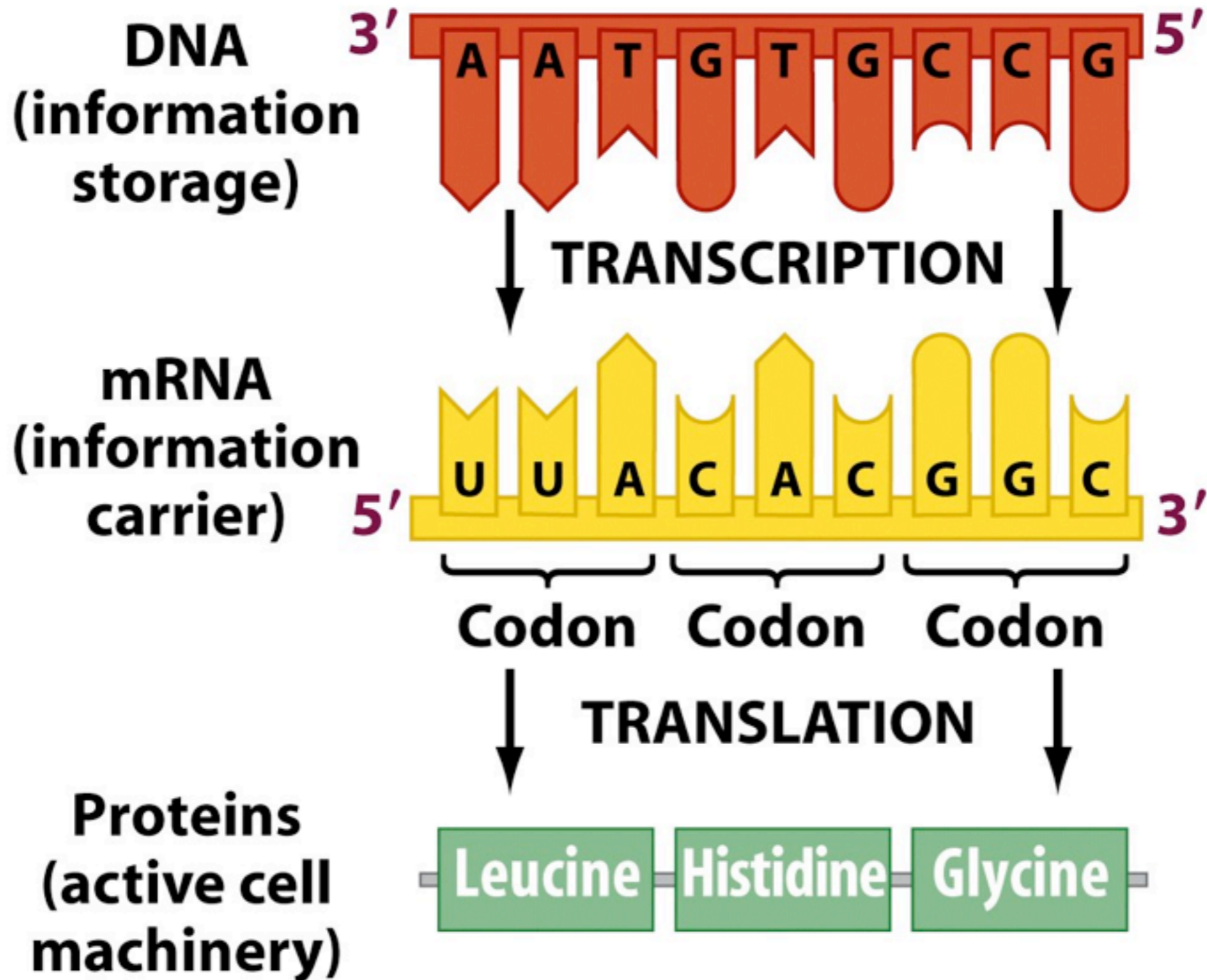
# Трансляция

		Second base					
		U	C	A	G		
First base	U	UUU } Phenyl- UUC } alanine <b>F</b> UUA } Leucine <b>L</b> UUG }	UCU } UCC } Serine <b>S</b> UCA } UCG }	UAU } Tyrosine <b>Y</b> UAC } UAA } Stop codon UAG } Stop codon	UGU } Cysteine <b>C</b> UGC } UGA } Stop codon UGG } Tryptophan <b>W</b>	U	C
	C	CUU } CUC } Leucine <b>L</b> CUA } CUG }	CCU } CCC } Proline <b>P</b> CCA } CCG }	CAU } Histidine <b>H</b> CAC } CAA } Glutamine <b>Q</b> CAG }	CGU } CGC } Arginine <b>R</b> CGA } CGG }	U	C
	A	AUU } Isoleucine <b>I</b> AUC } AUA } AUG } Methionine <b>M</b> start codon	ACU } ACC } Threonine <b>T</b> ACA } ACG }	AAU } Asparagine <b>N</b> AAC } AAA } Lysine <b>K</b> AAG }	AGU } Serine <b>S</b> AGC } AGA } Arginine <b>R</b> AGG }	U	C
	G	GUU } GUC } Valine <b>V</b> GUA } GUG }	GCU } GCC } Alanine <b>A</b> GCA } GCG }	GAU } Aspartic GAC } acid <b>D</b> GAA } Glutamic GAG } acid <b>E</b>	GGU } GGC } Glycine <b>G</b> GGA } GGG }	U	C
						A	G

РНК → Белок

3 нуклеотида (кодон) → 1 аминокислота (aa)

# Центральная Догма

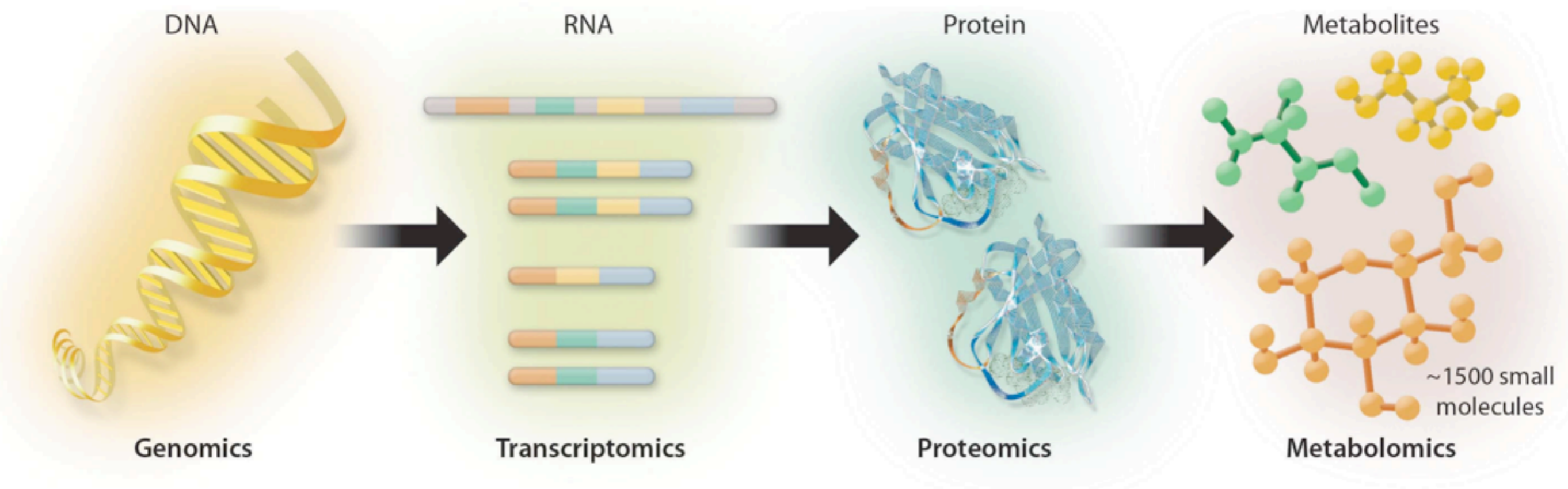


# ОМИКИ

Геном — все ДНК организма.

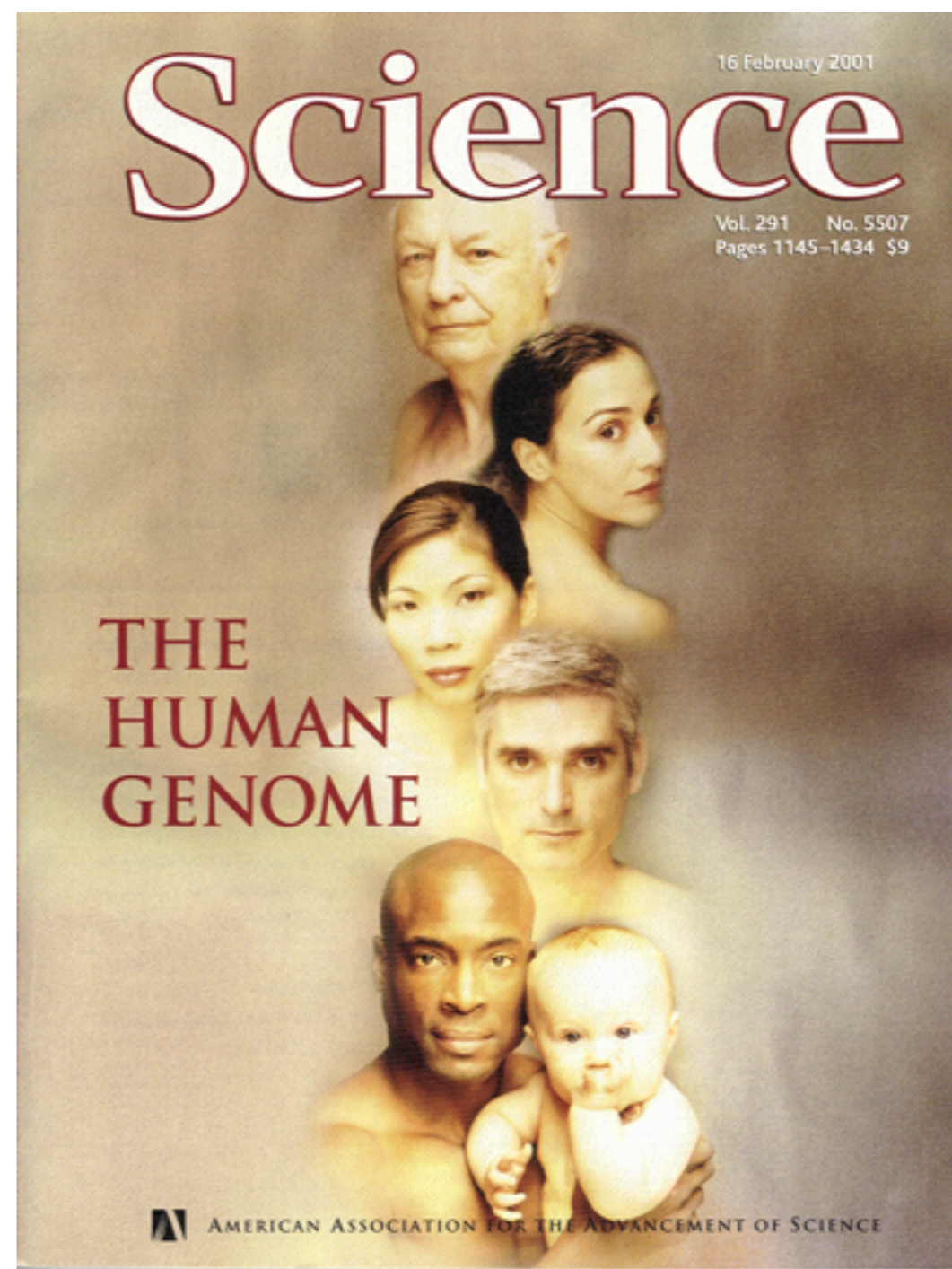
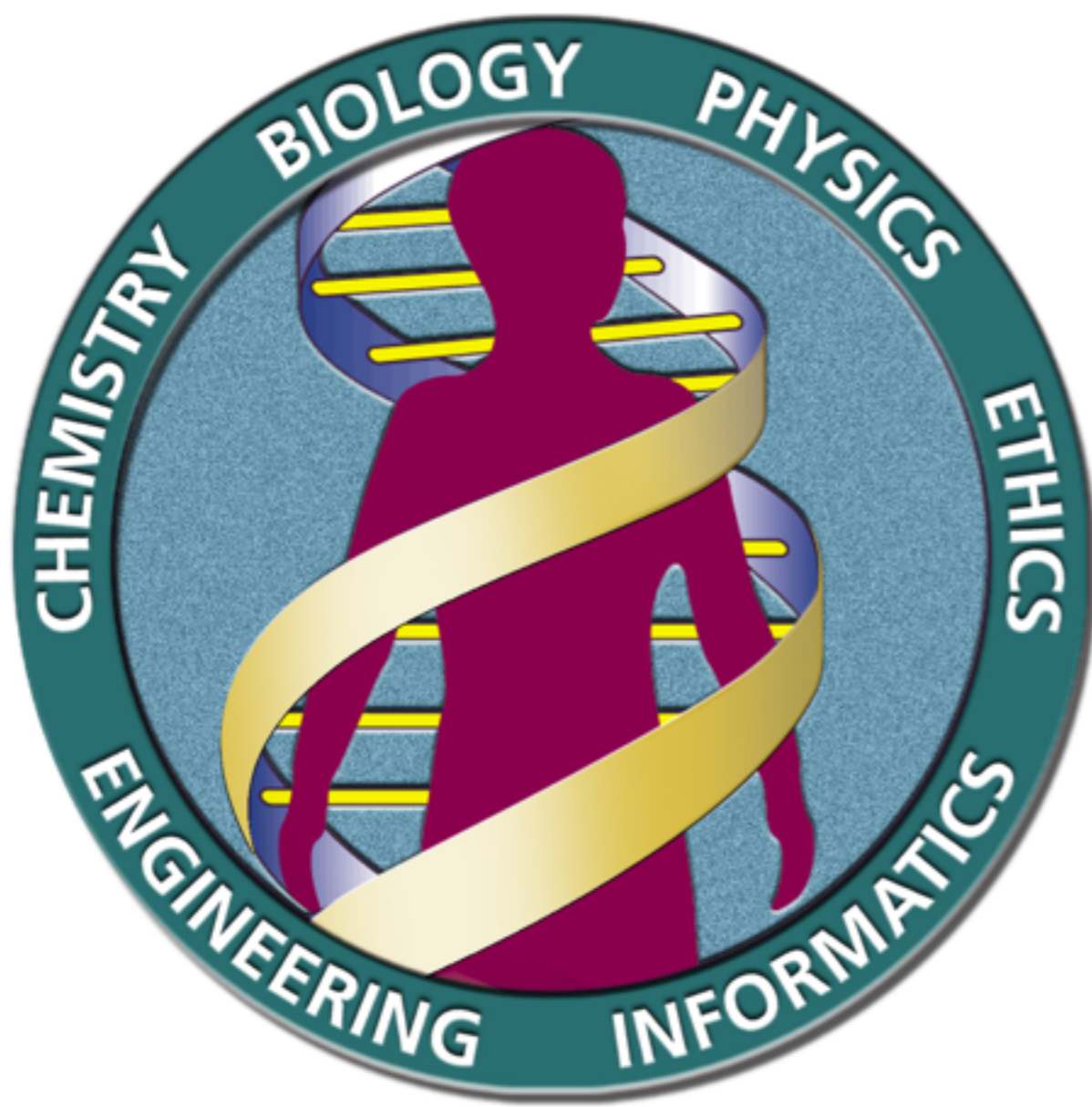
Транскриптом — все РНК организма.

Протеом — все белки организма.

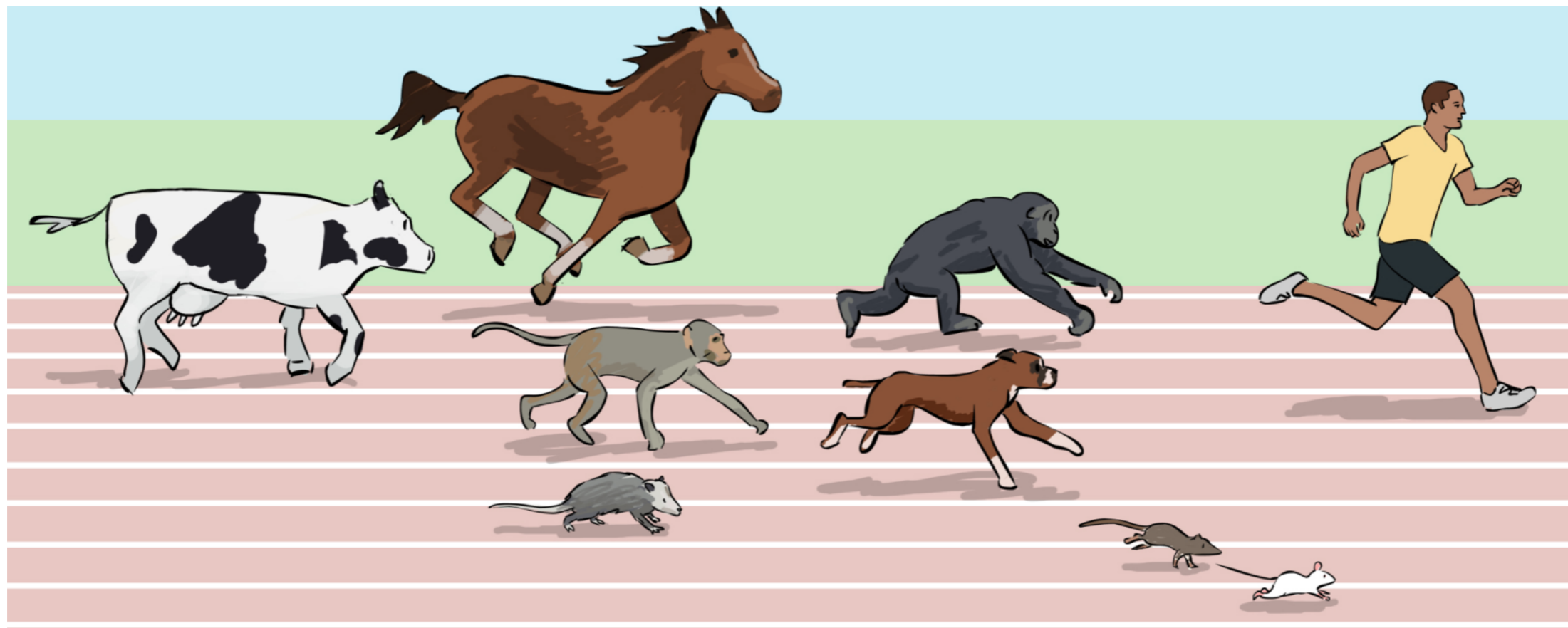




# Геном человека



# Геномы



cow  
2009

horse  
2007

opossum  
2007

macaque  
2006

dog  
2005

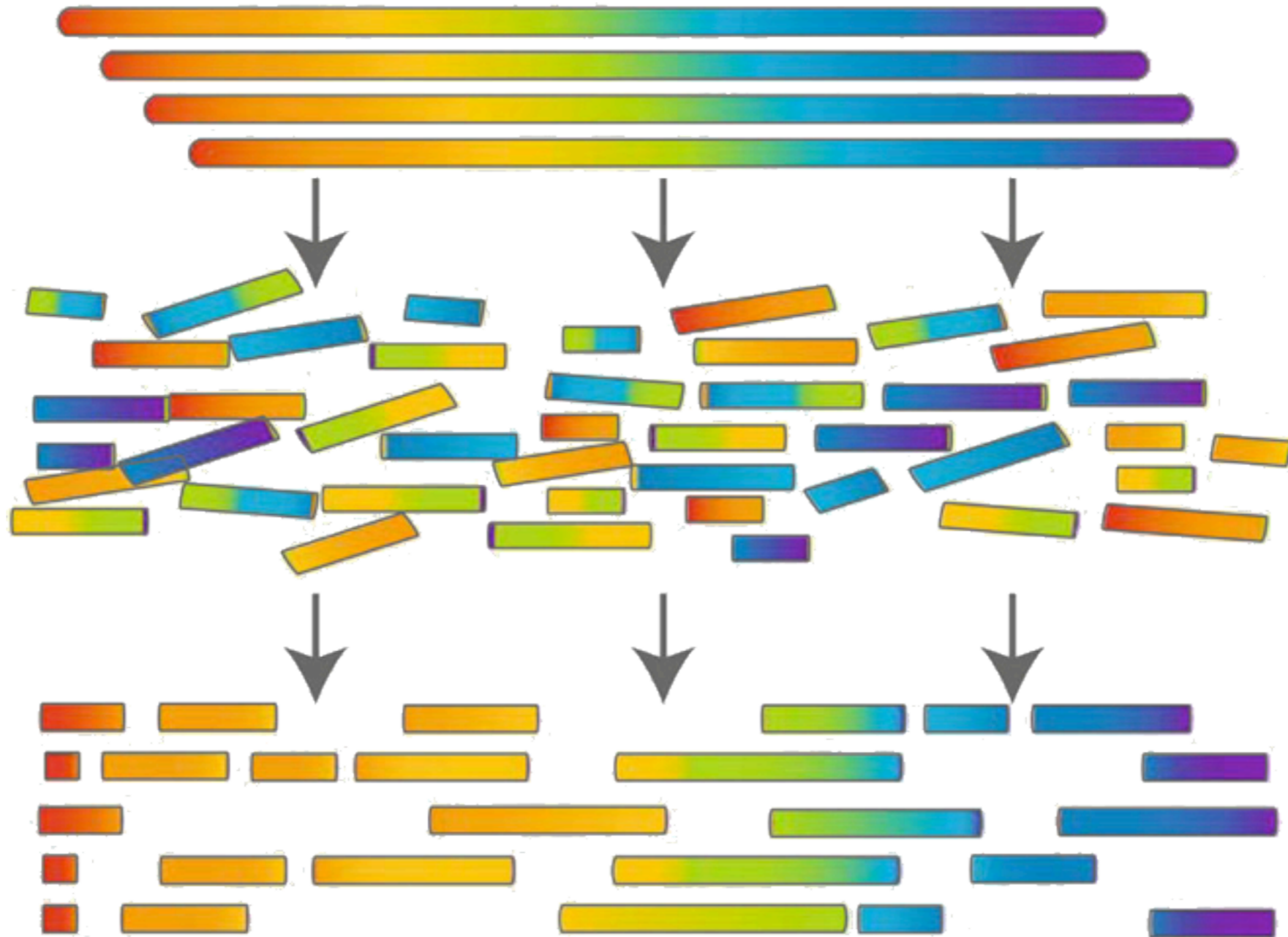
chimpanzee  
2005

rat  
2004

mouse  
2002

human  
2001

# Чтение геномов

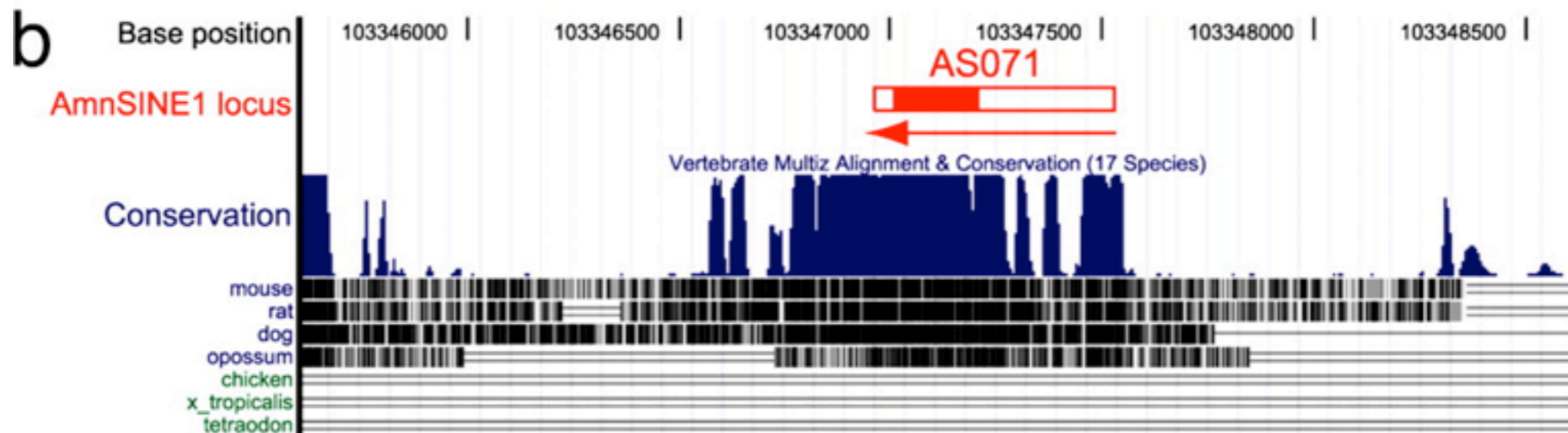
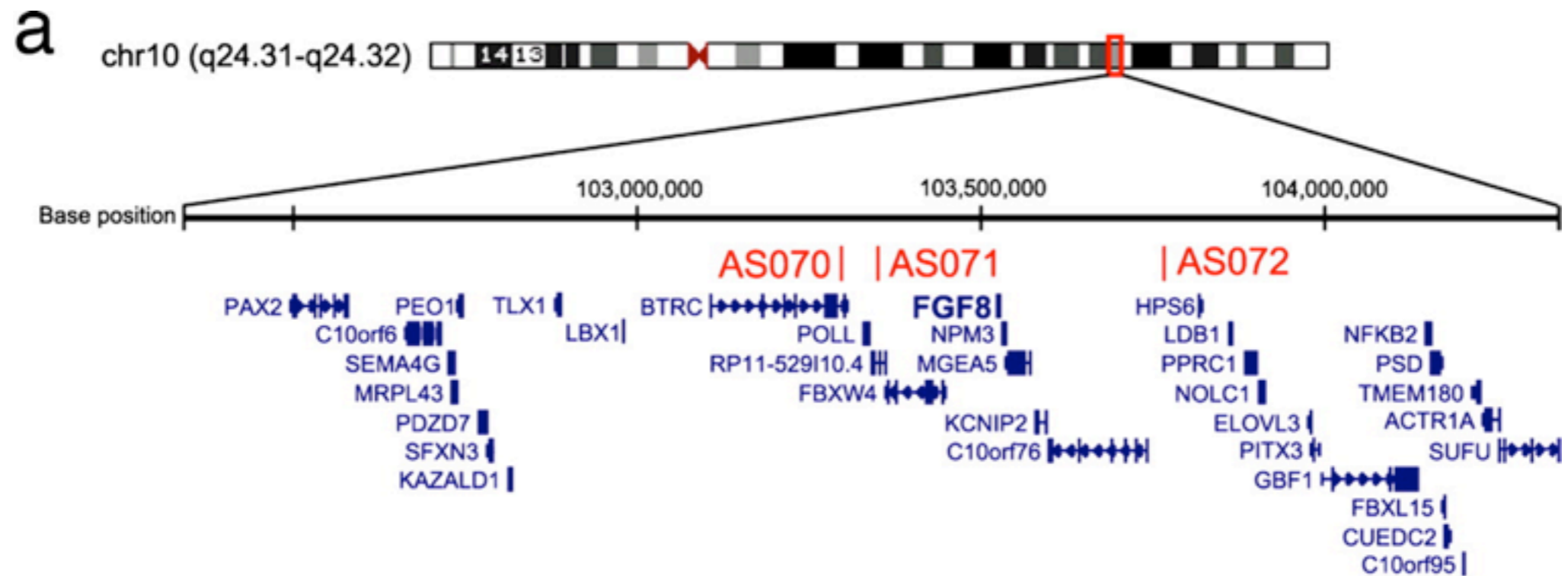


ATGTTCCGATTAGGAAACCTATCTGTAAGTTCATTTCAGTAAAAGGAGGAAATATAA

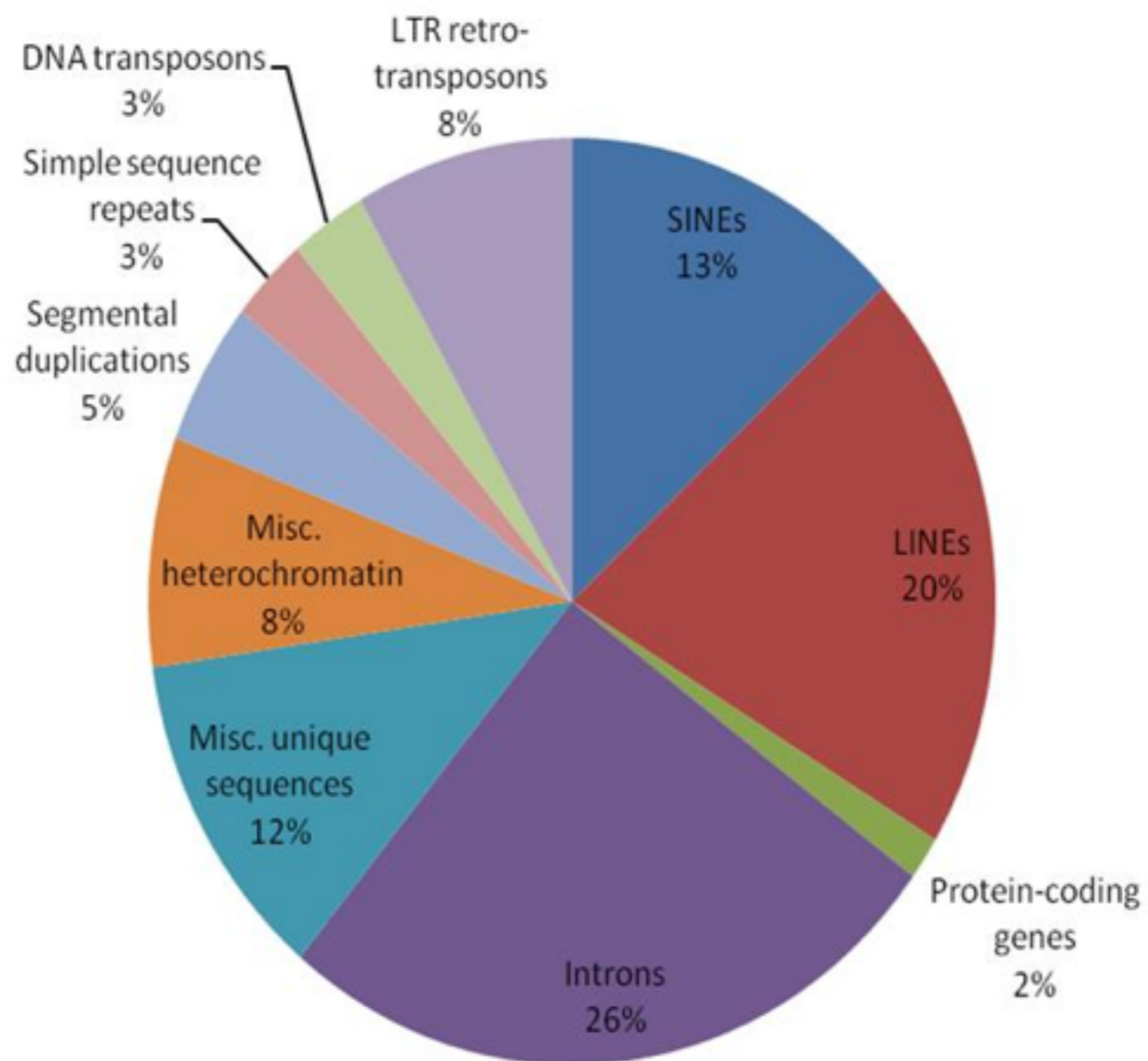
# Геномика

AGCTTTTCATTCTGACTGCAACGGGCAATATGTCTCTGTGTGGATTAAAAAAGAGTGTCTGATAGC  
AGCTTCTGAACTGGTTACCTGCCGTGAGTAAATTTAATTTGACTTAGGTCACTAAATACTTT  
AACCAATATAGGCATAGCGCACAGACAGATAAAAATTACAGAGTACACAACATCCATGAAACGCATT  
AGCACCACTTACCACCACCATCACCATACCACAGGTAACGGTGCGGGCTGACGCGTACAGGAAA  
CACAGAAAAAGCCCGCACCTGACAGTGCGGGCTTTTTTTTTTCGACCAAAGGTAACGAGGTAACAAC  
CATGCGAGTGTTGAAGTTCGGCGGTACATCAGTGGCAAATGCAGAACGTTTTCTGCGTGTTGCCGAT  
ATTCTGGAAAGCAATGCCAGGCAGGGGCAGGTGGCCACCGTCCTCTCTGCCCCGCCAAAATCACCA  
ACCACCTGGTGGCGATGATTGAAAAAACCATTAGCGGCCAGGATGCTTTACCCAATATCAGCGATGC  
CGAACGTATTTTTGCCGAACTTTTGACGGGACTCGCCGCCGCCAGCCGGGGTTCCCGCTGGCGCAA  
TTGAAAACTTTCGTCGATCAGGAATTTGCCCAAATAAAACATGTCCTGCATGGCATTAGTTTGTGG  
GGCAGTGCCCGGATAGCATCAACGCTGCGCTGATTTGCCGTGGCGAGAAAATGTCGATCGCCATTAT  
GGCCGGCGTATTAGAAGCGCGCGGTCAACAACGTTACTGTTATCGATCCGGTCGAAAAACTGCTGGCA  
GTGGGGCATTACCTCGAATCTACCGTCGATATTGCTGAGTCCACCCGCCGTATTGCGGCAAGCCGCA  
TTCCGGCTGATCACATGGTGCTGATGGCAGGTTTCACCGCCGGTAATGAAAAAGGCGAACTGGTGGT  
GCTTGGACGCAACGGTTCCGACTACTCTGCTGCGGTGCTGGCTGCCTGTTTACGCGCCGATTGTTGC  
GAGATTTGGACGGACGTTGACGGGGTCTATACCTGCGACCCGCGTCAGGTGCCCGATGCGAGGTTGT  
TGAAGTCGATGTCCTACCAGGAAGCGATGGAGCTTTCCTACTTCGGCGCTAAAGTTCCTCACCCCCG  
CACCATTACCCCATCGCCCAGTTCAGATCCCTTGCCTGATTAAAAATACCGGAAATCCTCAAGCA  
CCAGGTACGCTCATTGGTGCCAGCCGTGATGAAGACGAATTACCGGTCAAGGGCCGGGACTCGCCCCG

# Аннотации

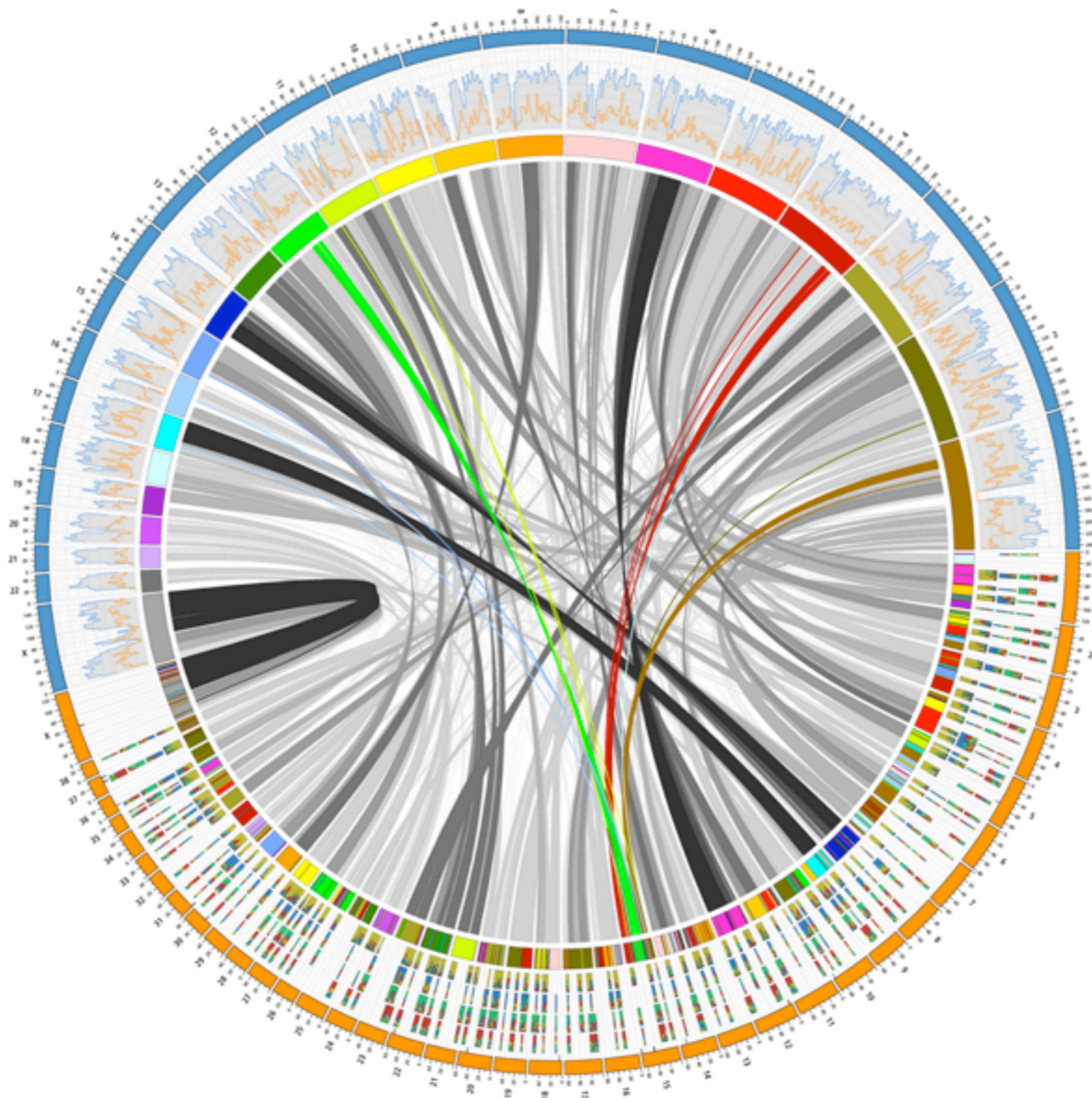


# Геном человека

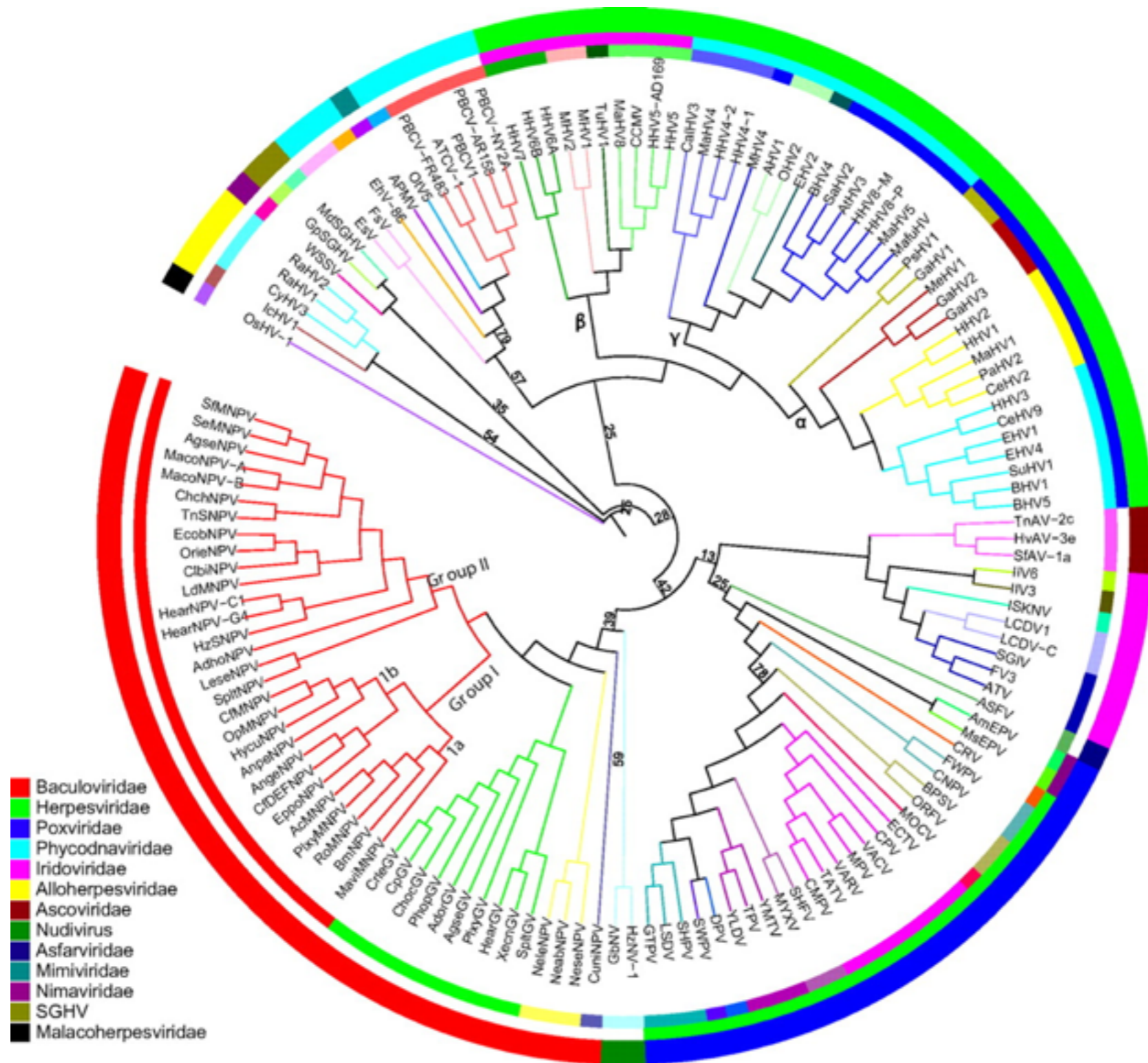


Components of the Human Genome

# Сравнительная геномика

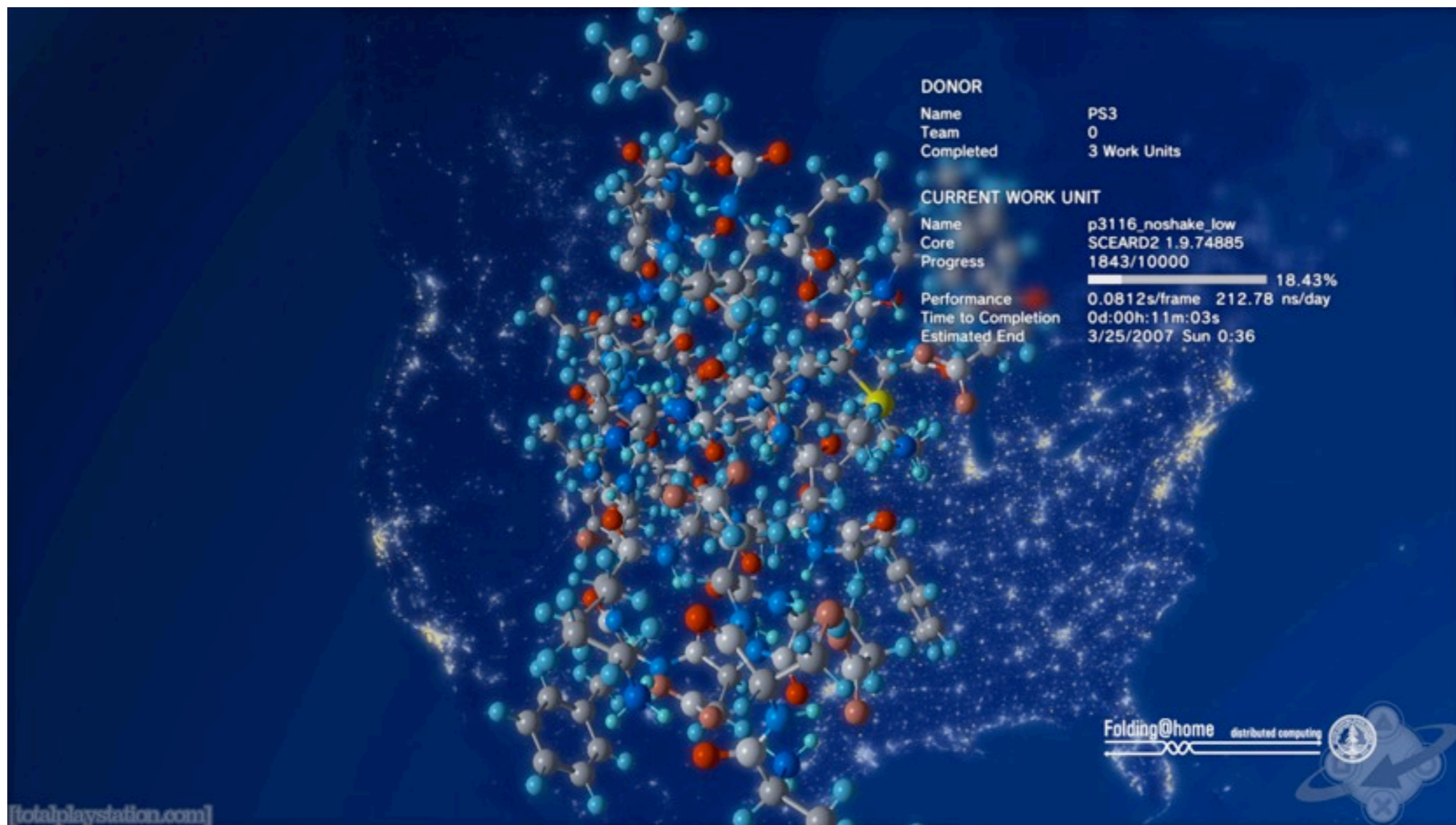


# Филогения





# Протеомика



The image shows a screenshot of the Folding@home interface. On the left, a large, detailed ball-and-stick model of a protein structure is displayed against a dark blue background with a faint map of the Americas. The protein is composed of numerous atoms represented by small spheres in white, blue, red, and yellow, connected by thin lines representing bonds. On the right side, there is a text-based status panel. At the top, it is labeled 'DONOR' and lists 'Name: PS3', 'Team: 0', and 'Completed: 3 Work Units'. Below this is the 'CURRENT WORK UNIT' section, which includes 'Name: p3116\_noshake\_low', 'Core: SCEARD2 1.9.74885', and 'Progress: 1843/10000' with a progress bar showing 18.43%. Further down, it lists 'Performance: 0.0812s/frame 212.78 ns/day', 'Time to Completion: 0d:00h:11m:03s', and 'Estimated End: 3/25/2007 Sun 0:36'. In the bottom right corner, there is the 'Folding@home distributed computing' logo, which includes a stylized atom and a PlayStation logo. In the bottom left corner, the text '[totalplaystation.com]' is visible.

DONOR	
Name	PS3
Team	0
Completed	3 Work Units

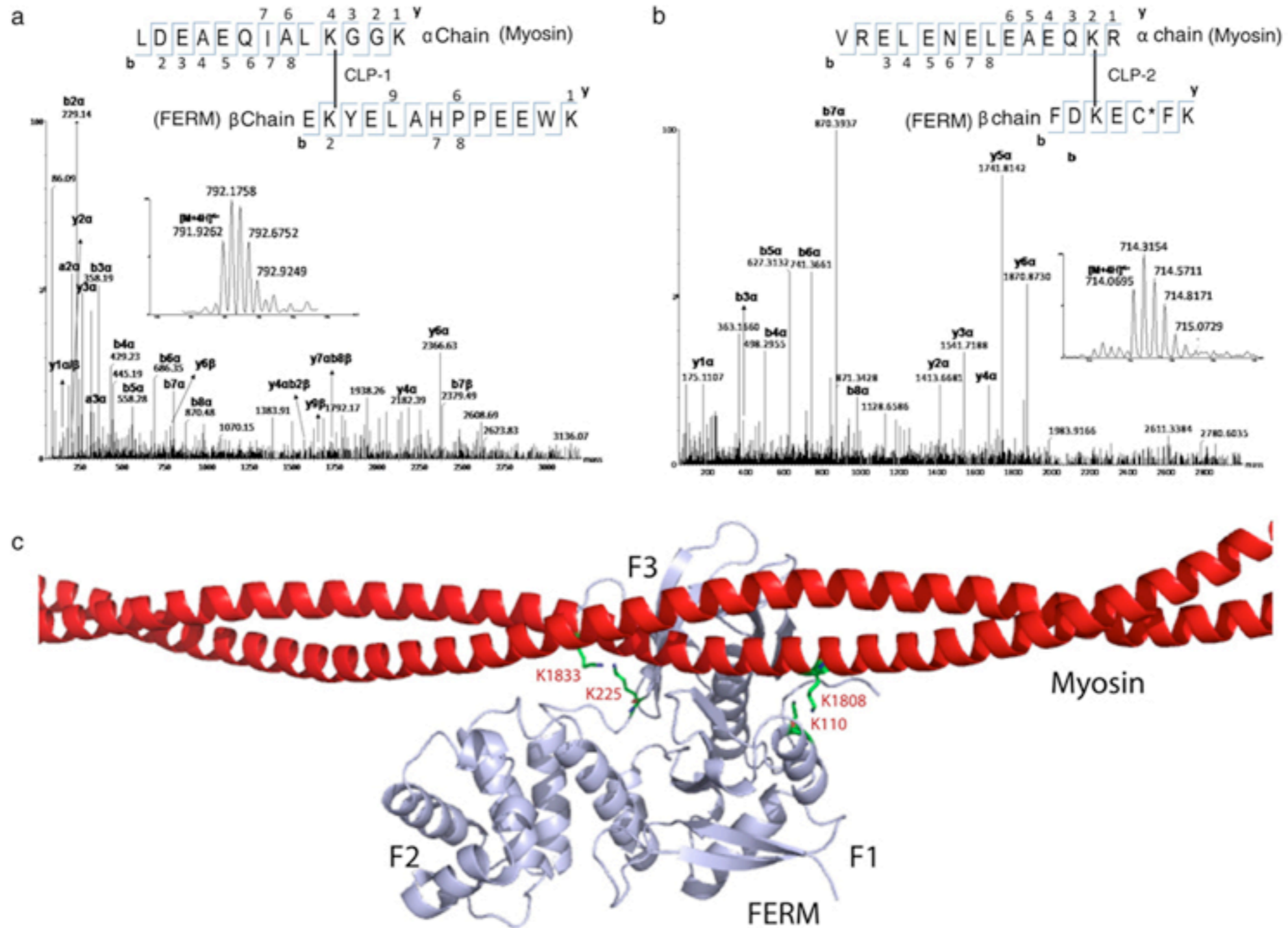
  

CURRENT WORK UNIT	
Name	p3116_noshake_low
Core	SCEARD2 1.9.74885
Progress	1843/10000
	<div style="width: 18.43%;"></div> 18.43%
Performance	0.0812s/frame 212.78 ns/day
Time to Completion	0d:00h:11m:03s
Estimated End	3/25/2007 Sun 0:36

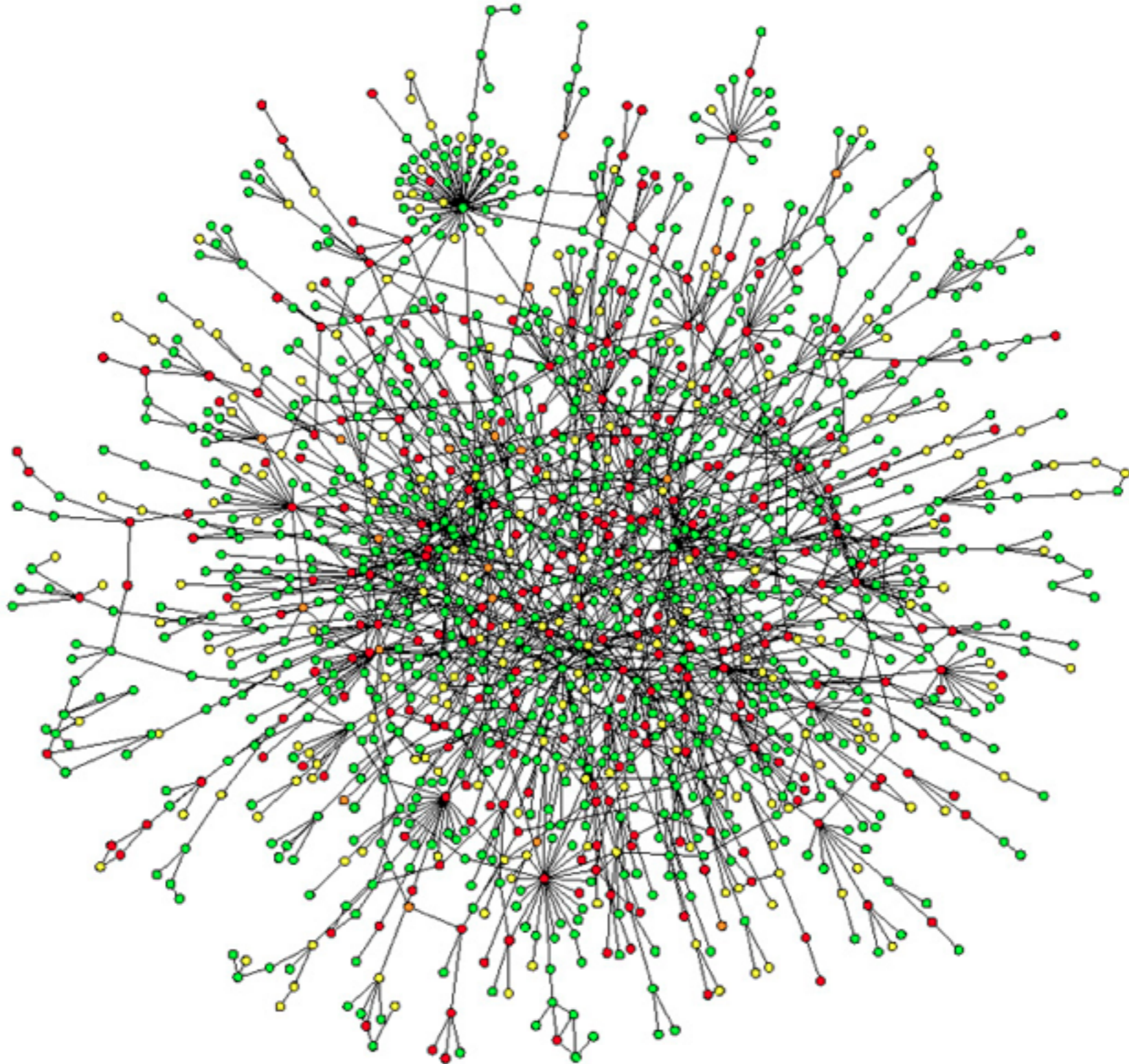
[totalplaystation.com]

Folding@home distributed computing

# Масс-спектрометрия



# Pathways



# Сьогодні

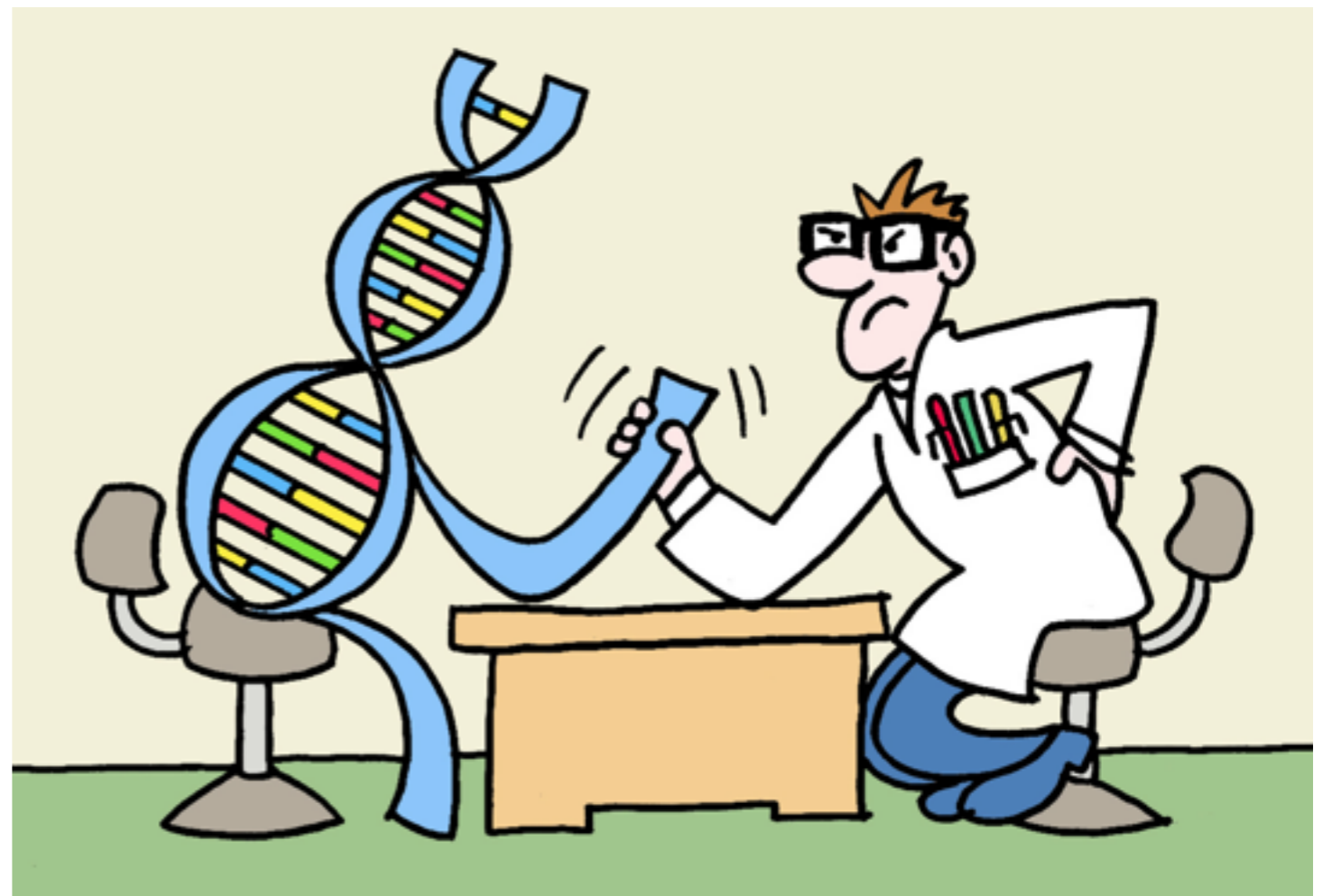
ДНК

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