

CREATOR

VOLUME 9

NUMBER 1

HEART TO HEART

*I will give them a heart to know Me,
that I am the LORD (Jeremiah 24:7).*

Boy, it's really cold out there, and the lights are incredibly bright! To top it off, Jenny's asleep. I don't mean to sound like I'm complaining, *but I feel so alone*. May I talk with you?

Please let me properly introduce myself—I'm Jenny's heart. Hi! I've been with her practically all her life. The Lord Jesus started me beating only three weeks after He began to knit Jenny in her mother's womb. I make sure she's well-cared for. I pump blood around her body, supplying 37 trillion cells¹ with oxygen, food, vitamins, hormones, and protective antibodies. I also clean up after her; like the forest brook fed by a spring rain, I'm the "stream" that removes the wastes from her cells. They're so messy! (Since I don't have any arms or legs, I can't do anything about the condition of her bedroom, though!) Even when she rests, I never miss a beat. You see, I don't sleep, but continue to pump her blood every minute of her life.

Jesus engineered the blood flow in Jenny's body (and yours too) in an absolutely fascinating way! It shows both His *genius* and His *loving care* for each human being. If you have a minute, I'd like to share with you His circulatory design.

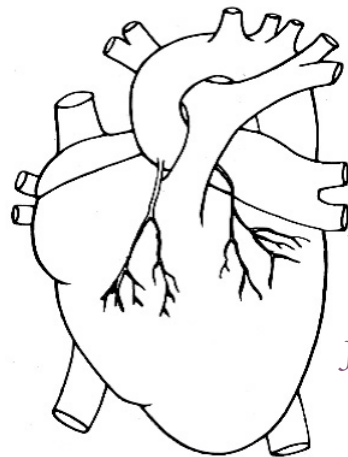
Doctors use the words **circulation** and **circulatory** to describe the flow of blood throughout your body, because your blood *circulates* within you. Now, please don't misunderstand—the circulatory system is unbelievably complex and it surely reflects the *wisdom* and *skill* of its Creator—but basically, the path blood

takes can be divided into two parts: pipes and pumps.

To insure that life-giving blood reaches all 70 trillion cells (that's a lot of cells!), Jesus laid out a system of tubes within you that stretches for 60,000 miles (96,500 kilometers)! That's right, *60,000 miles*! Some of these pipes are huge, like the *aorta* (pronounced ay - OR - tah), which is the elastic tube attached to your heart and through which blood travels to all the hungry little cells of your body. Most of the plumbing inside you consists of capillaries. Capillaries are too small for the naked eye to see.

That reminds me, your circulatory system is composed of three different types of vessels or tubes: *arteries*, *capillaries*, and *veins*. **Arteries** are specially designed pipes Jesus made from muscles and extra-stretchy, elastic material. An artery carries blood *away from* your heart. **Veins** are ducts with thin, less-muscular walls that bring blood *back to* your heart. **Capillaries** are extremely tiny and delicate vessels that come in *direct contact with the tissues* of your body.

Capillaries are very important—they are the lifelines which deliver "goods" to the cells, and remove unwanted



Jenny's
heart

¹ Bianconi, E., et al, "An estimation of the number of cells in the human body."

materials. Think of your circulatory system as the roadways of a major city: Highways and expressways (arteries) quickly bring traffic into the city; while other routes allow cars and trucks to leave (veins). The real commerce, however, occurs on the small side streets (capillaries), where couriers slow their vehicles to drop-off deliveries (oxygen and nutrients), and pick-up materials (carbon dioxide and cell waste products). Unlike a city, however, the “roadways” of your body don’t slow down after 6:00 p.m. They never cease their endless activity.

The other component of blood flow, and the thing that makes the “traffic” of your blood go, is a marvelous pump called the **heart**. Hold your hand in front of you and make a fist—this is approximately the size your heart is. It is located behind your breastbone (sternum) just left of center, and it weighs less than one pound (10 to 12 ounces or one-third of a kilogram). Don’t let its size fool you, because the heart proclaims the strength of an infinite God! What is it about my design that is so remarkable? Well, if you’ve ever done pushups, or some other repetitive exercise, you know that it doesn’t take long before you become tired. This is the way all other muscles are made to work—those of your arms, legs, head, and ears. (Can you wiggle your ears? Muscles connected to your ears allow them to move back and forth. But try wiggling your ears very long and they will get sore.) If you continue to work the various muscles of your limbs, neck, etc., you will eventually need to stop. Jesus designed your *muscles* so that they *must rest* in between exercise. I suppose this is one way that Almighty God shows us that we are totally dependent upon Him!

The muscles that make up your heart are collectively called the **myocardium**, and never cease to work (that is, until your life is over). I keep beating in Jenny’s chest, 80 to 100 times each minute, day and night, night and day! On average, a person’s heart beats *two to three billion times* during their lifetime! I stop and rest for no more than a second between contractions, yet I don’t tire out! No other muscle in the body is like this.

Every minute, I pump the equivalent of Jenny’s entire blood volume through my chambers. In an adult, that amounts to ten pints (five liters) per minute, or 2,500 to 3,000 gallons (11,500 to 13,500 liters) of blood each day! The strength that the Lord Jesus infuses in me is not the same as that of an earthquake or tornado. Natural disasters properly demonstrate the awesome power of Christ. The human heart also reveals His divine power, but in a very different way.

Each time I beat, I push approximately 2 ounces (60 ml) of blood into Jenny’s arteries. This may not seem like much, but over Jenny’s lifetime, it will amount to many millions of gallons (liters)! Unlike the *temporary* fury of a volcano or hurricane, the Heavenly Father uses me to demonstrate His *enduring power* and His *persevering love*. To put it another way, although I am able to push only a small quantity of blood through Jenny’s blood vessels with each beat, the sum total of all my beats in a 24-hour period is powerful enough to lift a small car twenty-five feet (eight meters) off the ground!

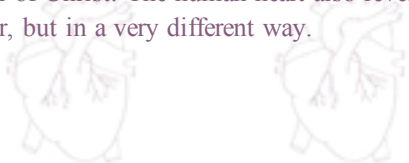
The heart rate of an adult averages 70-75 beats each minute, whereas the heart of a baby inside the mother’s womb beats twice as fast, or about 150 per minute. An older child like Jenny has a heart rate between 80-100 at rest. When Jenny exercises, her heart rate increases in order to supply more oxygen to her tissues; when she sleeps, it decreases. Her pulse also speeds up when she runs a fever.

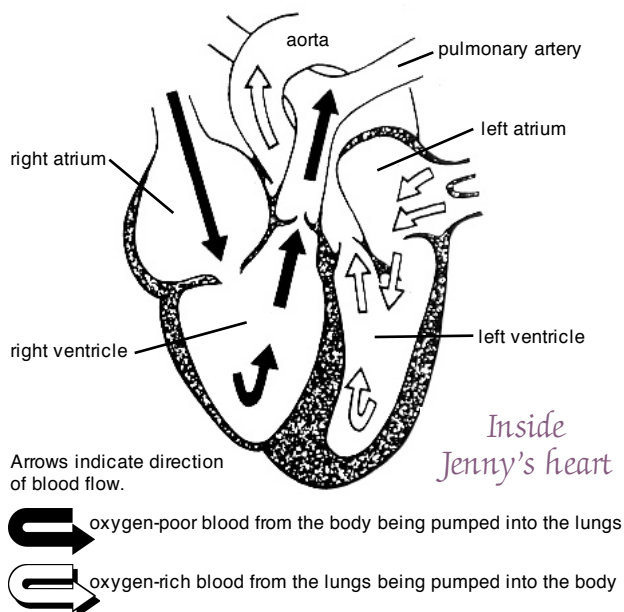
The pumping of your heart is controlled by your brain, as well as hormones released into your bloodstream. Your heart can, however, beat on its own. There is a special group of cells Jesus placed in the right side of the human heart that acts like a tiny generator of electricity. The electrical impulse created here travels throughout the rest of the heart like electricity moving along wires in a building. It is the surge of this electrical impulse, occurring every second or so, that causes the muscles in the heart to contract and thus pump blood. A doctor can measure the electrical activity of your heart using a machine called an **electrocardiograph**.

I haven’t mentioned this yet (and by the way, thanks for being such a good listener, I feel less lonely now), Jenny’s heart is actually four-pumps-in-one! I’m composed of two **atria** (atrium = singular) and two **ventricles**. The atria are thin-walled, upper chambers that receive blood from the body and help move it into the two muscular pumps below, her ventricles. The right atrium delivers blood to the right ventricle, and the left atrium delivers blood to the left ventricle. In turn, the right ventricle pumps purplish, oxygen-poor blood into the capillaries of her lungs where the blood again becomes bright red with oxygen.

In the lungs, blood also releases carbon dioxide,² because carbon dioxide is poisonous to Jenny’s body. Oxygen-rich blood returns to her heart via her left atrium and is pumped into her left ventricle. The powerful left ventricle then forces blood out through her **aorta**, the

² Carbon dioxide is a waste product of cell metabolism.





largest artery in her body, and into the many blood vessels that make up her circulatory system.

Each time my left ventricle squeezes blood into Jenny's arteries, it creates **blood pressure** (BP). This is akin to the pressure necessary to force water through a pipe, except it's more complicated than that. Without the constant pressure exerted by my muscles, blood in Jenny would cease to flow through her arteries and veins, and she would die. In humans, the Lord Jesus Christ carefully maintains a normal BP of between 80 and 120 millimeters of mercury.³ A nurse or a doctor can measure your BP using a simple instrument with a difficult name, a sphygmomanometer (SFIG - mow - mah - NOM - i - ter).

In the doctor's office, blood pressure is expressed as a ratio of two numbers; for instance, a typical BP might be 120/80. (These numbers represent the pressure necessary to keep blood moving within the body.) Along with the pumping action of the heart, elastic arteries are crucial for maintaining a normal BP. As I push blood into Jenny's bloodstream, her arteries stretch to prevent her BP from going too high, and then contract to keep her BP from falling too low. It's critical that her BP be maintained at just the right level. Chronically high BP, known as **hypertension**, can damage her arteries over time, and a low BP (**hypotension**) will prevent the organs (brain, kidneys, etc.) of her body from functioning properly.

In order to keep blood flowing through my

³ This is the force or pressure necessary to raise a column of mercury 80 to 120 millimeters in a glass tube.

atria and ventricles in the correct direction, the Lord Jesus placed four different one-way valves inside me. There is a valve between each atrium and each ventricle (the **tricuspid** and **mitral valves**), and between each ventricle and its corresponding artery (the **pulmonary** and **aortic valves**).

The study of the heart and circulatory system began in earnest during the 17th century. A man named William Harvey, the court physician for King Charles I of England, was the first person to understand the basic workings of the heart and blood vessels. In 1628, Dr. Harvey published an important document describing the flow of blood throughout the body. What an exciting time that must have been!

Fortunately for Jenny, Jesus has allowed the wisdom and skill of physicians to increase over the past 400 years. As a young child, she had an infection that damaged her mitral valve, one of the four valves located inside me. This eventually necessitated the open-heart surgery she has been undergoing for the past several hours.

The surgeons have just finished sewing me up and it appears that the operation was a success. I can't wait till she's awake again! We should never take anything for granted, but, God willing, I will be able to go on demonstrating the faithful strength of Christ, and serve Jenny for many years to come!

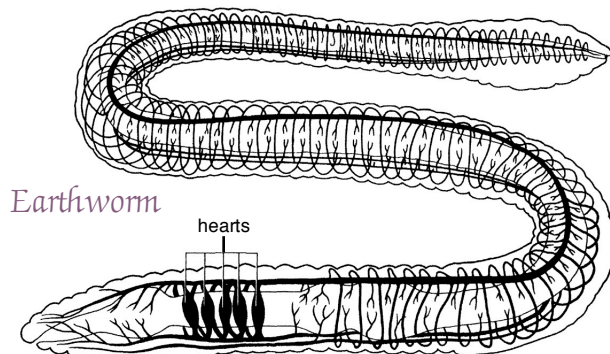


ANIMAL BEATS

If we could hear the heartbeats of all the animals and all the people in the world at one time, what a sound that would be! The fury of an exploding volcano might be dull in comparison. Fortunately for our ears, though, most hearts are buried deep within the bodies of the living beings they inhabit and we normally don't hear them beating. In this way, Jesus brings His all-powerful life to each of His creatures, *quietly*.

I am constantly amazed at the utter variety of Christ's creations! Take the heart—some hearts are simple tubes that pulsate, while others are a complex of one, two, three, or four chambers. And would you believe that many animals have more than one heart, and some have none? The common tick is one such enigma—it has no heart! (This seems to fit the tick, doesn't it?) On the other hand, Jesus gave the squid two hearts, and the grasshopper has many smaller hearts to help pump blood through its wings and legs.

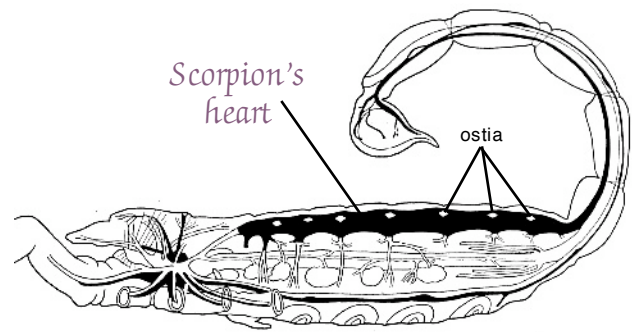
Now, the earthworm has five pairs of hearts, for a total of ten! In addition, it has a **closed circulatory system**, which means that its blood is contained within



arteries, capillaries, and veins, much like our own blood stream (maybe Jesus designed a worm's circulatory system like ours to remind us that we all come from the dust of the earth—Ecclesiastes 3:18-20). Most invertebrates,* like the scorpion and spider on the opposite side of the page, have an **open circulatory system**; that is, the blood is pumped from the heart(s) and into the tissues, thus directly bathing them. In the open circulatory system, blood is not contained within blood vessels, and these animals have no capillaries or veins.

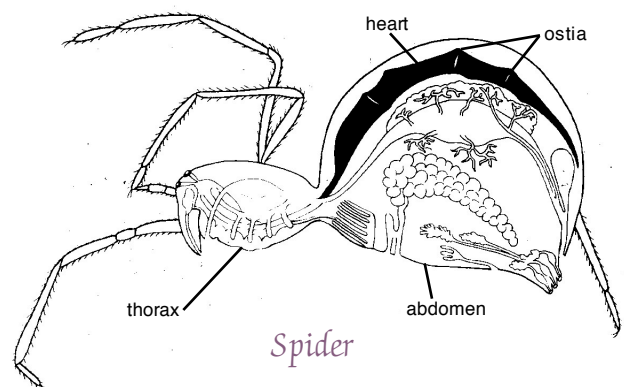
An earthworm's *blood is red* because it contains

* An invertebrate is an animal without a backbone, such as a worm, insect, or scorpion.



hemoglobin. Hemoglobin carries oxygen to cells and is the same substance found in our blood. Since an earthworm has no lungs, Christ designed its blood to receive oxygen when it passes through the worm's skin.

A spider's heart is found in its belly (abdomen), not in its chest (thorax)! And the blood of a spider is not red, but *pale blue* because it contains a chemical called **hemocyanin**. Blood squeezes around its organs and squishes through its tissues (remember it has no blood vessels), and returns to the heart by way of holes, called **ostia** (pronounced OS - tea - ah). Ostia line the sides of the spider's heart and possess one-way valves to insure that blood flows in only one direction. Surprisingly, the blood pressure of a spider at rest is almost identical to ours. Its pressure doubles when active, something that would put us in the hospital! Blood pressure is important in God's creatures. It's what allows a spider to extend its legs, and a butterfly to unroll its straw-like tongue!

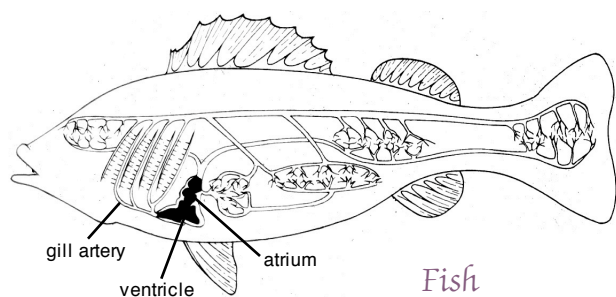


Speaking of insects, the blood of a grasshopper is either *colorless or green*, and the Lord Jesus did not design it to carry oxygen to the insect's tissues. Instead, it supplies the organs of the grasshopper with nutrients and it removes wastes.

By far the biggest heart compared to animal size

belongs to the scorpion. In some scorpions, the heart takes up one-third of the body! Like all arthropods (spiders, scorpions, insects, lobsters, crayfish), the scorpion has an open circulatory system. Its blood is also light blue in color.

If we jump from discussing invertebrates to vertebrates (fish, frogs, reptiles, birds, and mammals), we find that all vertebrates possess a closed circulatory system, with a single heart, and many blood vessels. The heart of a fish consists of **one atrium and one ventricle**. Its atrium is a thin-walled pump that receives blood from the fish's organs and propels it into the muscular ventricle. The ventricle then pumps the oxygen-poor blood through the gills where it picks up oxygen. From there, the blood circulates throughout the fish's body



again. The heart of an amphibian (frog, salamander) consists of **two atria and one ventricle**; by contrast, Christ created the heart of birds, mammals, and people with **two atria and two ventricles**.

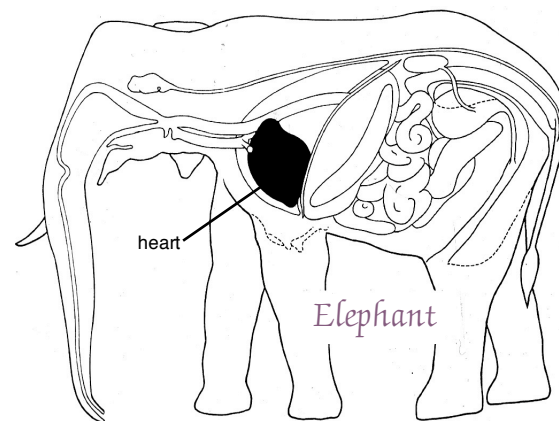
A survey of the animal kingdom reveals that mammals possess the largest of hearts. An elephant's heart is huge by human standards. But, by far, the granddaddy of all pumps is the massive heart of the blue whale, the largest creature God ever made. Its heart is as big as a car and weighs 1,300 pounds (590 kilograms)! Can we begin to imagine the powerful surge of blood it produces with each beat?!

If we compare the size of an animal's heart to its heart rate (the number of times it beats in one minute) we find an intriguing relationship. The larger the mammal, for instance, the slower the heart beats. Conversely, the smaller the animal, the faster its heart rate.

A pig's heart averages 70 beats each minute, while a cat has a heart that pumps about 150 times per minute. The heart rate of a mouse is 650, and that of a shrew, the world's smallest mammal, an incredible 1,000 beats in just one minute! At the other end of the spectrum, a

horse's heart beats approximately 40 times each minute and an elephant's, just 30. The heart rate of a small whale may be only 10 to 15, and that of a blue whale, a lumbering five beats a minute!

The heart rate of many animals also changes during hibernation. A golden hamster normally has a pulse of 350. While hibernating, its heart rate drops to as low as four beats a minute!*



Another fascinating thing takes place when an animal dives underwater. In the case of a beaver, its heart rate decreases from a normal 140 beats per minute, to 10 while diving deep into a pond. The same is true of a penguin—its heart rate goes from 240 to 20 as it swims underwater. It has been documented that even in man a change in heart activity occurs with skin diving. An otherwise normal human being will experience a decrease in pulse from 70 to 35 while submerged! It is not known exactly why Jesus created the heart to react this way, but some scientists feel it has something to do with shunting of blood to vital organs and preservation of oxygen. One also wonders if the envelope of water might have a calming effect, like an unborn baby in the womb of his mother!

The incredible variety and function of the hearts God has fashioned is almost unbelievable! He is certainly an intensely creative Father, and the heart is a symbol of His awesome power and strength!



THE HEART OF GRACE

Do you have a good heart? There are at least two ways of looking at this question: 1) Is your heart physically sound? 2) Are you good-hearted? (Are you basically a “good” person?)

So, what I mean to ask is, “Are you a good person?” If you are, what determines your goodness? Going to church? Giving to charities? Showing “tolerance” for those different from you? Not swearing or drinking? The Bible explains, however, that these things *don’t determine* goodness. Then what does?

“No one is good—except God alone,” Jesus told a rich young man (Luke 18:19). In effect, Jesus was saying, “No one can be good if they are not from God.” How, then, can we determine if we are from God? Well, there’s only one way: Is the love of God living within us?

Spiritually, we’re all very sick people. Because of sin, our “heart” or soul is diseased and dying. And everyone is destined to experience a painful and eternal death if we don’t seek help. Not a pleasant thought! There’s good news, though: God is the Great Physician and He can transplant a good heart into us. This good heart comes from God Himself (1 John 4:15), and we can share it with Him. (Maybe the reason marriages today frequently fail is that men and women don’t literally share the same heart!)

Christ died on a cross to lovingly endure the punishment for all our sins. Are you ready to believe this *and turn from your sins*? It’s one thing to *believe* a doctor can cure you. It’s quite another to put your very life in his hands and allow him to perform surgery on you. Are you willing to “go under the knife” and receive a heart transplant? If you are, God will give you the gift of His eternal life, a gift known as *grace*.

Grace is like an operation that seeks to replace our infected and corrupt heart with the heart of a King. We must, first, truly believe that Jesus died for us. (He had to die. After all, who ever heard of removing the heart of a man still walking around?) His heart can be transplanted into our life, if we are willing. We don’t deserve Christ’s righteous life within us—there’s nothing we’ve done, or can do, to earn it—this is grace!

What effect, then, does grace have on our lives if we are willing to receive it from God? We can’t see the heart of a man beating within him, yet do we fail to perceive its impact on his life? A transplanted heart bears fruit in the weakest, most frail person because we know he is still alive (otherwise, he would be placed in the ground). Such is the grace of Christ’s *love*. It is a free gift, but not an ineffective gift! Once grace has been implanted into the

life of a Believer, it continues to beat for all eternity. The enduring *strength* of the Lord Jesus Christ cannot help but have its effect on those who are saved from hell. As blood courses through the veins of our body, grace penetrates every fiber of our being and it will bear fruit as good works (Ephesians 2:10-11, Titus 2:11-13). Grace cannot be dead because it is the gift of the *living* God. Christ rose from the grave because He has power over death. He is Life (1 John 1:2)!

If we say we have faith, but don’t surrender our lives to Jesus, He won’t give us the new heart we so desperately need. But if we give Him our all, we can then be assured we have the loving and eternal relationship with Him that we so desire. This is the effect of grace!

Are you ready to undergo the Surgeon’s knife? If you will completely trust the Lord Jesus, commit yourself to Him in obedience, and receive His heart of grace.

Dear Father, I recognize that I have lived my life independently of You and You consider this 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 God and my Savior. I receive Your gift of eternal life. Show me how to live the way You want me to live. In the name of the Lord Jesus Christ I pray, Amen.



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