‘Glass Half Full or Empty’: Illuminating the Human Transcriptome

Lecture 1

What is the world?

What is the world?

What is the world?

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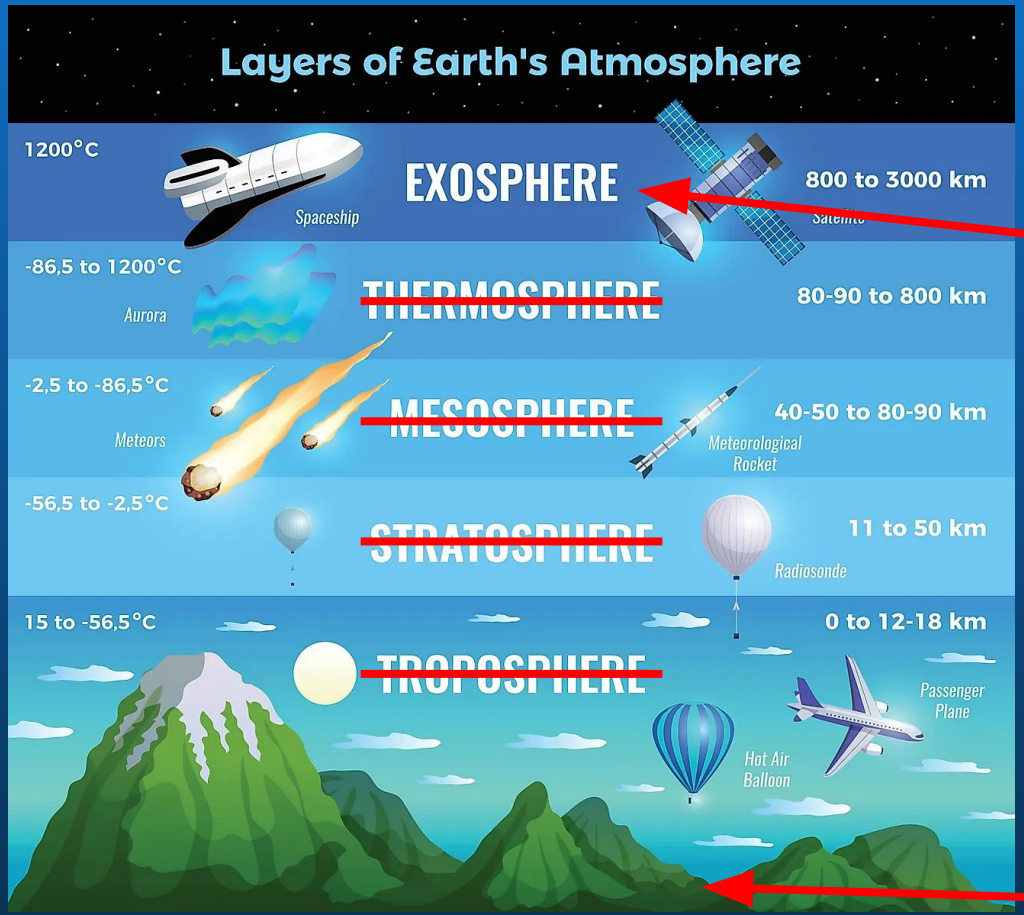
What is the world?



This course focuses on two specific layers within biology

Why Biology?

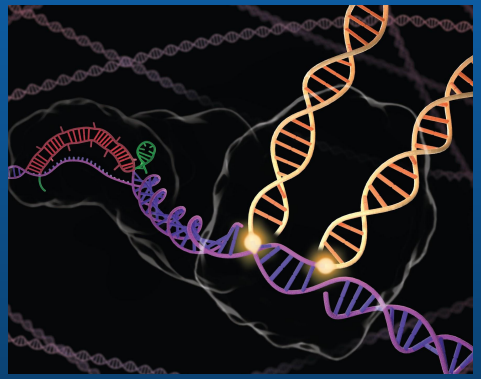
Biology = Life

Biology + Medicine = More Life

Why Biology?

Biology = Life

Biology + Medicine = More Life



Rewriting the code of life with CRISPR

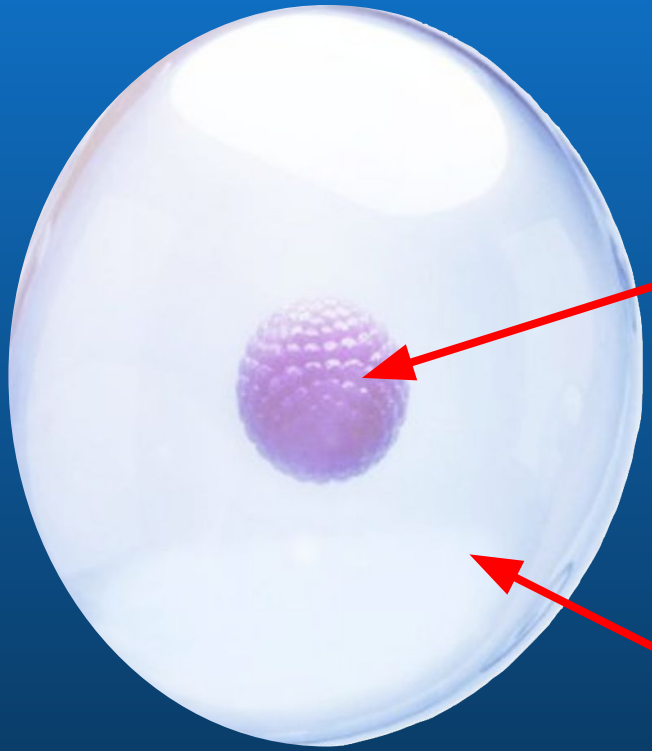
Experimental Gene Therapy Reverses Sickle Cell Disease for Years

December 13, 2021

The World of Biology

The Cell

The World of Biology



Nucleus => DNA

RNA

Protein

Cytoplasm

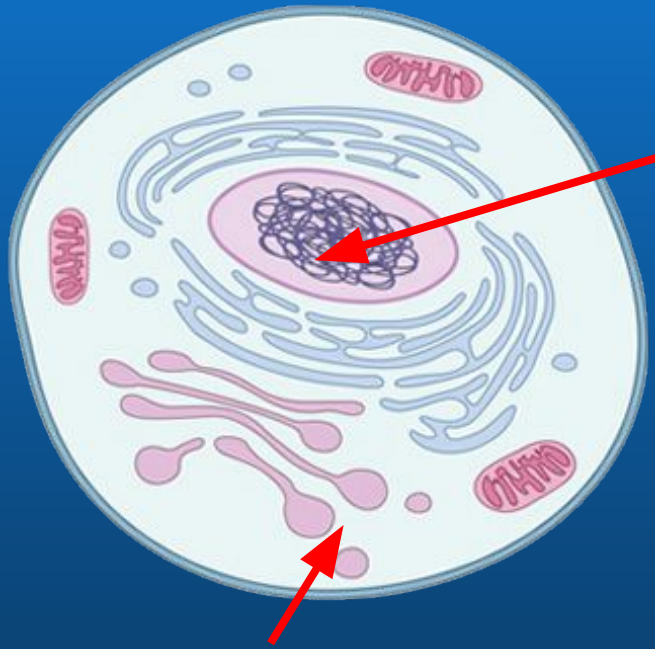
The Cell

The World of Biology

The Cell

The World of Biology

The Cell



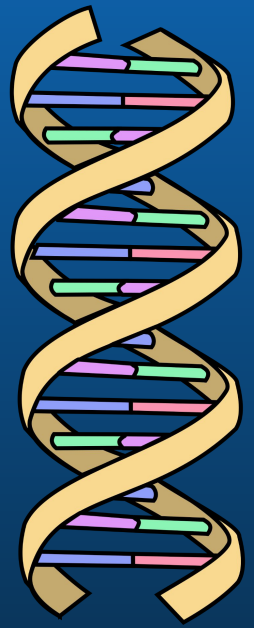
Nucleus

Cytoplasm

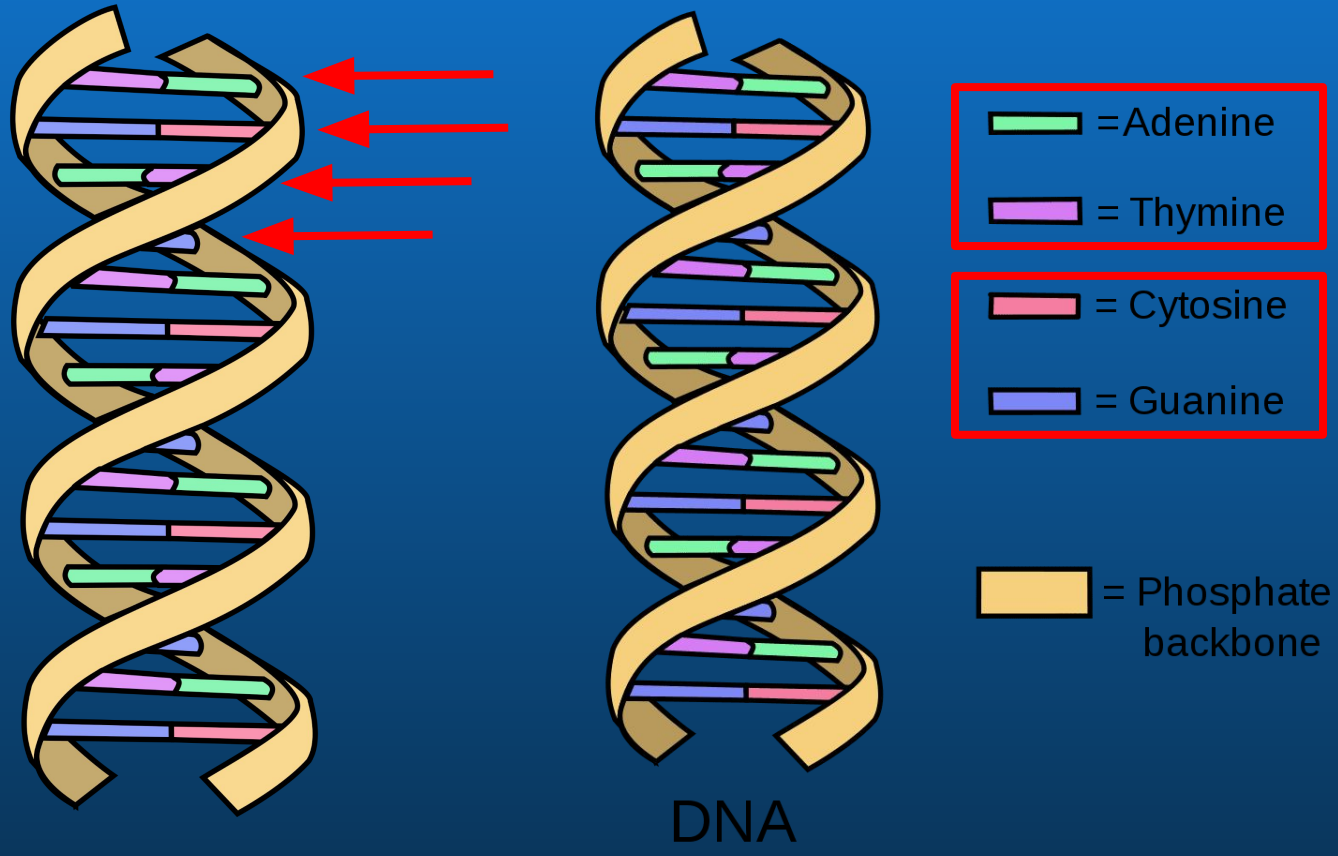
DNA in the Nucleus

The Cell

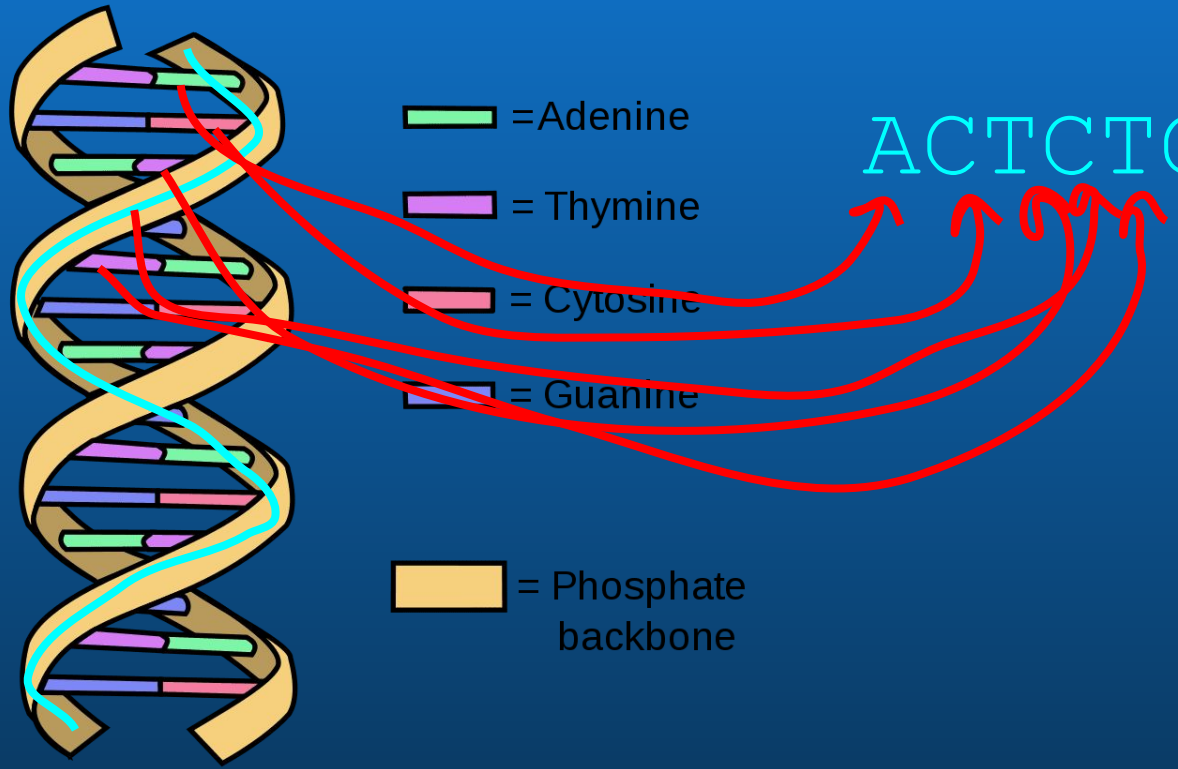
Nucleus => DNA



DNA in the Nucleus

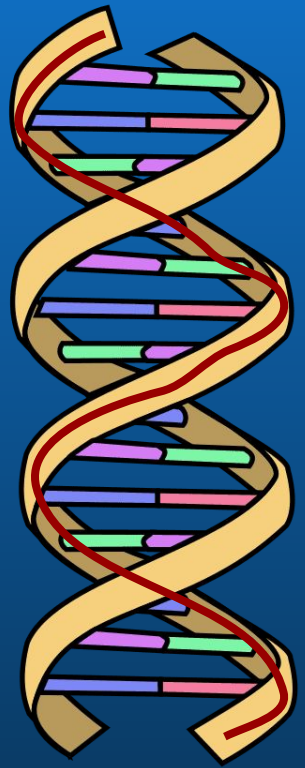


DNA in the Nucleus



ACTCTGAGACTCTG

Your Turn



DNA

=Adenine

= Thymine

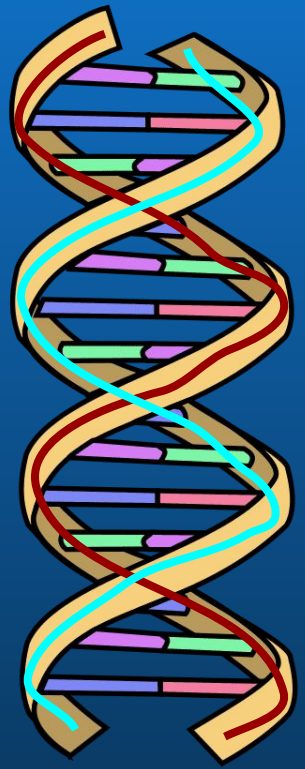
= Cytosine

= Guanine

= Phosphate backbone

TGAGACTCTGAGAC

Think about it a different way



DNA

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ACTCTGAGACTCTG

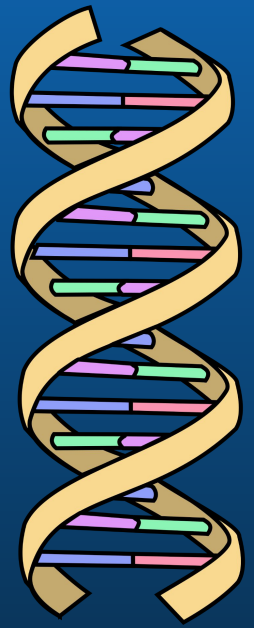
TGAGACTCTGAGAC

Worksheet Time!

The Genome

The Cell

Nucleus => DNA



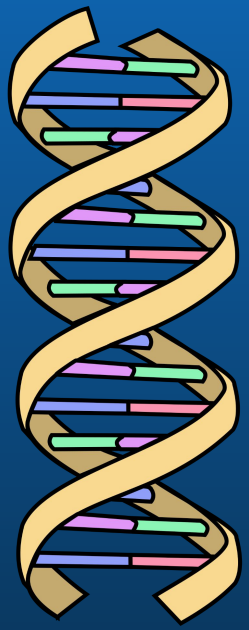
The Genome

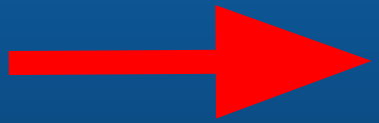
The Cell

Nucleus => DNA

The Genome

Nucleus => DNA





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```

The Human Genome

Nucleus => DNA

```
AGCCTTCTGGGTCCGAGGCTCCCAC
CTGCTCTAAGCGCTTGACACCCTTT
AAAAAAATGTATTTAAAGAG
GCTGGTTCCTATCCATCCGACTGGA
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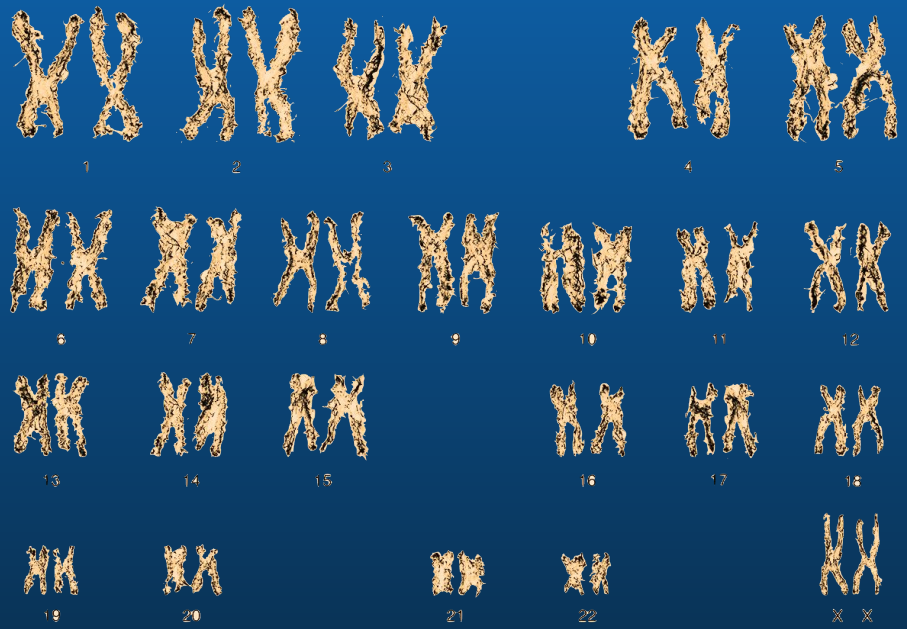
```

+ 3 billion more

How do we Access a Location in the Genome?

The Cell

Nucleus => DNA



How do we Access a Location in the Genome?

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How do we Access a Location in the Genome?

UCSC Genome Browser Demo

https://genome.ucsc.edu/cgi-bin/hgGateway

The Human Genome

AGCCTTCTGGGTCCGAGGCTCCCACCTGCTCTAAGCGCTTGACACCCTTTAAAAAAATGTATTTAAAGAG
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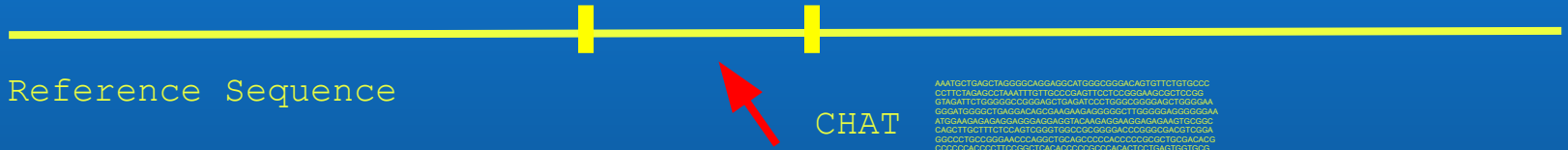
Reference Sequence

The Human Genome

Reference Sequence

The Human Genome



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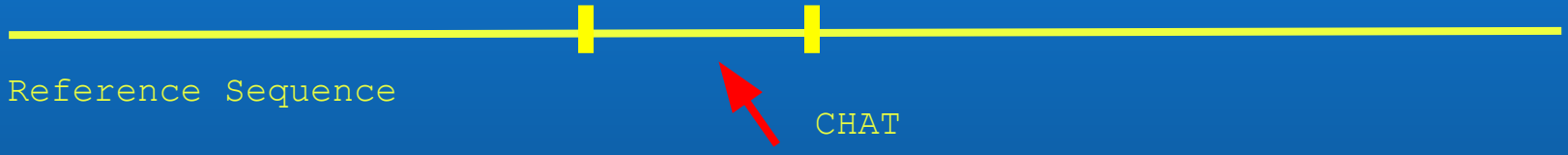
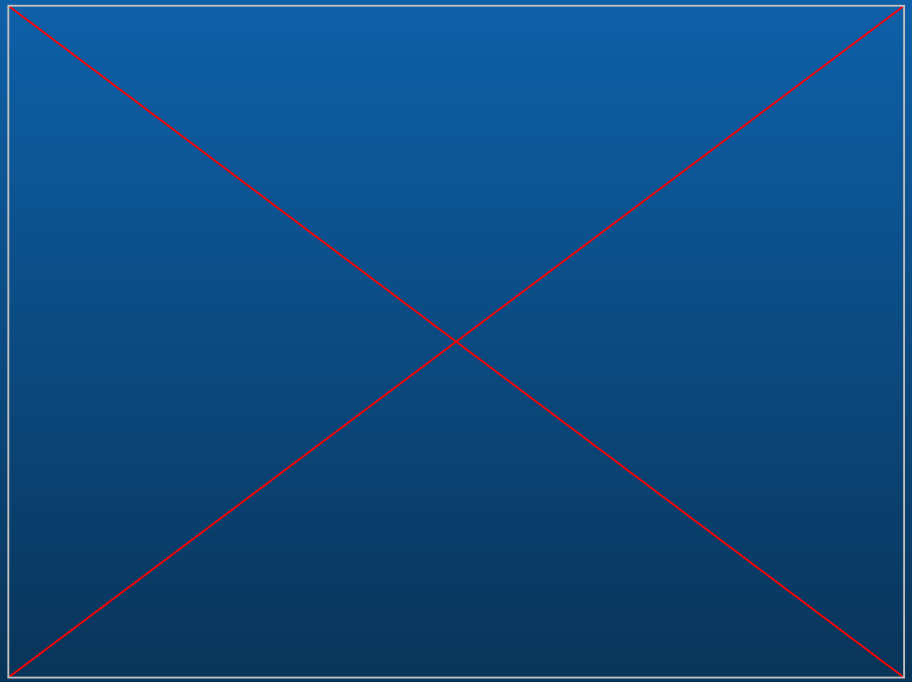
G...

What is CHAT?





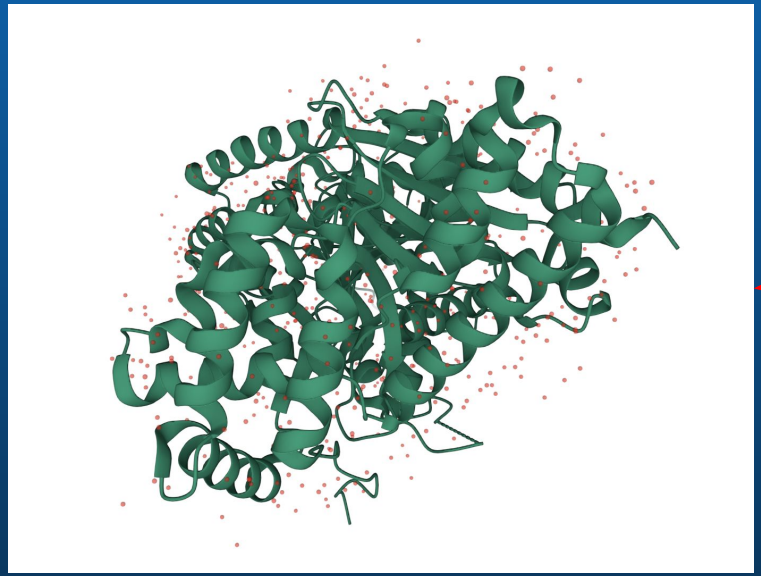
What is CHAT?

CHAT

Nucleus => DNA

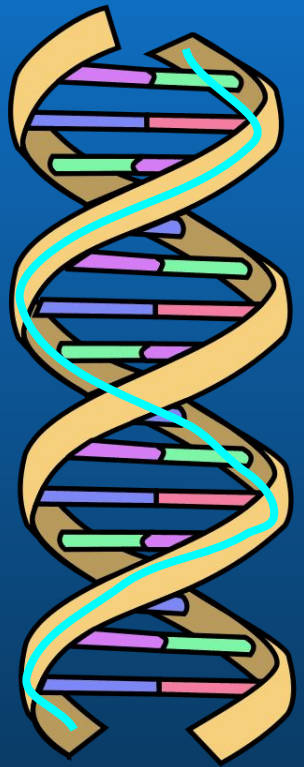
RNA

Protein



Cytoplasm

What is RNA?



DNA

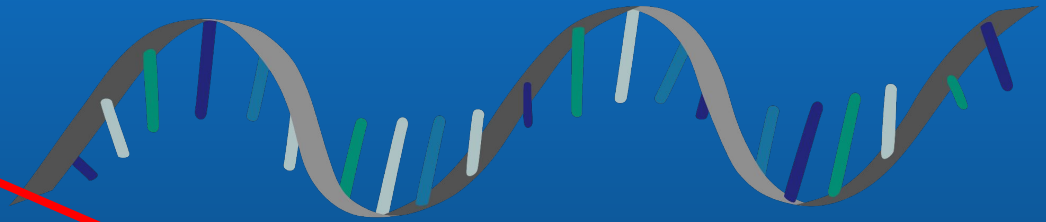
=Adenine

~~Thymine~~

= Cytosine

= Guanine

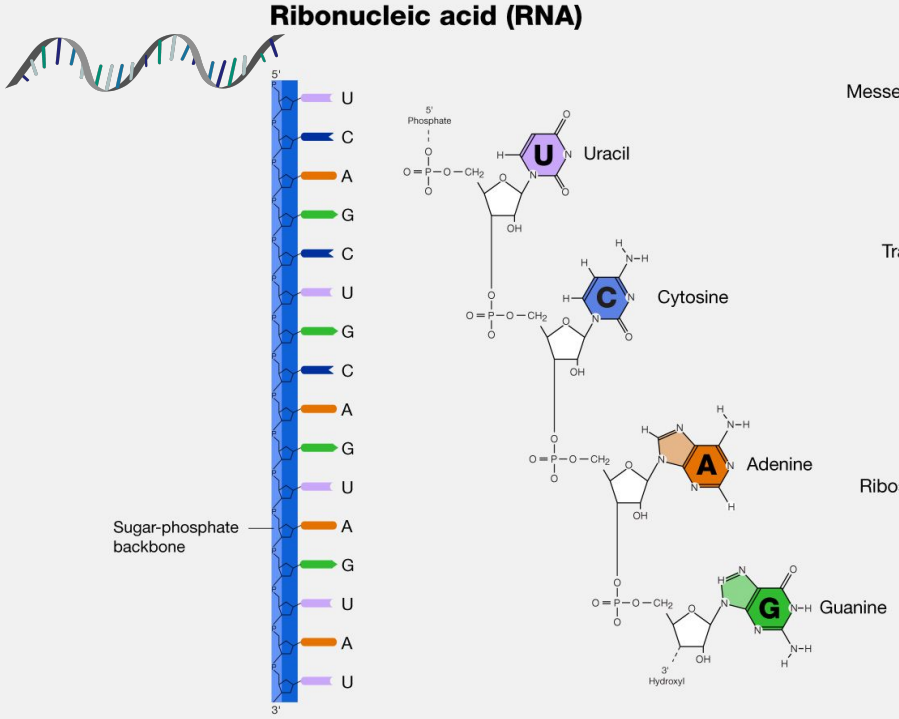
= Phosphate backbone

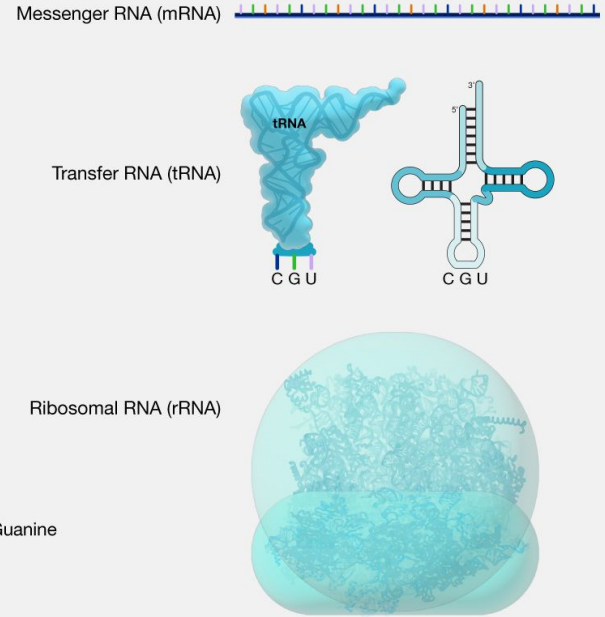


Uracil

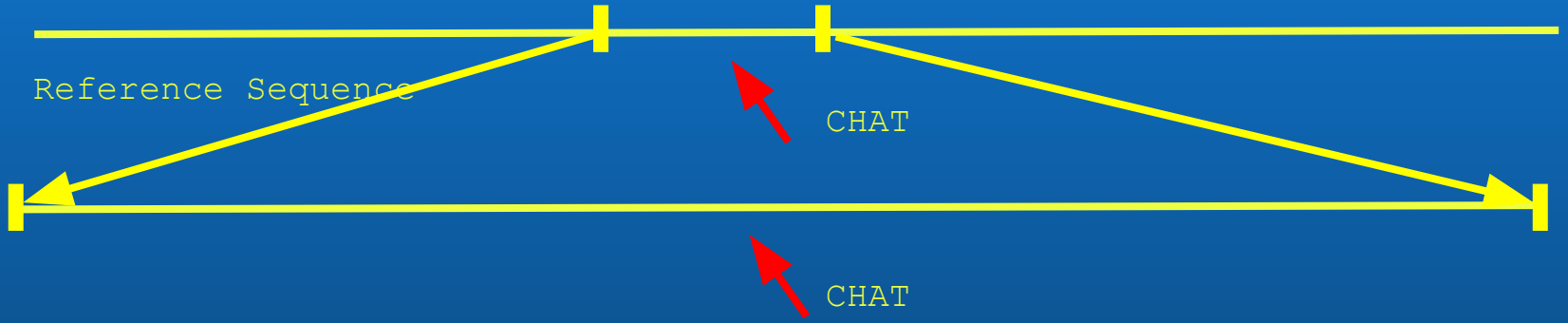
Theo Loves U

RNA Can Make Lots of Structures!





Alternative Splicing



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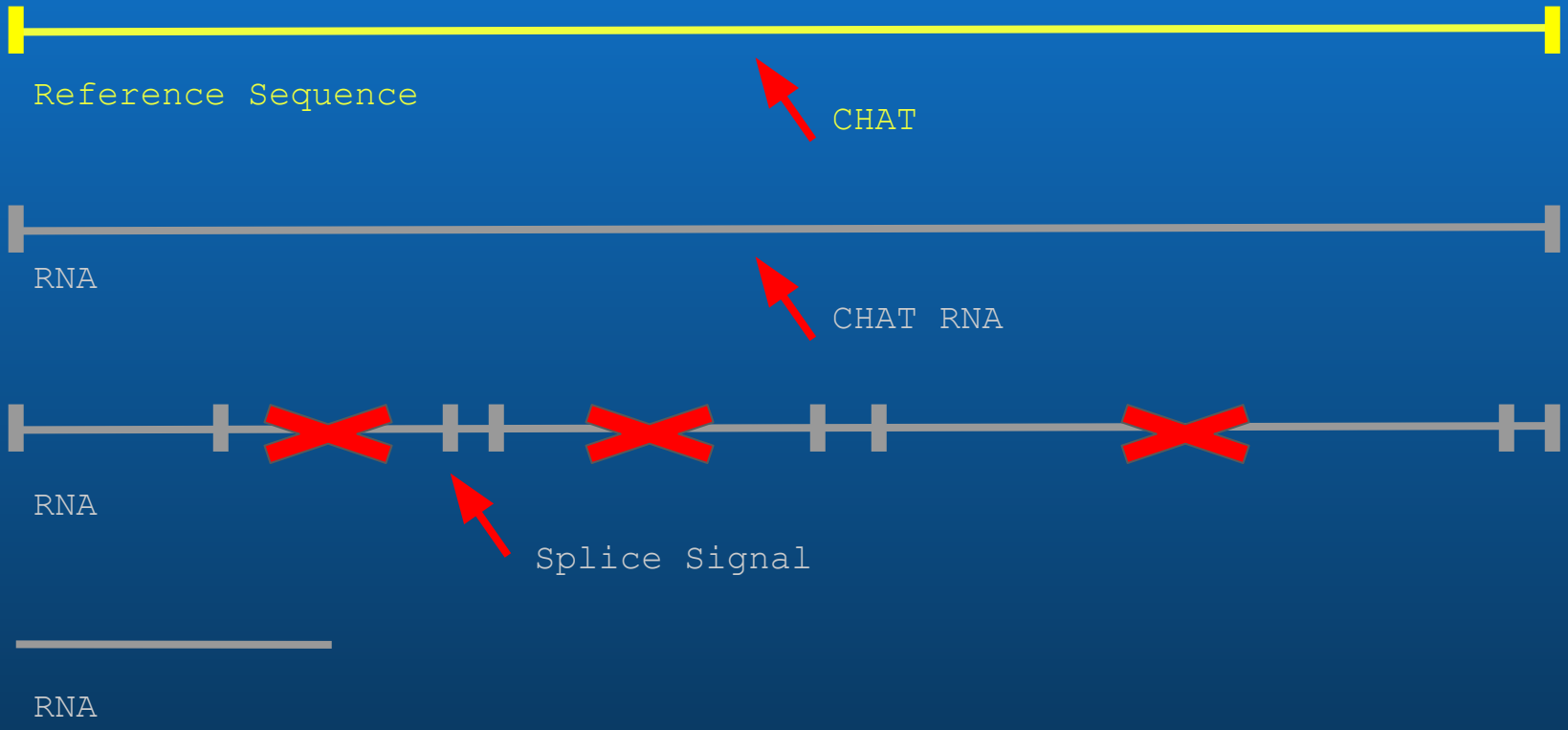
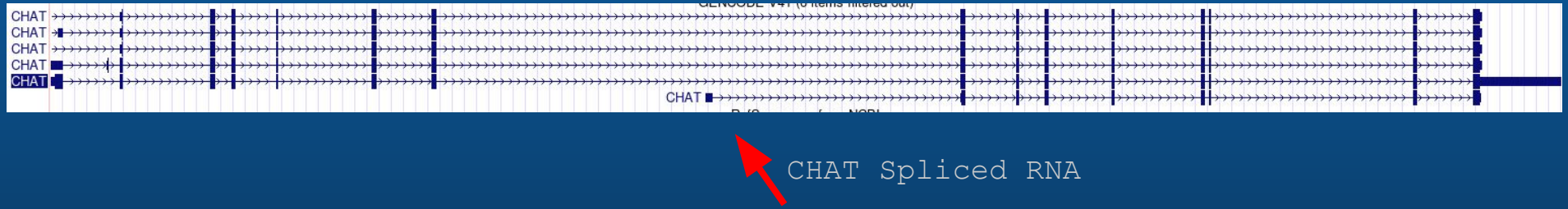


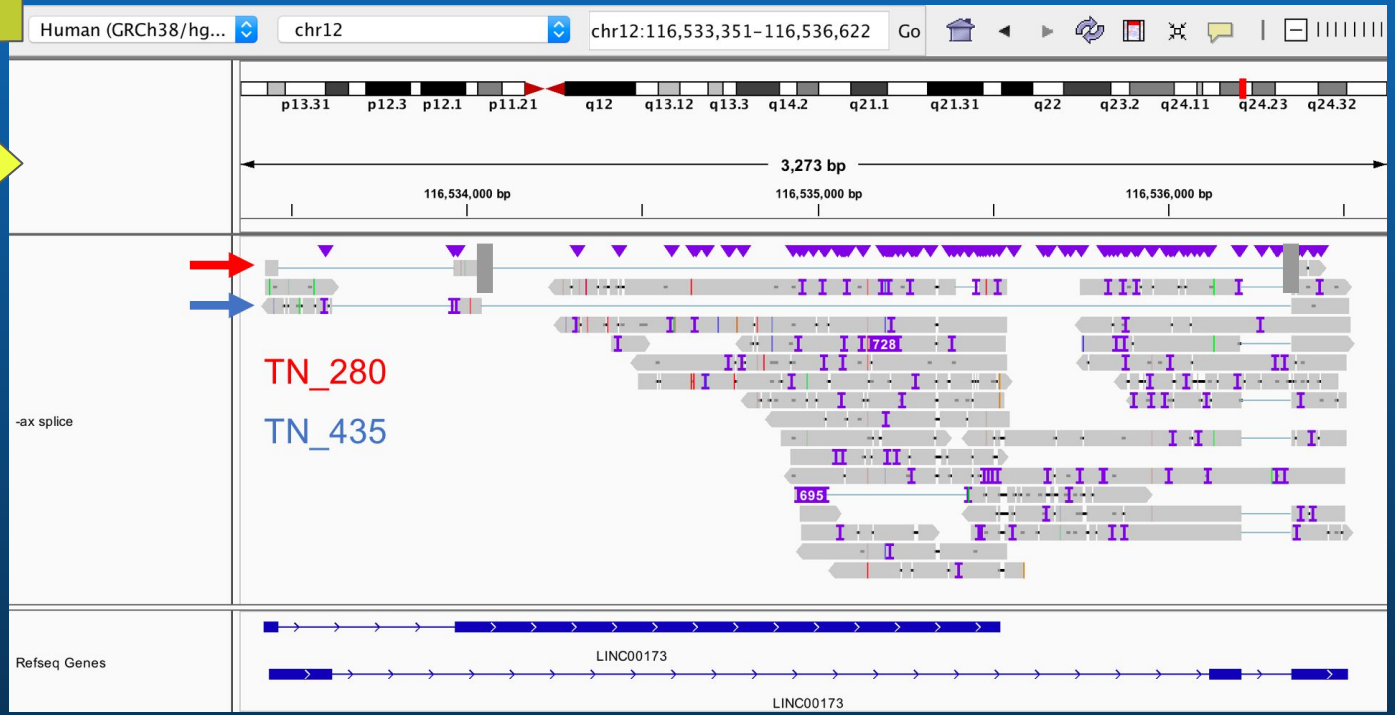
Alternative Splicing



There are many possible splice variants!

Interpreting IGV Charts

Reference Sequence



LINC00173
RNA

Worksheet Time!

What Will I Learn?

- Deoxyribonucleic Acid
- Ribonucleic Acid
- Sequencing
- *Alignment*

What Will I Learn?

- Theory
- Methods !
- The Great Unknown