

THE STRUCTURE OF SCIENCE:

HOW PROTEIN STRUCTURE & FUNCTION SHOW THAT SCIENCE IS NOT A STRAIGHT LINE

SCIENTIFIC EXAMPLE

Proteins are important macromolecules involved in the vast majority of cellular processes including DNA replication, cell division, and metabolism. A protein's specific biochemical function is closely related to its three-dimensional structure, which is influenced by its amino acid sequence.

Because of this, scientists have used amino acid sequences as evidence to learn about protein function. However, sequence information does not always provide the full picture. As technologies such as X-ray crystallography and NMR spectroscopy allowed scientists to determine more protein structures, they gained new evidence about how proteins are shaped and how they function. In some cases, structural evidence revealed relationships between proteins that were not apparent from their sequences. Scientists can then use this new information to develop, test, and refine their understanding of protein structure and function.

NATURE AND SCIENCE CONNECTION

The study of proteins demonstrates that scientific knowledge is not always complete or fixed. Scientists work with the evidence and technology available to them at a particular time, meaning that their explanations can have limitations. As new methods provide different types of evidence, scientists may discover information that was previously unknown or difficult to detect. Rather than discarding everything they previously knew, they can use the new evidence to expand, refine, or sometimes change existing explanations.

Research on protein structure shows this process because scientists have continued to develop a more detailed understanding of how proteins relate to one another and carry out their functions. This illustrates that science is not a straight line toward one final answer; it is an ongoing process of questioning, investigating, and improving explanations as evidence develops.

WHY THIS MATTERS

Understanding that scientific knowledge can change when new evidence becomes available helps students recognize that changing explanations is a normal part of science. This can help learners evaluate scientific claims more carefully instead of assuming that every scientific conclusion is permanent or completely certain. It also encourages people to ask what evidence supports a claim and whether new research provides additional information. For teachers, understanding this process can help them present science as an ongoing process of investigation rather than simply a collection of facts to memorize. This supports a more accurate and meaningful understanding of science.

LEARNING AND CLASSROOM USE

This case card could be used as a discussion prompt at the beginning of a biology lesson on proteins or the Nature of Science. Students could examine how scientists' understanding of protein structure and function developed as new evidence became available. They could then discuss whether changing a scientific explanation means that earlier science was incorrect, or whether it can represent how scientific knowledge becomes more detailed over time.

REFERENCES

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