ENGLISH

CHAPTER 6: THE MAKING OF SCIENTIST

THE MAKING OF SCIENTIST

~Summary~

-by Robert W Peterson

Richard's Success at Young Age

The article of Richard and his friend was published in the scientific journal *Proceedings of the National Academy of Science'. He was only twenty two years old at that time. It was the first time that the research work of college students was published. It was a rare honour for Richard.

Richard-A Collector from Childhood

Richard was the only child of his parents. He grew up at reading in Pennsylvania, USA. He had no one to play with. So, he started collecting things like rocks, fossils and coins. Gazing at stars and collecting butterflies were his hobbies.

Richard's Mother—His Companion

Richard's mother was constantly with him. She encouraged him by taking him on trips and bought him telescopes and other equipment. She found work to challenge him and helped him to learn a lot.

Richard Reads 'The Travels of Monarch X'

The reading of a children's book titled 'The Travels of Monarch X' inspired him. He became interested in the world of science. The book asked the readers to study butterfly migrations. Richard came in contact with the scientist Dr Urquhart though this book, who influenced him greatly.

Richard Raises Monarch Butterflies

Richard decided to raise butterflies at home to study their migration pattern. He would catch a female monarch and take her eggs. He would watch all the stages of development of the butterfly. Then he would tag their wings and free them. He did it for many years and raised thousands of butterflies in the basement of his home.

Richard Enters County Science Fair

Richard displayed his slides of frogs at the county science fair, but did not win any award. He realised that he needed to carry out real experiments to win an award. He took suggestions from Dr Urquhart. As a result of his many experiments, he won many prizes at the county and international science fairs in the following years.

Richard's Eighth Grade Project

Richard tried to find the cause of a viral fever that kills thousands of monarch butterflies. He thought that a beetle may carry the virus that causes viral fever. Although this was not the case, he still won a prize for his project.

Richard's Win at County Science Fair

Richard experimented on viceroy butterflies. He tried to prove that viceroys copy monarchs. Viceroys do it to protect themselves from birds as birds don't eat monarchs. The project won the first prize in the Zoology division and overall third prize in the county science fair.

Richard's Discovery of a Hormone

Richard was curious to know the reason behind twelve gold spots on a monarch pupa. He and his friends built a device to prove that the spots were producing a hormone necessary for its full development. The project got him first prize in the county fair. He also entered the International Science and Engineering Fair. He got third prize for Zoology in this fair.

Richard Continues his Research on Monarch Pupa

Richard grew cells from the wings of a monarch butterfly. He further proved that cells grow into scales of wings only when they are injected with the hormone from the gold spots. He carried on his work at the Army laboratory and laboratory of the US Department of Agriculture. After his freshman year at Harvard, he returned to the laboratory of the Department of Agriculture to identify the chemical structure of hormone. This gave him a new idea about cell life.

Richard's Study of Cell and DNA

Richard's research on the hormone gave him an idea. He believed that his study could tell how cells read their DNA. He, along with his college roommate, James R Wong, worked on the idea. Then, they wrote a paper explaining their theory.

Richard's Glory at Harvard

Richard graduated with second position in a class of 1510 students. He became a graduate student researcher. He started experimenting to prove his new theory. His theory may create new ways to prevent some types of cancer and other diseases.

Richard—An All-Rounder

Richard was not just a scientist. He was an allrounder. He was a good debater and a public speaker. He was also a photographer and an outdoors-person. His social studies teacher praised him for his will to work hard, do his best and win.

Richard—A True Scientist

Richard had all qualities that made him a true scientist. He had curiosity and a first rate mind. He wanted to win for the right reasons.

Conclusion of The Making of a Scientist

In the chapter – The Making of a Scientist teaches perseverant and dedicated towards our work. This will help us achieve our dreams and would bear the fruits of our labour some day, sooner or later.

NCERT SOLUTION

Questions (Page No. 32)

(READ AND FIND OUT)

Question 1: How did a book become a turning point in Richard Ebright's life?

Answer: Richard Ebright had a deep fascination of collecting butterflies of different species. By the time he was in the second grade, Ebright had collected all twenty five species of butterflies found around his hometown. That was probably the end of butterfly collecting for him. Then, his mother brought him a children's book 'The Travels of Monarch X' which explained how monarch butterflies migrated to Central America and this book opened the world of science for Richard. After reading the book, he found a lot of interest in tracking the migration of butterflies. This deep interest led him to work on several other projects and experiments on the Monarch butterflies. Thus, the book became a major turning point in Richard Ebright's life and he became a renowned scientist.

Question 2: How did his mother help him?

Answer: Richard's mother always helped him by encouraging his interest to learn new things. She took him on occasional trips and bought scientific equipment for him such as telescopes, microscopes, cameras, mounting materials and other related equipment and tried helping him in every possible way. If he didn't have anything to do, she found new learning things for him. She helped him through different ways, both directly and indirectly. She even gifted him the book 'The Travels of Monarch X' which proved a major turning point in Richard's life and motivated him to become a great scientist.

Questions (Page No. 34)

(READ AND FIND OUT)

Question 1: What lesson does Ebright learn when he does not win anything at a science fair?

Answer: Ebright's entry at a science fair was with slides of frog tissues, which he showed under a microscope. He did not win any prize for his display. He understood that to win in such a science competition, it was important for him to conduct real experiments, not simply make a neat display. Thereafter, he started working on various projects and conducted real experiments.

Question 2: What experiments and projects does he then undertake?

Answer: Ebright worked on many projects and conducted experiments. In his eighth grade project, he tried to find the cause of a viral disease that kills nearly all monarch caterpillars every

few years. He assumed that the disease might be carried by a beetle. For the following year science fair project, he started testing the viceroy butterflies to show that they copied monarch butterflies. Besides, he also studied bright spots on the monarch pupa and discovered an unknown insect hormone that indirectly led to his new theory on the life of cells and how cells read their DNA.

Question 3: What are the qualities that go into the making of a scientist?

Answer: According to the author, there are three key ingredients that make a scientist – starting with a first-rate mind, curiosity and the will to perform the best and win for the right reasons. Richard Ebright was a bright student, a champion debater, public speaker, a good canoeist and all-around outdoors-person. He was also an expert photographer, particularly of nature and scientific exhibits. He was a competitive person blessed with a curious mind and had all the necessary qualities to become a successful scientist that finally led him to his theory on the life of cells.

Questions (Page No. 38)

(THINK ABOUT IT)

Question 1: How can one become a scientist, an economist, a historian…? Does it simply involve reading many books on the subject? Does it involve observing, thinking and doing experiments?

Answer: Reading books on any subject is just an aspect of learning. A learner must work on developing his/her observation skill and thinking power. To become a genius in a particular field, one must have a curious mind and the desire to explore new things by conducting real life experiments and working on related projects. One must work hard and not feel taken down by mere failures. An urge to learn and discover a new theory requires a person to put in a lot of sweat and effort in any particular area of interest.

Question 2: You must have read about cells and DNA in your science books. Discuss Richard Ebright's work in the light of what you have studied. If you get an opportunity to work like Richard Ebright on projects and experiments, which field would you like to work on and why?

Answer: Richard Ebright's works were related to Biochemistry and Molecular Biology. His theory on the life of cells has helped the scientific community to study the cell structure, its growth and functions of different organisms. Indirectly, it also helps in detecting disease causing organisms and discovering how these grow inside the body of living beings. Ebright's findings about insect hormones and the photos gave him the answer to one of biology's puzzles, how the cell could 'read' the blueprint of its DNA. DNA is the substance in the nucleus of a cell that controls heredity and passes genetic information from one generation to another. It determines the form and function of the cell.

If I get an opportunity to work like Richard Ebright on projects and experiments, I would like to study about various life-threatening diseases. By studying the DNA, I may find useful remedies to cure chronic or fatal illnesses.

Questions (Page No. 38)

(TALK ABOUT IT)

Question 1: Children everywhere wonder about the world around them. The questions they ask are the beginning of scientific inquiry. Given below are some questions that children in India have asked Professor Yash Pal and Dr Rahul Pal as reported in their book, Discovered Questions (NCERT, 2006).

(i) What is DNA fingerprinting? What are its uses?

(ii) How do honeybees identify their own honeycombs?

(iii) Why does rain fall in drops?

Can you answer these questions? You will find Professor Yash Pal's and Dr Rahul Pal's answers (as given in Discovered Questions) on page 75.

Answer:

1. DNA is the blueprint for life. DNA fingerprinting is a useful forensic method that helps to identify parentage, since a son or a daughter would always exhibit a pattern identifiable as coming from both parents. It is possible to identify genes from a tiny drop of blood or a single strand of hair. It is also widely used in criminal investigation to prove the innocence or guilt of a murder suspect at the crime scene.
2. Honeybees are extremely sophisticated insects that are well aware of their location, position and navigation. They have warning chemicals that leave trails for fellow honeybees to locate their honeycomb. Bees also have pictorial memory of some sort, a direction-finding mechanism and a way of reckoning distance due to which they are in a better position to find their own honeycombs.
3. Rain is formed from the condensation of vapour when the air is cooled below the dew point. Some vapour in a cloud cannot condense simultaneously and it turns into a large pool of water. Most raindrops start as tiny ice crystals that slowly accumulate more moisture on the way at lower altitudes and the crystals melt into water droplets and fall on Earth as rain.

Question 2: You also must have wondered about certain things around you. Share these questions with your class, and try and answer them.

Answer: Here are some of interesting questions that can be discussed among students for discussion in class:

1. Why are plants green in colour?
2. How and why do stars twinkle at night not during daytime?
3. Why do fruits and flowers fall on Earth?
4. Where does a rainbow get its colours from?

(Note: Students can think of a few questions as per their own understanding and discuss among themselves.)