CREATOR

VOLUME 26 NUMBER 1

The Lord of Life

Where shall I go from your Spirit? Or where shall I flee from your presence? . . . For you formed my inward parts; you knitted me together in my mother's womb. Psalm 139:7, 13

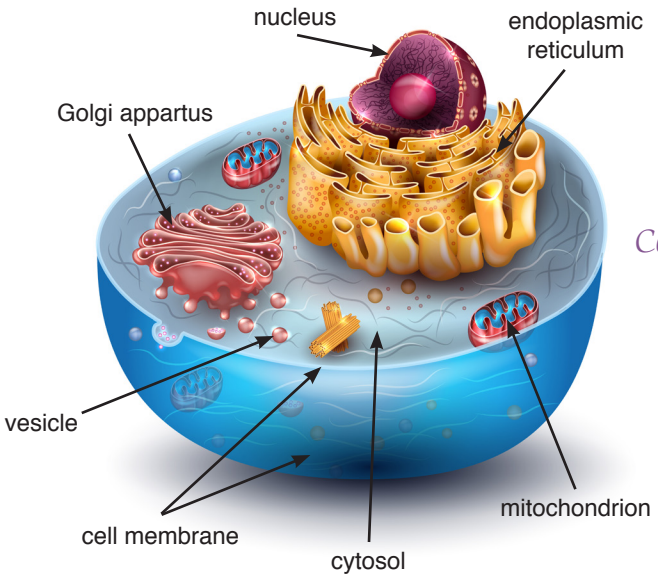
Are you staggered by the wonder of who Christ is? Does your heart desire to stand in trembling awe before our Lord Jesus? If so, then consider this: Your body is composed of roughly *50 trillion cells*.[1] And each of these cells is made up of *more than a trillion parts*, many of which are impossibly complex in their own right. It is difficult to grasp just how intricate our bodies are. They speak loudly of the greatness, goodness, and beauty of the One who made us! Of course, none of us is without physical flaws—less-than-perfect eyes, skin blemishes, defects both hidden and public. We live in a fallen world. We can say, however—despite what modern science teaches—God is the only one who can create a cell and knit countless cells together to form the fearfully- and wonderfully-made person you are.

Today, we join Professor Seismo and his three grandchildren for a discussion centered around our cells. Fifteen-year-old Rick, Professor Seismo's oldest grandson, has prepared an informal science presentation as part of a school project. Let's listen in . . .

1 Cells are the "building blocks" of all life.

What Is A Cell?

Rick: "I've titled my presentation, *'What Is a Cell?'* And I want to share with you the fantastic way God has created our bodies. Cells are extremely small and we need a powerful microscope to see them."
Professor Seismo: "Rick, just how small did our Lord make cells?"
Rick: "I read somewhere that 10,000 white blood cells could fit on the head of a pin."
Seismo's bushy eyebrows go up in amazement.
Rick: "That's why I love studying cells—Jesus made them so incredibly tiny and packed each with even tinier machines.



Cell

Nothing people build today comes even close to the wonder of Christ's work!

"We might think of a cell as a 'family home,' which cannot be broken into pieces and still be considered alive. It's a super-small 'house' filled with hard-working 'members' known as *organelles*. These 'little organs' are the 'heart,' 'mind,' and 'guts' of a cell. Organelles selflessly contribute to the cell's well-being and constantly work to keep their home healthy and intact."

Professor Seismo: "Rick, what gives cells their stable shape?"

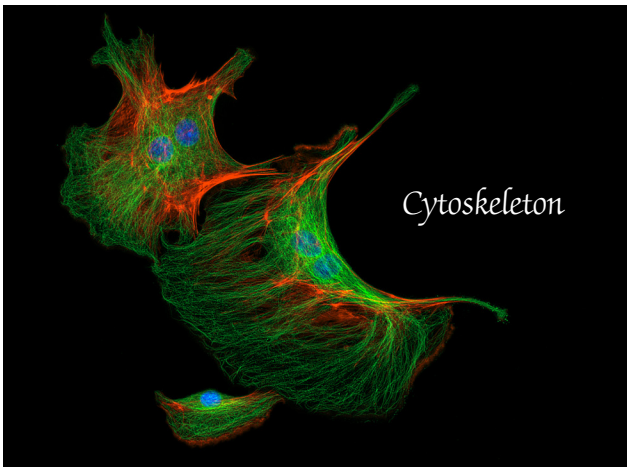
Rick: "All cells are filled with a liquid called *cytosol* (SY - tuh - sol), which is 70% water.[2] Suspended in this gel-like solution is a flexible framework of proteins known as the *cytoskeleton*. The cytoskeleton provides the cell with shape and allows for movement. And each of our cells is surrounded by a *membrane*. The cell membrane helps all the organelles stay in close contact with each other and protects the cell from the outside world. It's similar to the thin rubber of a water balloon that holds liquid in place. And like the balloon, a cell can change shape.

"We could also liken a cell membrane to the outside of a drafty old house that allows air to go through cracks in the walls. A cell doesn't have cracks, but our Lord Jesus wisely designed it so oxygen and carbon dioxide can easily pass across its membrane in both directions. Cell membranes have built-in 'doors,' 'windows,' and 'water lines' too."

Professor Seismo: "Rick, please tell us more about the cytoskeleton."

Rick: "God fills the inside of a cell with long fibers and tubes made out of protein. These protein fibers stretch throughout the cytosol and form an internal framework for the cell—the cytoskeleton. In a house, walls and floors are what create hallways and corridors, allowing us to go from one room to another. Likewise, our Lord Jesus uses these fibers to organize the insides of a cell."

2 "Cyto" is a Greek word meaning "cell," and "sol" is short for "solution."



Stained cells revealing a beautiful network of protein fibers

Professor Seismo: "There's no chaos in God's world, is there Rick?"

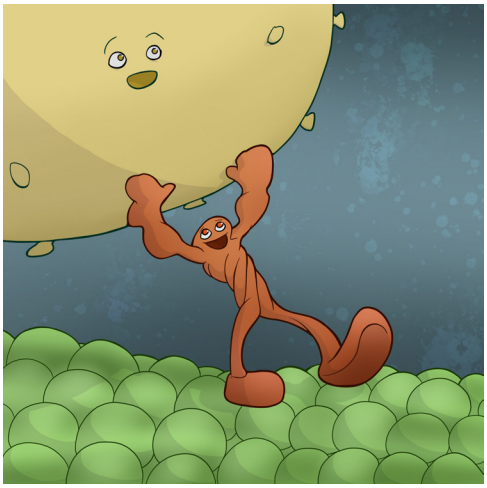
Rick gives Grandpa a thoughtful look.

Rick: "Protein fibers are like the two-by-fours that give walls in a home their strength and support. They form the 'hallways' and 'corridors' down which molecules and organelles can walk."

Professor Seismo: "They walk?!"

Professor Seismo asks with genuine surprise.

Rick: "Well, some do. Here's a cartoon drawing showing how a specially-made molecule carries an organelle along a microtubule from one part of the cell to another:



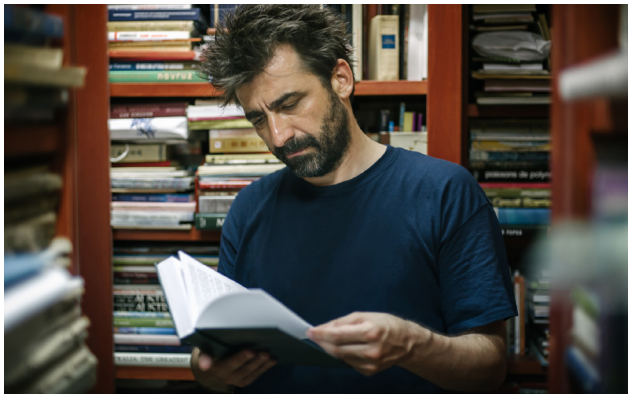
A motor protein carrying a vesicle

This 'walking molecule' is known as a *motor protein* because it has moving parts. Of course, proteins and organelles don't have smiley faces.

"The fibers that help give a cell its shape are constantly being formed and reformed—like the silk of a spider's web. The female spider makes a web in the evening and then disassembles it in the morning, creating a new web the next evening. A similar thing happens in cells."

Professor Seismo: "Rick, that brings to mind a couple of verses of Scripture: Jesus said in John 5:17, 'My Father is working until now, and I am working,' and Psalm 104:30, 'When you send forth your Spirit, they are created.' Our Triune God is always working in us to make us alive. If we could only see the Lord forming and rearranging the cytoskeleton. Oh, what a sight that would be!" *Rick pauses to think.*

Rick: "The most important organelle is the *nucleus*—the 'command and control center' of a cell. The instructions for how the cell should

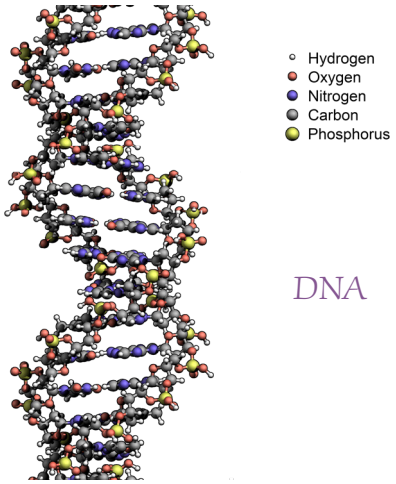


The nucleus is like Dad in the home libary.

operate are stored in this organelle. It's like the home library where 'Dad' spends long hours reading his Bible and the many manuals needed to maintain appliances, electricity, heating, and ventilation in the home.

"The 'manuals' of a cell are in the form of *genes*, which our Lord Jesus uses to make the thousands of different proteins of a cell.[3]

3 Proteins are very large molecules that perform most of the work in a cell.



DNA

The huge 'library' of the nucleus is filled with super-large molecules called *DNA*. DNA stores the blueprints (genes) for building protein molecules needed in a cell. Proteins possess no intelligence of their own, yet they're able to perform the work needed to keep a cell healthy. How do they know when and where to do their jobs? Proteins are like little machines . . . but who operates the machines?"

Kelsey: "Jesus!"

Rick: "Yes, Kelsey, that's right, Jesus!

"Before proteins can be made, the instructions stored in DNA must be copied onto another molecule known as *messenger RNA* or *mRNA* for short. The mRNA forms inside the nucleus and passes through pores in the nuclear membrane.[4] Once outside, the mRNA 'searches' for tiny machines called *ribosomes*. It then latches onto a ribosome and it's here that proteins are manufactured."

Professor Seismo: "In your family home analogy, what would the ribosome represent?"

Rick: "The family in my illustration owns a business that makes clothes. So the ribosome would be the family loom . . . or 10 million looms because that's the number of ribosomes found in a typical cell."

Professor Seismo: "Your family business must be pretty big, huh?"

Rick: "Almost too big!" *Rick sighs.*

Professor Seismo: "Don't feel bad, Rick.

4 The nuclear membrane holds the nucleus together.

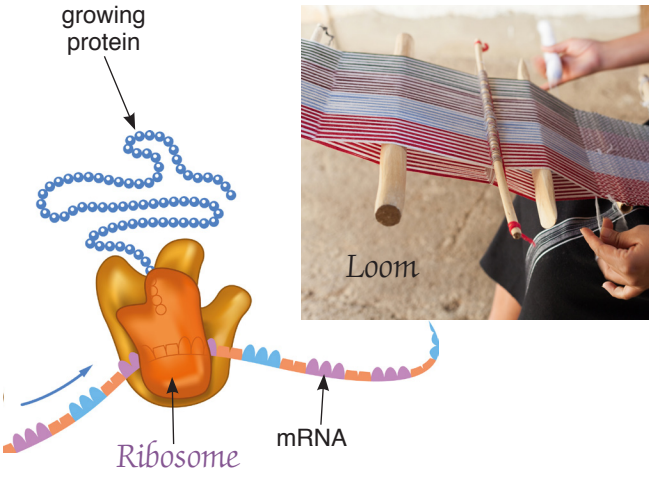
For the Extra Curious

Every time a cell divides, it must make a perfect copy of its genetic code (DNA). If we compare this process with the way scribes of old painsakingly copied the Bible word for word, we might get an idea as to the enormity of the task. Human DNA is composed of a staggering 3.2 billion nucleotide molecules. This number is 1,000 times more than the individual letters (a, b, c, d, e, etc.) found in the King James Bible—3,116,480.[5] Even the most faithful scribe occasionally made mistakes in transcription, which might change the meaning of a word, *though never the truth of a passage.*

It typically took scribes months to transcribe one book of the Bible. A cell can replicate its DNA in less than an hour. This happens quickly because there is an army of proteins/enzymes to serve DNA. One particular enzyme, *helicase*, helps unzip the double helix of DNA. Helicase is a molecular motor that literally spins as fast as a jet engine![6]

When God first created DNA, He formed many proteins/enzymes to assist it. Our Lord Jesus thus ensures that the genetic instructions in our cells are copied correctly. He also created molecules that "proofread" the newly replicated DNA,[7] and if an error is detected, it is quickly repaired.[8] What an amazing Creator we serve!

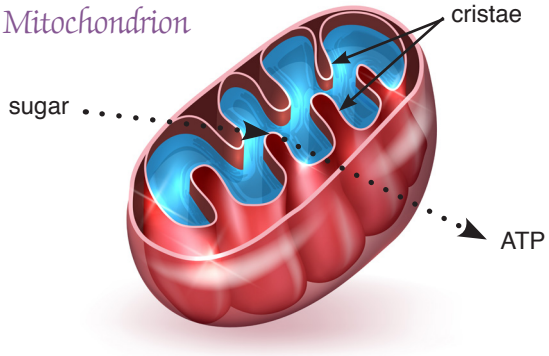
5 The "alphabet" of DNA is composed of just four "letters" (nucleotides)—adenine (A), cytosine (C), guanine (G), and thymine (T).
6 Another molecule that allows DNA to be copied in less than an hour is a motor protein which moves along the DNA strands at a velocity 30 times faster than the world's fastest aircraft!
7 DNA polymerase "proofreads" the newly-created DNA for accuracy.
8 On average, DNA replication results in only one error for every one billion nucleotides copied. That's like someone hand copying 321 Bibles in less than one hour and making only one letter mistake!



Your analogy is a good one. It illustrates just how much greater are the things of God than the things of man! Please keep going."
Rick: "The reason a cell needs so many ribosomes is that it must have millions and millions of proteins to do all the essential jobs. A cell's proteins help carry out 10,000 chemical reactions *each second*. Proteins can be likened to individuals performing jobs or tasks within our pretend family. The truth is, however, for a home business to match what's going on in a typical cell, it would need to fit a trillion employees under one roof!"
Professor Seismo: "Hmmm, that's a lot of mouths to feed. I'm guessing that the kitchen would have to be fairly big."
Professor Seismo smiles at Rick.
Rick: "Well, God gave each cell several 'kitchens.' They're called *mitochondria*."
Professor Seismo nods in approval.
Rick: "Mitochondria are organelles that break down sugar so that energy can be released—the 'food' that proteins need to perform their jobs. Believe it or not, mitochondria generate electricity, which is stored in tiny molecules called *ATP (adenosine triphosphate)*.

"Much of the food we eat is converted into sugar, which eventually enters our cells. Sugar is broken apart in the cytosol and shuttled into mitochondria. The energy produced from sugar is transferred to mitochondrial membranes called

Mitochondrion



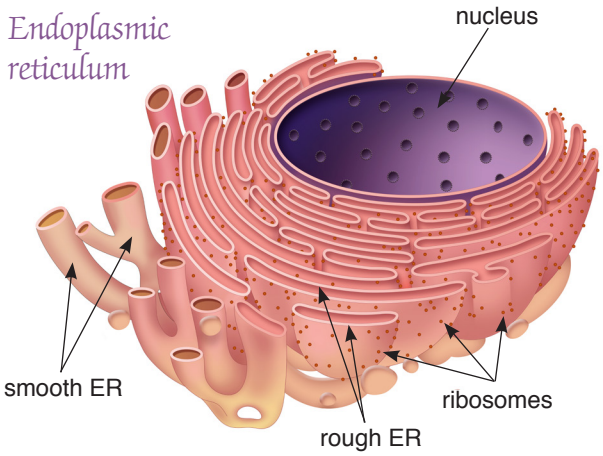
cristae (kris - tee). It's here that a very complex enzyme[9] takes the energy—together with oxygen—and produces ATP molecules, which then exit from the mitochondria.[10] You can think of ATP as the 'batteries' of a cell because they carry energy to all parts of the cytosol, powering chemical reactions. In our home business, it's akin to the meals that feed countless employees."

Professor Seismo: "Great explanation, Rick!"

Rick: "I also read somewhere that if we could stitch mitochondrial membranes end to end and stretch them out three feet (one meter) or more, their electrical field strength would be that of lightning—30 million volts!"

Kelsey: "Yeah, let's do that!" *Rick grins.*

Endoplasmic reticulum



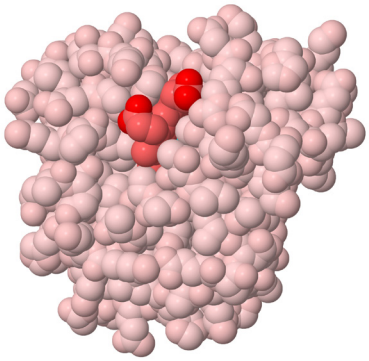
Rick: "The next thing I want to talk about is the *endoplasmic reticulum*."

Josh: "The ectoplasmic what?!"

Rick: "No, the *endo*-plasmic reticulum, Josh. I realize they're pretty big words. It's an organelle connected to the nucleus that forms complex tunnels and caverns throughout the cell. Many of the cell's ribosomes are attached to the surface of the endoplasmic reticulum, which I'm going to call the 'ER' to save time. If we look under a microscope, the tiny ribosomes attached to the ER give it a bumpy or rough appearance, so scientists have nicknamed it the *rough ER*. Some of the ER of a cell lacks ribosomes, so it's known as *smooth ER*.

"Proteins manufactured by ribosomes must be folded in the rough ER before they can go anywhere. They're like the big sheets of cloth produced by our looms. The cloth is

Myoglobin protein
(properly folded)



folded, cut, and sewn into clothes . . . only *protein* folding is a lot more complicated!

"It was once thought that a protein could fold itself without any help, until someone studied *myoglobin*, a protein found in our muscles. It's now estimated that it would take 1,000,000,000,000,000,000,000,000,000 years for a single muscle protein to fold on its own."

Josh: "Woah, that's a long time!"

Rick: "Impossibly long, Josh. Our cells would not function had Jesus not given them a way to speed things up."[11]

Professor Seismo: "So, what job does the smooth ER do?"

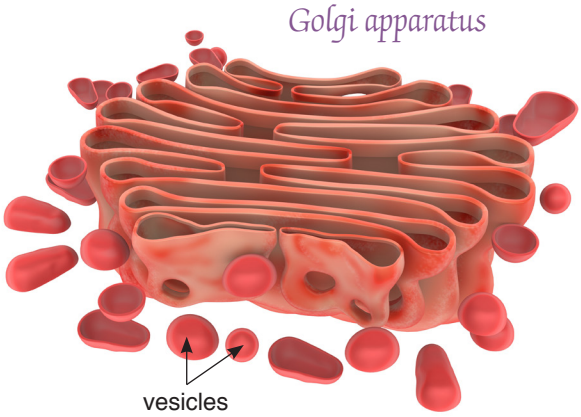
Rick: "Do you remember the story of Nehemiah in the Bible?"

9 ATP Synthase
10 Mitochondria also produce the heat that keeps us warm.
11 There are many molecules that assist in protein folding.

Professor Seismo: "Yes."
Rick: "The smooth ER is a 'cupbearer.' It prevents the cell from being poisoned by removing harmful chemicals from the cytosol."
Professor Seismo: "What then happens to the folded proteins in the rough ER?"
Rick: "These proteins pass through the smooth ER and eventually make their way to another organelle with a strange name, the *Golgi apparatus*.[12] It's in the Golgi apparatus where proteins are accessorized."
Josh: "Access . . . or . . . ized?"
Rick: "Yeah, things are added to proteins, like sugar or fat. If we compare it to our family business, it's where buttons, bows, and other stuff are added to the clothes that will eventually be sold. Like a shirt without buttons, an unfinished protein is of no use to the cell.

"The Golgi apparatus is also the place where proteins are prepared for distribution

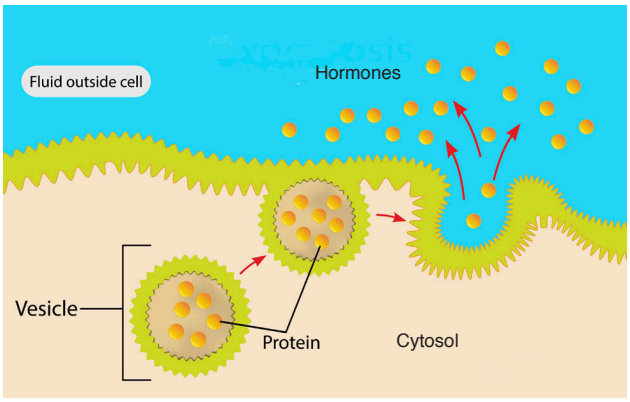
Golgi apparatus



both inside and outside the cell. It's like the 'packing and shipping center' of our home business. The Golgi apparatus produces vesicles similar to the one in the cartoon I showed you earlier (page 2). A *vesicle* is a 'parcel' or 'package' that contains proteins wrapped in a membrane.

"Certain enzymes get packaged by the Golgi apparatus and are then sent to organelles called lysosomes. A *lysosome* is a membrane-bound bag of digestive enzymes that helps keep the cell free from germs and debris. It's like the 'trash service' of our home.

"And sometimes proteins are delivered to the cell membrane to be released outside."



Professor Seismo: "Why does this occur?"
Rick: "Well, some of the manufactured proteins are *hormones* destined to enter the bloodstream and go to other parts of the body. Hormones are like 'post' or 'letters' that give instructions to distant cells. Other proteins can be released as *enzymes*. This is what happens in the pancreas. Certain cells of the pancreas produce enzymes that are transported to the small intestine where they help digest food.

"When I compare the cell to our family home business, I'm convinced that the Golgi apparatus is the closest thing to 'Mom.' If we could give the Golgi apparatus a personality, I think it would best be described as a hard-working, intelligent, skillful, and self-sacrificing wife and mother—a true Proverbs 31 woman!

"And as I already said, the nucleus is most like 'Dad,' the God-ordained head of the home. But it is 'Mom' who makes certain that the family is provided with clothing and that the family business remains profitable. We might say that—like 'Mom' at home—the Golgi apparatus takes care of 'a million-and-one details' in the cell."

12 Pronounced GOAL - jee

Professor Seismo's face forms the world's biggest smile and his eyes crinkle with delight as he listens to the uncommon wisdom of his grandson.

Rick: "The structure and inner workings of a cell cry out, loudly proclaiming God's power, wisdom, greatness, and beauty. *His wisdom* is seen in the millions of complex molecules that form and operate within a cell. The instructions God places in the nucleus—or 'Dad' of the cell—tell us that He is a *diligent ruler and manager of His creation*. The hard-working organelles, and especially the ever-changing cytoskeleton, declare that our *Lord is always working for His Father's glory*. Lysosomes prove that He is *our Protector*. And the Golgi apparatus, or 'Mom,' gives us a glimpse into Christ's *gift of humility and selfless service*.

" Grandpa Seismo, I really think I might like to become a scientist who studies cells. It seems that there is so much more to learn about them. Every time I read and discover something new, I find myself praising Jesus. That's a good thing, isn't it?"

Professor Seismo: "It's the best thing you can do with your life, Rick, no matter what profession you choose.

"The stunning architecture of the human body proves that nothing is impossible for God (Luke 1:37). It is a visible doxology proclaiming the incomprehensibleness of our Lord's glory. He truly is the Living God, greatly feared by the saints and angels in Heaven (Psalm 89:7)!"

Oh, the depth of the riches and wisdom and knowledge of God! How unsearchable are his judgments and how inscrutable his ways!
Romans 11:33

Links to several wonderful videos about cells have been posted on our website: www.hiscreation.com

A Cellular Kingdom

I praise you, for I am fearfully and wonderfully made.
Psalm 139:14a

What if I were to tell you that your body is a vast kingdom and in it reside millions, billions . . . no, trillions of 'families' living in peace and unity with one another? Would you believe me? If true, no present-day nation—or country that has ever existed—could measure up to such a magnificent kingdom, for Christ alone is its Lord. And God has made you the Prince Regent of your bodily realm, to care for it (Ephesians 5:29) much the way Joseph cared for Egypt (Genesis 41).

We can liken each of the cells that make up our bodies to a well-managed home. In His infinite kindness, our Lord Jesus Christ has led doctors to discover a great deal about His design of us. For most of human history, the way our bodies work has been a great mystery. "It is the glory of God to conceal things, but the glory of kings is to search things out" (Proverbs 25:2). Since we are members of the Royal Family (1 Peter 2:9), let us take advantage of this great privilege. Let us learn as much as we can about that which is "fearfully and wonderfully made." And in so doing, let us honor God. What we discover is sure to be fascinating.

All life is made up of cells, from tiny yeast to blue whales. Single-celled creatures—bacteria, amoebas, parameciums, diatoms—

fill the Earth, but organisms composed of many cells are no less dominant.[13]

Our bodies possess trillions of cells. Now consider this: All of them originated from *just one cell* in our mother's womb (the *zygote*). From the get-go, even this one cell was "complex beyond our wildest dreams," which is proof that our Lord was with us at the very beginning of our life—nurturing, guiding, and knitting us into the people we are today (Psalm 139:13).

What Is a Trillion?

Can we truly comprehend a trillion? If you had a trillion pennies, you would be a billionaire—ten times over. If you could jump straight up one trillion yards (meters), you would propel yourself past the orbit of Jupiter. If God gave you a lifespan of one trillion seconds, you would live for 31,688 years. That's a lot of birthdays! As we can see, a trillion of anything is truly beyond our comprehension.

Please don't let anyone convince you that when you were a single cell, or a small network of cells, that you were not yet a person. Nothing could be further from the truth. And no one has the right to interfere with or destroy the work our Almighty Lord Jesus is doing in the womb (Psalm 139:13)! The genius behind even a single cell far exceeds the world's greatest computers. No computer can divide itself, differentiate into other computers, form computer complexes, possess the image of God or worship Him.

Exactly how our amazing Creator fashions us from just one cell is beyond the scope of this article. We can say, however, that over the course of nine months, Christ Jesus causes a single cell to divide and divide and divide.[14] Early on, He commands our cells to differentiate into specific types—nerve cells, heart cells, bone cells, etc. By the time we become children, our bodies showcase more than 200 different kinds of cells, in thousands of shapes and sizes. Most of our body's 50 trillion cells are differentiated to perform very specialized tasks in near-perfect cooperation with all other cells.

But God does not cease His work once you reach adulthood (John 5:17). Every day, billions of cells in your body die. This would be cause for alarm except that it is a normal part of life. While cells are dying, new cells are being created (Psalm 104:30). *Each minute*, for instance, 30,000 to 40,000 skin cells die and are replaced. A certain percentage of the dust in your home is composed of dead skin cells that you and your family daily cast off. Our Lord Jesus is constantly working to renew the skin you lose to dust (Psalm 103:14).

All cells have a common anatomy, yet not all cells behave or function in the same way. Muscle cells help us move, nerve cells (neurons) allow us to think, and red blood cells faithfully supply oxygen to our tissues. It's fascinating to note that the DNA in a liver cell is *precisely the same* as the DNA in a muscle cell. We must conclude that it is our Creator alone who makes each cell unique . . . it doesn't just happen on its own!

Please don't let anyone convince you that when you were a single cell, or a small network of cells, that you were not yet a person.

If you think of your body as a "kingdom" of cells, then your organs (heart, lungs, brain, skin, bones, digestive tract, kidneys) are

13 Multicellular organisms

14 We experience 10 quadrillion cell divisions in our lifetime.

"provinces" or "states." How then do these tissues and organs communicate with each other so that your body functions as a whole?

Our gracious Lord provides several means for preserving the unity of your physical being. One way to have cells "talk" with other cells at a distance is via *hormones*. Hormones are like hand-written letters sent through the "postal service" of the bloodstream that inform other regions of your body of something important. In winter, the thyroid gland in your neck secretes greater-than-normal amounts of thyroid hormone, which increases your metabolism so that you can withstand colder temperatures.

If you remember from the first article, hormones are manufactured in the smooth endoplasmic reticulum, but not all cells produce hormones. Our Lord Jesus has created specially-designed glands in your body—like the thyroid—to secrete different hormones depending on the body's need. There are insulin-producing cells in the pancreas that maintain healthy blood sugar levels. A pea-sized gland at the base of the brain (the pituitary gland) secretes numerous hormones that regulate heart rate, body temperature, blood pressure, etc. And adrenal glands produce adrenalin (epinephrine) in times of stress. A woman's body, especially, has been uniquely designed to manufacture a mind-boggling array of hormones that regularly interact with one another in a very precise way *that doctors cannot replicate*. They perform an impossibly-coordinated "dance," waxing and waning before, during, and after pregnancy.

So remarkable is the wonder of our bodies, that Christ's Spirit likens the unity of His Church to the unity of our cells, tissues, and organs (1 Corinthians 12:12-27). His creation and maintenance of both—physical (body) and spiritual (Church)—clearly reveal His love for us. If we take time out of our busy days to ponder these things, we will surely grow in humility and joy.

State of the World

And the tongue is a fire, a world of unrighteousness . . . setting on fire the entire course of life. James 3:6

The power of our Lord Jesus knows no limits. Consider Lazarus. Scripture records that he died and was four days in the tomb before Jesus arrived at Bethany (John 11:17). By that time, all the cells in Lazarus' body had begun to decompose. Though different in many ways, we might compare it to the way Chicago suddenly began to disintegrate when it burst into flames . . . exactly 150 years ago.

The moment Lazarus died, his cells stopped making ATP and without it, his membranes and organelles began to decay. Jesus had purposely delayed visiting His dying friend so that God's glory would be put on display. He then commanded all 50 trillion of Lazarus' putrifying cells to come back to life . . . *instantly*. It took the Jews 52 days under Nehemiah's leadership to rebuild the wall around Jerusalem. Yet in the twinkling of an eye, Jesus restored the cell membranes, the organelles, and every strand of DNA in Lazarus' body. If the mayor of Chicago could have single-handedly doused the famous fire of 1871 and commanded his city to be instantly rebuilt, it would not begin to compare with the miracle that Jesus did!

In like manner, the world has been set ablaze with the fire of our wicked tongues. Society has sadly become a burning forest of lies, slander, and mockings. Hatred and blasphemy against the Living God have reached an all-time high. Throughout history, these verbal incendiaries have consumed mankind in sin—ever since Adam believed the lie of Satan in the Garden, which led to the spiritual death of all (Romans 6:23). People today may be alive physically, but most are spiritually dead (Ephesians 2:1, 5).

The world is aflame with sin. This "fire" cannot be seen with our eyes or sensed with our hands, but it has far-reaching consequences. And apart from the Cross of Christ, there is no way to extinguish the flames of man's iniquity. As such, God does not call us to reform the world—a task infinitely greater than extinguishing the Chicago fire. Rather, we are commanded to call others to repent of their sins and believe in Jesus Christ. *This is the Gospel.* The Father's will is to deliver His people out of the domain of darkness and transfer them into His Son's kingdom (Colossians 1:13), a kingdom not of this world (John 18:36).

The Gospel lovingly warns unbelievers of God's great anger at our sins. We must repent and believe in the Christ of the Bible to be saved from His fiery wrath. As we mentioned, everyone born into the world is spiritually dead (Colossians 2:13). On our own, we are unable to respond to this warning; we cannot even see the danger. Without God's Spirit, we are like a blind man living near Chicago in 1871—we might sense the flames, but we cannot see them and don't know how to flee.

The Bible plainly states that apart from the shedding of blood there is no forgiveness of sins (Hebrews 9:22). This is precisely why Jesus chose to die on a cross. Being the perfect Son of Man, He was the only one who could pay the penalty for our sins and as the perfect Son of God, endure the punishment we deserve. If you do not know Christ, *we beg you* to believe in what He has accomplished through the Cross. Please pray that God's Spirit would grant you faith.

Do you doubt His ability to save you? Do you think you are too great a sinner? When Christ's Spirit opens our eyes to God's holiness and the horror of our sins, we may become quite anxious and discouraged. Please know that Jesus' blood washes away *all sin* (Colossians 2:13). And the power that raised Him from the dead, is far greater than the power that gives life to a trillion trillion cells!

So don't be afraid to examine your life and see the countless ways you have rebelled against our holy Lord. Ask Him to take away these sins and give you His own righteousness (2 Corinthians 5:21). If you receive Jesus, no fire of Hell will ever touch you. God then promises to give you a new body that will never see decay (2 Corinthians 5:1), but will live forever in the light and ineffable joy of Christ's glory!

Therefore, if anyone is in Christ, he is a new creation. The old has passed away; behold, the new has come.
2 Corinthians 5:17

HIS CREATION

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