

## TEACHER'S NOTES LESSON 28

Present these key points and questions to the students during the *Activities* section of Lesson 28, as your lecture/discussion. Make sure that as you are speaking, students are taking notes.

There are three types of **RNA**: **messenger RNA** (mRNA), **ribosomal RNA** (rRNA) and **transfer RNA** (tRNA). The cell has genes for all three, since all three structures are needed to make proteins. Essentially the rRNA is the ribosome (or factory where proteins are made). The tRNA is the transfer RNA—the pickup truck that brings the amino acids to the factory. The mRNA contains the instructions for the formation of a specific protein. Here we will discuss how mRNA is formed.

The **DNA helix** contains all the information that needs to be passed on in its sequences. In order to transcribe this information an enzyme must read the information. How does it know where to begin? Well, there is a promoter, a sequence found in front of the gene that says the gene begins right after me. The **RNA polymerase** binds, opens the DNA double helix and starts reading the DNA sequence and adds complementary nucleotides to form the message. The RNA polymerase can only read in one direction, 3' to 5', therefore, it only reads one of the two possible chains, the 3' to 5'. It writes the new message in the 5' to 3' direction. Once finished the new message is released. But that's not all. This message is a precursor. It contains **exons** and **introns**. Exons are sequences of DNA that contain the information for part of the protein. Introns are essentially extra DNA that the cell drags along generation after generation. This may not be true since we humans don't know why it is there. It may have some important information that we don't understand. Maybe you'll be the one to discover what it's for. Anyway, this message must be processed in order to be used.

The process the cell uses is called **splicing**. Splicing is just like editing a movie film. You are a producer and have created a delightful film, but the editor and critics don't like certain scenes. For example, those sex scenes are a little much for a Disney movie. Therefore, you cut them out. Well, in a cell, splicing is the same thing. The cell cuts out the introns in the message, which it can't use, and connects the exons, the parts it need to use. But that isn't the end of the processing. The cytoplasm is a dangerous place for a piece of RNA since there are nucleases waiting to cut them to pieces. Thus, the cell has a way of protecting the mRNA. It adds a cap and a tail to protect the ends from digestion. This is comparable to adding the new movie trailers to the beginning and the credits to the end of the movie. Once the message has been spliced and protected it is sent to the cytoplasm, just like a finished film is sent to a movie theater. Note that this message is a single strand of nucleotides, not a double helix like DNA.