

Decoding the Transcription Unit

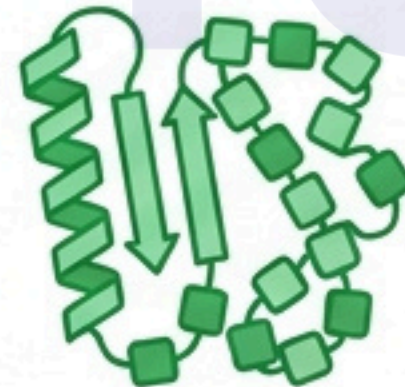
From the conceptual gene to the physical architecture of exons and introns.



The Gene



The Cistron



The Gene (Macro):

The functional unit of inheritance. Difficult to define strictly by DNA sequence, as it includes sequences coding for tRNA and rRNA.

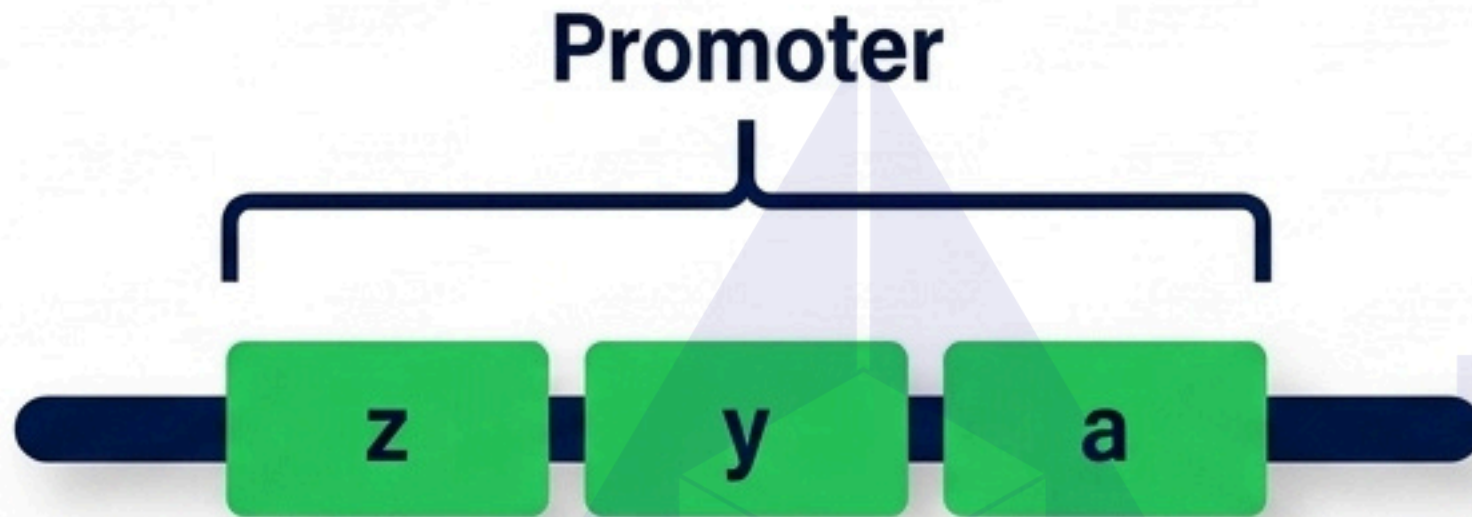
The Cistron (Micro):

A specific, measurable segment of DNA coding directly for a polypeptide.

Definition Check

All cistrons are genes, but because genes can also code for **non-polypeptide RNA**, **not all genes are cistrons**.

Polycistronic



Mostly found in Bacteria.

Multiple structural genes transcribed as a single unit.

Highly efficient, streamlined organization.

Monocistronic



Mostly found in Eukaryotes.

One structural gene per transcription unit.

Complex, highly individualized regulation.



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$$E=mc^2$$



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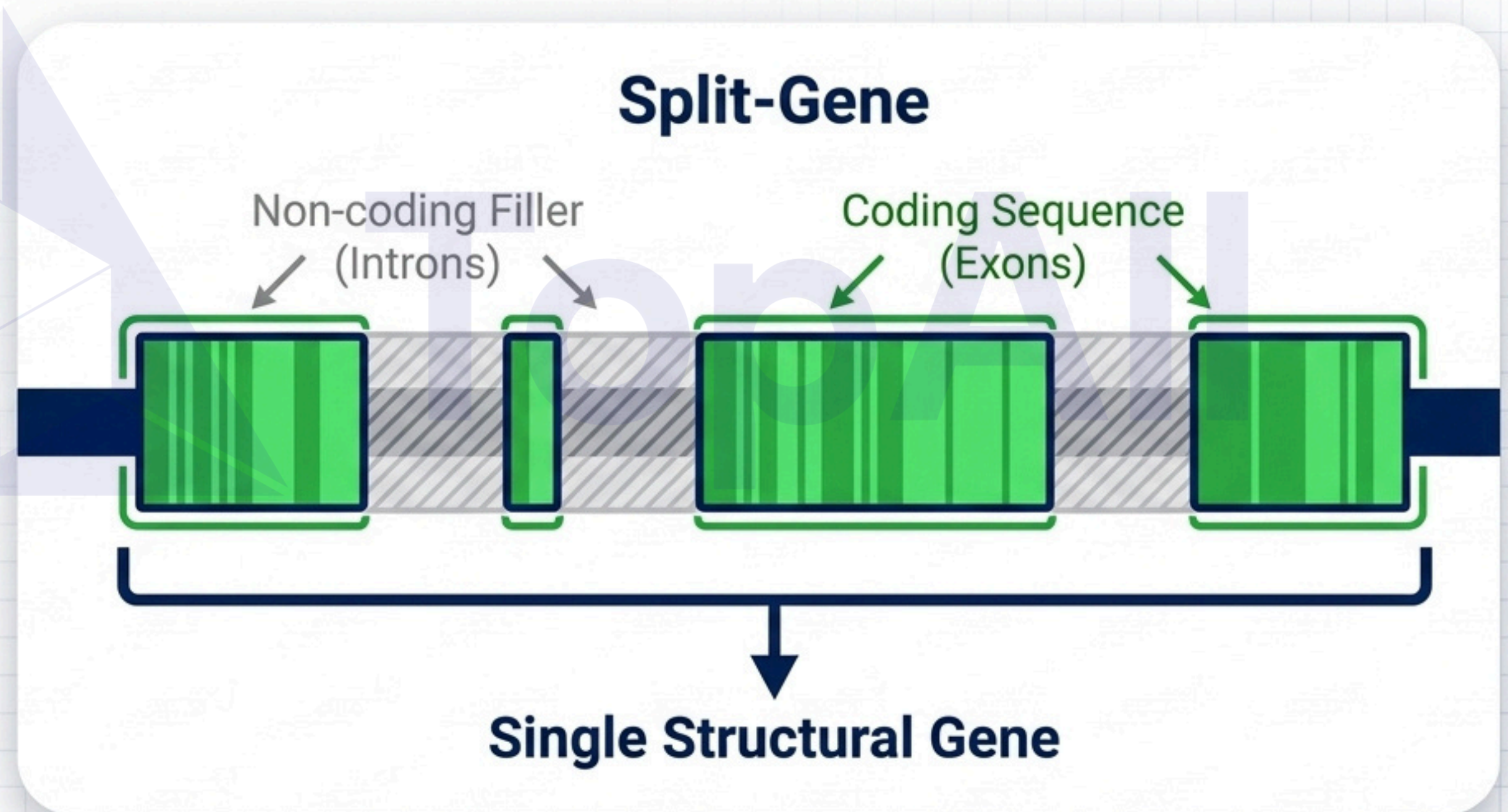
The Eukaryotic Complication: Split Genes

Eukaryotic monocistronic structural genes feature interrupted coding sequences. The usable information is scattered among non-coding filler.

! Common Pitfall

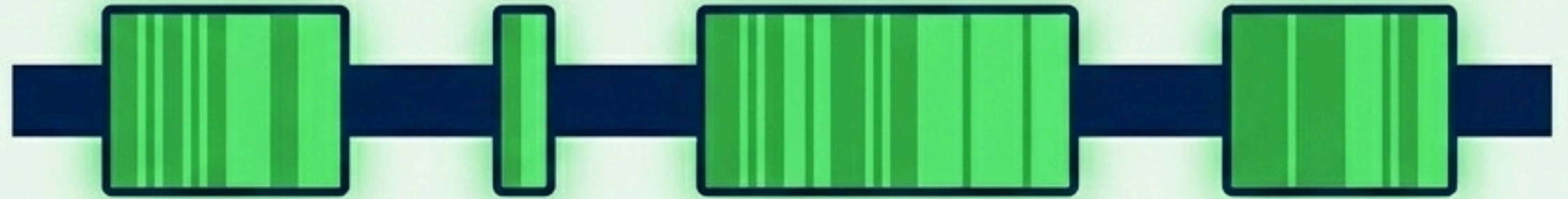
Assuming a eukaryotic DNA sequence translates 1:1 directly into a protein.

In reality, the genetic sequence is severely fragmented.



Exons (Expressed Sequences)

The active coding sequences.
These are the critical segments
that will ultimately appear in
the mature, processed RNA.



Introns (Intervening Sequences)

The non-coding interruptions.
These sequences are
transcribed but do NOT
appear in the mature,
processed RNA.



RNA Splicing: From Primary Transcript to Mature mRNA

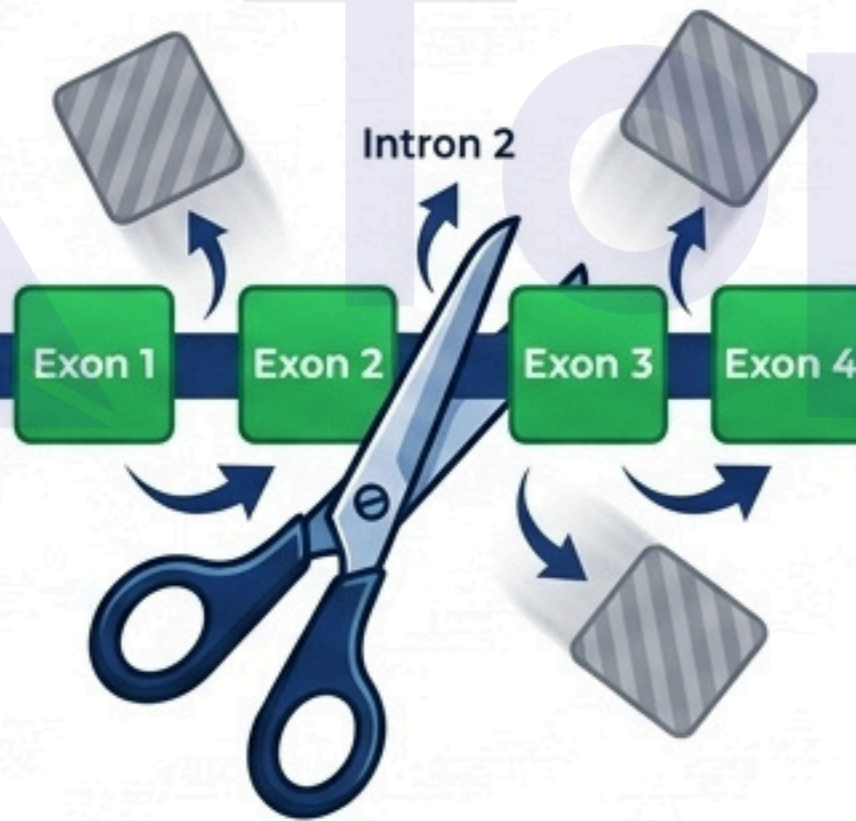
The Primary Transcript (hnRNA)

Contains both Exons and Introns. Non-functional.



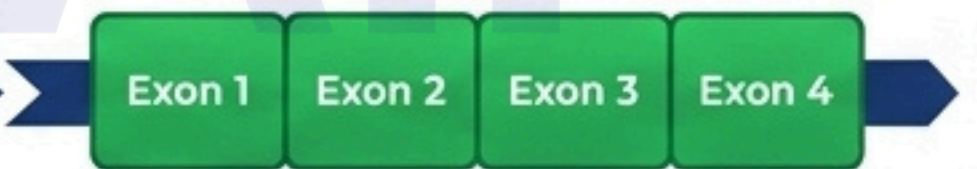
Splicing Action

Introns are actively removed.

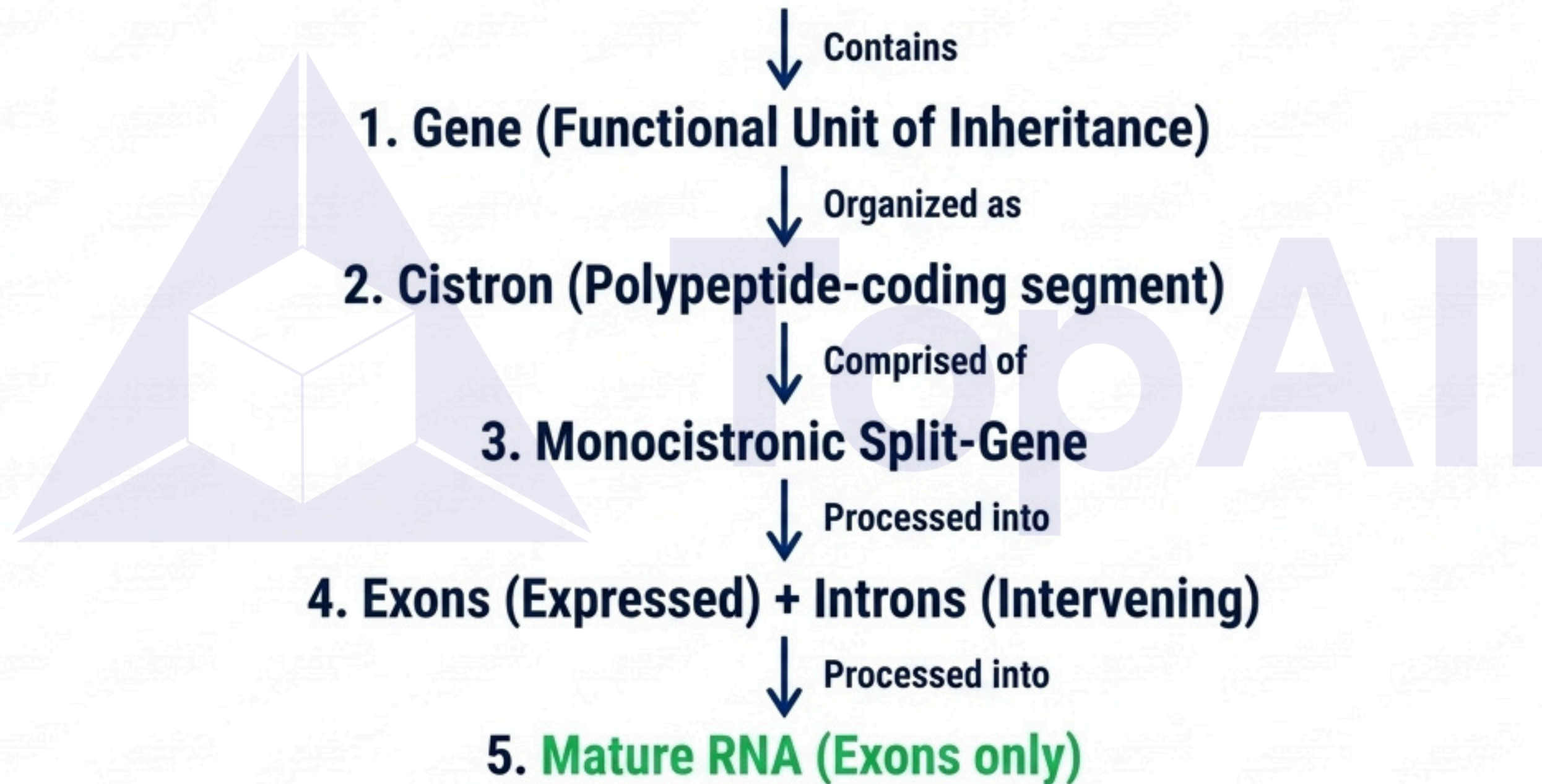


Mature mRNA

Exons are joined in a defined order. Ready for translation.



Key Takeaway: The Eukaryotic Blueprint



The split-gene arrangement complicates the physical definition of a gene, but allows for immense evolutionary complexity.



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