

The Internet

Inventions that Shook the World Series

Grade Levels:

5-12

Subject Areas:

Technology

Synopsis:

Bob Kahn is working for DARPA when the first network to connect computers was created: ARPA Net. Soon, proprietary networks began popping up around the world. Kahn has the idea to connect these networks so they can talk to each other. The problem is, they all use their own language to communicate. Kahn calls Vint Cerf, a computer scientist and together they create TCP/IP language, connecting networks around the world.

Learning Objectives: Students will:

- Understand how the first computer networks worked.
- Explain what Kahn and Cerf had to do to make these independent networks communicate with each other.
- Understand the impact the invention of TCP/IP has had on our world today.

Vocabulary:

Internet, computer science, DARPA, ARPA Net, Bob Kahn, Vint Cerf, computer language, computer protocol, TCP/IP

Pre-Viewing Discussion:

How do you use the internet?

How do you think people felt when the internet was first created? How do you imagine it changed their lives?

Post-Viewing Discussion:

Why were scientists attracted to working at DARPA? Why do you think Bob Kahn went to work there?

What were some of the problems with early computer networks? How did Bob Kahn want to solve those problems?

Who did Kahn enlist to help him find a way to make different computer networks communicate? How successful were they?

Further Activities:

Research the evolution of computer networking from the 1980s to today. Detail the many ways this technology has changed our culture and our day-to-day lives. Are there places in the world where this technology is very rare, even today?

DNA Profiling**Inventions that Shook the World Series****Grade Levels:**

5-12

Subject Areas:

Technology

Synopsis:

Alec Jeffreys is a geneticist. In the 1980s, he was working on using genetics to cure disease. He identified repeat patterns in people's DNA, and eventually realized that these patterns are different for each person. He used these patterns to match DNA to people, eventually finding the man responsible for two murders in his community, and launching DNA evidence into judicial systems.

Learning Objectives: Students will:

- Understand what Jeffreys recognized about DNA patterns and how he matched them to people.
- Explain how his community used his research to solve a crime.
- Understand the impact DNA profiling has had on our legal system.

Vocabulary:

DNA, DNA profiling, genetics, forensics, Alec Jeffreys

Pre-Viewing Discussion:

What is DNA? How is your DNA different from the other people in your class?

How is DNA used to help solve crimes today? How do you think that came about?

Post-Viewing Discussion:

What was Jeffreys researching when he recognized that DNA had repeat patterns? What did he eventually learn about these patterns?

How are repeat patterns used to match DNA to a person? How accurate are the results?

How did Jeffreys' community go about trying to find the criminal? How did they eventually catch him?

Further Activities:

DNA evidence is commonplace in today's investigations and court cases. Research the development of DNA profiling as a forensic tool. Was there resistance when the science was first used? What are some arguments for and against DNA evidence? Be sure to include privacy concerns in today's world in your analysis.

The Nicotine Patch**Inventions that Shook the World Series****Grade Levels:**

5-12

Subject Areas:

Science

Health/Safety

Synopsis:

Frank Etscorn is a psychologist, working on aversion therapy and trying to keep rats away from sugar water, using nicotine. His wife smokes two packs of cigarettes per day, and he is concerned with her health. When he accidentally spills nicotine on himself, he becomes violently ill...but it gives him the idea that he might be able to use liquid nicotine to satisfy the need for a cigarette. Today, over 15 million patches are sold every year.

Learning Objectives: Students will:

- Understand what why Etscorn was so concerned about his wife.
- Explain how he came to the idea of a nicotine patch.
- Understand the impact the nicotine patch has had for smokers trying to quit.

Vocabulary:

Nicotine, addiction, aversion therapy

Pre-Viewing Discussion:

Why is smoking bad for you? How does it affect your body?

Why is it so hard to quit smoking?

Post-Viewing Discussion:

What effect do the tar and carbon monoxide from smoking have on the body?

How does nicotine work to make the rat not want sugar water in Etscorn's experiments?

What happened when Etscorn spilled liquid nicotine on himself? How did that lead him to the idea for a nicotine patch? How do you imagine his world has changed since the nicotine patch went on the market?

Further Activities:

It is well known that smoking is addictive and bad for your health. Find three other drugs or substances that have addictive properties and compare and contrast them with nicotine and smoking. What are the health effects of these substances? Why is it important not to use them?

The MIR Space Station
Inventions that Shook the World Series

Grade Levels:

5-12

Subject Areas:

Technology

Engineering

Synopsis:

Konstantin Feoktistov is a chief space engineer in the Soviet Union when the United States puts a man on the moon. Feoktistov has bigger dreams, though, of going all the way to Mars. To do so, they would need space stations along the way, and Feoktistov starts with the Salyut space stations. Years later, the Soviets want a more permanent station, and task Feoktistov with creating it. Despite design challenges, Feoktistov creates the MIR space station, with the genius innovation of the “robot claw.”

Learning Objectives: Students will:

- Understand the political environment during the “space race”.
- Explain the challenges Feoktistov experienced when creating a larger space station.
- Explain the solutions to those challenges that Feoktistov designed.
- Understand the impact of the MIR, and then the International, space stations on the relationship between nations.

Vocabulary:

Space travel, space race, Soviet Union, Konstantin Feoktistov, Salyut space station, MIR space station, International space station, Modular

Pre-Viewing Discussion:

What was the space race?

What do you know about the International Space Station?

Post-Viewing Discussion:

How might man eventually get to Mars? What would we have to build to get there?

What were some of the challenges of building a space station larger than the Salyuts?

How were these challenges overcome? What genius idea did Feoktistov have to make docking spacecraft to the station safer?

Further Activities:

Research the development of the MIR and International Space Stations. Detail how we came out of a confrontational period during the Cold War and the space race into one of international cooperation in space, such as what we see now.

The Capsule Endoscopy**Inventions that Shook the World Series****Grade Levels:**

5-12

Subject Areas:

Science

Technology

Engineering

Synopsis:

Dr. Tarun Mullick had an interest in medicine from a young age. At 13, he shadowed a gastroenterologist and thought there had to be an easier way to check the digestive system for polyps. His idea was to put a camera in a tiny capsule that the patient would swallow, and the camera would provide images of the entire digestive tract.

Learning Objectives: Students will:

- Explain the experience that triggered Tarun's idea.
- Explain the challenges he faced when designing an endoscopic capsule.
- Understand how medical technology is always changing.

Vocabulary:

Medical research, Dr. Tarun Mullick, endoscopy, gastroenterologist, colonoscopy, fiber optics, Ram Nair

Pre-Viewing Discussion:

What is a capsule endoscopy? What kind of information do you think doctors get from this test?

What are some common medical tests today? How do you think future innovation might make them easier on the patient and doctor?

Post-Viewing Discussion:

What triggered Tarun to try to create a capsule endoscopy? What did he have to do to be successful?

How long did it take for Tarun to get a patent for his capsule? Why do you think it took so long? What are the benefits of this device?

What is Dr. Mullick working on now? How might his research change future medical tests?

Further Activities:

Write down some of the ways Tarun pursued his interest in science and medicine as a teenager. Now take something you have an interest in, and plot out ways you can explore and pursue it while you are still in school.