

The Manifold Works of the Lord, part 2

Psalm 104:24-25

O LORD, how manifold [how many] are thy works! in wisdom hast thou made them all: the earth is full of thy riches. So is this great and wide sea, wherein are things creeping innumerable, both small and great beasts. (Psalm 104:24-25)

One of the most interesting new fields of scientific endeavor is called “biomimetics” or “biomimicry.” This science seeks to mimic or imitate the biologically produced materials, structures or functions found in creation (or most people would say, “Nature.”) Inventors and scientists are basing their designs on the blueprints found in God’s creation. Of course, some want to argue that all of nature simply came about by chance. But even brilliant scientists are learning to admire the greater brilliance behind some of the simplest creatures in creation. To illustrate the wisdom and riches of the earth, biomimicry will be very useful to us. Whether in the riches of creation on the dry land, or the plants and animals of the sea, the Lord’s many works show us His wonderful wisdom. Here are a few illustrations of God’s works and the wealth of His wisdom.

Cockleburs

Consider what we learn from the way the Lord made cockleburs. A Swiss engineer, George de Mestral, was walking in the woods with his dog one day in 1948. When he returned home, he found that his dog and his clothing were full of burs. As he patiently pulled them out of his dog’s hair, George got an idea. Why not put a bur under the microscope to see why they attached to everything so easily? When he did, he saw that each one was covered with tiny hooks, ready to snag anything with a loop, such as hair or clothing. Thinking like an engineer, he began to wonder if there were any practical or commercial applications for this. How could he replicate what he had observed in nature? How could he develop a hook and loop system? It took him nearly 10 years, but when he began to experiment with nylon (which had been invented in 1938), the plan came together. He called the hook and loop system Velcro® and now you know the rest of the story. So this week, when you hear that ragged rasp when you pull off your child’s shoes, or adjust your backpack, think of Psalm 104:24. Our Lord created these many wonderful works in great wisdom. The earth is full of His riches if we would only learn to look for them. And each new wonder causes us to worship Him. **“O LORD, how many are thy works! in wisdom hast thou made them all: the earth is full of thy riches.”**

Paper

For centuries, paper was made from plant reeds, wood and cloth. The word “paper” comes from the Egyptian reed plant called “papyrus.” But the discovery by a French naturalist in 1721 helped produce the kind of paper that is so plentiful today. One of the best known scientists in the field of entomology (the study of insects) was René-Antoine Ferchault de Réaumur. On one of his nature walks, he began to observe the way that wasps make their nests. He noticed that wasps would chew plant fibers and mix them with saliva to form nests from paper. (A Chinese naturalist named T’sai Lun, noticed the same thing – 1700 years earlier!) But it was nearly 150 years before inventors acted on the discoveries of de Réaumur, first with a mechanical pulping machine, and now using chemicals. (But it’s probably not that different from wasp saliva!) All these inventions are merely mimicking the creativity of our Creator, who designed the wasp. Think about the wonders of God’s wisdom that you can see in the wasp. This remarkable insect is only one of the many works of the Lord whom we worship today.

Hexagons

While we are talking about wasps, don't forget hornets and honeybees. What do these have in common? One thing they have in common is that they form their nests in hexagons. All of these insects sweep their antennas across the walls they are making to measure where to put the next wall. This accounts for the uniform size of each unit in the nest. They make these hexagons by ending each straight wall in a "Y." And it turns out that the hexagon is the best possible way to cover a surface without wasting space. Scientists and mathematicians labored to finally prove this in a historical problem called, "The Honeybee Conjecture."ⁱⁱ But if this is such an efficient use of space, wouldn't we expect to find it elsewhere? And, indeed, we do! Snowflakes are hexagonal because they reflect the microscopic, molecular structure of water. The eyes of dragonflies, the shells of turtles, the skin of pythons and lizards all are made up of hexagons. There is even a hexagon on the north pole of Saturn and hexagons form naturally in columns of lava. It turns out that the 120 degree angles in the hexagon are the perfect angle to relieve the most stress in those columns. You can see this online at a national park called "The Giant's Causeway" in the United Kingdom.ⁱⁱⁱ Today, designers and engineers use the hexagon to produce materials that are low in density but very strong all while using available space most efficiently. It all started with God's works of wisdom.

Insects with Gears!

A recent discovery in the body of a leaf hopper called "*Issus coleoptratus*" has generated a lot of excitement.^{iv} It's the first time that gears have ever been discovered in the body of a creature in nature. In human history, the gear wasn't invented until the 3rd century B.C. But it turns out that we were discovering God's designs all along. The gears in this leaf hopper perfectly synchronize their back legs so that they jump together – sending it forward in a straight line. "The researchers' high-speed videos showed that the creatures, who jump at speeds as high as 8.7 miles per hour, cocked their back legs in a jumping position, then pushed forward, with each moving within 30 microseconds (that's 30 millionths of a second) of the other."^v What should we say when we see these wonders? **"O LORD, how manifold are thy works! in wisdom hast thou made them all: the earth is full of thy riches."**

The Head of the Kingfisher

Since 1964, the Japanese have operated bullet trains, which reach speeds of 150-200 mph.^{vi} But that rapid transit created a problem. When the bullet train entered a tunnel, it would push along a huge cushion of air. But when the train would exit the tunnel, the cushion of air would create a giant boom, not unlike thunder or a sonic boom. So every time the train left a tunnel, it would disturb the local wildlife and rattle the dishes in the homes nearby. As the engineers began to look for answers, one of them noticed the kingfisher which reaches speeds of 25 mph as it hits the water to catch unsuspecting fish. The engineer noticed that the bird barely made a ripple in the water so that it didn't disturb its prey. Using the shape of the bird's beak and skull as a pattern, the engineers redesigned the train engine and solved the problem of the big boom at the end of the tunnel. This is a beautiful illustration of biomimicry. How could anyone really believe that the kingfisher's design was merely by chance? His shape shows us the wonderful riches and wisdom of the God whom we worship. **"O LORD, how manifold are thy works! in wisdom hast thou made them all: the earth is full of thy riches."**

Ducklings and Fluid Dynamics

According to an article in *Science News* last October, a naval architect in Glasgow, Scotland discovered something wonderful about a mother duck and her ducklings. In the *Journal of Fluid Dynamics*, Zhiming Yuan reported the discovery: the ducklings cruise in the perfect “sweet spot” behind their mother. When the duckling swims on its own, it kicks up waves in its wake which consume some of its energy in wave drag. But the ducklings in the sweet spot consume 158% less energy – which means they get a push forward!^{vii} Now engineers are trying to apply what they have learned in ship design and the sailing formation of ships.^{viii}

The wisdom of our Creator is not only on display on dry land, it can also be seen in the sea. As the psalmist wrote, **“So is this great and wide sea, wherein are things creeping innumerable, both small and great beasts.” (Psalm 104:25)**

Mantis Shrimp

Neither a mantis, nor a shrimp, the technical name for the creature is Stomatopod.^{ix} But this little creature under the sea can pack a wallop. It has a club in its front claws called a dactyl club, which is like a hammer claw. It uses the club to smash open the hardened shells of hermit crabs with the force of 10,000 g’s at the speed of a .22 caliber bullet.^x It strikes so fast that for a brief moment, the water around the club reaches the temperature of the sun. Now scientists at Purdue University are studying that hammer club because it suffers almost no damage after striking with terrific force. They know that the club is designed with spiral architecture in a herringbone pattern. The researchers at Purdue believe that the dactyl club design has applications for helmets, body armor, vehicles and building materials.

Shark Skin

Scientists have been fascinated by the formations on shark skin. When viewed under an electron microscope, these formations are recognizable as being more like teeth than scales. For some time, we have known that the design of shark skin keeps barnacles and microorganisms (such as bacteria) from attaching to the skin. The formations on the shark skin are called “dermal denticles;” these allow the shark to glide through the water with less resistance. Olympic swimmers now have body suits made with this design. With the invention of 3-D printers, scientists are mimicking the design of this shark skin for other applications; they are devising ways to use this design on the wings and fuselage of aircraft, in order to reduce drag.^{xi} Because the pattern keeps microorganisms from attaching to it, hospital designers are now using it in hospital rooms and surgery wards.^{xii}

Our Creator and Redeemer

John, the beloved apostle, wrote, **“All things were made by Him; and without Him was not anything made that was made. In Him was life; and the life was the light of men” (John 1:3-4).** Every time you think of these wonders, remember the creative power of Christ on display. Think about that the next time you use Velcro® or turn the paper pages of your Bible. Burrs and wasps, snowflakes and nests all reveal our Creator, who is also our Redeemer. His life is the light of men! But there is a problem, isn’t there? As John 1:5 puts it, “The light shined in the darkness...” What? With this much creativity and illumination all around us, why is there talk of darkness? As Romans 5:12 puts it, “...sin entered the world, and death by sin.” Mankind, the greatest of God’s creation, chose to rebel against the living God and His Creator. And death passed upon all men. According to the Scriptures, all creation labors under

the curse of man's sin. But Christ's creative power still shines through with astounding reminders that God's riches are real and His wisdom is unsurpassed. But perhaps most astounding of all is that Christ became a human being and suffered the consequences of the curse for all who would place their faith in Him. **"And the Word was made flesh, and dwelt among us, (and we beheld his glory, the glory as of the only begotten of the Father, full of grace and truth"** (John 1:14). The creation is majestic, but our Creator Himself, entering into His creation, is even more majestic! And this same Christ went to the cross of Calvary to redeem His creation from the curse. **"Christ has redeemed us from the curse of the law, being made a curse for us: for it is written, Cursed is every one that is hanged on a tree:"** (Galatians 3:13). The Scriptures portray our Creator as our Redeemer (see Isaiah 43:1; 54:5). And this is the greatest of His many works: Christ died for our sins, was buried and rose again to save us. So whether in the riches of creation on the dry land, or the plants and animals of the sea, the Lord's many works show us His wonderful wisdom. Christ is our Creator and Redeemer.

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ⁱ The Merriam-Webster dictionary defines "biomimetics" as "the study of the formation, structure, or function of biologically produced substances and materials (such as enzymes or silk) and biological mechanisms and processes (such as protein synthesis or photosynthesis) especially for the purpose of synthesizing similar products by artificial mechanisms which mimic natural ones" accessed at <https://www.merriam-webster.com/dictionary/biomimetics>

ⁱⁱ See Thomas C. Hales, "The Honeybee Conjecture" May 20, 2022 accessed at <https://arxiv.org/pdf/math/9906042.pdf>

ⁱⁱⁱ See Giant's Causeway at https://en.wikipedia.org/wiki/Giant%27s_Causeway

^{iv} This Insect Has The Only Mechanical Gears Ever Found in Nature, Smithsonian Magazine, September 12, 2013 accessed at <https://www.smithsonianmag.com/science-nature/this-insect-has-the-only-mechanical-gears-ever-found-in-nature-6480908/>

^v Ibid.

^{vi} See Jolie Li, "Shinkansen: The bullet train inspired by Kingfishers" UX Collective, April 19, 2021 accessed at <https://uxdesign.cc/shinkansen-the-bullet-train-inspired-by-kingfishers-bf6173cc5eae>

^{vii} See Emily Conover, "Here's the physics of why ducklings swim in a row behind their mother," Science News, October 20, 2021 accessed at <https://www.sciencenews.org/article/physics-why-ducklings-swim-row-behind-mother-duck-waves-energy>

^{viii} See Simen A. Ellingsen, Getting the Ducks in a Row, Journal of Fluid Dynamics, December 9, 2021, accessed at <https://www.cambridge.org/core/journals/journal-of-fluid-mechanics/article/getting-the-ducks-in-a-row/377C201FC5E85988D0B2C5392BF67F47>

^{ix} See Mantis Shrimp Packs a Punch accessed at <https://www.youtube.com/watch?v=E0Li1k5hGBE>

^x Possibly unique design feature discovered in mantis shrimp, Purdue University, May 31, 2016, accessed at <https://www.purdue.edu/newsroom/releases/2016/Q2/possibly-unique-design-feature-discovered-in-mantis-shrimp.html>

^{xi} Shark skin-inspired designs that improve aerodynamic performance, August G. Domel et.al. The Royal Society Chapel, February 7, 2018, accessed at <https://royalsocietypublishing.org/doi/10.1098/rsif.2017.0828>

^{xii} Sharks' skin has teeth in the fight against hospital superbugs, BMC, Springer Nature, n.d. <https://www.biomedcentral.com/about/press-centre/science-press-releases/17-sep-2014> The product called "Sharklet™" harbored 94% less MRSA than regular surfaces.