

CREATOR

VOLUME 13

NUMBER 3

THE GRAVITY OF GOD'S GLORY

For our light and momentary troubles are achieving for us an eternal glory that far outweighs them all (2 Corinthians 4:17).

Dearest Friends,

I enjoy writing to you about our Lord Jesus Christ and I just love telling you about His glory. If you're willing, we're going to examine a topic of His creation that affects us all—**gravity**. It may be that the science of gravity *illustrates* the mighty workings of **Jesus' glory** better than any other physical phenomenon in the universe!

But in order to share with you the precious truth of God's majesty in this way, I must also explain some rather technical scientific ideas. **Please hang with me** as I stumble around in the basement of revealed Truth (His thoughts are so much higher than mine—Isaiah 55:8), and let's learn about the wonder of gravity together. And, oh, gravity is wonderful because the One who created it is wonderful and it points to His glory!

A ROLLER COASTER RIDE

One way to really understand gravity is to brave a ride on a roller coaster. If you do, you will be transported up a very steep incline to the top of a hill, usually constructed of wood or steel. The pull of gravity then takes over. The cars of your roller coaster creep over the summit and start **accelerating** down the track on the other side, **increasing in velocity** as they descend. This acceleration of the coaster is **a result of gravity**—it's what makes any object dropped from any height **speed up** as it falls.

When the train reaches the bottom of the first hill it is moving as swiftly as it can go. There is a roller coaster in New Jersey that hurtles downward at 128 miles per hour (206 kilometers per hour) from a height of 45 stories.¹ Fortunately most coasters don't go nearly that fast!

What happens next? Your coaster slows down as it goes up the second hill, right? But why? Well, it **slows down** for the same reason it sped up—the pull of gravity. As your car travels up the second hill, gravity pulls it downward toward Earth with a **force of acceleration** equal to the force of acceleration which caused the roller coaster to speed up in the first place. But if gravity is pulling on the roller coaster with an accelerating force, why don't the cars increase in velocity rather than slow down as they go up the hill? That's because the coaster is moving away from the

¹ At the time of this writing, the Kingda Ka at Six Flags Great Adventure in New Jersey is the world's fastest roller coaster.

Earth. Gravity is trying to pull you and your car back home, so *you slow down (decelerate)*. If the roller coaster ride has been designed properly, the train should have just enough momentum to make it over the crest of the second hill. It then speeds up again as it goes down the other side.

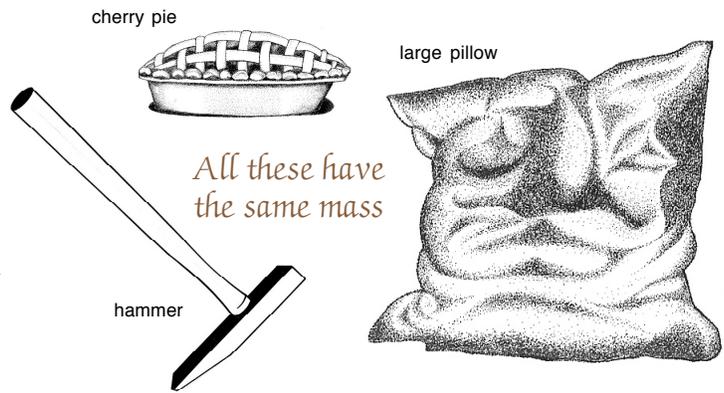
As the ride continues, the car you're sitting in constantly loses energy due to the friction between the car's wheels and the track (and air resistance). Your car, therefore, can never go up a second or third or fourth hill as high as the first—it doesn't have enough velocity. Eventually the cars of your roller coaster train will come to a stop. It's time to buy another ticket!

MASS

Let's say that the first time you ride the roller coaster the cars are completely filled with people. And you return one hour later and go on the ride again. But this time only half as many people are on the coaster. What will happen to the speed of the train as it plummets down the first hill? Will it go faster or slower than before? The answer is neither! It will reach *the same maximum velocity* as the first time. This doesn't necessarily make sense, so allow me to explain.

Sir Isaac Newton (1642–1727) was a brilliant English scientist and the first person to give the world a solid understanding of Christ's mysterious design of gravity. He explained through mathematics that God has sewn into creation an invisible force that causes one object to be attracted to another object no matter where it is in the universe.

Newton's study of gravity led him to realize that the greater the combined *mass* of two objects, the greater the gravitational attraction between them. Mass is simply the "stuff" an object or an organism possesses. Something can be composed of cheddar cheese, scrap metal, living cells, or anything else—it doesn't matter to gravity—it's all mass. So why



doesn't a roller coaster filled with people (more mass) go faster than an empty coaster (less mass)? Before answering this question let me ask another.

What would happen if you dropped a two-pound (one kilogram) rock from a height of three feet (one meter) at the same time you let go of a rock weighing one pound (half a kilogram) from the same height? Does the heavier rock hit the ground first? No, it doesn't. The two rocks hit the ground at the same time! The astronomer Galileo (1564–1642) was the first to realize this fact. What he discovered is that the gravity of Earth *accelerates* both rocks toward the ground at exactly the same rate of 22 miles per hour (mph) for every second the rocks fall, or 35 kilometers per hour (kph) per second.²

Let me give you an idea how fast this is: If you were traveling in a car accelerating at the rate of a falling stone, your car would increase in speed 22 mph (35 kph) for every second you were in the car. At the end of one second you'd be going 22 mph (35 kph); at the end of two seconds, 44 mph (70 kph); and after only three seconds you'd be traveling 66 mph (105 kph), and so on. Now, there is a *greater force of attraction* between the rock weighing two pounds and the Earth, but the one-pound rock and the two-pound rock *both accelerate at the same rate* and hit the ground at precisely the same moment in time.

Back to my previous question. All other things being equal (let's assume that the friction between the train and track remains the same whether the cars are full or empty), a roller coaster filled with

² This is equivalent to 32 feet (or 9.8 meters) per second per second. The acceleration caused by gravity depends on where you are in the universe. This acceleration is less on the surface of the Moon and much greater on the Sun.



people travels no faster than a train half-full or one completely empty. Why? Because *the acceleration caused by Earth's gravity* is identical for each train. The acceleration of the roller coaster *remains the same* even if the number of people sitting in the coaster changes (that is, the mass of the roller coaster train changes)!

The fact that gravity accelerates an object, whether big or small, at the same rate is a property of every planet and moon in our solar system, and all the stars in the heavens. While on the Moon, Apollo 15 astronaut David Scott dropped a hammer and a falcon feather at the same time. Guess what? Though the feather was



much lighter than the hammer, the two objects fell at the same rate, proving that Galileo was correct.³ (The Moon is a vacuum and there was no air resistance to slow the feather down.)

Using what Galileo learned, Isaac Newton discovered some other very important things about the way Christ created gravity. Earlier we mentioned that Newton came to realize that the greater the mass two different objects have, the greater the gravitational attraction between them. This is why you weigh more on Earth than you would on the Moon, because the Moon has only one-quarter the mass of Earth. Sir Isaac also discovered that this same *gravitational pull* dramatically *decreased* if the *distance* between the two masses *increased*. (In this way, gravity is similar to magnetism—the further you pull a refrigerator magnet away from a refrigerator, the weaker the attraction between them.)



³ If you tried this experiment on Earth, the hammer would hit the ground before the feather because air causes the feather to float rather than drop quickly. To see an actual video of this lunar experiment go to: http://www.hq.nasa.gov/alsj/a15/a15v_1672206.mpg

THE WEIGHT OF GRAVITY

Every star and planet, every particle in the universe, is pulling at each other (and us) with this invisible, mysterious force called gravity. All objects, including you and me, produce a gravitational field of attraction for every other object because of mass. *Mass produces gravity!* (The amount of gravity you produce is so small it is difficult to detect—but it's there!)

The mass of an object, however, is not the same as its *weight*, though the two are related. *Weight* is the *force of gravity exerted on a mass*.

FOR THE EXTRA CURIOUS

$$F_{\text{weight}} = m \times a_{\text{Earth}}$$

or

Weight = mass x acceleration of gravity

Weight is a force (F_{weight}). On Earth someone's weight (F_{weight}) can be determined by multiplying their mass (m) by the acceleration of gravity at the Earth's surface (a_{Earth}), which is 32 feet per second per second or 9.8 meters per second per second.

Let's say you own a very fast spaceship and you take a coin out into space—out into the middle of nowhere, very far from any planet or star. The coin will become weightless. It has no weight because there is no large object close enough to pull on it with gravity. But the coin still has the same mass that it had on Earth! The shape and metallic composition of the money hasn't changed. Bring your coin back to Earth and it has its original weight again.

Now let's assume you weigh 90 pounds (41 kilograms) on Earth and you decide to take a trip to the Moon. Once you land on the surface

there you discover that you weigh only 15 pounds (seven kilograms)! Why? The force of gravity on the Moon is only one-sixth as much as the surface of Earth because the Moon has quite a bit less mass compared to the mass of the Earth.

Remember, mass produces gravity, and the smaller the mass, the less gravity it produces. But as you travel from Earth to the Moon and back again your mass does not change, it stays the same. What changes is the mass of the object (Earth or Moon) that is pulling on you with its own gravity. Your mass remains the same because the essence of who you are stays the same no matter where you go in the universe. Only your weight changes. The following is a table that illustrates how your weight (but not your mass) changes depending on where in the Solar System you are:

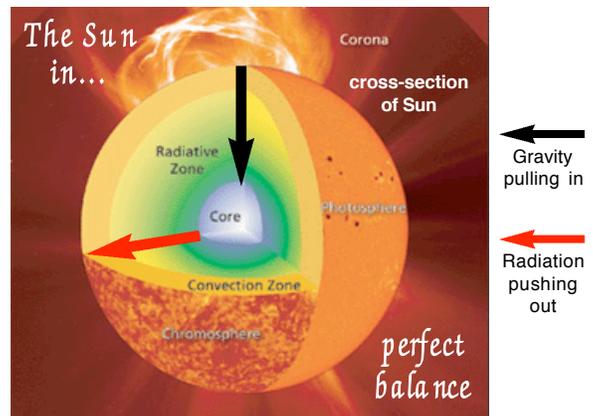
Weight on:		
Earth	90 pounds	41 kilograms
Mercury	34 pounds	16 kilograms
Venus	81 pounds	37 kilograms
Mars	34 pounds	15 kilograms
Jupiter	228 pounds	104 kilograms
Saturn	96 pounds	44 kilograms
Uranus	81 pounds	37 kilograms
Neptune	106 pounds	48 kilograms
Pluto	6 pounds	3 kilograms
Sun	2,520 pounds	1,148 kilograms
Moon	15 pounds	7 kilograms

When someone goes on a diet it might be better to say that they have lost mass, not weight (though they have lost weight as well). People describe mass and weight differently depending on whether they live in the United States or not. In America, weight is given in *pounds* and, believe it or not, mass is measured by something called “slugs.” That’s right, *slugs!* (Now please don’t ask someone who is on a diet how many slugs they’ve lost!) The rest of the world measures both mass and weight using *grams* and *kilograms*.⁴

⁴ One kilogram equals 2.2 pounds. One slug weighs about 32 pounds or 14.5 kilograms on Earth.

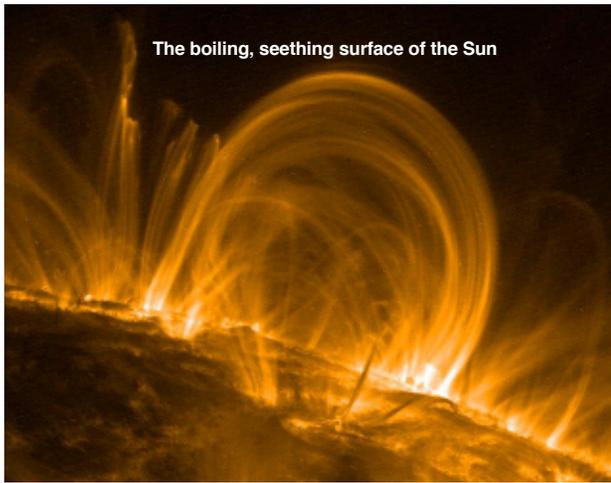
STARS OF GLORY

Let’s now turn our attention to objects in the universe with the greatest mass—stars—because they are the grandest heralds of God’s glory commonly found in nature (Psalm 19:1-4). Our Lord Jesus Christ uses the unimaginable mass and gravity of our Sun (a typical star) to keep at bay mammoth streams of electromagnetic radiation



spewing outward from the center of the star’s fiery heart. The Sun is like a gigantic hydrogen bomb. Jesus applies the crushing force of the Sun’s massive gravity, however, to pull almost everything back into the Sun so that it does not explode outward. He balances a star’s gravity with the immense nuclear furnace located inside. Thus an enormous amount of gravity—the result of the star’s sheer mass—keeps the Sun from blowing itself apart and incinerating every planet in the Solar System. In turn, Christ uses the constant pressure of heat and radiation pushing out from the Sun’s center to prevent the star from collapsing in on itself.⁵ The Sun, and every other star in the universe, is perfectly controlled by its Creator, our Lord Jesus Christ. He tames the Sun in meekness, using its immense “weight” to contain its explosive hydrogen and allow a tiny portion of its heat and light to shine into space and especially on Earth.

⁵ The core or center of the Sun is 25 million degrees F or 14 million degrees C.



The Sun is a beautiful illustration of *the radiance of God's being: the "gravity" of God's internal glory and the "shining forth" of His external majesty*. For years, theologians have described these two kinds of divine glory: God's internal and external majesty. The internal glory of God is that which is shared between and enjoyed by the three Persons of the Trinity and is totally unknown to us. His external glory, however, has been revealed to us in Creation, the Bible, and in the Person of Jesus Christ.

As an illustration, let's compare the essence of *Who God Is* with *the mass of a star*. God's internal glory could then be thought of as the unseen gravity a star produces because of its mass. This invisible glory of God is like the inner workings of a star because both are beyond our ability to see and experience, whereas the outward majesty of God is visible, like the blinding light and radiation shining forth from the star!

When we explore nature we experience the glory of God everywhere (Isaiah 6:3). And when we read and study the Bible we come face to face with the beauty of Christ's character flowing from its pages. This *external glory* can be understood as *the expression of all God's revealed attributes*. Think of Christ's glory as brilliant sunshine and picture God's attributes (which are seen in His glory) as the rainbow of colors⁶ we see when white light is

⁶ We get a sense of the "multicolored" glory of Christ in Ephesians 3:10 (God's "multicolored" wisdom) and 1 Peter 4:10 (God's "multicolored" grace). See also Ezekial 1:28.

passed through a prism—the prism of the Gospel.

Now God has perfections or attributes essential to His internal glory that we cannot observe. In the same way, we can enjoy the warmth of sunshine (a reflection of His external glory), but we cannot experience what's going on inside the Sun. Nor would we want to because it would instantly destroy us (read Exodus 33:20)!

The most common Hebrew term that the Holy Spirit uses in the Old Testament to describe God's glory is the word *kavod*. The literal translation of "kavod" is "weightiness, heaviness, or gravity." So we can understand why God would associate stars with His glory in the Scriptures (1 Corinthians 15:41). If the word kavod is placed together with *Adonai*, one of many titles for God, then "kavod Adonai" can be translated the "weight of God's glory." But what does this mean?

It is said that Martin Luther trembled before God because he (Luther) was painfully aware of "man's utter inability to withstand the *weight of God's devastating holiness*."⁷ The Puritan pastor Jonathan Edwards warned that the enemies of God would eventually be placed under the feet of Christ, Christ "being gloriously exalted over them."⁸ Scripture says that our Lord "treads the winepress of the fury of the wrath of God Almighty" (Revelation 19:15c).

So, how heavy is Christ's glory? And how weighty is God's wrath? Since God is Spirit, and cannot be weighed in pounds or kilograms, we must try to understand His glory by comparing it with something we can grasp. Think about it for a minute—the infinite glory or "weight" of God in Christ *standing on His enemies!* No wonder Scripture warns us that at the judgment seat of Christ, the condemned will cry out for the mountains to fall and crush them (Revelation 6:15-17). As terrible a thought as this is, mountains are far, far lighter than the weight of Christ's glory (kavod Adonai). If a star was placed on top of someone, it would be a "feather" compared to the sheer

⁷ Danielle DuRant reviewing "Losing Our Virtue: Why the Church Must Recover Its Moral Vision" by David Wells

⁸ "Christ Exalted" by Jonathan Edwards: Lecture, August 1738

force of God's holiness! And it is this infinite "gravity" of God's Son that will trample the sons of Hell forever. Instead of cherishing the sweet light of Jesus' beautiful face in the safety of Heaven—as we now enjoy sunshine from the safety of Earth—those in Hell will experience the terror of His wrath as one thrown into the seething and *ever-crushing* heart of a monstrous star. But this does not have to be true for you and for me. Christ's love can shield us from being consumed by the gravity of His glory (Lamentations 3:22).⁹

"YOU SHINE LIKE STARS"

The gravity of Christ's glory is inescapable—we can't simply ignore it. Let me illustrate: If a spaceship tried to fly close to the Sun it would find the Sun's gravitational pull unrelenting. In other words, a spacecraft can't simply pass by the Sun pretending as if it weren't there. A spaceship headed for the Sun has two choices: it can insert itself safely into orbit around the Sun and enjoy the awesome spectacle of the star from a safe distance or it can neglect to fire braking thrusters and plunge into a fiery death. We, too, must one day approach the Son of God—He can't be ignored by anyone! And we also have two choices: become vehicles for God's glory—love Jesus and believe that He is God, that He died on a cross for our sins and rose from death providing for us safe passage into Heaven—or reject God in Christ and be swallowed up by the fires of Hell forever with no escape (Matthew 25:31-46). Down through the ages, people have tried to demand other choices for eternity and that's why they invent their own religions. But these are the only two choices we have!

We have all sinned and fall short of the glory of God (Romans 3:23). Our sins (even a single sin) are an infinite offense to an infinitely holy God Who demands infinite payment for our trespasses. We can either ask Jesus to pay the penalty for our sins (being God, Christ's sacrifice of His life on the Cross is the only treasure valuable enough to cancel our debt with His Father) or we can,

⁹ We cannot fully understand the weight of God's love without looking into the face of His all-consuming holiness.

through painful futility, try to pay our own debt in Hell forever under the infinite weight of God's glory. The problem with the latter choice is that it is forever—there's no escaping the holy gravity of our Creator. Ever! So the choice is ours. What will you chose? Know this, if we surrender our lives to Christ, *He "will tread our sins underfoot and hurl all our iniquities into the depths of the sea"* (Micah 7:19, emphasis added). *That's Good News!*

Please don't hesitate to commit yourself to Christ because someone might think you strange or hate you, or because you will experience difficulties in this world. God promises all who love His Son Jesus something far greater than that.

Children of God...you shine like stars in the universe as you hold out the Word of Life.
Philippians 2:15b, 16a

"Oh, Father in Heaven, I confess that I have lived my life in rebellion against You, and this is sin. Please forgive me through Your Son, Jesus Christ—through His death on the cross. Jesus, please come into my heart right now. I embrace You as my delightful God and my sweet Savior and my Eternal Life. Show me how to live the way You want me to live, and allow me to see and hear Your praises throughout the universe! In Your name, Lord Jesus Christ, I pray. Amen."



DR RICK DESTREE
Editor

PASTOR HUGH FITZPATRICK
PASTOR CHRIS KAWA
Theology Consultants

JOSH DESTREE
*University of Colorado
Department of Astrophysics*

KELLEY CARLSON
COLLEEN DESTREE
Contributing Artists

GRETCHE GANZEL
RACHEL WILEY
Editorial Proofing

REED EVANS
Printing

VISIT US AT OUR WEB SITE:
www.hiscreation.com

CREATOR is published quarterly by **HIS CREATION**, PO Box 785, Arvada CO 80001- 0785. Copyright © 2007 by **HIS CREATION**. All rights reserved. **CREATOR** is offered without charge; however, donations are greatly appreciated!

Unless otherwise identified, Scripture taken from the **HOLY BIBLE, NEW INTERNATIONAL VERSION**. Copyright © 1973, 1978, 1984 International Bible Society. Used by permission of Zondervan Bible Publishers.

PHOTO/ILLUSTRATION CREDITS

Roller Coaster (1): Writing Time
David Scott on Moon (3): NASA
Cross-section of Sun (4): © 2007
Chabot Space & Science Center
Surface of Sun (5): NASA
Sun (6): Naval Research Laboratory