Chapter 8 – Genes to Proteins

*Bulletproof: Scientists hope to spin spider silk into the next indestructible superfiber*

Driving Questions
1. What determines the shape of a protein molecule?
2. What are the steps of gene expression, and where in the cell do they occur?
3. How can organisms be genetically modified to produce recombinant proteins?
4. What are some pros and cons of genetically modified organisms?

Story Summary
This chapter uses the example of genetically engineered spider silk to illustrate the relationship between genes and proteins and the process of gene expression. With genetic engineering techniques, scientists can transfer spider silk genes to other organisms, such as yeast. The yeasts synthesize the silk protein as they take in nutrients and grow in steel vats. Several companies, including Bolt Threads and Spiber Inc., have begun to make and sell clothing made with genetically engineered spider silk.

The unique properties of spider silk—a polymer made of silk protein monomers—illustrates the relationship protein structure and function. The tremendous strength and flexibility of spider silk relates to the way that amino acids in the silk protein fold together.

The conservation of the genetic code across different species reinforces the shared evolutionary history of life and the fundamental importance of gene expression to cellular function in all species.

Core science includes:
- Protein structure and function
- Genes (regulatory and coding sequences)
- Transgenic organisms
- Gene expression (transcription and translation)
- Genetic code

Science for a changing world (story-specific science) includes:
- Properties of spider silk
- Genetically modified organisms

For additional information:
- Bolt Threads: [https://boltthreads.com/](https://boltthreads.com/)
- Spiber: [https://www.spiber.jp/en](https://www.spiber.jp/en)
- Center for Genetics and Society: [http://www.geneticsandsociety.org](http://www.geneticsandsociety.org)