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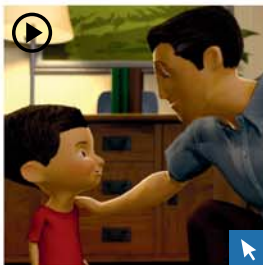
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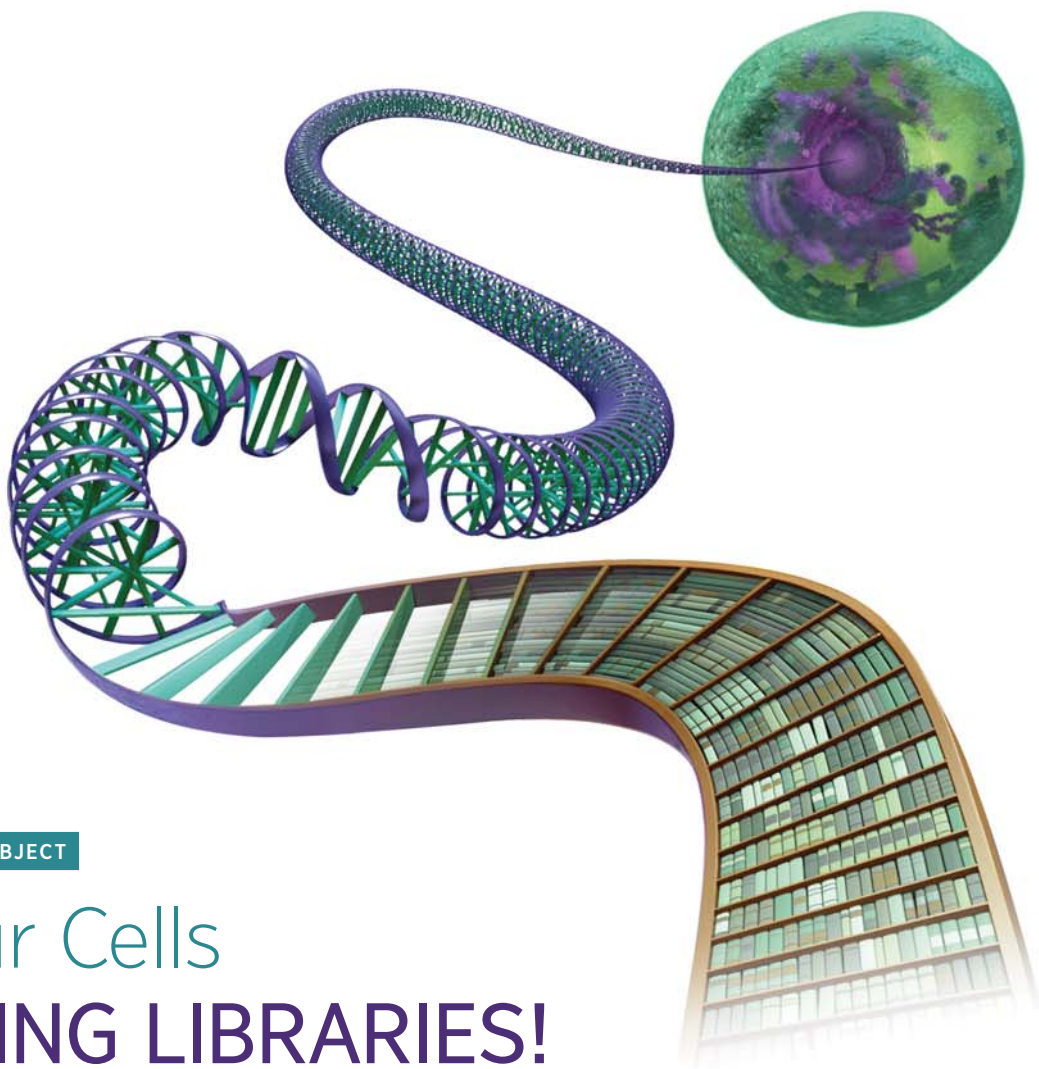
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COVER SUBJECT

Your Cells LIVING LIBRARIES!

IN 1953, molecular biologists James Watson and Francis Crick published a discovery that was critical to our scientific understanding of life. They had discovered the double-helical structure of DNA.* This threadlike substance—mostly found in the nucleus of cells—contains encoded, or “written,” information, making cells living libraries, as it were. This amazing discovery opened up a new era in biology! But what purpose is served by the “writing” in cells? More intriguing, how did it get there?

* Watson and Crick built on the work of earlier researchers into DNA, which stands for deoxyribonucleic acid.—See the box “DNA—Key Dates.”



WHY CELLS NEED INFORMATION

Have you ever wondered how a seed becomes a tree or how a fertilized egg becomes a human? Have you ever wondered how you inherited your traits? The answers involve the information found in DNA.

Nearly all cells have DNA, complex molecules that resemble long twisted ladders. In the human genome, or our complete set of DNA, the ladders have approximately three billion chemical “rungs.” Scientists call these rungs base pairs because each rung is made up of two chemical substances, of which there are four altogether. Using the first letter of each, these substances are abbreviated A, C, G, and T—a simple, four-letter alphabet, as it were.* In 1957, Crick proposed that it is the linear *sequence* of the chemical rungs that forms coded instructions. In the 1960’s, that code began to be understood.

Information, whether in the form of pictures, sounds, or words, can be stored and processed in many ways. Computers, for example, do this all digitally. Living cells store and process information chemically, DNA being the key compound. DNA is passed on when cells divide and organisms reproduce—abilities that are considered defining characteristics of life.

How do cells use information? Think of DNA as a collection of recipes, each one involving step-by-step processes, with each step carefully scripted in precise terms. But instead of the end result being a cake or a cookie, it might be a cabbage or a cow. In

* The letters stand for adenine, cytosine, guanine, and thymine.

DNA Key Dates

1869 Chemist Friedrich Miescher identified what we now call deoxyribonucleic acid, or DNA.

Early 1900’s Biochemist Phoebus Levene discovered the order of certain chemical components of DNA and how these combine to form a chainlike molecule.

1950 Biochemist Erwin Chargaff discovered that the composition of DNA varies among species.

1953 Scientists James Watson and Francis Crick described the double-helical structure of DNA.

The information in a bacterial cell would fill a 1,000-page book

living cells, of course, the processes are fully automated, adding yet another layer of complexity and sophistication.

Genetic information is stored until it is needed, perhaps to replace worn out or diseased cells with healthy new ones or to pass on traits to offspring. How much information does DNA hold? Consider one of the smallest organisms, bacteria. German scientist Bernd-Olaf Küppers stated: “Carried over to the realm of human language, the molecular text describing the construction of a bacterial cell would be about the size of a thousand-page book.” For good reason, chemistry professor David Deamer wrote: “One is struck by the complexity of even the simplest form of life.” How does the genome of a human compare? “[It] would fill a library of several thousand volumes,” says Küppers.

“WRITTEN IN A WAY THAT WE CAN UNDERSTAND”

To describe the writing in DNA as “molecular-genetic language” is more

than “mere metaphor,” says Küppers. “Like human language,” he points out, “the molecular-genetic language also possesses a syntactic dimension.” Put simply, DNA has a “grammar,” or set of rules, that strictly regulates how its instructions are composed and carried out.

The “words” and “sentences” in DNA make up the various “recipes” that direct the production of proteins and other substances that form the building blocks of the various cells that make up the body. For example, the “recipe” might guide the production of bone cells, muscle cells, nerve cells, or skin cells. “The filament of DNA is information, a message written in a code of chemicals, one chemical for each letter,” wrote evolutionist Matt Ridley. “It is almost too good to be true, but the code turns out to be written in a way that we can understand.”

The Bible writer David said in prayer to God: “Your eyes even saw me as an embryo; all its parts were written in your book.” (Psalm 139:16) Of course, David



How does a child inherit traits from its parents?

was using poetic language. Nevertheless, in principle, he was right on the mark, which is typical of the Bible writers. None were even slightly influenced by the fanciful folklore or mythology of other ancient peoples.—2 Samuel 23:1, 2; 2 Timothy 3:16.

HOW DID THE WRITING GET THERE?

As is often the case, when scientists explain one mystery, they open a door to another. That was true regarding the discovery of DNA. When it was understood that DNA contains coded information, thoughtful people asked, ‘How did the information get there?’ Of course, no human observed the formation of the first DNA molecule. So we have to draw our own conclusions. Even so, these conclusions need not be speculative. Consider the following comparisons.

- In 1999, fragments of very ancient pottery with unusual markings, or symbols, were found in Pakistan. The marks still remain undeciphered. Nevertheless, they are considered man-made.
- A few years after Watson and Crick discovered the structure of DNA, two physicists proposed searching for coded radio signals from space. Thus began the modern-day search for extraterrestrial intelligence.

The point? People attribute information to intelligence, whether that information

is in the form of symbols on clay or signals from space. They do not need to see the information being created to draw that conclusion. Yet, when the most sophisticated code known to man—the chemical code of life—was discovered, many shoved that logic aside, attributing DNA to mindless processes. Is that reasonable? Is it consistent? Is it scientific? A number of respected scientists say no. These include Dr. Gene Hwang and Professor Yan-Der Hsuuw.* Consider what they say.

Dr. Gene Hwang studies the mathematical basis of genetics. At one time he believed in evolution, but his research changed his view. “The study of genetics,” he told *Awake!* “provides insight into the mechanisms of life—an insight that fills me with awe for the Creator’s wisdom.”

Professor Yan-Der Hsuuw is the director of embryo research at Taiwan’s National Pingtung University of Science and Technology. He too once believed in evolution—until his research led him to conclude otherwise. Regarding cell division and specialization, he said: “The right cells must be produced in the right order and at the right places. First they assemble into tissues that will in turn assemble themselves into organs and limbs. What engineer can

* A number of interviews with respected scientists can be found on our website, jw.org. Click the Search button, and enter “interview scientist.”

Gene Hwang (left) and
Yan-Der Hsuuw



even dream of writing instructions for such a process? Yet the instructions for embryo development are superbly written in DNA. When I consider the beauty of it all, I'm convinced that life was designed by God."

DOES IT MATTER?

Justice says yes! If God created life, then God deserves the credit, not evolution. (Revelation 4:11) Also, if we are the work of an all-wise Creator, then we are here for a reason. That would not be so if life were a result of undirected processes.*

Indeed, thinking people long for satisfying answers. "Man's search for meaning is the primary motivation in his life," said Viktor Frankl, who was a professor of neurology and psychiatry. To put it another way, we have a spiritual hunger that we yearn to satisfy—a hunger that makes sense only in the light of special creation. But if we are the handiwork of God, did he give us the means to satisfy our spiritual need?

Jesus Christ answered that question, saying: "Man must live, not on bread alone, but on every word that comes from Jehovah's [or, God's] mouth." (Matthew 4:4) Jehovah's words, which are recorded in the Bible, have satisfied the spiritual hunger of millions, giving meaning to their lives and providing them with a hope for the future. (1 Thessalonians 2:13) May the Bible do the same for you. At the very least, this unique book merits your consideration. ■

* The creation-evolution question is discussed more fully in the brochures *The Origin of Life—Five Questions Worth Asking* and *Was Life Created?* available at www.jw.org.

Is Evolution a Scientific Theory?

What qualifies a theory as a scientific theory? According to the *Encyclopedia of Scientific Principles, Laws, and Theories*, a scientific theory, such as Albert Einstein's theory of gravity, must



1. Be observable



2. Be reproducible by controlled experiments



3. Make accurate predictions

In that light, where does evolution stand? Its operation cannot be observed. It cannot be reproduced. And it cannot make accurate predictions. Can evolution even be considered a scientific hypothesis? The same encyclopedia defines a hypothesis as "a more tentative observation of facts [than a theory]," yet lends itself "to deductions that can be experimentally tested."

* By "evolution," we mean "macroevolution"—apes turning into humans, for example. "Microevolution" refers to small changes within a species, perhaps through selective breeding.



Teaching Children Self-Control



THE CHALLENGE

Your six-year-old seems to have no concept of self-restraint. If he sees something he wants, he wants it *now*! If he gets angry, he sometimes lashes out. ‘Is this normal behavior for a child?’ you wonder. ‘Is it just a phase that he will outgrow, or is it the time for me to teach him self-control?’*

* Although we refer to the child as a boy, the principles discussed in this article apply to both genders.

WHAT YOU SHOULD KNOW

Today’s culture undermines self-control. “In our permissive culture, adults and children constantly hear messages that we should do whatever we want,” writes Dr. David Walsh. “From well-meaning self-help gurus to dollar-grubbing hucksters, we constantly hear that we should give in to our urges.”*

Early teaching of self-control is vital. In a long-term study, researchers gave a group of four-year-old children one marshmallow each and told them that they could either eat the one marshmallow right away or wait a brief period and receive *another* marshmallow as a reward for their patience. Later in life, as high school graduates, the children who showed self-control at four were doing better than their counterparts emotionally, socially, and academically.

The cost of *not* teaching self-control can be heavy. Researchers believe that the circuitry of a child’s brain can be altered by his experiences. Dr. Dan Kindlon explains what that means: “If we overindulge our children, if we don’t make them learn how to wait their turn, delay gratification, and resist temptation, the neural changes that we associate with strong character may not take place.”#

* From the book *No: Why Kids—of All Ages—Need to Hear It and Ways Parents Can Say It*.

From the book *Too Much of a Good Thing—Raising Children of Character in an Indulgent Age*.



WHAT YOU CAN DO

Set the example. How are *you* at showing self-control? Does your child see you lose your temper in a traffic jam, cut in line at the store, or interrupt others in conversation? “The most straightforward way to help our children develop self-control is to exhibit it ourselves,” writes Kindlon.—*Bible principle: Romans 12:9.*

Teach your child about consequences. In a manner appropriate for his age, help your child see that there are benefits to resisting his urges and a price to pay for giving in to them. For example, if your child is angry over being mistreated by someone, help him to stop and ask himself: ‘Will retaliation help or hurt? Is there a better way to deal with the situation—perhaps counting to ten and allowing the anger to subside? Would it be better just to walk away?’—*Bible principle: Galatians 6:7.*

Create incentive. Praise your child when he displays self-control. Let him know that it may not always be easy to suppress his urges but that it is a sign of strength when he does so! The Bible says: “As a city broken through, without a wall, is the man who cannot control his temper.” (Proverbs 25:28) In contrast, “the one slow to anger is better than a mighty man.”—Proverbs 16:32.

Practice. Create a role-playing game called “What Would You Do?” or “Good Choices, Bad Choices” or something similar. Discuss potential scenarios and act out possible reactions, labeling them either “good” or “bad.” Get creative: If you like, use puppets, drawings, or another method to make the activity enjoyable as well as informative. Your goal is to help your child realize that having self-control is better than being impulsive.—*Bible principle: Proverbs 29:11.*

Be patient. The Bible says that “foolishness is bound up in the heart of a child.” (Proverbs 22:15, footnote) So do not expect your child to develop self-control overnight. “This is a long, slow process with forward progress, meltdowns, and more progress,” says the book *Teach Your Children Well*. The effort, however, is worthwhile. “The child who can hold off,” the book continues, “is in a much better position to hold off on drugs at twelve or sex at fourteen.” ■

KEY SCRIPTURES

“Let your love be without hypocrisy.”—Romans 12:9.

“Whatever a person is sowing, this he will also reap.”
—Galatians 6:7.

“A stupid person gives vent to all his feelings, but the wise one calmly keeps them in check.”
—Proverbs 29:11.

REWARD POSITIVE BEHAVIOR

Even toddlers can start learning self-control. “If a child cries and cries for a piece of candy at the grocery store and you give it to her, you have just taught her that crying is an effective way to get what she wants,” says the book *Generation Me*. “The next time she wants something, she will cry and whine because that worked last time. Instead, give the child treats for good behavior. Many parents cave in to a crying child because it feels easier, or because they can’t stand to deprive a child of something she wants. However, you’re depriving her of a lot more if you give in. Rewarding the child who asks nicely teaches social skills as well as self-control.”



Bible Education Promotes Literacy

*“Literacy is a human right, a tool of personal empowerment and a means for social and human development.”—UNESCO.**

REPORTS indicate that worldwide over 700 million people aged 15 and above cannot read or write. As a result, they are unable to explore a vast world of knowledge, including the fine moral and spiritual teachings “written for our instruction” in the Bible. (Romans 15:4) In a number of lands, therefore, Jehovah’s Witnesses incorporate literacy training into their program of Bible education—all of which is free of charge. Has the program been successful?

Consider the work of Jehovah’s Witnesses in Mexico, a predominantly Spanish-speaking country. Since the year 1946, the Witnesses have taught more than 152,000 people to read and write, many students later becoming teachers themselves. The government has sent the Witnesses numerous letters in recognition of their work. One letter states: “This General Board of Education acknowledges and congratulates

* United Nations Educational, Scientific, and Cultural Organization.



Daniel learned Mexican Sign Language with the aid of DVDs

Many millions of copies of the literacy aid *Apply Yourself to Reading and Writing* have been produced in more than 100 languages

HE AMAZED HIS FAMILY

Daniel was deaf and unable to communicate effectively. As a result, he often felt frustrated and lashed out at his family. When Daniel was about 23 years old, a deaf Witness named Josué began to study the Bible with him, first using mime, or gestures, along with drawings. Then, with the aid of DVDs, Daniel learned Mexican Sign Language.*

As Daniel took Bible teachings to heart, he developed what the Bible calls “the new personality,” which is marked by such qualities as “compassion, kindness, humility, mildness, and patience.” (Colossians 3:10, 12) Daniel also took to heart the Bible’s exhortation to be obedient to one’s parents and to honor them. (Ephesians 6:1, 2) His family was amazed! In fact, Daniel’s mother, with tears in her eyes, thanked Josué for helping her son spiritually. In 2007, Daniel qualified to be baptized as one of Jehovah’s Witnesses.

* In Mexico, 46 publications of Jehovah’s Witnesses are available on DVD in Mexican Sign Language. Our website, jw.org, contains material in about 80 sign languages. For the benefit of the blind, literature is also available in Braille.

you for your cooperation in the development of the Adult Education Program.”

Young and old have benefited from the literacy program. For example, Josefina was 101 years old when she enrolled in the course, which she successfully completed in two years!

Although Mexico’s principal language is Spanish, it is not the only language in which literacy classes are held. In the year 2013, people belonging to eight indigenous groups learned to read and write in their mother tongue using this program.

Literacy is, indeed, a precious asset that opens up a world of learning. But above all, literacy enables people of all sorts to read the Bible—a divinely inspired book that can set them free from enslaving superstitions, false religious beliefs, and hurtful behavior.—John 8:32. ■



TOLERANCE

Acceptance, forgiveness, and tolerance foster peaceful relationships. But should tolerance have boundaries?

What is the key to becoming more tolerant?

THE REALITY TODAY Worldwide, winds of intolerance are blowing strongly, fanned by such things as racial and ethnic prejudice, nationalism, tribalism, and religious extremism.

WHAT THE BIBLE SAYS During his ministry, Jesus Christ was surrounded by intolerance. Jews and Samaritans in particular hated one another. (John 4:9) Women were treated as inferior to men. And Jewish religious leaders scorned the common people. (John 7:49) Jesus Christ stood out as vastly different. “This man welcomes sinners and eats with them,” said his opposers. (Luke 15:2) Jesus was kind, patient, and tolerant because he came,

not to judge people, but to heal them spiritually. Love was his primary motivation. —John 3:17; 13:34.

Love, the key to becoming more tolerant, opens our heart to others, despite their imperfections and idiosyncrasies. Says Colossians 3:13: “Continue putting up with one another and forgiving one another freely even if anyone has a cause for complaint against another.”

“Above all things, have intense love for one another, because love covers a multitude of sins.”—1 Peter 4:8.

A model of tolerance, Jesus came, not to judge people, but to heal them spiritually



Why must tolerance have limits?

THE REALITY Most societies try to maintain law and order. As a result, they usually put reasonable limits on behavior.

WHAT THE BIBLE SAYS “[Love] does not behave indecently.” (1 Corinthians 13:5) Although Jesus was a model of tolerance, he did not condone indecency, hypocrisy, and other forms of badness. Instead, he boldly condemned such things. (Matthew 23:13) “Whoever practices vile things hates the light [of truth],” he said.—John 3:20.

The Christian apostle Paul wrote: “Abhor what is wicked; cling to what is good.” (Romans 12:9) He lived by those words. For example, when certain Jewish Christians segregated themselves from non-Jewish believers, Paul—who was himself a Jew—firmly but kindly spoke up.

(Galatians 2:11-14) He knew that God, who “is not partial,” would not tolerate racial prejudice among His people.—Acts 10:34.

As Christians, Jehovah’s Witnesses look to the Bible for moral guidance. (Isaiah 33:22) Hence, they do not tolerate wickedness in their ranks. The clean Christian congregation must not be corrupted by people who brush aside God’s standards. To that end, the Witnesses obey the clear Biblical directive: “Remove the wicked person from among yourselves.”—1 Corinthians 5:11-13.

“O you who love Jehovah, hate what is bad.”—Psalm 97:10.

Will God forever tolerate badness?

WHAT MANY BELIEVE Because of human nature, badness will always be with us.

WHAT THE BIBLE SAYS The prophet Habakkuk prayed to Jehovah God: “Why do you tolerate oppression? Why are destruction and violence before me? And why do quarreling and conflict abound?” (Habakkuk 1:3) Leaving his troubled prophet in no doubt, God assured him that He would call the wicked to account. About that promise God said: “It will without fail come true. It will not be late!”—Habakkuk 2:3.

In the meantime, wrongdoers have opportunity to turn away from their bad course. “‘Do I take any pleasure at all in the death of a wicked person?’ declares

the Sovereign Lord Jehovah. ‘Do I not prefer that he turn away from his ways and keep living?’” (Ezekiel 18:23) Those who seek Jehovah by abandoning their bad ways can look to the future with confidence. “The one listening to me will dwell in security and be undisturbed by the dread of calamity,” says Proverbs 1:33. ■

“Just a little while longer, and the wicked will be no more . . . The meek will possess the earth, and they will find exquisite delight in the abundance of peace.”—Psalm 37:10, 11.



She Stuck to Her Beliefs

An interview with Song Hee Kang

When Song Hee was 11 years old, her mother noticed an abnormal curve in her daughter's back. A doctor diagnosed scoliosis, a lateral, or sideways, curvature of the spine, the shape of the letter "C" or "S." Song Hee's condition became so bad that surgery was needed. But Song Hee would not accept a blood transfusion. "Awake!" asked her about her experience.

When you were first diagnosed, were doctors able to help you?

For about three years, I was monitored by two doctors, but the curvature in my spine continued to increase. In fact, it became so bad that my spine began pressing against my heart and lungs, making breathing difficult. Surgery was the unavoidable next step.

Did you agree to surgery?

Yes. But I was told that the operation would be difficult. By then, my spinal curvature was 116 degrees, which is very severe. In my case, however, surgery posed a special challenge. Because of my religious convictions, which are based

on the Bible, I would not accept a blood transfusion.¹

Did you find a surgeon who was willing to do the procedure?

My mother and I saw a specialist in my home state of Florida, U.S.A. However, when I told him that I would not accept blood, he said that no surgeon would perform such a complicated procedure on me under those circumstances. What is more, he said that I might not live to be 20 without surgery. I was only 14.

Did you explain to him the reason for your convictions?

Yes. I told him that my beliefs were based on the Bible, point-

ing out that God declared blood sacred, whether human or animal blood.² For an Israelite, even eating blood was a capital offense!³ I also showed him Acts 15:19, 20. Addressed to Christians, it says in part: "Abstain from . . . blood." This means it should not be taken into one's body in any way—orally or intravenously.

How did the surgeon respond?

He still insisted that he would have to administer a blood transfusion. And to my surprise, the hospital said that if I accepted blood, they would not charge anything for the operation.

Doctors should take the whole patient into account

That was quite an offer! What did you and your mother do?

Although no one seemed willing to perform the surgery without blood, we firmly decided to stick to our beliefs. Then things got even more complicated. Legally, I was still a minor. So because my condition was becoming critical, my case went to court. Thankfully, however, the Florida state attorney gave us 30 days to find a surgeon who would respect my wishes.

Did you find someone?

Yes! The local Hospital Liaison Committee of Jehovah's Witnesses kindly contacted a scoliosis specialist in New York who felt positive about the procedure and agreed to see me. So we met the court's deadline.⁴

How did the surgery go?

It was a complete success! In order to straighten my spine, the surgeon, Dr. Robert M. Bernstein, inserted adjustable rods into my back. He performed the surgery in two stages two weeks apart.

Why two stages?

If the first procedure had resulted in significant blood loss, the interval would have given my body time to produce more red blood cells prior to the second procedure. As things worked out, in both procedures I lost very little blood, thanks to the surgical team's good planning, skill, and meticulous work. I also made a strong recovery, free of the complications that can result from blood transfusion.⁵

How did your surgeon feel about the outcome?

He was delighted! "Medical care," he said, "is not just about performing operations." Doctors, he felt, should take the whole patient into account, including his or her beliefs and values. Many people besides Jehovah's Witnesses would fully endorse that view. ■

1. Song Hee's mother is one of Jehovah's Witnesses. Song Hee shares her mother's faith and was baptized in 2012 at 16 years of age.

2. Genesis 9:3-5.

3. Leviticus 17:10-14.

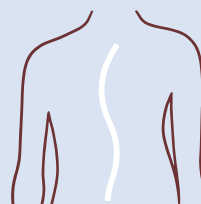
4. Hospital Liaison Committees help Witness patients locate doctors who will provide good medical treatment without using blood transfusions.

5. In an article on the risks of blood transfusion, the Clinical Excellence Commission, New South Wales (Australia) Health, states: "A blood transfusion is a living tissue transplant. With any transplant the human body is innately primed to react to something foreign. The safety implications of this are significant."

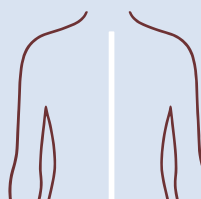
SCOLIOSIS FACTS

- Scoliosis* is not caused by poor posture or a lack of calcium
- Spinal deformities are not contagious
- Braces do not straighten the spine but may prevent further progression of the curve
- Scoliosis surgery does not interfere with future childbearing
- There is no known prevention for many spinal deformities
- Smoking hampers bone healing

* Sources: *Spinal Deformity: Scoliosis and Kyphosis—A Handbook for Patients*; "Diseases and Conditions—Scoliosis," by Mayo Clinic Staff, Mayo Clinic, U.S.A.



DEFORMED SPINE



NORMAL SPINE



The Mechanical Gears of the Issus Leafhopper

MECCHANICAL GEARS have long been thought to be solely a product of human ingenuity. That view has been proved wrong! Interlocking gears have been discovered in a living creature—the juvenile Issus leafhopper, found in gardens all over Europe.*

A juvenile leafhopper can reach a velocity of 3.9 meters per second in just two thousandths of a second, subjecting its body to nearly 200 times the force of gravity! It can disappear from sight during the blink of an eye. Such leaps require that both of the creature's two hind legs exert exactly the same force at precisely the same time. What is the secret behind this precision?

Consider: Scientists have discovered two interlocking gears at the base of the leafhopper's two hind legs. When the insect leaps, those gears ensure that both legs are perfectly synchronized. Otherwise, a leap would become an uncontrolled spin!

* The gears fall away during the insect's final molt into adulthood.



When jumping, larger creatures rely on their nervous system to synchronize their legs. For the juvenile leafhopper, however, neural impulses would be too slow. Hence its two interlocking gears. "We usually think of gears as something that we see in human designed machinery," says author and researcher Gregory Sutton. The reason, he adds, is that "we didn't look [elsewhere] hard enough."

What do you think? Did the gear mechanism of the Issus leafhopper come about by evolution? Or was it designed? ■

Leafhopper photo: Image © Sue Robinson/Shutterstock; gears: Courtesy Burrows and Sutton, University of Cambridge, UK

