The Gene Explorer

This application is an interactive simulation of gene expression that allows the user to:

- Explore a sample gene:
  - Explore the correspondence between DNA, pre-mRNA, mature mRNA, and protein
  - Map the functional elements of a gene.
- Create mutations in a gene and explore their effects.
- Design a gene of their own and see how it is expressed.

The figure above shows the Gene Explorer display:

- The DNA strands with base-pair 62 highlighted.
  - The user can scroll to select other bases with the arrow keys.
  - The user can edit the DNA sequence to produce mutations.
- The pre-mRNA extending from the promoter to the terminator. Exons and introns are shown in color. The mRNA base corresponding to base 62 in the DNA is highlighted.
- The mature mRNA spliced according to the splice signals in the pre-mRNA. Start and stop codons are underlined. The mRNA base corresponding to DNA base 62 is highlighted.
- The protein with its N and C termini shown. The amino acid whose codon includes the mRNA encoded by DNA base 62 is highlighted.

Any changes to the DNA are immediately reflected in changes in the other sequences as appropriate. The software computes the different sequences as follows:

1. Starts with a DNA sequence.
2. Finds the promoter (TATAA).
3. Transcribes the pre-mRNA until it reaches a terminator (GGGGG).
4. Removes the introns from the pre-mRNA (GUGCG......CAAAG).
5. Adds a poly A tail.
6. Translates the mature mRNA from the first AUG to the stop codon.

Downloading and installing

- You can download version 2.1.0 (as of 05-July-2012) of the Gene Explorer from the following links:
  - GeneExplorer for Windows 98 and above
  - GeneExplorer for Mac OS X. Warning: if you are using OS X version 10.8 ("Mountain Lion") you will need to consult this link for details on how to run this software.
  - GeneExplorer for Linux/UNIX
- The Gene Explorer is also available as an applet that can be incorporated into a web page with custom parameters. Sample page.
- This is a lab manual for a lab that uses Gene Explorer.

This software requires Java, which is available free from this link.

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