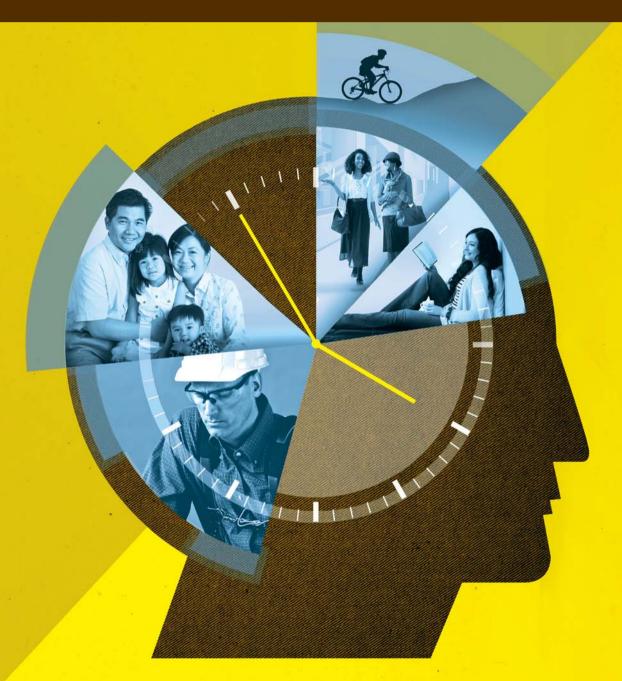
# Awake!



HOW TO INVEST YOUR TIME WISELY

## Awake!® IN THIS ISSUE





How to Invest Your Time Wisely PAGES 6-9

- 3 WATCHING THE WORLD
- 4 THE BIBLE'S VIEWPOINT **Spiritism**
- 10 INTERVIEW
  A Biotechnologist Explains His Faith
- 12 PORTRAITS FROM THE PAST Constantine
- 14 HELP FOR THE FAMILY
  When Your Teenage Daughter Is
  Stressed-Out
- 16 WAS IT DESIGNED?

  The Lantern of the Photuris Firefly

#### TEENAGERS



Find Bible-based answers to dozens of questions, including:

- "Am I Obsessed With My Appearance?"
- "What's a Real Friend?"
- "What Should I Know About Sexting?"

Also watch the video "What Your Peers Say—Healthy Lifestyles."

(Look under BIBLE TEACHINGS > TEENAGERS)

#### CHILDREN



Read illustrated Bible stories. Use the activity pages to help your children improve their knowledge of Bible characters and moral

(Look under BIBLE TEACHINGS > CHILDREN)

Vol. 95, No. 2 / Monthly / ENGLISH Printing Each Issue: 44,748,000 in 99 Languages

This publication is not for sale. It is provided as part of a worldwide Bible educational work supported by voluntary donations. Unless otherwise indicated, Scripture quotations are from the modern-language New World

Translation of the Holy Scriptures.

Awake! (ISSN 0005-237X) is published monthly by Watchtower Bible and Tract Society of New York, Inc.;

L. Weaver, Jr., President; G. F. Simonis, Secretary-Treasurer; 25 Columbia Heights, Brooklyn, NY 11201-2483, and

L. Weaver, Jr., President; G. F. Simonis, Secretary-Treasurer; 25 Columbia Heights, Brooklyn, NY 11201-2483, and by Watch Tower Bible and Tract Society of Canada, PO Box 4100, Georgetown, ON L7G 4Y4. Periodicals Postage Paid at Brooklyn, N.Y., and at additional mailing offices.

POSTMASTER: Send address changes to Awake! 1000 Red Mills Road, Wallkill, NY 12589-3299.

© 2014 Watch Tower Bible and Tract Society of Pennsylvania. Printed in Canada

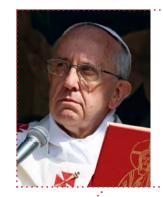
Would you welcome more information or a free home Bible study?

Visit www.jw.org or send your request to one of the addresses below.

JEHOVAH'S WITNESSES: UNITED STATES: 25 Columbia Heights, Brooklyn, NY 11201-2483. CANADA: PO Box 4100, Georgetown, ON LTG 4Y4. For a complete list of worldwide addresses, see www.jw.org/en/contact.

#### **UNITED STATES**

"A smoker costs a private employer... an extra \$5,816 a year compared with a nonsmoker," says a New York Times report. According to data collected by researchers at Ohio State University, the estimated average additional cost resulted from smoking breaks, higher health-care expenses, and absenteeism. Another factor was lost productivity, likely caused by the withdrawal effects of nicotine addiction.



#### **ITALY**

"Inconsistency on the part of pastors and the faithful between what they say and what they do, between word and manner of life, is undermining the Church's credibility."—Pope Francis.



#### **MALAYSIA**

Malaysian authorities uncovered 24 tons of smuggled ivory—more than 1,000 elephant tusks—hidden in two shipments of mahogany. Conservationists said that the seizure was the largest ever. The shipment originated in Togo and was destined for China.



#### **AFRICA**

According to a 2012 World Health Organization report, 63 percent of deaths were caused by communicable diseases, notably HIV/AIDS, diarrheal diseases, malaria, tuberculosis, and childhood diseases.

#### **AUSTRALIA**

Simulated-gambling apps (applications) for smartphones and other devices have become popular among children. Some apps mimic real casino games but are easier to win. A government report warns that such simulations may legitimize gambling among children "and may lead them to become problem gamblers in the future."





#### Is it wrong to attempt to communicate with the dead?

"Do not turn to the spirit mediums . . . so as to become unclean by them."—Leviticus 19:31.

WHAT PEOPLE SAY Understandably, people want reassurance that a dead loved one is not suffering. So they say: "Why not try to make contact with him or her by means of a spirit, or psychic, medium? Perhaps the medium can give us some sort of closure and peace of mind."

WHAT THE BIBLE SAYS The Bible is clear concerning attempts by the living to contact the dead—a practice that was common in ancient times. For example, Jehovah God's Law to the nation of Israel said: "There should not be found in you anyone . . . who consults a spirit medium or . . . inquires of the dead. For whoever does these things is detestable to Jehovah." (Deuteronomy 18:10-12) The Bible also states that those who practice spiritism in any of its forms "will not inherit God's Kingdom."—Galatians 5:19-21.

#### Can the dead influence the living?

WHAT PEOPLE SAY Many claim that the dead live on in some form. Hence, they may try to communicate with the dead, perhaps to obtain information or to appease the dead in hopes that they will leave the living in peace.

WHAT THE BIBLE SAYS "The living know that they will die, but the dead know nothing at all . . . Their love and their hate and their jealousy [all of which they felt while alive] have already perished." (Ecclesiastes 9:5, 6) Yes, the Bible teaches that the dead are just that—dead! They cannot think, act, or even worship God. "The dead do not praise [God]; nor do any who go down into the silence of death," says Psalm 115:17.

"The living know that they will die, but the dead know nothing at all."

-Ecclesiastes 9:5.

#### Do not spirit mediums at times provide accurate details?

WHAT PEOPLE SAY Some claim that spirit mediums are able to disclose information that only the dead and their family or friends could possibly know.

WHAT THE BIBLE SAYS Chapter 28 of the book of 1 Samuel relates how an unfaithful king named Saul violated God's command not to consult spirit mediums. He appealed to a medium, a woman who seemed to communicate with a deceased man of God named Samuel! But did she actually contact Samuel? No! She was, in fact, communicating with an impostor—someone impersonating dead Samuel.

That impostor was a wicked spirit, an agent of "the father of the lie"-Satan. (John 8:44) Why do the wicked spirits, or demons, promote the view that the dead live on? Their goal is to malign God and discredit his written Word, the Bible.—2 Timothy 3:16.

Does the foregoing mean that the dead have no hope? Not at all! The Bible promises a future resurrection for those who are 'asleep,' as it were, in the grave.\* (John 11:11-13; Acts 24:15) In the meantime, we are assured that our dead loved ones are not suffering in any way.

<sup>&</sup>quot;Should [people] inquire of the dead in behalf of the living?"—Isaiah 8:19.

<sup>\*</sup> Chapter 7 of the book What Does the Bible Really Teach? is entitled "Real Hope for Your Loved Ones Who Have Died." You can read it online at www.jw.org.

"If only I had more time!" How often have you said that? In a sense, time is a universal leveler, because the powerful and rich have no more of it than do the lowly and poor. Furthermore, neither the rich nor the poor can accumulate time. Once it is gone, it is gone forever. The course of wisdom, then, is to make good use of the time we have. How? Consider four strategies that have helped many people to invest their time wisely.

## HOW TO INVEST YOUR TIME WISELY

#### Strategy 1: Be Organized

**Prioritize.** "Make sure of the more important things," the Bible advises. (Philippians 1:10) Prepare a to-do list of things that are important or urgent or both, keeping in mind that what is important—buying food for dinner, for example—may not necessarily be urgent. And what may seem urgent—catching the start of your favorite TV program—may not be important.\*

Think ahead. "If an iron tool is dull and one does not sharpen its edge, he will need to exert much effort," says Ecclesiastes 10:10, adding: "But wisdom helps to achieve success." The lesson? Sharpen your ax, as it were, by planning ahead so that you can make the most effective use of your time. Set aside or eliminate nonessential tasks, which do little more than consume time and energy. If you find that you have time on your hands because you have caught up on your work, why not move on to a job that is scheduled for later? By thinking ahead, you increase your productivity, like a wise workman who sharpens his ax. Simplify your life. Learn to say no to things

Simplify your life. Learn to say no to things that are unimportant or that do little more than consume time. Too many activities and appointments can add needless stress and can rob you of joy.



<sup>\*</sup> See "20 Ways to Create More Time," in the April 2010 issue of Awake!

#### Strategy 2: Avoid Time Stealers

Procrastination and indecision. "The one who watches the wind will not sow seed. and the one who looks at the clouds will not reap." (Ecclesiastes 11:4) The lesson? Procrastination is a thief of both time and productivity. A farmer who waits until conditions are perfect may never sow seed or reap his harvest. Similarly, we could allow life's uncertainties to make us indecisive. Or we may feel that we have to wait until we have every scrap of relevant information before making a decision. To be sure. important decisions warrant research and deliberation. "The shrewd one ponders each step," says Proverbs 14:15. But the reality is that many decisions involve some uncertainties.-Ecclesiastes 11:6.

Perfectionism. "The wisdom from above [or from God] is . . . reasonable," says James 3:17. Of course, high standards are commendable! Sometimes, though, we might set standards so high that we invite disappointment and even failure. A person learning another language, for example, must be prepared to make mistakes. aware that he will learn from these. A perfectionist, however, would likely shudder at the thought of saving something incorrectly—an attitude that would impede his progress. How much better to be modest in our expectations! "Wisdom is with the modest ones," says Proverbs 11:2. Moreover, the modest and humble do not take themselves too seriously and can usually laugh at themselves.

"YOU DON'T REALLY PAY FOR THINGS WITH MONEY, YOU PAY FOR THEM WITH TIME." -What to Do Between Birth and Death



SOME REVEALING FACTS

50.2 HOURS

The time that the typical employee in Canada spends in work-related activities each week, based on a sample of 25,000 workers.

242 MINUTES

The time, on average, that people in the United Kingdom four years of age or older spent watching TV each day in 2011.

The time that fathers in India spend talking with their children each day. Working mothers there spend about 11 minutes talking with their children; and stay-athome mothers, no more than 30 minutes.

#### Strategy 3: Be Balanced and Realistic

Balance work and recreation. "Better is a handful of rest than two handfuls of hard work and chasing after the wind." (Ecclesiastes 4:6) Workaholics often deprive themselves of the fruitage of their "two handfuls of hard work." They simply have no time or energy left. The lazy, on the other hand, opt for "two handfuls" of rest and squander precious time. The Bible encourages a balanced view: Work hard and enjoy the rewards. Such rejoicing is "the gift of God."—Ecclesiastes 5:19.



Do not scrimp on sleep. "I will lie down and sleep in peace," said a Bible writer, (Psalm 4:8) Most adults need about eight hours of sleep a night to gain the full physical, emotional, and cognitive benefits. Concerning the latter, sleep is a sound investment of time because it aids in concentration and consolidates memories. thus fostering learning. Sleep deprivation, however, impedes learning and contributes to accidents, errors, and irritability. Set realistic goals. "Better to enjoy what the eyes see than to wander after one's desires." (Ecclesiastes 6:9) The point? A wise person does not let mere desires take the reins of his life, especially desires that may be unrealistic or impossible to satisfy. Hence, he is not seduced by clever advertising or easy credit. Instead, he learns to be content with what he can actually attain—"what [his] eyes see."

## HOW MUCH OF YOUR TIME IS IT WORTH?

Before you buy something, convert its monetary value into the time it would take you to earn that amount of money, "and then see if it's still worth it," suggests author and psychologist Charles Spezzano.

#### Strategy 4: Be Guided by Good Values

Consider your values. Your values enable you to gauge what is good, important, and worthwhile. If your life were an arrow, your values would aim that arrow. Good values. therefore, help you to set sound priorities in life and to make the very best use of your time hour by hour and day by day. Where can you find such values? Many people look to the Bible, recognizing its superior wisdom.—Proverbs 2:6, 7.

Make love your foremost value. Love "is a perfect bond of union," says Colossians 3:14. We cannot be truly happy and emotionally secure without love, especially within the family. People who disregard that fact, perhaps giving priority to the pursuit of riches or a career, actually invest in unhappiness. Yes, for good reason the Bible makes love the preeminent value. mentioning it hundreds of times.—1 Corinthians 13:1-3: 1 John 4:8.

Set aside time to address your spiritual need. A man named Geoff had a loving wife, two happy children, good friends, and a rewarding job as a paramedic. Nevertheless, his work often brought him face-to-face with suffering and death.

WHAT IS IMPORTANT TO YOU?

FAMILY \_\_\_\_ COMMUNITY \_\_\_ WORK \_\_\_\_ SPIRITUALITY \_\_\_ EDUCATION \_\_\_\_ LEISURE \_\_\_\_ FRIENDS \_\_\_\_ HFALTH

"Is this how life is supposed to be?" he asked. Then one day he read some Bible literature published by Jehovah's Witnesses and found satisfying answers.

Geoff explained what he was learning to his wife and children, and they too became interested. That started the family on a spiritual journey that enriched their lives and helped them to invest their time far more wisely. Their study of the Bible also gave them the wonderful hope of everlasting life in a world free of futility and suffering.—Revelation 21:3, 4.

Geoff's experience calls to mind the words of Jesus Christ, when he said: "Happy are those conscious of their spiritual need." (Matthew 5:3) Are you willing to set aside a little time to address your spiritual need? To be sure, no other investment will give you the wisdom to make the most, not of just each day, but of your life as a whole. ■





## A Biotechnologist Explains His Faith

In 1978, Dr. Hans Kristian Kotlar's first job in scientific research was at the Norwegian Radium Hospital, where he studied cancer and the human immune system. At that time, he also became interested in the origin of life. *Awake!* asked him about his research and his religious faith.

## What stirred your interest in the origin and meaning of life?

My father was Catholic and my mother was Protestant. That said, they did not view religion as important. As for me, during my teens, I wondered about the meaning of life, and I read books about Buddhism, Hinduism, and Islam. I even asked God to reveal the truth to me.

By the 1970's, the field of molecular biology had made some amazing advances, and I wondered if it might reveal how life began. The mechanisms within living cells intrigued me, so I chose to study biotechnology. I might add that most of my professors said that life evolved by natural processes, and I believed them.

## Why did you take an interest in the Bible?

Two of Jehovah's Witnesses visited our home. Although they were pleasant, I reacted rudely and told them I was

not interested. My wife overheard me. "That was not kind, Hans Kristian," she said. "You have always been interested in the meaning of life." She was right, and I felt ashamed. So I ran after the Witnesses. During our conversation, I told them that I wanted to know if the Bible is in harmony with science.

## How did they respond to that?

They showed me what the Bible says about the Source of the energy manifest in the universe. The scripture they read states: "Lift up your eyes to heaven and see. Who has created these things? . . . Because of his vast dynamic energy and his awe-inspiring power, not one of them is missing." This statement

### My research led me to conclude that life is a product of an intelligent Creator

intrigued me. It also seemed reasonable that only an intelligent Source of energy could account for the order in the universe.

#### Did your view of evolution change?

I gradually realized that the various theories of evolution lacked rigorous scientific proof. In fact, they are basically stories invented to explain how the remarkable designs found within living things, such as the immune system, could originate in a mindless manner. The more I studied the immune system, the more I realized just how complex and effective it is. Thus, my research led me to conclude that life is a product of an intelligent Creator.

#### Can you give us some evidence of design?

The immune system is actually an astonishing array of structures and mechanisms designed to defend us from a wide variety of agents, including bacteria and viruses. The mechanisms, in turn, can be grouped into two complementary systems. The first mobilizes an attack on invading microbes within hours. The second takes several days to

respond but targets the invaders like a well-aimed arrow. This second system also has a good memory, so that if a specific invader returns years later, this enemy will be met with a rapid response. The whole system works so well that often you do not even realize that you have been infected and effectively defended. Also amazing is the way the immune system distinguishes between foreign substances and the hundreds of cell types that make up our body.

#### Tell us, what happens when a microbe enters our body?

Microbes sneak in through our breath, our food, our urogenital tract, or breaks in our skin. When the immune system detects intruders, it sets in motion a cascade of reactions involving dozens of precisely designed proteins. Each component in this cascade activates the next to amplify the counterattack. The process is mind-boggling!

#### Could we say, then, that your knowledge of science has strengthened your faith in God?

Absolutely! The power and sophistication of our immune

system points to a wise and loving Creator. I might add that science has also strengthened my faith in the Bible. For example. Proverbs 17:22 tells us that "a joyful heart is good medicine." Researchers have discovered that our state of mind can influence our immune system. Stress, for instance, can weaken our immune response.

#### Many of your peers don't believe in God. Why is that?

The reasons vary. Some, as was true of me, simply accept what they were taught. Perhaps they assume that evolution is backed up by good science. Others give little thought to how life began. That's a pity. I think they should ask more questions.

#### Why did you become one of Jehovah's Witnesses?

I was attracted by their hospitality and their faith in the Creator's promise of a better future.2 And that faith rests on research and sound reasoning, not myths or speculation.3 ■

<sup>1.</sup> Isaiah 40:26.

<sup>2.</sup> Revelation 21:3, 4.

<sup>3.</sup> Hebrews 11:1.



## QUICK FACTS

- ➤ Constantine became emperor of the Western Roman Empire in 306 C.E. and was sole emperor of both the East and the West from 324 to 337.
- ► Constantine claimed that in either a dream or a vision he was assured that the God of the Christians would assist him in battle.
- ▶ Attributing a certain military victory to God, Constantine "immediately ordered" that a spear in the form of a cross be placed in the hand of his own statue "in the most frequented place in Rome."—Paul Keresztes, historian.
- ➤ Constantine held the pagan title *pontifex maximus*, or chief priest, and thought himself overlord of all religions in his realm.

## CONSTANTINE

Constantine was the first Roman emperor to profess Christianity. By doing so, he profoundly influenced world history. He embraced this previously persecuted religion and set it on a path that led to the formation of Christendom. Thus, so-called Christianity became "the strongest social and political agent" ever to influence the course of history, according to *The Encyclopædia Britannica*.

WHY should you care about an ancient Roman emperor? If you are interested in Christianity, you should know that Constantine's political and religious maneuvers have affected the beliefs and practices of many churches right down to this day. Let us see how.

#### THE CHURCHES-LEGALIZED AND THEN USED

In 313 C.E., Constantine ruled over the Western Roman Empire, while Licinius and Maximinus ruled over the East. Constantine and Licinius granted freedom of worship to all, including Christians. Constantine protected Christianity, believing that the religion could unify his empire.\*

Constantine was thus appalled to find that the churches were divided by disputes. Eager for consensus, he sought to establish, and then enforce, "correct" doctrine. To win his favor, bishops had to make religious compromises, and those who did received tax exemptions and generous patronage. "Getting the 'right' version of Christian doctrine," said historian Charles Freeman, "gave access not only to heaven but to vast resources on earth." The clergy thus became powerful figures in worldly affairs. "The Church had acquired a pro-

<sup>\*</sup> The sincerity of Constantine's Christian convictions has been much debated, in part because of "his apparent concessions to pagan cults, even late in his reign," according to one reference.

"The Church had acquired a protector, but it had also acquired a master." -A.H.M. Jones, historian

tector," says historian A.H.M. Jones, "but it had also acquired a master."

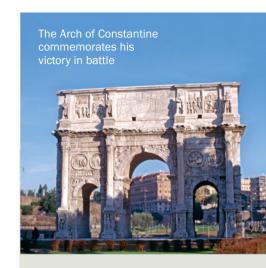
#### WHAT KIND OF CHRISTIANITY?

A result of Constantine's alliance with the bishops was a religion with tenets that were part Christian, part pagan. It could hardly have been otherwise, since the emperor's goal was religious pluralism, not the pursuit of religious truth. He was, after all, the ruler of a pagan empire. To please both religious camps, he adopted a stance of "conscious ambiguity in his acts and government in general," wrote one historian.

While professing to champion Christianity, Constantine kept one foot in paganism. For example, he practiced astrology and divination—occult activities that the Bible condemns. (Deuteronomy 18:10-12) On the Arch of Constantine in Rome, he is shown sacrificing to pagan deities. He continued to honor the sun-god by featuring the deity on coins and promoting the sun-god cult. Late in life, Constantine even permitted a small town in Umbria, Italy, to construct a temple to his family and himself and to appoint priests to serve there.

Constantine postponed his "Christian" baptism until a few days before his death in 337 C.E. Many scholars believe that he held back in order to retain the political support of both Christian and pagan elements within the empire. To be sure, his life record and the lateness of his baptism raise questions about the sincerity of his professed faith in Christ. However, one thing is certain: The church Constantine legitimized became a powerful political and religious entity, one that thus turned its back on Christ and embraced the world. Jesus said of his followers: "They are no part of the world, just as I am no part of the world." (John 17:14) From this church-that was now worldly-sprang countless denominations.

What does all of this mean for us? It means that we should not take the teachings of any church for granted but that we should examine them in the light of the Bible.—1 John 4:1. ■



- "A good emperor—even a good Christian-would inevitably find himself compelled to choose between losing heaven and losing power. Having just assumed the throne, Constantine was by no means finished either with power or with committing the sins necessary to retain it."-Richard Rubenstein, professor of conflict resolution and public affairs.
- "That Constantine was a Christian at least at the end of his life cannot be doubted, provided that one does not judge the question by the quality of his Christianity."-Paul Keresztes, professor of classics and history.

## When Your Teenage Daughter Is Stressed-Out



#### THE CHALLENGE

Your daughter says she is stressed-out. 'At 13?' you ask yourself in disbelief. 'She's too young to know what stress is!' Before you tell your daughter that, however, consider some reasons why life might seem overwhelming to a young teenage girl.



#### WHY IT HAPPENS

**Physical changes.** The growth spurt of puberty can cause a girl considerable anxiety, especially if she is behind—or ahead of—her peers. "I was one of the first girls to have to wear a bra, and I felt so uncomfortable with myself," says Anna,\* now 20. "Compared with my peers, I felt that I was weird, as if I were a mutant!"

**Emotional changes.** Karen, now 17, recalls: "It was so frustrating not knowing why I would be so happy during the day and later, during the night, I would be crying my eyes out. I didn't know what was wrong with me. It was as if my emotions were out of control."

Onset of the menstrual cycle. "Even though my mom prepared me, my first period totally caught me off guard," says a young woman named Kathleen. "I took several showers a day because I felt dirty all the time. Plus, my three older brothers would tease me mercilessly. They somehow thought that my whole ordeal of getting periods was funny."

**Social pressure.** Marie, now 18, recalls: "When I was between 12 and 14, peer pressure was really strong. Kids in my school were mean to anyone who stood out as different." Anita, 14 years old, says: "At my age, feeling that you are accepted by a group of friends is crucial and being left out is devastating."

<sup>\*</sup> Names in this article have been changed.

#### WHAT YOU CAN DO

#### Encourage your daughter to talk about her stress.

At first, she may be reluctant to talk. But be patient and follow the Bible's advice to "be quick to listen, slow to speak."-James 1:19.

Take your daughter's stresses seriously. Remember. she does not have your experience in life, and therefore she has little with which to compare her stresses—much less develop the skills to address them.—Bible principle: Romans 15:1.

Do not burden your daughter with too many extracurricular activities. According to the book Teach Your Children Well, youths whose schedules are overly crammed "often show signs of stress, particularly physical signs like headaches and stomachaches."-Bible principle: Philippians 1:9, 10,

Make sure your daughter gets enough rest. Sleep is often the first thing teenagers neglect. Without it, however, your daughter's thinking skills will be weakened and so will her ability to ward off stress.—Bible principle: Ecclesiastes 4:6.

#### Help your daughter find healthy outlets for stress.

For some girls, exercise reduces anxiety, "Physical training is beneficial," acknowledges the Bible. (1 Timothy 4:8) Other girls find that keeping a journal helps them put their stress in perspective. "When I was younger," recalls 22-year-old Brittany, "I would write about problems that I just couldn't work out. That helped me to understand how I really felt about a problem, and then it would be easier either to resolve it or just let it go."

**Set the example.** How do you cope with stress? Do you take on more than you can handle and then panic when getting things done? Do you burn yourself out working too hard, not taking time for the more important things of life? "Let your reasonableness become known," says Philippians 4:5. Remember, your teenager is watching your example and learning from it—for better or for worse.

#### **KEY SCRIPTURES**

- "We . . . who are strong ought to bear the weaknesses of those not strong."—Romans 15:1.
- "Make sure of the more important things."—Philippians 1:9, 10.
- "Better is a handful of rest than two handfuls of hard work and chasing after the wind."-Ecclesiastes 4:6.

#### PARENTAL EXAMPLE

"My dad is a very busy man," says a young woman named Laura, "but through it all he keeps a positive attitude. When a problem arises. his first response is usually 'How can we fix this?' or 'What's the best solution to this problem?' One of my dad's favorite sayings is, 'Life is 10 percent what happens and 90 percent how you react to it.' My dad isn't perfect—he does get stressed-out at times. But he never lets a problem defeat him. He's a good role model for me in handling stress."



# The Lantern of the Photuris **Firefly**



THE lantern, or light organ, of a particular *Photuris* firefly is covered with jagged scales that dramatically enhance the brightness of the light that the insect produces.\*

Consider: Researchers have found that tiny scales on the lantern surface of some fireflies form a corrugated pattern, somewhat like overlapping shingles or tiles. The scales tilt up at one end by just 3 micrometers—less than one twentieth the thickness of a human hair. Yet this tiny tilt lets the lantern shine almost 50 percent more brightly than it would if the scales formed an even surface!

Could that concept improve the efficiency of light-emitting diodes (LEDs), which are used in electronic devices? To find out, scientists coated LEDs with a corrugated surface similar to that of the firefly's lantern. The result? The LEDs emitted up to 55 percent more light! Physicist Annick Bay says: "The most important aspect of this work is that it shows how much we can learn by carefully observing nature."

What do you think? Did the lantern of those *Photuris* fireflies come about by evolution? Or was it designed? ■







Visit www.jw.org, or scan code



<sup>\*</sup> Scientists have not studied all species of this firefly.