

CREATOR

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THE LIGHT CATCHER

One thing I have asked from the LORD, that I shall seek: . . . To behold the beauty of the LORD (Psalm 27:4).

“Whap! Whap!” goes the baseball as it lands in the glove, gets plucked out, and then hits the leather again. Twelve-year-old Jake is on his way to the park, hoping to find some guys to play a pick-up game with. As he comes up Maple Avenue, he passes through a tunnel of trees, faintly green, highlighted by tiny leaves that are just starting to emerge from their buds. The air exudes a rich, wet earth smell as bright sunshine slowly melts away heaps of snow, yet the chill is enough to make the tips of Jake’s ears and nose pink.

A short walk soon brings Jake to the town’s only park—he’s disappointed to spy a deserted baseball diamond with no friends in sight. Discouragement makes the stinging sensation in his icy hands all the more painful, but he clings tightly to ball and mitt. Hearing the abrupt guttural “Caw!” of a solitary crow at the park’s center, Jake quickly glances over and notices a familiar figure sitting on a bench not far from the noisy bird.

It’s Dr. Trakelsen (TRAY - kel - sen), the biochemistry teacher at the local college and an elder at church.¹ “What’s Dr. Trakelsen doing here by himself?” Jake wonders to himself. Since he has nothing else to do right now, the ruddy youth determines to find out.

As he approaches the fair-haired man, with fine wrinkles around his eyes that communicate an inward gentleness, Jake hears the professor exclaim, “Beautiful! Just wonderful!” Dr. Trakelsen (who is also called Dr. T by the townsfolk) is staring intently into the pages of a rather large book. At that very moment, the crow leaps from the ground and, with a loud squawk, flies off. Dr. Trakelsen looks up to see the seventh grader standing before him.

Dr. Trakelsen: “Hi there, Jake.”



¹ Jake and Dr. Trakelsen are fictitious characters.

Jake: “Hi Dr. T,” comes the boy’s somewhat shy response, “what’ya reading about?”

Dr. Trakelsen: “Photosynthesis . . . the marvelous way Jesus converts the pure energy of sunlight into food. Come on, sit next to me and I will show you.”

Dr. Trakelsen—who is ever eager to teach—warmly encourages the boy to sit down. Jake is quite curious to find out what is so “beautiful,” and he joins him on the bench.

Dr. Trakelsen: “We all need energy in order to survive, and the energy God provides us comes from the sun. Green plants take sunlight and turn it into sugar and starch.”

Jake: “How do plants do that?”

Dr. Trakelsen: “A typical leaf has around 70 million cells and each of these cells contains fantastic, molecule-sized machines that capture the *photons* of light.² You love playing catch with a baseball, don’t you, Jake?”

Jake quickly nods.

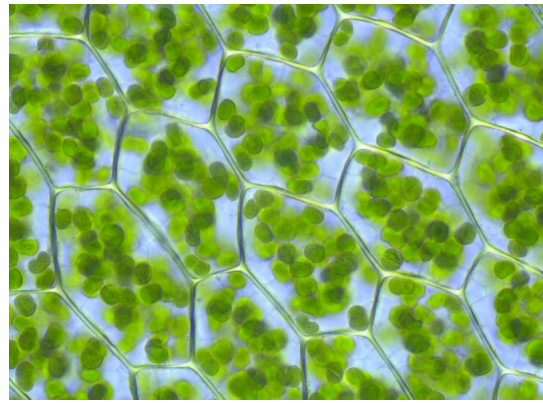
Dr. Trakelsen: “And think about the number of hours of practice it’s taken you to get good at catching a baseball. Well, Jesus has created a molecule called *chlorophyll*³ (a microscopic ‘baseball mitt,’ if you will) that can capture a photon traveling at 670 million miles per hour.⁴ That would be like catching a baseball shot directly at you from a huge cannon, only a million times faster!”

Jake: “Woah!”

Dr. Trakelsen: “Our Lord Jesus placed between 50 and 200 microscopic green bags, called *chloroplasts*, into each cell. And He filled these chloroplasts with millions of chlorophyll molecules because it takes a lot of chlorophyll to do the job right. Chlorophyll is the pigment that makes leaves green in spring and summer.”

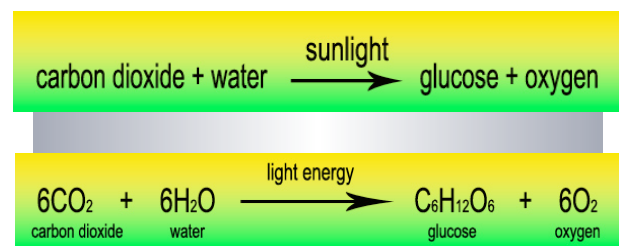
Jake again nods his head. The cold doesn’t seem to be bothering him now.

Dr. Trakelsen: “Along with capturing photons,



Plant cells (hexagons), each containing numerous green chloroplasts

plants absorb water through their roots and take in carbon dioxide through tiny holes, or *stomata*, in their leaves. It’s absolutely fascinating how our Lord has devised a way to transform these tiniest of things—photons, water molecules, and carbon dioxide gas—into much larger, energy-rich sugar molecules.” *Dr. Trakelsen points to a drawing in his biochemistry book. “The arrow pointing to the right represents this transformation, which takes place during photosynthesis.”*



C—carbon atom, H—hydrogen atom, O—oxygen atom

Jake: “Does oxygen come from carbon dioxide?”

Dr. Trakelsen: “Looking at these equations, you’d think it does. But no, Jake, the oxygen given off by green plants is produced when water molecules are broken apart. But here’s the rub—it is extremely difficult to break a water molecule into hydrogen and oxygen; it takes a lot of energy. On its own, sunlight can evaporate water off a sidewalk, for instance, but it can’t split water in two. Truth be told,

2 Read about photons in **CREATOR** Volume 20 Number 1.

3 The word “chlorophyll” comes from the Greek words *chloros*, meaning green, and *phyllon*, meaning leaf.

4 Or 1,078 million kilometers per hour

scientists still don't understand how God does it. Each photon of light is actually fairly low in energy, so it's necessary for Jesus to concentrate their collective energy in order to power photosynthesis. God uses what we scientists call 'antenna molecules' to capture photons."

Jake: "Why are they called antenna molecules?"

Dr. Trakelsen: "Because most of the chlorophyll molecules in a leaf cannot convert sunlight into usable energy. Most of these molecules act like tiny 'outfielders' relaying the energy of photons to a very special chlorophyll molecule 'at home plate.'⁵ Like radio antennas, they capture and concentrate electromagnetic radiation, which is then stored as chemical energy.⁶

"Jake, think of it as a group of neighborhood children in summer wanting to create a 'firefly lantern.' It would take quite a few kids catching lightning bugs in order to light up a jar in any significant way. So it takes a number of chlorophyll molecules—all capturing photons—to 'light up' or power photosynthesis."



Jake: "Oh, I get it!"

Dr. Trakelsen: "Scientists have discovered that *hundreds of chlorophyll molecules* need to be linked together to capture enough sunlight to energize photosynthesis. Once the sun's energy is captured and concentrated by the antenna molecules, an extremely complex

series of reactions rapidly takes place in what's called the *reaction center*.

"In the end, this series of events generates an extremely important substance called *ATP*.⁷ It is what powers our cells and is essential to the survival of all living things—both plants and animals alike. In fact, ATP has come to be known as the 'energy currency of life.' You can't buy anything at a store without money . . ."

Jake: "Yeah, do I know that."

Dr. Trakelsen: "Well, you can't survive without ATP. Once ATP is generated from sunlight via chlorophyll, our Lord Jesus does something no one else can—He uses ATP to convert water and carbon dioxide into food."

Jake: "Ya mean that green plants actually make sugar from sunlight?" *Up until now, Jake has had his doubts.*

Dr. Trakelsen: "Yep, Jake, they do—although the amount of sugar found in any given plant varies quite a bit. The leaves and other green parts of most plants are usually bitter, not sweet. Yet some plants—like sugarcane and sugar beets—have a high concentration of sugar.

"As with most things that God has created, it's taken researchers years and years to understand the inner workings of photosynthesis, and there is much left to be discovered. The term 'chlorophyll,' for instance, was first coined by French scientists Pierre-Joseph Pelletier and Joseph-Bienaimé Caventou back in 1818—they were the first people to isolate chlorophyll from green plants. Over the past 200 years, thousands of researchers have dedicated their lives to understanding God's design of photosynthesis, the creation of food from light."

Jake: "Does all food come from photosynthesis?"

Dr. Trakelsen: "Well, let's consider pepperoni pizza: The crust is made from flour, which

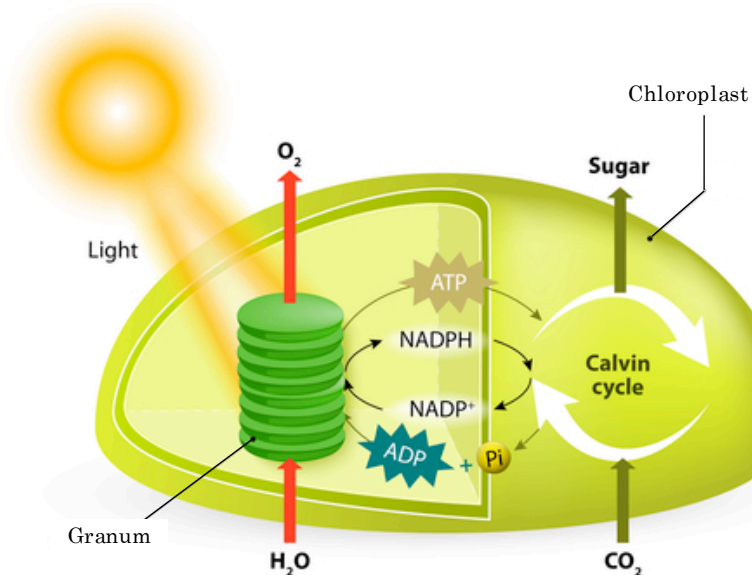
5 There are actually two kinds of chlorophyll involved in photosynthesis: P680 and P700.

6 Read about electromagnetic radiation in **CREATOR** Vol. 20 Num. 1.

7 ATP stands for adenosine (uh - DEN - uh - sin) triphosphate.

comes from wheat, a green plant containing chlorophyll. The sauce is made of tomatoes, the fruit of a green plant, and seasonings like oregano, which comes from a green plant in the mint family. The cheese is made from the milk of cows, which eat grass, a green plant with abundant chlorophyll. And pepperoni sausage is made from the meat of cows and pigs, which eat feed derived from . . . ”

Jake: “Green plants!”



Dr. Trakelsen: “That’s right. All food can be traced back to plants.”

Jake: “Is ATP found in food, Dr. T?”

Dr. Trakelsen: “No, but it is found in your body. Look at it another way: We could think of ATP molecules like tiny batteries that are charged up when sunlight hits the green leaf of a plant. These ‘batteries’ are then used to produce sugar from carbon dioxide—like baking sugar cookies in a small, battery-powered oven. Eventually we eat this sugar, or ‘sugar cookies’ if you will, and burn it in our body to produce ATP once again. It’s ATP that powers the chemistry of all our body’s cells.

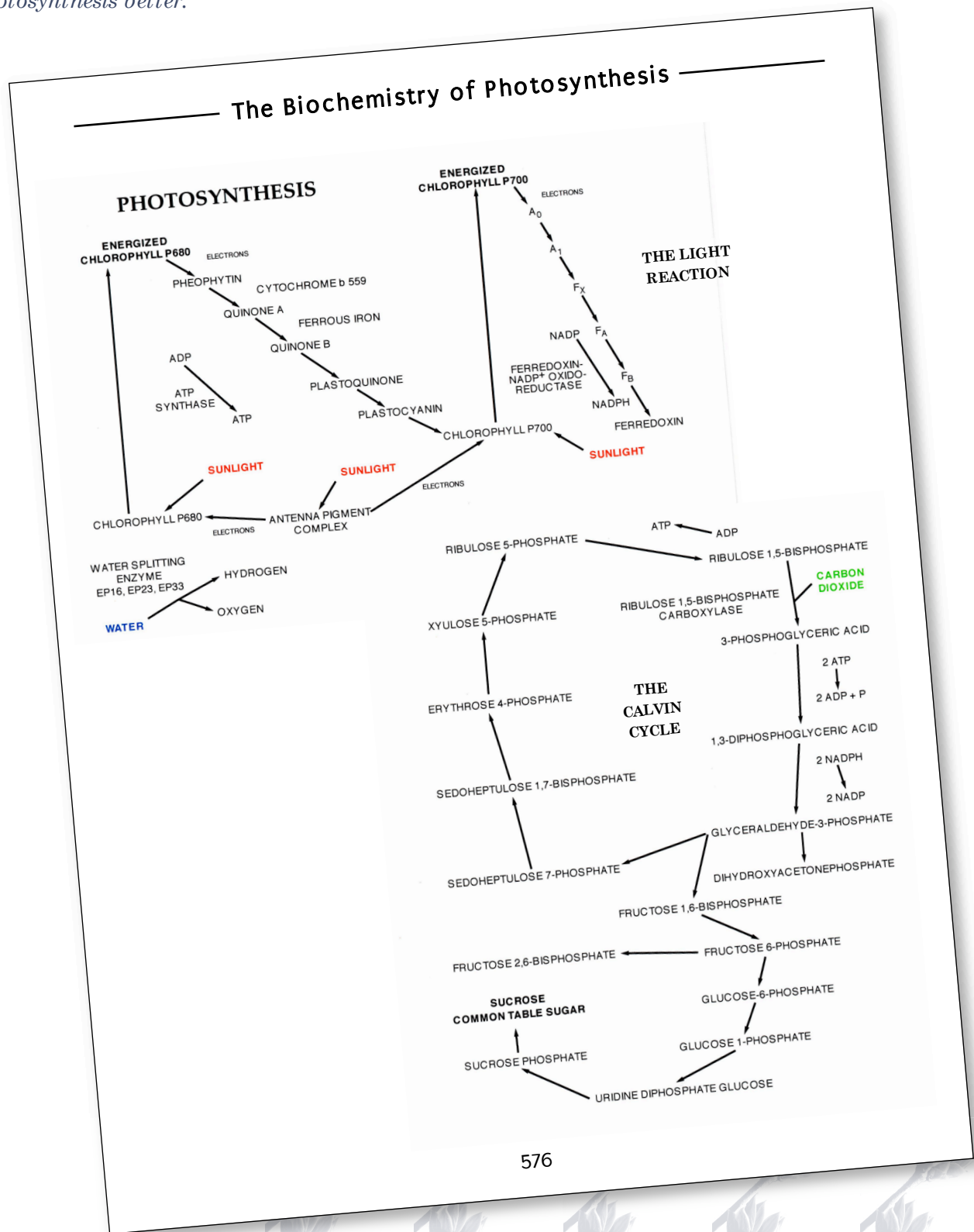
“Jake, through photosynthesis, Jesus provides the world with food and oxygen. Nothing that man has been able to invent in the laboratory comes even close to duplicating it.”

FOR THE EXTRA CURIOUS

During the 20th century, a brilliant researcher named Melvin Calvin discovered how sugar is made in green plants. During the day, plants open holes in their leaves, holes called *stomata*, in order to allow carbon dioxide gas inside the leaf and release oxygen into the atmosphere. Carbon dioxide molecules are the building blocks of sugar. After ATP is generated via photosynthesis within chloroplasts, its energy is used to convert the carbon dioxide found in air into a simple sugar called *triose*. Once triose is formed, it can then be converted into *sucrose*, which is another name for common table sugar. Although this might sound simple enough, the molecular machinery by which it occurs is quite complex (see page 5). This series of chemical reactions, including all the enzymes involved, has come to be known as the *Calvin cycle*, in honor of its discoverer.

When we eat food, it is broken down by our digestive tract and simple molecules, like sugar, are transported to our cells and there broken into smaller pieces. These smaller molecules then migrate into tiny bags called *mitochondria* located in our cells. Mitochondria are a bit smaller than the chloroplasts of plant cells, and perform similar chemical reactions, *only in reverse*. Mitochondria are found in the cells of all living things, including plants. Like chloroplasts, Christ gave mitochondria their own unique molecular machinery, only in mitochondria the chemicals derived from food are converted back into usable ATP.

Jake peeks at the open page in the biochemistry book as Dr. T is talking — he can't believe the complexity of the illustrations. Jake hopes that some day he will be able to take the professor's class so he can understand photosynthesis better.



Jake: “Dr. T, I get that what you’ve shared with me is really wonderful, but I also heard you call it ‘beautiful.’ I’m having a hard time seeing beauty in photosynthesis because I can’t actually see what’s happening in a leaf.”

Dr. Trakelsen: “Chlorophyll’s task is simple but unique. There are many ways to catch fish and even more ways to catch some sleep. Yet, in all creation, there is *only one way* to catch a beam of sunlight and transform it into food. It is the uniqueness of chlorophyll’s task that makes it beautiful. True beauty is often rare—like the beauty of diamonds, which are difficult to find. Chlorophyll has been given extraordinary responsibility by our sweet Creator, Jesus Christ, who meticulously designed it. Though plants are quite common, what they accomplish is rare . . . and beautiful. With the coming of spring, green plants will soon surround us—silently, but faithfully performing the work of photosynthesis. Chlorophyll is truly an emerald in the treasury of Christ’s fantastic handiwork.

“And oh, think about the beauty of the One who made chlorophyll! Who other than our incomparable Lord Jesus could perform a work so wisely, tenderly, and faithfully? Jesus transports the energy of the sun—an object of fierce, unimaginable, raw power—across 93 million miles of barren space, then lovingly packages it into the fabric of green leaves and plants. And He performs this feat so that the people and animals He created might have food and oxygen. Jake, can you think of anyone more wonderful and beautiful than Jesus our Creator?

“But there’s even more to our Lord’s beauty. As impossibly complex as photosynthesis is, it is far easier to catch a beam of sunlight than it is to capture a man’s heart for God. Chlorophyll was designed by Christ to ‘catch’ sunshine. It is *the catcher of light*. The human heart was originally designed by God to capture and treasure the glories of His character (2 Corinthians 4:7). But the hearts of people have become calloused to the things of God—

God’s glory seems to bounce off them like a baseball off a brick wall. Frankly, it is more likely for a rock to perform photosynthesis than for the stony heart of mankind to cherish God. Yet God is the God of the impossible and nothing is too difficult for Him.⁸ This is Christ’s cause on Earth: to transform the hard hearts of people into fertile soil, so that God’s glory can grow there—truly a miracle only He can perform. Through a life of perfect obedience and the sacrifice of that perfect life on a cross, Christ captures the hearts of His people and fills them with a sweet knowledge of God. *He is the Catcher of souls*. Christ is unique because only He can rescue us from our sins, and this makes Him exceedingly attractive! Compared to the beauty of Jesus, our sin is ugly, but God can make us beautiful through Christ’s blood! Jake, do you believe this?”

Jake: “Yes, Dr. T, I do!”

Dr. Trakelsen: “Then God has given you a heart that will catch the beams of His glory and He will faithfully transform you into one who obeys, loves and enjoys Him forever. And in time God will reveal to you, more and more, the utter beauty of His Son, Jesus.

“Please allow me to share with you a portion of a letter I always carry with me. It was written by Pastor Samuel Rutherford.”

*Give Christ your virgin love; you cannot put your love and heart into a better hand. Oh! if you knew Him, and saw His beauty, your love, your liking, your heart, your desires, would close with Him, and cleave to Him. Love, by nature, when it sees, cannot but cast out its spirit and strength upon amiable objects, and good things, and things love-worthy; and what fairer thing than Christ? O fair sun, and fair moon, and fair stars, and fair flowers, and fair roses, and fair lilies, and fair creatures; but O ten thousand thousand times fairer Lord Jesus!*⁹

⁸ See Jeremiah 32:17.

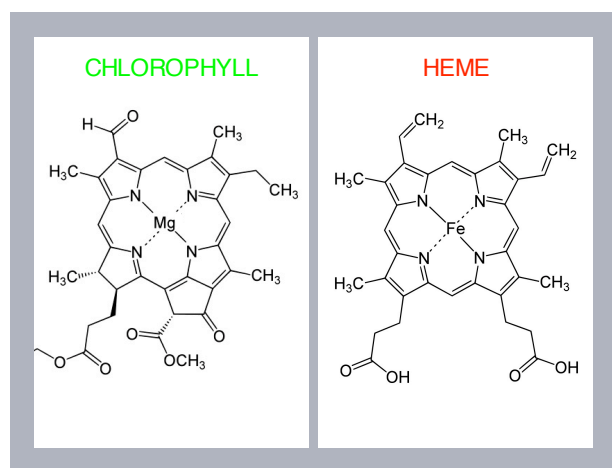
⁹ Samuel Rutherford, *Letter to the Laird of Cally*, 1637

LORD OVER ALL

Yours, O LORD, is the greatness and the power and the glory and the victory and the majesty, indeed everything that is in the heavens and the earth; Yours is the dominion, O LORD, and You exalt Yourself as head over all (1 Chronicles 29:11).

Did you know that the green of leaves and the red of your blood are exactly the same substance, up to a point? Our Lord Jesus uses many steps to create chlorophyll (the green of leaves) and hemoglobin (the red of your blood). What's amazing is that the first nine chemical reactions in the formation of both are exactly the same. Which begs the question: How could a plant and a human being have the exact same chemistry since they are such vastly different organisms? The answer is that *God is the Creator of all*—the same divine mind has fashioned both.

There is a critical step in the formation of both chlorophyll and heme (the building block



of hemoglobin) when metal is added—either magnesium (Mg) or iron (Fe). If our Lord Jesus adds a magnesium atom, chlorophyll will be the result; if an iron atom is added, then the molecule eventually becomes hemoglobin.

This choice of metal determines the type of work that the subsequent molecule performs. Green chlorophyll, which has at its heart a magnesium atom, captures energy from a star 93 million miles away; red hemoglobin, which has iron at its core,¹⁰ captures life-sustaining oxygen from the air and carries it in your blood. Vastly different functions are determined by a single atom of metal. If you are a Christian, the same thing applies to your spiritual life—if God gives you faith, then you believe; if He provides courage, then you are bold; if mercy, then you're merciful. There is never a need to feel that our gifting is better or worse than someone else's because it is God alone who determines it.

Without chlorophyll and hemoglobin, none of us could survive. I am so thankful for Christ's application of both magnesium and iron in the chemistry of life! It reveals Him—with His Father and Spirit—to be the God over all (Isaiah 45:22) and the God who cares deeply for us (1 Peter 5:7). The health of ecosystems is dependent upon the green of chlorophyll, and the health of our bodies upon the red hemoglobin in our blood (anyone who has experienced iron deficiency anemia knows this to be true). Much of our culture today is focused on these two things: the health of the world, represented by "green," and the well being of our bodies, evidenced by the high priority given to health care and hospitals.

Both "green" and "red" are critically important, for the here and now. But God's Word works to shift our emphasis from the here and now to what is eternal:

*All flesh is like grass,
And all its glory like the flower of grass.
The grass withers,
And the flower falls off,
But the word of the Lord endures forever.
1 Peter 1:24, 25*

10 Actually, hemoglobin is composed of four heme subunits, each containing an iron atom.

Jesus also proclaimed that, “He who eats My flesh and drinks My blood has *eternal life*.” (John 6:54 emphasis added).

The Lord promises to create a new Earth for His people (2 Peter 3:7,13). Will this new Earth possess chlorophyll and green plants? Only God knows. But of the two molecules — chlorophyll (green) and hemoglobin (red)—it is significant that the blood of Christ alone can save a person from their sins and the wrath to come. So we might see “green” as an emblem of God’s love and provision for life here on Earth, and “red” representing His gift of eternal life. It is not through the green of chlorophyll that we are saved from the wrath to come, but through the red blood of Jesus, God’s Son. God’s people are not redeemed with perishable things, but “with precious blood, as of a lamb unblemished and spotless, the blood of Christ” (1 Peter 1:19). And they are saved with not just any blood, but the crimson blood of Christ. The first chapter of Peter’s first epistle clearly outlines this contrast. Our bodies, like green grass, will pass away, but the heart that is captured by the Word of God and convinced that the blood of Christ saves will receive eternal life.

Caring for God’s creation is extremely important—it was the first job given to mankind by his Creator (Genesis 2:15). But creation must also be redeemed—we can’t simply work to sustain it. And we can’t correct the corruption that our sin has wrought upon all of nature (Romans 8:19-22). The late British pastor, D. Martyn Lloyd-Jones, once said, “Nature every year, as it were, makes an effort to renew itself.” But he also pointed out that ultimately this renewal fails (as the spring creation moves into summer, then autumn, and finally winter), because our sin’s effect upon creation has not yet been removed. But there is hope! God will renew and recreate nature once and for all time (Romans 8:20-21). In fact, the redemption of those things that are green—that is, creation—is also purchased through the red

blood of Christ and *His blood alone* (Colossians 1:20; Isaiah 11:6-9). When will this happen? When all the sons of God are finally revealed (Romans 8:19).

I love science because it shows me how Jesus fashioned the universe, and it points my heart to those things that reflect His glory. This display of Christ’s glory is similar to an artist’s personality being seen in his or her paintings. But I love God’s Word even more because it shows me a clear and accurate picture of my sin and my desperate need for a savior. And it shows me the stunning beauty of the redemption Jesus has given me through his blood.

Christ Jesus is God over all (Romans 9:5) and there is no other Lord apart from God. He is Lord over the earth, our bodies, and the salvation of His people. The stamp of His lordship can be seen everywhere in Heaven and on Earth (Isaiah 6:3). Glory be to our Triune God—Father, Son, and Holy Spirit!



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