

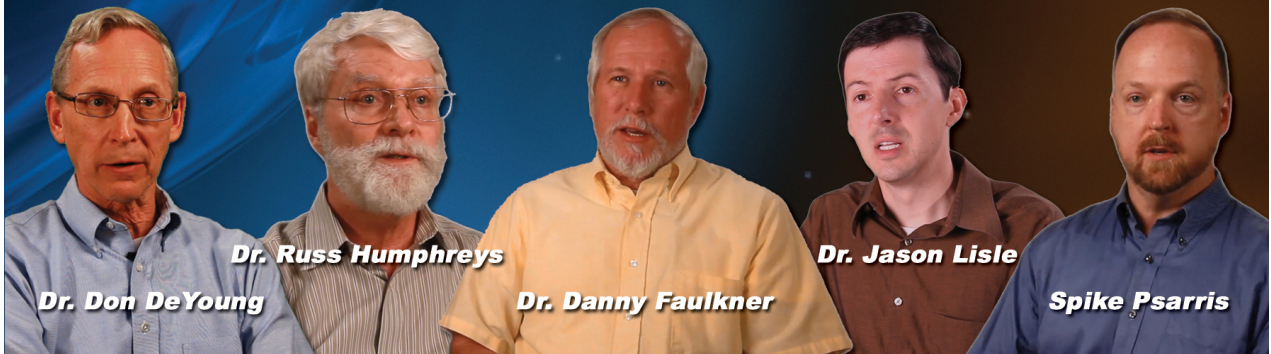
# STUDY GUIDE

AWESOME SCIENCE MEDIA PRESENTS

**EPISODE 9** *"The Wonder of Magnetism"*

## THE HEAVENS DECLARE

***A DVD Series exploring the scientific  
evidence which supports the Biblical worldview  
for the formation of the universe***



**Dr. Don DeYoung**

**Dr. Russ Humphreys**

**Dr. Danny Faulkner**

**Dr. Jason Lisle**

**Spike Psarris**



**Presents**

**The Heavens Declare – Episode 109**

## **“The Wonders of Magnetism”**

### **Study Guide**

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## Introduction

Welcome to this study guide for the *Heavens Declare - Episode 109, "The Wonders of Magnetism"*. This guide is designed to be used by youth groups, Sunday schools, church groups, public school parents that want to reinforce their student's faith, or anyone that wants to go deeper in their understanding of the concepts presented in the video. It can also serve as curriculum for homeschool students.

Like the video, this study guide is broken-up into 10 different sections. Please start by watching a chapter of the video, and then complete the accompanying section in this guide. You will find the information presented in several different interesting formats:



**Summary.** These brief overviews will give a big-picture understanding of the content covered in the video.



**Vocabulary.** This will be an introduction of possible new terms.



**Review Questions.** These questions will help to clarify many of the concepts presented throughout the video. Answers to the questions will be presented at the end of this study guide.



**Discovery Questions.** These questions will take the student deeper in drawing their own conclusions to see the bigger picture.



**Scripture Quotes.** God's Word will clarify the truth of the concepts being presented.



**Quote Boxes.** These quotes will demonstrate man's thinking on different subjects.



**Historical Reference.** These boxes will introduce us a person who made contribution to modern thinking.



**Interesting Discoveries.** These boxes will introduce us a place which made contribution to modern thinking.



**Activities.** These exercises will provide creative ways to reinforce the information presented.



**Riddles.** These will be activities that require a problem to be solved, allowing students to arrive at conclusions by going deep.

## Chapter 1 – What is the Purpose of Earth’s Magnetic Field?

Please start by watching Chapter 1 of the video, then complete the following section.



### “What is the Purpose of Earth’s Magnetic Field?” Summary

Welcome to this study of Earth’s magnetic field. In this section, we’ll learn that the magnetic field is something of a mystery to scientists. It is believed that this magnetic field is generated by the motion of convection currents in the outer core. It is believed that this electrical current generates

**V**

**Amperes (amps)** – A measure of the amount of electrical current that flows through a system.

**Van Allen Radiation Belt** – A zone of charged particles that are held around a planet by that planet’s magnetic field.



“For by him were all things created, that are in heaven, and that are in earth, visible and invisible, whether they be thrones, or dominions, or principalities, or powers: all things were created by him, and for him:

Colossians 1:16

billions of amperes. All electrical current produces magnetic fields. So, the currents flowing in the core produce the Earth’s magnetic field. However, this is just a theory, because the currents flowing through the outer core has never

been directly observed. We do know for sure, however, that the magnetic field exists.

The Earth’s magnetism is a one of the shields God has placed around the Earth to protect us from cosmic rays, and solar winds. It deflects solar radiation material, which then forms the Van Allen Radiation Belt around the Earth.

When the astronauts went to the moon, they traveled through this belt, which surrounds the whole earth, hundreds of miles high from the surface. This solar wind is made of particles. When it hits the Earth’s magnetic field, it spirals and moves toward both poles. Finally, it moves downward, and sometimes produces the Northern and Southern lights.



“James Van Allen was one of the greatest and most accomplished American Space scientists of our time. Few researches had such wide range of expertise in so many scientific disciplines. NASA’s path of space exploration is far more advanced today because of Dr. Van Allen’s ground-breaking work.

Former NASA Administrator and aerospace engineer, Michael Griffin (2005-2009)



## James A. Van Allen

1914-2016

James Van Allen was a physicist from Mt. Pleasant, Iowa, who discovered that there were two zones of energetic particles of radiation surrounding Earth. His cosmic ray experiment, launched January 31, 1958, consisting of a Geiger counter and a tape recorder, showed that there were belts of radiation circling the Earth. His discovery brought a new understanding of cosmic radiation.

He attended the Iowa Wesleyan College in 1935 and got his M.S. and Ph. D. at the University of Iowa 1936-1939. He worked for the U.S. during World War II and became a professor of physics in 1951, until he retired. He and his associates built the instrumentation of the early explorer satellites as part of the U.S.'s International Geophysical Year of 1957-58 space program. Explorer 1 was the first successful U.S. space satellite. The information gathered by the satellites is what led to the discovery of the Van Allen radiation belts. Dr. Van Allen later helped develop many space probes in order to study planetary and solar physics.



### **“What is the Purpose of the Earth’s Magnetic Field?” Review**

1. Read Colossians 1:14-16, who created the invisible as well as the visible things on the Earth?
2. Where does Earth’s magnetic field come from? Has it been observed?

3. What is one of the benefits of the Earth's magnetic fields?
4. What is the Van Allen Belt? Who discovered it? How high is it according to the section we watched?
5. What was the name of the space satellite that had the experiment that allowed for the discovery of the Van Allen belt? When was the satellite launched? What was noteworthy about the satellite?
6. What happens to the solar winds when they fall back to the Earth?



## **“What is the Purpose of Earth’s Magnetic Field?” Discovery**

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1. What do you think the magnetic fields show you about God?
2. What are some “unseen”, or perhaps unnoticed areas of your life where God’s hand is at work?



## **“The Earth’s Magnetic Field” Activity**

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We can actually see Earth’s magnetic field at work when we use a compass! A fun and easy activity (as well as a good survival skill should you lose your way in the wilderness) would be to make your own.

What you need:

- A bowl
- A small leaf
- Water
- A needle
- A magnet
- A sharpie
- A compass

Directions:

1. Put some water in a bowl.
2. Take your small leaf and mark one end with the sharpie. This will be your pointer.
3. Get your needle and rub it against the magnet. (This magnetizes the needle).
4. Float your leaf.
5. Carefully put the needle on top of the leaf and watch it align with the Earth's magnetic field.
6. Take out your compass and check to make sure the needle oriented to North.
7. Write the date.
8. Take note of which way it's pointing.