

Wisdom Booklet 43



WISDOM QUIZ

Matthew 6:28-30

"And why take ye thought for raiment? Consider the lilies of the field, how they grow; they toil not, neither do they spin:

And yet I say unto you, That even Solomon in all his glory was not arrayed like one of these.

Wherefore, if God so clothe the grass of the field, which to day is, and to morrow is cast into the oven, shall he not much more clothe you, O ye of little faith?"



How well do you understand the functions of faith and wisdom?

True/False

1 Based on the fact that lilies do not toil, we should not work for food and clothing.

☐ ☒

(Read John 6:26-27.)

- God commands us to work. If a man does not work, he should not eat. (See II Thessalonians 3:10.) Thus, we are to be diligent and never slothful. However, the motive and goal of our work must not be to acquire clothing or food but to accomplish the work of God through our lives. (See Luke 12:30.)

"Taking thought for raiment" refers to worrying about and planning ahead for what we will wear.

☒ ☐

(See Proverbs 31.)

2 The primary topic of Matthew 6:28-30 is our clothing.

☐ ☒

(Read I Peter 3:1-7.)

- God observes our tendency to worry about outward appearance. Thus, He directs our attention not to how lilies appear but to how they grow. The glory of lilies springs from the life within, not

from the flowers' self-efforts. It is the wisdom of God which causes the lily to grow and fulfill His purposes.

The primary purpose of clothing is to draw proper attention to the wearer.

☐ ☒

(See Matthew 11:7-11.)

3 Solomon's glory was in the splendor of his clothing.

☐ ☒

(Read I Kings 10:1-29.)

- The clothing, food, and buildings of Solomon were simply by-products of the wisdom God gave to him. (See I Kings 3:12-13.) It was Solomon's wisdom that was his glory, and this is what his people and the Queen of Sheba praised.

God wants to give us glory through the clothes we wear.

☐ ☒

(See Matthew 5:14-16.)

4 Faith can be summed up in the phrase "Let go and let God."

☐ ☒

(Read James 2:14-26.)

- Christians are to release their own wills but not for the purpose of abdicating personal responsibility. Instead they are to draw upon the grace of God so they can labor abundantly according to His wisdom. Paul describes this process in Philippians 2:12-13: "... Work out your own salvation. ... For it is God which worketh in you. ... " God has a rest for Christians, but we are to labor to enter into it. (See Hebrews 4:9-11 and I Corinthians 15:10.)

True faith and works are simply by-products of wisdom.

☐ ☒

(See Romans 10:17.)

Total Correct 6

All Your Anxiety

E. H. Joy



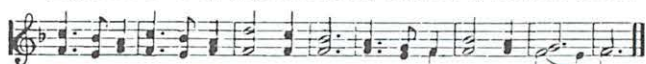
1. Is there a heart o'er-bound by sor-row? Is there a life weighed down by care?
2. No oth-er Friend so keen to help you; No oth-er Friend so quick to hear;
3. Come then, at once, de-lay no long-er; Heed His en-treat-y, kind and sweet;



Come to the cross, each bur-den bear-ing, All your anx-i - e - ty-leave it there.
No oth-er place to leave your bur-den; No oth-er one to hear your prayer.
You need not fear a dis - ap-pointment, You shall find peace at the mer-cy-seat.

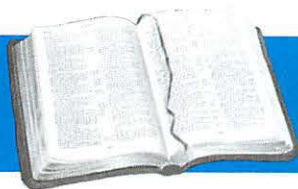


CHORUS
All your anx-i - e - ty, all your care, Bring to the Mer-cy-seat, leave it there;

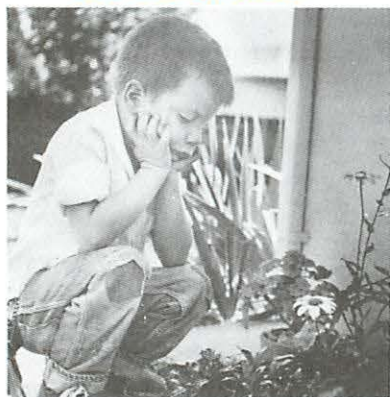


Nev-er a bur-den He can - not bear, Nev-er a Friend like Je - sus.

WISDOM WORKSHEET ON MATTHEW 6:28–30



“And why take ye thought for raiment? Consider the lilies of the field, how they grow; they toil not, neither do they spin: And yet I say unto you, That even Solomon in all his glory was not arrayed like one of these.”



Esther Bubley's World of Children in Photographs

“Wherefore, if God so clothe the grass of the field, which to day is, and to morrow is cast into the oven, shall he not much more clothe you, O ye of little faith?”

Because we tend to focus on outward appearance rather than on heart attitudes, we are often more anxious about clothing than we are concerned about genuine spiritual maturity.

Such maturity comes not through our own fleshly efforts, but by entering into the riches of God's grace and acting in accordance with the faith and wisdom God gives.

The growth of the lily is primarily dependent on factors beyond itself. This observation reflects the daily attitude by which God wants each of us to approach Him. The lily is an annual flower, springing from a bulb. Its cycles have significant application to our lives. Both faith and wisdom are required for glory. Faith without wisdom is presumption. Wisdom without faith is self-effort.

Linguistics

Languages,
Grammar, Vocabulary,
Communication



CONSIDER

Greek: καταμανθάνω
(kah-tah-mahn-THAH-no)

DEFINITION: κατά, means “intensive,” and μανθάνω means “to learn”; thus, to study thoroughly; to think upon well (in contrast to worry).

Do Resource A.

LILIES

Greek: κρίνον (KRIH-nawn)

DEFINITION: Refers to wildflowers such as the gladiolus, iris, and lily.

TOIL

Greek: κοπιᾶω (kaw-pee-AH-oh)

DEFINITION: To labor with much effort; to be weary from labor.

INSIGHT: Refers to a man's hard labor in the field.

SPIN

Greek: νήθω (NAY-tho)

DEFINITION: Weaving together cloth.
INSIGHT: Refers to a woman's work in the house.

ARRAYED

Greek: περιβάλλω (peh-rih-BAH-lo)

DEFINITION: περί means “about,” and βάλλω means “to throw”; thus, to throw about oneself, as with a robe.

Do Resource B.

CLOTHED

Greek: ἀμφιέννυμι

(ahm-fee-ENN-oo-mee)

DEFINITION: ἀμφί means “around,” and έννυμι means “to clothe”; thus, to put clothing around oneself.

INSIGHT: From ἀμφί we get the word *amphitheater*.

LITTLE FAITH

Greek: ὀλιγόπιστος

(awe-lih-GAW-piss-toss)

DEFINITION: ὀλίγος means “few” or “little,” from which we get *oligarchy*; πιστός means “faith.”

INSIGHT: πιστός also includes “discernment in knowing and trusting God's will.”

History

Archaeology,
Geography, Prophecy,
Music, Art, Literature



What was the secret of Solomon's glory, causing God to compare the lily to it?

Solomon's true glory was not his wealth but his wisdom. “And all the earth sought to Solomon, to hear his wisdom, which God had put in his heart” (1 Kings 10:24).



Solomon's kingdom was established by the wisdom God gave him.

As the kings of the earth came to visit Solomon, they traded gold for wisdom. “And they brought every man his present, vessels of silver, and vessels of gold . . .” (1 Kings 10:25).

The physical splendor of the lily is brief, and Solomon's life was as a vapor. Yet, the glory of God's wisdom in each one continues.



The plant Solomon's seal is a member of the lily family.

How was the life of a great songwriter like the lilies of the field?

Philip Bliss had only three years in which to minister. You probably cannot recall any sermons he preached during those years, but you have probably sung many songs written by Mr. Bliss, such as “I Will Sing of My Redeemer,” “Almost Persuaded,” and “Whosoever Will.”

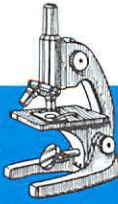


**P. P. Bliss
1838–1876**

Do Resource C.

Science

Chemistry, Biology,
Astronomy, Geology,
Physics, Mathematics



What botanical facts do we need to know in order to consider the lilies?

Lilies comprise one of the largest and most important plant families. There are more than two hundred genera of lilies with about four thousand species, varying widely from the fragrant hyacinth to the nutritious asparagus and the medicinal aloe plant.



A lily of Palestine

Lilies are herbaceous perennials. They have scaly bulbs and firm, leafy stems. Lilies can grow in open fields, in poor soil, and in full sun. Lilies have

a strong root system and require deep planting.

How do the lilies of the field survive without toil?

Factors such as a large and deep root system, the light of the sun, the tracheid cells, and pollinating insects combine to bring about the glory of the lily.



Tracheid cells

Do Resource D.

How does topography reveal God's design for clothing the earth?



H. Armstrong Roberts

God clothed the earth with forests, flowers, grass, leaves, and even snow. However, the exposed soil of barren deserts constitutes a shameful condition which continues to worsen.

Do Resource E.

Law

Government,
Economics, Logic



How do laws which protect the environment help clothe the earth?



Bucyrus-Erie Company

Gigantic earth-moving equipment ravishes the land by removing its covering. If the ground is not re-covered, devastating erosion will take place.

Strip-mining is a profitable business for those who engage in it. However, when the land is left bare, ugly scars remain for years, allowing further destruction through erosion.

At the end of the nineteenth century, Congress gave the President statutory power to establish national forests. It was not until 1974, however, that legislation was passed to protect these national forests from destructive timber-cutting techniques.



© Diana Hunt from Louis Mercier

The Butchart Gardens of Victoria, British Columbia, illustrate that beauty can be restored by re-covering barren lands with flowers, shrubs, and trees.

Do Resource F.

Medicine

Health,
Nutrition, Behavior,
Counseling



How does the lily of the field bring healing to millions of people?

Within the lily family is the aloe plant. Its thick, pulpy leaves contain a juice which has potent healing qualities. It is also one of the safest and most effective purgatives.

Aloe juice is the most common domestic medicine, and is used primarily for the treatment of burns.

In addition to the healing qualities of aloe juices, the aloe flower is in bloom for the greater part of the year, and it is an extremely hardy plant. If the leaf of an aloe plant is separated from the parent plant, it can lie in the sun for several weeks without becoming entirely shriveled. If the leaf is then put in water, it will become plump and fresh within a few hours.

As suggested in Scripture, aloe is most effective when combined with other herbs. (See John 19:39.) The aloe flower also has a rich fragrance. (See Psalm 45:8 and Proverbs 7:17.)

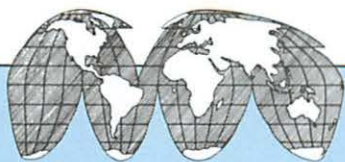
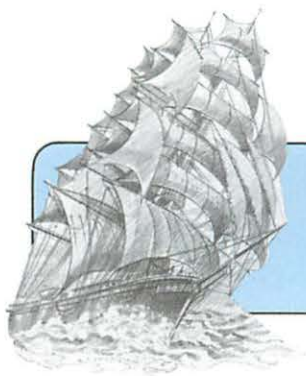
How do the dangers of hypothermia confirm our need for clothing?

Roald Amundsen was successful in his polar expeditions because he wore the appropriate clothing. His rival, Robert Scott, wore inadequate clothing and perished from hypothermia.



Roald Amundsen

Do Resource G.



RESOURCE QUIZ

How many of these questions can you answer before studying the resources?

HOW CAN FAITH BE MEASURED?



- How did Jesus measure the faith of His disciples? . . . 2223
- What caused some disciples to have no faith? . . . 2223
- What caused other disciples to have little faith? . . . 2224
- How do three types of fear affect faith? . . . 2224
- What is the secret of having great faith? . . . 2225

HOW DO LILIES CONDEMN NAKEDNESS?



- How does the glory of the lily surpass that of Solomon? . . . 2226
- How is glory turned to shame through nakedness? . . . 2227
- How do flowers and grass clothe the earth? . . . 2227
- How does lack of covering produce defilement? . . . 2228
- What does it mean to "uncover" nakedness? . . . 2229
- How does nakedness relate to a person's vision? . . . 2230

HOW DOES THE LILY ILLUSTRATE THE LIFE OF A GREAT SONGWRITER?



- How did Philip Bliss learn to stand alone at the age of thirteen? . . . 2233
- What promise did Philip fulfill so things went well for him? . . . 2234
- Why were crowds moved to tears when Philip sang? . . . 2236
- How did Mr. Moody build the faith of P. P. Bliss? . . . 2238
- How did a tragic train wreck only extend the ministry of P. P. Bliss? . . . 2245

HOW DO LILIES GROW WITHOUT TOIL?



- What is unique about the roots of the lily? . . . 2248
- How does the sun produce tropism in lilies? . . . 2250
- How do lilies lift water? . . . 2251
- How do lilies benefit from inward pressure? . . . 2252
- Why is it vital for lilies to attract visitors? . . . 2255
- How do lilies use ultra-violet light? . . . 2256

HOW DOES GOD CLOTHE THE EARTH?



- How did God establish the earth on water? . . . 2257
- How do the ocean mountains show themselves? . . . 2258
- How do forests determine rainfall? . . . 2259
- How did pioneers use grass to build houses? . . . 2263
- What is a tundra? . . . 2263
- Why are deserts evidences of God's judgment? . . . 2265

WHAT LAWS PROTECT EARTH'S CLOTHES?

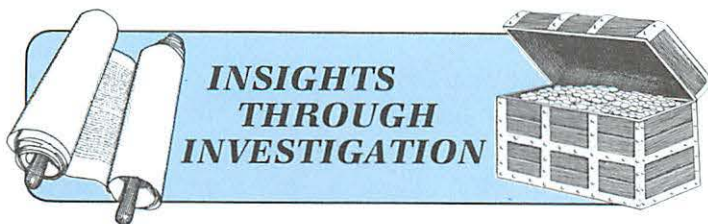


- What are some of the consequences of removing the earth's "clothes"? . . . 2268
- What conservation laws did God give? . . . 2269
- How were laws to protect land used to destroy it? . . . 2270
- Why is "clear-cutting" damaging to forests? . . . 2271
- What do strip-mining and clear-cutting have in common? . . . 2276

WHEN DOES NAKEDNESS BRING DEATH?



- How does hypothermia kill its victims? . . . 2277
- Why is hypothermia more deadly at 50°F than at 30°F? . . . 2278
- Why is air more valuable than gold in fighting hypothermia? . . . 2278
- Why should you wear a hat if your feet are cold? . . . 2278
- Why does a freezing person remove his clothes? . . . 2279



INSIGHTS THROUGH INVESTIGATION

1 NO FAITH

“... How is it that ye
have no faith?”
(Mark 4:40).

HOW DID JESUS MEASURE THE QUANTITY AND QUALITY OF HIS DISCIPLES' FAITH?



The lily is but one object in nature that Jesus used to evaluate the faith of His disciples.

Faith is the key to the Christian life. We are saved by faith; we grow by faith; we walk by faith; we pray by faith; we fight by faith; and we conquer by faith. Without faith it is impossible to please God, but with faith even as a grain of mustard we can remove mountains.

On various occasions during the earthly ministry of the Lord Jesus Christ, He measured and evaluated the faith of His disciples. He observed that some disciples had no faith, others had little faith, and still others had great faith.

Elsewhere in Scripture faith is evaluated as *dead faith*, *unfeigned faith*, *steadfast faith*, *precious faith*, and *most holy faith*.

The objects of nature which Jesus used to measure faith contain rich insights in helping us to measure and evaluate our own faith.

In the following study see if you can determine how much faith you have by Christ's standards. Also, try to evaluate the quality of faith that you have in your Christian life.



God used a raging storm to test the faith of the disciples early in Christ's ministry. The disciples responded in different ways, and for each response Jesus gave an evaluation of their faith.

When a sudden storm engulfed the little boat in which Christ and His disciples were riding, Jesus was asleep. Several of His disciples were experienced fishermen—notably, Peter, James, and John.

They were accustomed to the sea and knew how to deal with storms. We can assume, therefore, that the other disciples looked to them for leadership during the storm.

However, when the other disciples saw fear in the face of Peter, they realized that they would have to trust someone else. Thus, they appealed to Jesus for help.

“... *Master, carest thou not that we perish?*” (Mark 4:38).

Christ's response to this first group was the question, “... *Why are ye so fearful? how is it that ye have no faith?*” (Mark 4:40).

This account of the storm is contained in Mark's Gospel. Mark was not a disciple but worked closely with Peter. There is evidence that Peter led Mark to Christ. (See I Peter 5:13.) Peter often went to Mark's home. (See Acts 12:12–14.) Mark was the cousin of Barnabas. (See Colossians 4:10.)

For these reasons many have considered the Gospel of Mark to be Peter's gospel. It is presumable that Peter is the one who charged Jesus with not caring whether the disciples perished in the storm.

It would have been to Peter, therefore, that Jesus addressed His question, "... *How is it that ye have no faith?*"

WHAT CAUSED THIS FIRST GROUP TO HAVE NO FAITH?

The passage in Mark 4 goes on to explain what caused these disciples to have "no faith." It was their fear. It is impossible to have faith in God and to fear at the same time. Either faith will eclipse fear, or fear will destroy faith.

*"And he arose, and rebuked the wind, and said unto the sea, Peace, be still. And the wind ceased, and there was a great calm. And he said unto them, **Why are ye so fearful? how is it that ye have no faith?**" (Mark 4:39–40).*

There are three Greek words for "fear."

1. φόβος (FAW-boss): The original meaning of this word was "to flee." Later it came to mean "that which causes one to flee." Its primary meaning is "dread" or "terror." There are things that should properly terrify us, such as the power of an earthly king, as stated in Romans 13:3:

*"For rulers are not a terror to good works, but to the evil. Wilt thou then not be **afraid** of the power? . . ."*

2. δειλία (day-LEE-ah): This word is translated *fearful*, but primarily identifies a spirit of fear. The word denotes timidity and cowardice and is never used in a positive way. We are told that God has not given us this kind of fear (see II Timothy 1:7), but that it comes from Satan.

3. εὐλάβεια (yoo-LAH-bay-ah): This term signifies initial caution, then reverence, and finally Godly fear. It denotes the mingling of love and holy fear which constitutes proper reverence before the Lord. (See Hebrews 5:7.)

☐ Which of these three types of fear do you suppose the disciples had when Jesus asked, "... *Why are ye so **fearful**? how is it that ye have no faith?*"

☐ After Jesus asked the disciples why they were so fearful, "... *they feared exceedingly. . .*" Was this more of the same fear or a different fear? Examine the following text.

καὶ	εἶπεν	αὐτοῖς,	Τί	δειλοί	ἐστε	οὕτως;
And	he said	to them,	Why	fearful	are ye	thus?
πῶς	οὐκ	ἔχετε	πίστιν;	Καὶ	ἐφοβήθησαν	
How	not	have ye	faith?	And	they feared	
φόβον	μέγαν,	καὶ	ἔλεγον	πρὸς	ἀλλήλους,	
[with] fear	great,	and	said	one	to another,	
Τίς	ἄρα	οὗτός	ἐστιν,	ὅτι	καὶ	ὁ ἄνεμος
Who	then	this	is,	that	even	the wind
καὶ	ἡ	θάλασσα	ὑπακούουσιν	αὐτῷ;		
and	the	sea	obey	him?		

2 LITTLE FAITH

*"... **Why are ye fearful, O ye of little faith? . . .**"*
(Matthew 8:26).



Matthew reports the account of Jesus stilling the sea and gives a new perspective which explains why he heard Jesus say, "... *O ye of little faith . . .*" rather than "... *How is it that ye have no faith?*"

A careful study of Matthew's and Mark's accounts of Jesus calming the sea reveals that there were two responses to the crisis within the group of disciples.

In Mark 4:38, there is no mention that the disciples *came* to Jesus. It can be assumed that they were close to Him in the back of the boat as He was sleeping. If this were a boat with a sail and rudder the most experienced crew would be at the back. These would have certainly included Peter, James, and John.

It further appears that these disciples felt responsible for the safety of the boat and its passengers because their exclamation to Jesus was one of reproof: “. . . Master, carest thou not that we perish?”

In Matthew’s account it is recorded that “. . . his disciples came to him, and awoke him . . .” (Matthew 8:25). These disciples must have been, therefore, closer to the front of the ship.

Their appeal to Jesus was distinctly different. Rather than reproving Him, they addressed Him as Lord and cried out for Him to save them: “. . . Lord, save us: we perish.”

It is also significant that Jesus responded to this group before He rebuked the winds and the sea, whereas in Mark’s account He first rebuked the wind and *then* spoke to the disciples.

☐ Which type of fear did Jesus identify when He said to the disciples who came to Him, “. . . Why are ye fearful . . . ?”

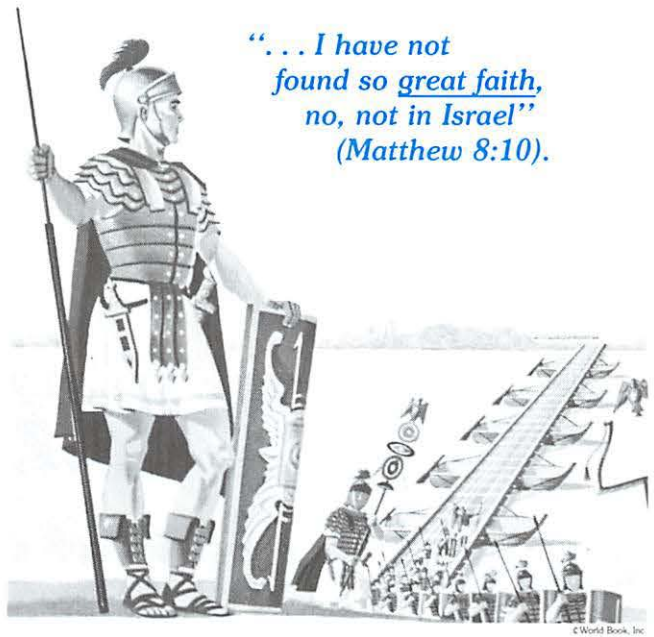
Καὶ λέγει αὐτοῖς, Τί δειλοί ἐστε,
And he says to them, Why fearful are ye,
ὀλιγόπιστοι;
O [ye] of little faith?

Even though these disciples had the same kind of fear as those in Mark’s account, they came to the only One Who could save them from that fear. They came in a reverential manner, calling Him Lord and pleading for His salvation.

It is significant that when Jesus supernaturally stilled the waves their faith was strengthened and they marveled at His power. In contrast, those who had no faith “feared exceedingly” after Jesus stilled the waves.

The violent storm was actually sent by God to test the faith of the disciples, because Jesus had just recently given them an example of great faith—the Roman centurion.

3 GREAT FAITH



Whereas the disciples linked their faith to what they could see, the centurion’s faith rested in what he understood about Christ and how He worked in harmony with His Heavenly Father.

Unlike the disciples, the centurion had no fear in the face of death. He knew that Jesus had the power and the authority to destroy Satan and death with a simple command. Therefore, he simply presented his need to the Lord without telling Him what to do: “. . . Lord, my servant lieth at home sick of the palsy, grievously tormented” (Matthew 8:6).

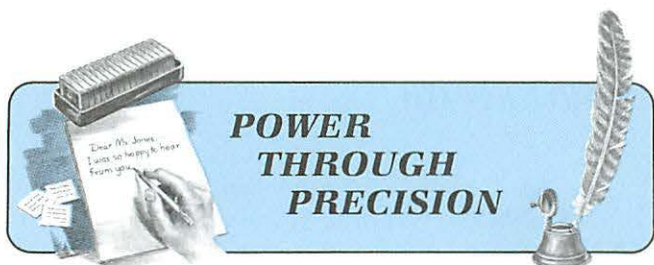
When Jesus said He would come and heal the servant, the centurion demonstrated a true spirit of humility and an amazing understanding of God’s structure of authority. The centurion stated that he was not worthy that Jesus should come under his roof, but that if He simply gave the command the servant would be healed.

When Jesus heard the centurion’s words He marveled and said, “. . . Verily I say unto you, I have not found so great faith, no, not in Israel” (Matthew 8:10).

PROJECT

How can the three types of faith which were demonstrated by the disciples and the centurion be related to Jesus’ teaching about our concern for clothing?

Date completed _____ Evaluation _____



POWER THROUGH PRECISION

HOW DO THE LILIES OF THE FIELD CONFIRM THE FACT THAT GOD REJECTS NAKEDNESS?



H. Armstrong Roberts

The splendor of lilies is a powerful testimony of the care and concern God demonstrates in clothing the earth.

The further a person, nation, or civilization moves from the authority of God's laws, the more nakedness is justified and practiced.

Sensual artists justify nakedness in their paintings with the false idea that they are simply honoring God's creation. Ungodly advertisers defend nakedness because it is effective in selling their products. Carnal playwrights and filmmakers excuse nakedness with the argument that it is a portrayal of real life.

Hospitals condone nakedness with the reasoning that it makes treatment more convenient for the medical staff. Eventually the arbitrary lines between "acceptable" and "unacceptable" nakedness are blurred, and all prohibitions against pornography are rationalized away.

Carnal Christians who desire to enjoy the pleasures of sin are willingly deceived by these arguments. Some of these Christians are *scorning* fools who can be corrected only by the harsh punishment of God's justice. Others are *simple* fools who can be taught why God rejects nakedness by the following Scriptural reasons.



Ewing Galloway

The Easter Lily

LESSONS FROM THE LILIES OF THE FIELD

By instructing us to consider the lilies, Jesus directed us to one of the largest and most important plant families—*Liliaceae* (lill-ee-AY-see-ee), the lily family. Of the four thousand species in this family, the Easter lily is the most well known. Other members of this family include the fragrant hyacinth, the colorful tulip, and the beautiful trillium.

Jesus emphasized the importance God places upon adequate covering when He reasoned, "... *If God so clothe the grass of the field . . . shall he not much more clothe you . . . ?*" (*Matthew 6:30*). Scripture reveals God's design for clothing and the severe consequences of rejecting His design in favor of nakedness.

The following observations about lilies provide a striking contrast to the consequences of nakedness.

THE GLORY OF THE LILY

The point which Christ emphasized about the lily was its glory: "... *Even Solomon in all his glory was not arrayed like one of these*" (*Matthew 6:29*).

When God created Lucifer, He clothed him with a glory that must have been spectacular. Lucifer was called the "son of the morning," and his garments, which radiated light and music, sang forth praises



©World Book, Inc.

The Hyacinth

to God. (See Isaiah 14:12; Ezekiel 28:13; and II Corinthians 11:14.)

There is good reason to believe that when God created Adam and Eve, He “clothed” them in glorious light. God is light, and He made man in His Own image. (See I John 1:5 and Genesis 1:27.) God designed our skin to reflect His light when we are in His presence, and each day Adam and Eve walked with God.

The reflective potential of our skin was demonstrated by Moses as he was with God in the mountain for forty days. When he returned to the people, his skin shone with the light of God’s glory. (See Exodus 34:29–35 and II Corinthians 3:7.)

1 Nakedness turns glory into SHAME.

The argument that nakedness is our natural, God-given state and we should not be ashamed of it is totally rejected by the Word of God. The Lord counsels us to get raiment “. . . *that thou mayest be clothed, and that the shame of thy nakedness do not appear . . .*” (Revelation 3:18).

When Adam and Eve sinned, they lost their glory, and they suddenly stood naked and were ashamed. Immediately they tried to cover their nakedness by sewing together coverings of fig leaves. (See Genesis 3:7–11.)

Those who try to deny the shame of nakedness are in reality trying to deny the fallen nature of man.

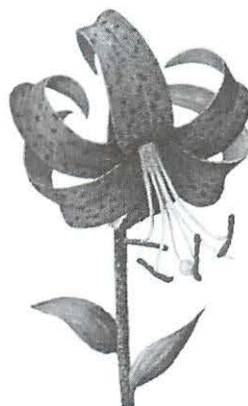
Definition of nakedness

The word *naked* means “nude; exposing one’s private parts or pudenda.” The Latin word *pudere* means “to be ashamed,” while the root means “that of which one should be ashamed.”

Definition of shame

Shame is a painful emotion caused by a strong sense of guilt, embarrassment, or disgrace.

The relationship between this kind of shame and nakedness is again emphasized in Revelation 16:15: “. . . *Blessed is he that watcheth, and keepeth his garments, lest he walk naked, and they see his shame.*”



© World Book, Inc.

The Tiger Lily

THE COVERING OF THE LILY

God states that lilies “. . . *clothe the grass of the field . . .*” (Matthew 6:30). The grass, in turn, clothes the bare soil. With this analogy we have a comparison to the outer garments and the undergarments of a person.

2 Nakedness trades covering for DEFILEMENT.

God warns that uncovering the nakedness of another is a violation of His Law and constitutes defilement. God has instilled a sense of modesty within us, and that modesty is to be protected by ourselves and by others. Those who break down modesty put themselves under the severe judgment of God.

“*Woe unto him that giveth his neighbor drink, that puttest thy bottle to him, and makest him drunken also, that thou mayest look on their nakedness!*” (Habakkuk 2:15).



When ground covering is gone, erosion of topsoil takes place. Similarly, when nakedness is condoned, the erosion of Godly character occurs.

When modesty is destroyed, character is also eroded. The resulting damage is a great deterrent to spiritual growth and fruitfulness in a person’s life.

The defiled person is left in a morally weakened condition—susceptible to temptation which otherwise could have been resisted.

Disintegration of character and the erosion of topsoil have striking similarities. Both occur when their protective covering is removed. Erosion of character and topsoil are often not noticed because they take place gradually, over a long period of time. However, once nakedness is exposed, Godly character and topsoil will deteriorate quickly.

In the eighteenth chapter of Leviticus God describes in detail how nakedness in the home leads to defilement and abomination outside the home. It is significant that the defilement which comes from nakedness also destroys the soil from which man derives his existence.

“Defile not ye yourselves in any of these things: for in all these the nations are defiled which I cast out before you: And the land is defiled: therefore I do visit the iniquity thereof upon it, and the land itself vomiteth out her inhabitants” (Leviticus 18:24–25).

Definition of defilement

At the heart of defilement is the profanity of that which should be revered. Defilement is desecrating and treating sacrilegiously that which God has designed to be honored. To defile is to dishonor, debase, disgrace, and degrade. It is to make unclean, to besmirch, to befoul, to spoil, to make dirty, and to soil that which was clean.

God begins the eighteenth chapter of Leviticus with the warning not to follow the degraded and corrupt practices of heathen nations: “After the doings of the land of Egypt, wherein ye dwelt, shall ye not do: and after the doings of the land of Canaan, whither I bring you, shall ye not do: neither shall ye walk in their ordinances” (Leviticus 18:3).

In this verse God commands His people to renounce the practice of nakedness. Nakedness was commonly accepted in Egypt, where the Israelites grew up, and was also practiced by the people of the land of Canaan.

God’s people were to be a unique people—committed to following His laws: “Ye shall do my judgments, and keep mine ordinances, to walk therein; I am the Lord your God. Ye shall therefore keep my statutes, and my judgments: which if a man do, he shall live in them: I am the Lord” (Leviticus 18:4–5).

Having established His Law as the only one to follow, God then defines the strict modesty which must begin in the home. It is in the home, especially in warm weather, where improper dress is most likely to occur and to be justified. Notice the precision of the following commands concerning nakedness:



Discovering the Biblical World, Harry Thomas Frankis, Harper and Row

The rich forested land which God described as flowing with milk and honey became a barren and desolate wasteland because of the defilement of the people in the matter of nakedness.

“None of you shall approach to any that is near of kin to him, to uncover their nakedness: I am the Lord.

“The nakedness of thy father, or the nakedness of thy mother, shalt thou not uncover: she is thy mother; thou shalt not uncover her nakedness.

“The nakedness of thy father’s wife shalt thou not uncover: it is thy father’s nakedness.

“The nakedness of thy sister, the daughter of thy father, or daughter of thy mother, whether she be born at home, or born abroad, even their nakedness thou shalt not uncover.

“The nakedness of thy son’s daughter, or of thy daughter’s daughter, even their nakedness thou shalt not uncover: for theirs is thine own nakedness.

“The nakedness of thy father’s wife’s daughter, begotten of thy father, she is thy sister, thou shalt not uncover her nakedness.

“Thou shalt not uncover the nakedness of thy father’s sister: she is thy father’s near kinswoman.

“Thou shalt not uncover the nakedness of thy mother’s sister: for she is thy mother’s near kinswoman.

"Thou shalt not uncover the nakedness of thy father's brother, thou shalt not approach to his wife: she is thine aunt.

"Thou shalt not uncover the nakedness of thy daughter in law: she is thy son's wife; thou shalt not uncover her nakedness.

"Thou shalt not uncover the nakedness of thy brother's wife: it is thy brother's nakedness.

"Thou shalt not uncover the nakedness of a woman and her daughter, neither shalt thou take her son's daughter, or her daughter's daughter, to uncover her nakedness; for they are her near kinswomen: it is wickedness.

"Neither shalt thou take a wife to her sister, to vex her, to uncover her nakedness, beside the other in her life time" (Leviticus 18:6-18).

It is unfortunate that some newer translations of the Bible, such as the New International Version (NIV), inaccurately translate the phrase *uncover the nakedness of* as "have sexual relations with."

Such a translation is totally unsupported by the context of the passage and by the actual Hebrew word for "uncover." Following the warnings not to uncover nakedness, God refers to sexual relations with the clear words: ". . . *Thou shalt not lie carnally with thy neighbour's wife, to defile thyself with her*" (Leviticus 18:20).

Definition of uncover

The Hebrew word for "uncover" is גָּלַה (gaw-LAW). It is a primary root word, meaning "to denude, especially in a disgraceful sense." By implication, it is used to describe the exile of captives, who were usually led away stripped of their clothing. Figuratively, גָּלַה means "to reveal, to discover, to remove, to make bare, to divest of covering, to open to view, and to make naked."

There are no grounds for translating this word "to have sexual relations with." Its plain and clear meaning is simply "to uncover the nakedness of a person."

In every case where גָּלַה is used in Scripture, it means "to remove the clothes and make bare."

The word is used to describe Ruth's uncovering the feet of Boaz. (See Ruth 3:7.) It was used by Michal when she condemned David for dancing before the people without having his kingly garments on. (See II Samuel 6:20.) It is also used by God to

describe His judgment upon backslidden Israel: "Thy nakedness shall be uncovered, yea, thy shame shall be seen . . ." (Isaiah 47:3).



The Lily of the Valley

THE PRAISE OF THE LILY

Whereas glory describes the wealth, beauty or splendor of that which God is or of that which He creates, praise refers to the response of others to God's glory.

Solomon uses the lily as a metaphor of praise eight times in the Song of Solomon.

"I am the rose of Sharon, and the lily of the valleys. As the lily among thorns, so is my love among the daughters" (Song of Solomon 2:1-2).

3 Nakedness turns praise into ABOMINATION.

Noah was a courageous man of faith. For many years he was a preacher of righteousness. (See II Peter 2:5.) His achievements earned him a place in God's "hall of fame":

"By faith Noah, being warned of God of things not seen as yet, moved with fear, prepared an ark to the saving of his house; by the which he condemned the world, and became heir of the righteousness which is by faith" (Hebrews 11:7).

After the flood Noah planted a vineyard. One day he became drunk with the wine he had made from it, and in his drunkenness he uncovered himself in his tent. One of his sons, Ham, happened to come into the tent and see the nakedness of his father.

The nakedness of Noah triggered a shameful response from Ham. After his disgraceful actions, Ham told his two brothers about the nakedness of their father. Notice how Scripture describes the careful response of the other two sons in not looking upon their father's nakedness.



Noah's faith led him to build the ark.

"And Shem and Japheth took a garment, and laid it upon both their shoulders, and went backward, and covered the nakedness of their father; and their faces were backward, and they saw not their father's nakedness" (Genesis 9:23).

When Noah woke up from his drunken stupor and realized how each of his sons had responded to his nakedness, he cursed Ham and blessed Shem and Japheth.



Noah's nakedness caused shame and defilement for himself and brought a curse upon his son. Thus, Noah's nakedness was his abomination.

Definition of abomination

God uses the word *abomination* to describe nakedness. (See Leviticus 18:27.) The Hebrew word **תועבה** (toe-ay-BAW) means "something which is disgusting and abhorrent; a practice which is repugnant and detestable." It refers to that which is loathsome and despicable.

THE PURPOSE OF THE LILY

Plants in the lily family are valued not only for their fragrance and beauty, but also for their practical uses. The asparagus plant, an edible member of the lily family, is rich in nutrients.

The lily commonly found in Palestine has long stems which, when dried, can be used as light fuel. This function is referred to in the phrase, "... and to morrow is cast into the oven ..." (Matthew 6:30).



© World Book, Inc.

Asparagus

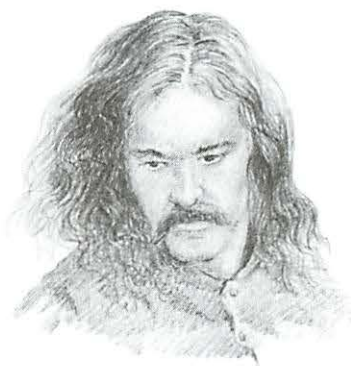
4 Nakedness turns purpose into REBELLION.

The following verse has direct application to both nakedness and rebellion, but these meanings are revealed only when the Hebrew definition of *perish* is understood.

"Where there is no vision, the people perish ..." (Proverbs 29:18).

Definition of perish

The Hebrew word for "perish" in this passage is **פָּרַע** (paw-RAH). It is a primary root word, meaning "to loose and let go." There are many applications of this definition. One is "to make naked"; another is "to let the hair hang down."



The rebellion of the sixties was characterized by long hair and nakedness.

Thus, a literal translation of Proverbs 29:18 would be, "Where there is no vision, the people go naked and let their hair hang down."

PROJECT

How would you use Scripture to explain to someone that the following practices are wrong?

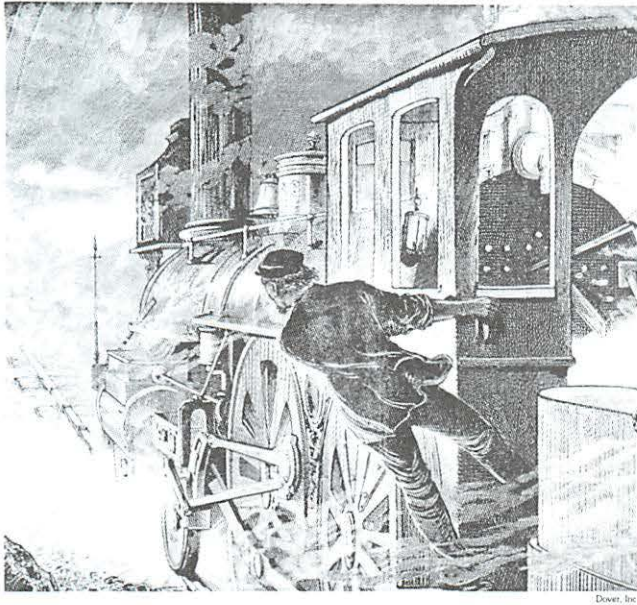
1. A family member walking through the house wearing only a skimpy undergarment (See Genesis 3:7, 10, 21.)
2. Parents suggesting that their children take baths together (See Leviticus 18.)
3. A mother inviting her children to view the birth of her child (See Leviticus 18:7-8.)
4. A person arguing that nakedness is simply a cultural preference (See Genesis 3:11 and Revelation 3:18.)

Date completed _____ Evaluation _____



HISTORY RESOURCE

HOW IS THE LIFE OF A GREAT SONGWRITER PORTRAYED BY THE LILIES OF THE FIELD?



The engineer could scarcely see where the train was going because deep snowdrifts blanketed the tracks, and the feeble beam of the locomotive's headlamp reflected only the blizzard's whirling whiteness.

The cold night wind howled unmercifully as it flung snow at the huge black locomotive. Inching westward through the darkness along the Ohio shore of Lake Erie, the Pacific Express was already three hours behind schedule.

Inside the seven passenger coaches, the 160 weary, holiday travelers could feel the gale's icy breath seep in around the windows in spite of two pot-bellied stoves going full blast in each train car. Among the two dozen or so passengers sitting in the parlor car was a young couple who, unlike most of the others on board, seemed not to be bothered by the foul weather and the delays it was causing.

The young man, in fact, had his Bible open on his knee and a pencil in his hand. Deep in thought and seemingly oblivious to his surroundings, he was apparently composing a piece of music. His wife chatted amiably with the lady in the next seat.



Dover, Inc.

Shortly before dark the train had stopped briefly at a small town just inside the Ohio state line. They were almost snowed in there, but the decision was made to push on in hopes that the storm would let up. Instead it got worse.

Straining to see through the ice-coated window panes, even the passengers who were familiar with the area had difficulty recognizing the terrain as they were nearing the little town of Ashtabula (ash-tuh-BYULE-uh). Before arriving at the station, however, they would cross the high trestle bridge over the Ashtabula River.

Even though the train was making progress at about ten miles per hour, the passengers could tell by the change in the slow clickity-clack of the wheels on the rails that they had started across the bridge. The man looked up momentarily from his writing, and the women paused in their conversation. They stared out the window but could not see past the snowflakes blowing against the glass.

Had they been able to see, they would have realized that their train was some seventy feet above the frozen creek below. At that point the water was only three to six feet deep and was covered with an eight-inch-thick layer of ice. The bridge itself consisted of a single, ironwork span of 159 feet supported at each end by a stone abutment. The original wood structure had been replaced about ten years before.

Just as the engine reached solid ground on the far side of the ravine, the passengers in the parlor car,

which was still only halfway across, heard a loud crack near the front end of the car. This was immediately followed by a similar noise at the other end as the car began to sway from side to side, causing the women to scream.

From below, the terrified passengers heard the awful creaking and groaning of metal beams bending and wooden timbers splintering. The kerosene lamps flickered out as the car tilted. The stoves fell over, spilling burning coals all across the wooden floor. Suddenly they felt the train falling through the darkness!

The young songwriter on the train that December night in 1876 was Philip P. Bliss. He and his wife were on their way back to Chicago to assist Dwight L. Moody in an evangelistic campaign.

During the previous three years Mr. Bliss had been ministering as a music evangelist in churches and revival meetings all over the South and Midwest. He wrote the words and music for hundreds of Gospel hymns and songs, which were being used mightily by the Holy Spirit to bring men and women to repentance and salvation.

In a number of ways Mr. Bliss's life illustrates characteristics of lilies of the field, which Jesus said were arrayed more gloriously than King Solomon.

1 A LILY APPEARS TO BE AN ORDINARY PLANT UNTIL IT BLOSSOMS.

Philip Paul Bliss was born on July 9, 1838, in a log cabin nestled among the forested mountains of Clearfield County in north-central Pennsylvania. He was the third of five children. As the oldest son, he enjoyed a special relationship with his father. Isaac Bliss was, in Philip's words, "... the best man I ever knew. . . . He lived in continual communion with his Savior; always happy, always trusting, always singing."

A diligent reader of the Scriptures, his father faithfully led the family in a daily prayer time. Often in the evenings after a hard day of work, he would sit on the porch and sing hymns. Little Philip delighted in listening to him and soon learned to sing along. The family moved three times during Philip's first ten years, finally settling in a sparsely populated area of Pennsylvania's Tioga County—not far from the New

York state line. At this time Philip's mother began to teach her children at home.



Pennsylvania Historical and Museum Commission

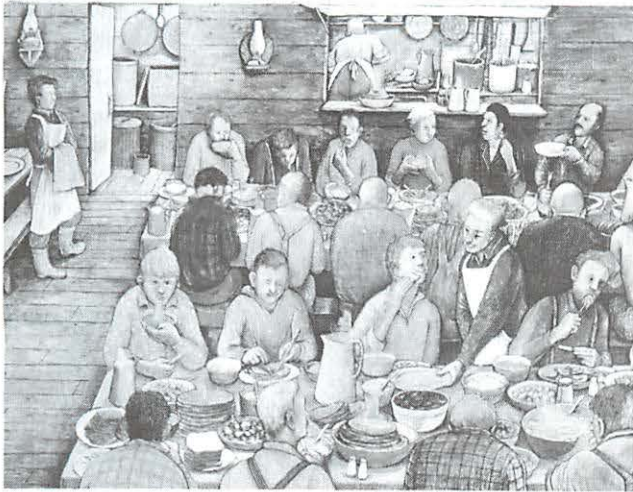
Philip's family was poor while he was growing up in the 1840s, but his Godly parents gave him a rich heritage of faith.

As Philip grew, so did his love of music. One summer day when he was about ten, he went into town. As he was walking barefooted along the dusty street, he heard music coming from the open door of a house. Irresistibly drawn by the beautiful sounds, he went up on the porch and stood just inside the doorway, listening to a young lady playing a piano. It was the first time he had ever seen or heard such a wonderful instrument.

When she finished the song and stopped, Philip said, "O lady, play some more!" Startled because she had not known he was there, the young woman whirled around and snapped, "Get your big feet out of here!" As the embarrassed boy ran down the street, the only thing that kept him from bursting into tears was the memory of the sweet music he had heard.

When Philip was eleven, he had to leave home to start working. He first worked on a nearby farm for a couple of years, then he went off to a lumber camp. The following year found him cutting logs at a sawmill. Whenever he could do so between jobs he went to school. During the time he was attending school near Elk Run, revival broke out among the students.

It was there at the age of twelve that Philip first made a public profession of his faith in Christ and was baptized in a creek near his home. It had not been a difficult decision for him to make, because, as he would testify years later, he could not remember a time when he did not love the Savior and desire to follow Him.



Lumberjack. © 1974 William Kurelek, Houghton Mifflin Company

Young Philip learned to stand alone for his faith in the rough surroundings of a logging camp where he worked as an assistant cook the year he was thirteen.

At age seventeen he was able to spend the whole winter in school. While there he wrote home: "My mind is established, with full purpose of heart, to serve God, to live acceptably. . . ." Enclosed with the letter was a copy of the first poem he wrote.

Apparently Philip did very well in his studies because the next year he was asked to teach school in Allegany County, New York. The year after that he had his first formal training in music at a singing school in Towanda, Pennsylvania.

In the winter of 1857 he also attended a musical convention at Rome, Pennsylvania. This type of gathering was becoming quite popular around the country. A group of people would come together to be instructed by an itinerant music teacher. At the end of three or four days, they would perform a piece of classical music.

These opportunities strengthened young Mr. Bliss's love for music. Another kind of love entered his life around this time, too. In 1858 he taught school in the little town of Rome and rented a room at the home of Mr. O. F. Young, one of the members of the local school board.

Mr. and Mrs. Young had five children. They were Mr. Bliss's pupils in school, but because they spent a lot of time together they also became his closest friends. He especially enjoyed the company of the oldest daughter, Lucy.

One lovely June morning after school was out in the spring of 1859, Mr. Bliss and Lucy were married. Mr. Bliss had no property or material goods with which to start a home, and his bride had no dowry, so following the wedding they went back to the Young homestead. After changing clothes,



Pennsylvania Historical and Museum Commission (Photo by George F. Johnson)

Philip spent several winters teaching in rural one-room schoolhouses in Pennsylvania and New York state.

Mr. Bliss went out to work on the farm, and Lucy went into the kitchen to help her mother.

Mr. Bliss wrote in his diary on his wedding day: "June 1, 1859—Married to Miss Lucy J. Young, the very best thing I could have done."

Even though the Blisses were poor, the Lord blessed their marriage with much happiness and love. They were very involved in the work of their church, and Mr. Bliss was asked to serve as superintendent of the Sunday school. He continued to work as a farmhand and schoolteacher. His burning desire, however, was to study music.

At that point God had not provided the means for him to pursue that goal, and Mr. Bliss began to feel very depressed about it. One summer day in 1860 he received a notice about a musical normal institute (a school for training music teachers) to be held in Geneseo, New York. Philip and Lucy were still living with the Youngs and did not have even one extra dollar to spend on something like this.

As he looked over the program and thought how much happiness it would give him to study music theory and have private vocal instruction from these master teachers, he could not keep back the tears of disappointment. He went into the sitting room and threw himself down on the sofa.

Lucy's grandmother happened to be in the room and asked him what was wrong. She listened sympathetically as he explained. Then she asked, "How much would it cost for you to go, Phil?"

"Oh, Grandma," he replied despondently, "it would probably take at least thirty dollars."

"I have an old stocking that I've been dropping coins into for a good many years," she said. "There might be as much as thirty dollars in it. If there is, you shall take it and go to the normal."

She dug the stocking out of a drawer and emptied it on the dining room table. It turned out to contain more than thirty dollars, and Mr. Bliss joyfully went off to Geneseo for six weeks of the most demanding (and most rewarding) musical training he had ever had.

Later he was able to pay back the thirty dollars. His spirit of gratefulness is reflected in what he wrote in a letter to the family: "... But [I] can never return her such kindness as she showed Lou & me. ..."

He returned to Rome with enough confidence and enthusiasm to launch a new career as a self-employed music teacher. His father-in-law furnished an old horse and a twenty-dollar melodeon so Philip was able to start holding his own singing schools in nearby towns that winter.



The Metropolitan Museum of Art

Mr. Bliss got a portable melodeon, or lap organ, and began teaching music in different towns.

He continued doing this for the next three winters. During the summers he worked on the farm and twice went back to Geneseo for further study.

The Lord honored the young man's diligence and he was able to save enough money to buy a small house in the village. Finally, after four years of marriage, he and his wife would have a home of their own, which Mr. Bliss christened "The Cottage of Contentment."

2 A LILY EXISTS FOR THE BENEFIT OF OTHERS.

The Blisses, however, were not the kind of Christians who keep the Lord's blessings to themselves. They promptly invited Mr. Bliss's

parents, who lived in an old backwoods farmhouse, to come share their home.



P. P. Bliss—A Centennial Sketch of His Life and Work, Victor C. Dett.

The Bliss home in Rome, Pennsylvania has now been turned into a museum.

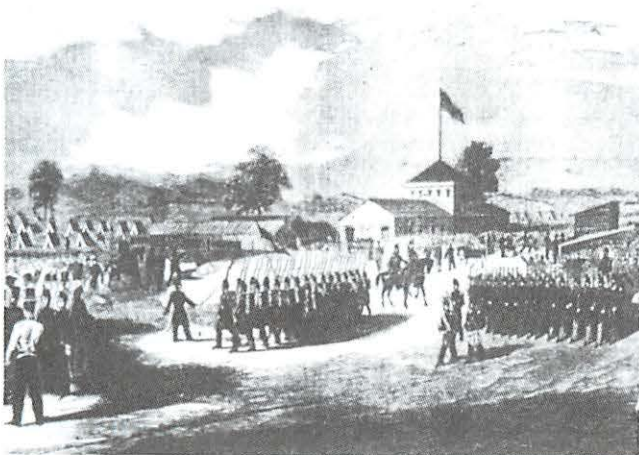
The day Mr. Bliss carried his father from the wagon into the house he told him, "This is your new home." The old man sat in a chair on the front porch, and tears streamed down his weather-beaten face. "Phil," he said, "I never expected to have so good a home on earth as this." After a few happy months the elder Mr. Bliss died, but Philip was always grateful he had this time to minister to one who had been such a Godly influence in his life.

A few years later Mr. Bliss mentioned his father in a letter to his older sister: "If we all had his faith and trust—such humility! But I am glad and thankful we were always poor; and oh, we begin to see and feel, how much we owe to Pa for his example and influence. We may be in better circumstances, but we can hardly hope to lead a better, purer, more zealous Christian life."

It was in 1864 that Mr. Bliss's first musical composition was published. The piece had been rejected by the first publisher he contacted, and he was so discouraged he almost did not submit it to another. He was delighted when the famous Chicago firm "Root and Cady" accepted it. A sentimental love song of the sort that was popular at the time, the composition was completely lacking in the spiritual power that characterized his later work.

The song sold several thousand copies, and its success opened some doors that led to Mr. Bliss's later ministry. Mr. Root, who corresponded with Mr. Bliss about the song, was more impressed with the songwriter than he was with this particular song.

About a year later Mr. Bliss began singing with a quartet called "The Yankee Boys." The group toured central Pennsylvania, giving concerts of popular patriotic music.



Pennsylvania Historical and Museum Commission

During the summer of 1865, Mr. Bliss was drafted into the Union Army. Because the war was over, however, he was discharged after only two weeks. He immediately rejoined "The Yankee Boys."

3 A LILY BLOOMS WHEREVER IT IS PLACED.

In the fall Root and Cady invited the quartet to come to Chicago and begin touring under the firm's sponsorship. The group liked the idea of a guaranteed salary with all expenses paid and promptly accepted the offer. Their first few engagements after they came to Chicago were not successful, and they had to disband, but Mr. Root offered Mr. Bliss a position doing musical conventions and normals for the company.

Mr. Bliss took the job, and he and his wife stayed in Chicago. From that time on, Chicago would be their base of operations, although Pennsylvania would always be home. For the next four years the Blisses traveled from town to town throughout the Midwest, returning to Chicago for a few days every four or five weeks. In addition to holding conventions, Mr. Bliss gave concerts and provided private music instruction.

In 1868 he spent several weeks in Chicago writing the music for a book published by Root and Cady. On the move again that summer, he wrote to his mother on his thirtieth birthday, "Almost every Sabbath I go out to address the Sabbath Schools and sing with them. In several towns I have held children's meetings at five o'clock, Sabbath, trying to do something for the cause of the Master.

"If He shows me the way for work in this direction—and because I like it, I think He will—I mean to give some considerable time to it, and I write

especially to ask you to pray for me in this field of labor, the Sabbath School. Pray that I may be blessed in leading the children to Christ, and glorify God, not myself."

Reflecting back on 1868, Mr. Bliss wrote in his journal at the end of the year, "Thus the overruling Providence has led me by unmistakable evidences to see and recognize His dealing with me all through life's journey.

"Truly we have much to be thankful for. My dear wife, my greatest earthly treasure, joins in the opinion that we are and ever have been highly favored of Heaven; that we find our greatest enjoyment in each other's society, when striving to make each other happy, and our highest aim is to be useful to ourselves and others, and to 'glorify God that we may enjoy Him forever.' "

Another event of providential leading took place during the summer of 1869. One Sunday afternoon when the Blisses were in Chicago, they went out for a walk before going to church. Passing by the courthouse on Clark Street, they came upon an open-air evangelistic meeting. Mr. Bliss was attracted by the earnestness of the speaker, who was addressing the crowd from the courthouse steps.

After listening for a few minutes, Mr. Bliss turned to the man standing beside him and asked the preacher's name. His answer confirmed what Mr. Bliss already suspected.



The Chicago Historical Society

It was on the steps of this Chicago courthouse that P. P. Bliss first heard the great evangelist D. L. Moody.

The speaker was D. L. Moody. Mr. Bliss had been hearing about the evangelist ever since he came to Chicago, but they had never met. Mr. Moody closed his message with an invitation for everyone to come a nearby hall where the evening meeting would begin shortly. Many in the crowd began to move in that direction, and Mr. and Mrs. Bliss decided to join them.

Mr. Moody's regular songleader was not present that evening, and the singing was rather half-hearted. From where he was sitting in the audience, Mr. Bliss tried to lead out in the hymns. The evangelist was impressed by the singer's vocal abilities and made it a point to meet the young man after the service. D. L. Moody approached Mr. Bliss at the close of the meeting and introduced himself. In the course of the conversation that followed, Mr. Moody exacted a promise from Mr. Bliss that whenever he was in Chicago on Sunday evenings he would come and help with the singing.

Mr. Bliss was glad to assist in this way, and Mr. Moody began to ask him to sing at the noon prayer meetings and various other gatherings as well. Since by this time Mr. Bliss was spending more time writing music and less time traveling, he was able to be there quite frequently. Mr. Moody was often heard to say what a shame it was that Mr. Bliss had been in Chicago for four whole years before they met.

In fact, since this was long before Mr. Moody had met his most famous coworker, Ira Sankey, it has been said that it was P. P. Bliss's powerful solos that convinced the great evangelist that he needed a Gospel singer to assist him in all his meetings.

Another example of how Mr. Bliss's singing and leading of congregational music could affect a crowd of people occurred about this same time. A Christian worker named Edward Eggleston had gone to a small Illinois town to hold a Sunday school convention. Very few people were present for the first afternoon meeting, and there was a real sense of heaviness as the service progressed. After about an hour Mr. Eggleston was informed that P. P. Bliss had arrived in town and was willing to sing.

"Who is this Bliss fellow?" asked Mr. Eggleston somewhat skeptically.

"A music teacher who travels for Root and Cady," was the reply.

"Bring him in."

Mr. Bliss agreed to sing but asked if he might use his melodeon. The pastor of the church where the convention was being held was reluctant to give permission but did not refuse. So the instrument was

brought in, and and Mr. and Mrs. Bliss both sang. "And such singing!" exclaimed Mr. Eggleston later. "Instead of some poor country singing-master, beating out his music with a flail, I soon found that here was a man with one of the richest voices in the world, capable of putting his own strong spirit into all he sang."

Soon many in that audience, including the reluctant pastor, were in tears because the Spirit had so touched their hearts through Mr. Bliss's singing. That night the service was packed, and a meeting which might have been a disappointment turned out to be quite a success.

As the year 1869 came to a close, the Lord led Mr. Bliss to resign his salaried position with Root and Cady. It was not a big change because he continued holding musical conventions and normals and giving concerts and private instruction. Now, however, he could set his own schedule in order to allow time for hymnwriting and evangelistic work.

A few months after leaving Root and Cady, Mr. Bliss was introduced to the man with whom he would work most closely in the coming years. His name was Daniel Webster Whittle, and he was a

business executive with the Elgin Watch Company. Having attained the rank of major in the Union Army during the war, he was usually addressed by his military title.



Daniel Webster Whittle
1840-1901

A close friend of Mr. Moody, Major Whittle was a deeply committed Christian. About the time that Mr. Bliss met him the Lord began to open up a preaching

ministry for Major Whittle. In May of 1870 he was invited to speak at a Sunday school convention in Rockford, Illinois. He wanted to take a singer with him and asked Mr. Moody for a recommendation, but the man he first suggested had a previous commitment. Just then Mr. Bliss walked in, and Major Whittle immediately asked him to go.

The singer readily agreed and boarded the train with the major that same afternoon. In the meeting that evening Major Whittle was very impressed with Mr. Bliss's powerful voice and winsome personality. In turn, Mr. Bliss was so

"HOLD THE FORT!"

Major Whittle told the story of an incident which occurred near Atlanta toward the end of the Civil War. General William T. Sherman had begun his famous "March to the Sea." Confederate forces under General John Hood managed to maneuver around behind Sherman's army, where they proceeded to tear up the railroad and burn fortifications. They took a number of prisoners and began their advance toward the Union outpost at Allatoona Pass as General Sherman's army pursued, trying to overtake them.

Under the command of General Corse, Allatoona Pass was an important position because of its strategic rail link to the north as well as the large amount of rations and other supplies stored there. The troops defending the pass were outnumbered by the Confederates nearly two to one, and General Sherman and his forces were almost twenty miles away. The Confederates quickly surrounded the garrison and demanded surrender, but General Corse refused to give up. In the fierce battle that followed, the Union troops were gradually driven from the earthworks to a small fort on the crest of a hill.

Their situation appeared hopeless, but just then an officer looked up from the battle long enough to see a signal flag on a mountain way across the valley. The signal was answered, and the distant white flag began to wave back and forth, slowly spelling out a message from General Sherman. "Hold the fort," it said, "I am coming." As the weary infantrymen heard this word from their commander, a shout went up, and they began to fight with renewed courage and vigor. During the next three hours, half their number, including General Corse,

would be cut down by enemy rifle fire. The remaining soldiers were able to hold out, though, until Sherman's advance guard arrived and forced the Confederates to retreat.



General Sherman was anxious to know if his instructions had been received by the beleaguered troops at Allatoona Pass.

Major Whittle used the analogy that we as Christian soldiers should be motivated to continue fighting against Satan's power because our Supreme Commander has signaled to us that He is coming. "Hold the Fort" eventually became one of Mr. Bliss's most widely known and best-loved Gospel songs. (For the words and music of "Hold the Fort" see *Hymn Histories*, page 282.)

inspired by one of the illustrations Major Whittle used in his sermon that he wrote a song about it when he got home that night.

That same summer the pastor of a large church in Chicago mentioned to Major Whittle that the church was looking for a choir director. On his recommendation Mr. Bliss was eventually selected for the position. Mr. Bliss also became superintendent of the Sunday school, which often had an attendance of 600 or 700 children.

Mr. Bliss was very effective in working with youngsters, perhaps because of the special love he had always held for them. He particularly enjoyed teaching them to sing and wrote many songs especially for young voices.

Because Major Whittle's house was only a block from the church and Mr. Bliss wanted to be near his work, the Bliss family moved in with the Whittles for about six months.

It was a blessed time of fellowship for both families. The major's invalid father was living with them at the time, and Mr. Bliss made a special effort to show kindness to the old gentleman. He would often cheer the elder Mr. Whittle by singing his favorite songs.

The pastor with whom Mr. Bliss worked during these years described the musician as "... intensely sympathetic and outspoken, with a heart overflowing with kindness of spirit, a conscience quick to hear and imperative to heed every call of duty, a

devotion to the service of the Master that never seemed to falter or grow cold.”

Another reason this pastor came to esteem his new coworker so highly was the convictions Mr. Bliss held regarding what kind of music is appropriate for Christian worship. There was a trend in that era, especially among large urban congregations, to introduce waltzes, arias, and sonatas as part of the worship service.

Mr. Bliss, in contrast, felt that church music which was showy or entertaining was an abomination to the Lord. He believed “. . . that the music should be strictly spiritual music—not selections made on the grounds of taste or high musical character, but selections aimed at honoring God, exalting Jesus Christ, magnifying His Gospel—music, in a word, that God’s Spirit could wholly own and use to comfort, strengthen, and inspire God’s people, and lead unsaved souls to Christ.”

Believing that the choir’s purpose in the service was not to perform but to lead in worship, Mr. Bliss always began rehearsals with prayer. Directly opposite the choir loft was a stained-glass window which featured a beautiful crimson cross. Often in the middle of a practice session he would stop and point to that cross.

“I am glad,” he would say to the choir, “we have the cross always before us. Let us forget everything else when we sing. Let us seek to have the people lose sight of us, of our efforts, our skill, and think only of Him who died there.” His exhortations were effective because he did not just say the words, he lived them.

One winter night the church where Mr. Bliss served caught fire. He stood helplessly in the crowd of horrified onlookers as the inferno raged. The blaze climbed higher and higher, causing the stained-glass stars which decorated the front windows of the church to glow. As the flames spread they swallowed the large, wooden cross mounted on the gable so that its form stood emblazoned against the black sky.

Just then Mr. Bliss recognized one of his Sunday school pupils in the crowd. Coming up to the boy, he put his arm around his shoulder and said, “James, won’t you give your heart to the Saviour tonight? Why don’t you come to the cross right now? Look at it up there. It never was more beautiful.” His earnest pleas persuaded the young man, and he gave his heart to Christ that night.

Although Mr. Bliss was able to transform this tragedy into a springboard for faith, he was soon to be tested again—this time in a more painful way.

No details are known, however, it must have been around this time that the Blisses lost their firstborn child. Perhaps the baby was stillborn because no name or birthdate is ever mentioned. Whatever suffering they went through, we can be sure that the Blisses found God’s grace more than sufficient. When their son Philip Paul, Jr., was born in November 1872, Mr. Bliss wrote, “Lou awfully sick—much worse than before.” The Lord was merciful and soon both baby and mother were doing fine.



Memoirs of Philip P. Bliss, D. W. Whittle, A. S. Barnes and Company

Little Paul was such a delight to his father that when Mr. Bliss had to go away for a meeting a couple of months later, he said in a letter to a friend, “I don’t want to leave home one bit. . . .”

During this period Mr. Bliss continued to travel, holding conventions and normals as he had before, but in many ways his heart was not in his work. He was writing fewer secular pieces, putting most of his efforts into Gospel songs, Sunday school choruses, and hymns.

Mr. Moody, seeing what an effective witness and songleader Mr. Bliss was, began urging him to go into evangelistic work full-time. Mr. Bliss was not only willing, but in fact greatly attracted by this possibility. Yet, he wanted to be sure that it was the hand of the Lord leading him, not just his own desire or the persuasive appeals of Mr. Moody.

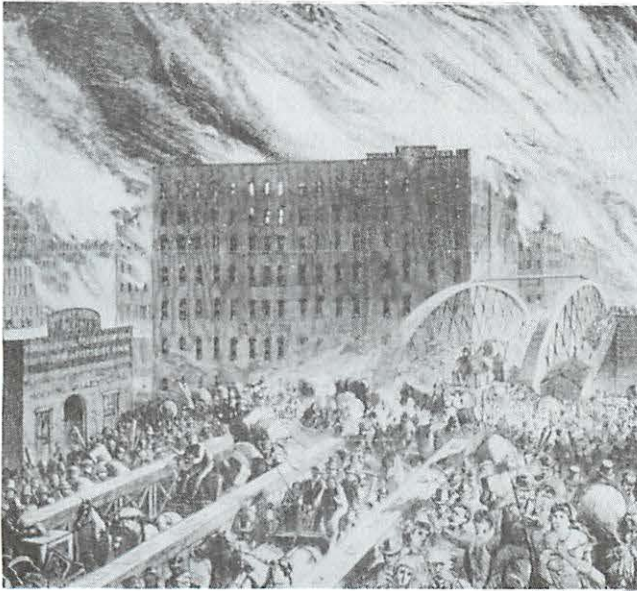
During the fall of 1873 Mr. Bliss prayed about the matter constantly. He hesitated because he doubted that he could be useful in evangelistic work. Mr. Moody, who was holding meetings in Great Britain at the time, wrote several letters encouraging Mr. Bliss to simply step out in faith. He was also writing to Major Whittle in an effort to convince him to give up his business and devote all his time to preaching the Gospel.

In one of his letters, Mr. Moody told Mr. Bliss, “You have not faith. If you have not your own on this matter, start out on my faith. Launch out into the deep.”

About this time Mr. Bliss was given the opportunity to move to California. If he had been attracted to worldly fame and fortune, he probably

would have accepted the invitation. The prestigious “Handel and Haydn Society” of San Francisco offered him an annual salary of \$3000 in gold to become their director.

Another event during this time period seemed to put everything into perspective for the Blisses. Their neighbors and close friends, Mr. and Mrs. Horatio G. Spafford, had four daughters. Mr. Spafford was a lawyer and also owned a great deal of real estate in Chicago.



Chicago Historical Society

Mr. Spafford's business suffered tremendous losses in the Great Chicago Fire, but his faith in God never wavered. Grateful that he still had his family and his law practice, he gave very sacrificially to help those who had lost everything.

In 1873, many Chicago schools had still not been rebuilt following the Great Chicago Fire of 1871, so the Spaffords decided to enroll their girls in an academy in England. Just as the family was ready to leave for Europe, a development in Mr. Spafford's law practice forced him to stay behind in Chicago. He sent his family on to New York, and they set sail on a ship called the *Ville de Havre*. He was to follow on another ship as soon as he could get away.

Halfway across the Atlantic, the *Ville de Havre* collided with another ship and sank. Most of the passengers and crew drowned. Mrs. Spafford was found almost unconscious, clinging to a piece of wreckage, but all four daughters were gone. From the rescue ship, she was able to send a message to her husband in Chicago. It consisted of only two words: “Saved, alone.”

The impact of such a telegram would have shattered the faith of many men, but H. G. Spafford

was able to put it into eternal perspective. As he prepared to leave for Europe immediately, his mind kept coming back to the thought of God's sovereignty. The promises of His Word shone like a light through the darkness which now engulfed his soul.

He expressed his feelings in a few hastily written verses and gave a copy to his friend P. P. Bliss. Mr. Bliss took the poem and set it to music:

When peace, like a river, attendeth my way,
When sorrows like sea-billows roll;
Whatever my lot, Thou hast taught me to say,
It is well, it is well with my soul.

While Mr. Spafford was in England, he spent some time with Mr. Moody. The great evangelist shared with the lawyer the urgency in his spirit about the need for their mutual friends, Mr. Whittle and Mr. Bliss, to leave their jobs and devote all their time to “Gospel work.”

Mr. Spafford returned to Chicago, and, in Major Whittle's words, “. . . urged the matter upon us, and his words and representations were used of God in bringing us both to regard it as probable that we should respond to the call.”

4 A LILY HAS NO THORNS.

In the meantime, Mr. Bliss was caught in a conflict at the church where he directed the choir. Apparently there were some in the congregation who did not share his views about the role of music in the worship service. They wanted the choir to perform with a more entertaining style.

Even though it must have been a difficult time for him emotionally, the only record of it in Mr. Bliss's correspondence is very brief and indicates that his concern was for the welfare of the church, not for himself. In a February 1874 letter he mentioned the church, noting that someone else would be leading the music.

He simply said: “I know not what they'll do. More showy music was demanded, and I resigned. I must insist on plain music for devotion in public worship. And I can have no sympathy with operatic or fancy music for Sunday.” Mr. Bliss stood up for his convictions but without any bitterness or a judgmental spirit. The following month Major Whittle and Mr. Bliss decided that one way to discern if the Lord was indeed calling them into full-time

evangelism would be to conduct a series of meetings and see what happened. If God gave them converts, they would regard it as His stamp of approval on their ministry.

They had been invited to a church in Waukegan, Illinois. They agreed to go and hold three midweek services to see what God would show them. The week before they were to go Mr. Bliss wrote to the pastor there: "Every time you think of our coming, offer a prayer that it may be purely for God's glory."

The first service was on a Tuesday evening. The attendance was poor, and nothing extraordinary happened, but both men felt that the Lord had been with them in a special way. The next day, however, was rainy, and they expected to draw an even smaller crowd that night. Instead they had twice as many people as the first night.

Even more significant than the increased attendance was the way the Spirit moved. After the sermon when Mr. Bliss sang "Almost Persuaded," the congregation became very quiet. All over the building people began to stand up, indicating they were ready to accept Christ.

The next afternoon Mr. Bliss met with Major Whittle in the pastor's study at the church. They spent several hours in intense prayer. The little room seemed almost to glow as the men were filled with a sense of God's presence. It was there that Mr. Bliss said "Yes" to the Lord's call and yielded his rights and expectations. He had to yield his right to financial security and his expectation of soon being able to settle down and stop traveling. He also gave up his reputation as a composer and even his right to write secular music.

The meeting that evening confirmed that the Lord was ready to use these two men. Over twenty people accepted Christ, and many others were under deep conviction. The next morning they returned to Chicago rejoicing. Major Whittle turned in his resignation at his company, and Mr. Bliss began looking for substitutes for the conventions he had already committed himself to do.

5 THE BEAUTY OF A LILY ELICITS PRAISE FOR ITS DESIGNER, NOT FOR ITSELF.

The letter Mr. Bliss wrote to his mother during the three days of meetings reflects the joy he felt at knowing this new direction was of the Lord. He

described his new vocation as "... giving all my time, voice, and heart to the cause of Christ, direct." Then he went on to say, "I've always wanted to do this, and now I can and must. Oh! pray that God may use me and bless my songs (His gift) to the winning of many precious souls. Praise Him for selecting me, even me, out of such surroundings, and giving me such honor. You can't imagine how perfectly happy I am, and Lou too, already."

From that time on, the Lord kept Mr. Bliss very busy in his new work. In less than three years' time he and Major Whittle would hold evangelistic crusades in twenty-five towns and cities in ten different states. These meetings lasted from one to four weeks each. Mr. Bliss also continued leading the music and singing solos in some of Mr. Moody's meetings.



Memoirs of Philip P. Bliss, D. W. Whittle, A. S. Barnes and Company

Mrs. Bliss was able to go with her husband to some of his crusades. Because she was an accomplished soloist herself, they often sang together in the meetings.

By the time Mr. Bliss left his church position he had already published three books of Sunday school songs and Gospel hymns: *The Charm* (1871), *The Sunshine* (1873), and *The Joy* (1873). During his first year in full-time evangelistic work he completed and produced *Gospel Songs* (1874). Also, a number of his compositions were published in the books of others and in sheet music form.

His music had always been popular, but it seemed that now the Holy Spirit began to use it in a powerful way as part of the spiritual awakening that was sweeping across America and Great Britain. Mr. Bliss was a very talented musician, but he was always quick to acknowledge the Lord as the source of his abilities, both as a singer and composer.

For example, shortly after the publication of one of the Sunday school songbooks, he wrote to a friend: "Yes, indeed, the Lord has blessed 'Sunshine' greatly. Help us to praise Him for it. It's His book anyhow, and He should have the praise."

Although Mr. Bliss was a very diligent and methodical worker, his songs were not planned, nor were they produced by his deliberately setting out to write a hymn. They came when a particular Scriptural truth got hold of his soul. Sometimes a melody would come to him. He would work it out and get it on paper, and then he would wait for the words to come.

At other times, a line or two of the chorus or perhaps the last verse of a hymn would serve as the foundation for the rest of the piece. Most of the time, though, God would give him both the tune and the text at the same time.

Major Whittle said, "My most vivid recollections of him will always be of his entire self-abandonment of joy in the consciousness of being used of God in bringing out in song some precious Gospel truth, some exalting view of Christ. He came to me often with the theme of a hymn . . . and asked me to thank God and pray with him that God might bless the song. He never felt that the songs *originated* with him. They seemed to him to come *through* him from God."

Mr. Bliss wrote to another hymnwriter with whom he had been corresponding: "Thanks for your complimentary mention of the songs I have had the pleasure of writing. You need not call them mine. If there is any good in any of them, it came from Him, the Source of all good. To Him be all the praise."

Mr. Bliss's statement that God deserved all the credit for his music was not just something he said. During all their time in Chicago the Blisses had either rented or boarded, but as their family grew they began to want a house of their own. The year after their second son was born, the royalties on his songbooks came to over \$60,000. Even though Mr. Moody urged them to take just \$5,000 of it and buy a house, Mr. Bliss refused. He said, "It must all go for the advancement of the work of the Lord."

6 A LILY DEPENDS ON SOURCES OUTSIDE ITSELF FOR ITS SUSTENANCE.

When Mr. Bliss went into full-time evangelism, he gave up a very comfortable income, trusting God to supply his needs. That God did so is indicated by

the fact that in all of Mr. Bliss's many letters to family and friends there is no mention of his ever being short of funds for any need. On the other hand, there are several references to special ways the Lord provided. On one occasion, for example, an unexpected \$500 in royalties was gratefully received.

Mr. Bliss learned to trust the Lord to meet other kinds of needs as well. In the spring of 1875 the Whittle-and-Bliss team was scheduled to hold meetings in Nashville. A few days before the first meeting, however, Major Whittle decided he could not go because of illness in his family.

They telegraphed and wrote letters to several different preachers, trying to find someone who could accompany Mr. Bliss. Both he and Major Whittle thought of Dr. Brookes from St. Louis as the man they needed to go and preach, but they had decided not even to ask him because they knew he was too busy. No one was able to go, but Mr. Bliss had prayed about the matter and was not worried.

The day he left Chicago, Major Whittle came to the station to see him off. Mr. Bliss told him, "Now don't worry, Whittle. I know the Lord has somebody to go with me."



The next morning Mr. Bliss walked through the train handing out tracts.

When Mr. Bliss walked into the car that had joined the train at St. Louis, he was surprised to see Dr. Brookes sitting there. After greeting him joyfully, Mr. Bliss said, "This is the answer to my prayer! You are to go with me to Nashville and take Mr. Whittle's place tonight."

The other man looked somewhat confused. "I can't do that," he replied. "I'm on my way to give

a commencement speech. There's no way I could preach in Nashville tonight and be back in Danville for the graduation tomorrow morning."

Mr. Bliss just said, "Let's wait and see. I'm sure you're going to Nashville with me." When the train reached Louisville, Dr. Brookes found to his amazement that he had made a mistake about the date of the graduation. He was one week early! This meant he could go to Nashville. He preached every night for a week to a crowd of four to five thousand people.

That summer when Mr. Moody returned from Great Britain, Mr. Bliss had been hard at work on a new songbook he planned to publish. His popularity was such that the publisher expected the songwriter to earn as much as \$12,000 in royalties. When Mr. Moody asked him to collaborate with Mr. Sankey in compiling a Gospel hymnal for use in their meetings, Mr. Bliss took most of the songs he had written for his book and put them into this joint effort without giving a thought to the royalties he was sacrificing.



The Lives of the Eminent American Evangelists D. L. Moody and Ira Sankey, Elias Nelson

As Mr. Moody's soloist and songleader Ira Sankey became famous by singing the Gospel hymns of P. P. Bliss. Mr. Bliss did not feel any jealousy toward Mr. Sankey and counted it a joy to work with him as they compiled two songbooks.

In town after town, Major Whittle and Mr. Bliss were so successful that the local newspapers began publishing accounts of the meetings. From Louisville Mr. Bliss wrote to his mother, "The Lord has done

and is doing a mighty work here. Thousands and thousands crowding daily and nightly to hear the old-fashioned Gospel of Christ. Three or four meetings daily; 200 or 250 arose for prayers Sunday night. This morning I had a glorious praise meeting in the hotel. Last evening, in the mass meeting in the hall, an immense opera house jammed full—2500 or 3000 people."

Though thrilled with the large crowds, Mr. Bliss got his greatest joy from being part of some of the small miracles that took place as individuals found salvation. When a woman who was a friend of the Bliss family was saved, he wrote home:

"Hallelujah! There is joy in heaven. If all the meetings had been carried on and only this one result, how richly paid I would have been. Yet hundreds of souls just as precious have been saved . . . and can it be that He has chosen me to be an instrument, a vessel in which to carry the water of life to perishing souls? Oh! pray daily that I may be a vessel sanctified and meet for the Master's use."

An incident that illustrates Mr. Bliss's willingness to be a sanctified vessel occurred late one night in Jackson, Michigan. After the evening service Mr. Bliss needed to send a telegram, so he went to the telegraph office, which was located in the train depot.

While he was writing out the message, a man who had been in the revival meeting came in and started talking about it. He had not noticed that Mr. Bliss was there. "Well, I've been to church," he said to a little group of railroad men who were sitting around the stove, "but I'll tell you, if I couldn't talk any better than that preacher, I'd quit! But that Bliss fellow can really sing."

About that time he saw Mr. Bliss standing there and immediately recognized him. Without a trace of embarrassment, the man said, "Well, look who's here! No offense intended, but I don't believe a word of what Whittle said." As Mr. Bliss proceeded to present the Gospel to him, it came out that what he objected to was Major Whittle's statement that a man could be sincere in his religious beliefs but still be lost.

Mr. Bliss tried to explain it to him this way: "Suppose somebody comes in here and wants to go to Chicago tonight. By mistake he gets on the train headed for Detroit. It doesn't matter how sincere he is in believing that he's headed for Chicago. The fact is, he'll never get to Chicago until he gets off that train and gets on one going the opposite direction."



The young man in the train station scoffed at the preacher, but he was very impressed with Mr. Bliss's music. The singer took advantage of the opportunity to share the Gospel with him.

The illustration was so clear that the young man had to admit that it made sense. It was late and Mr. Bliss was exhausted, but he stayed there in the train station talking to him for an hour or so. The man was not convinced, so Mr. Bliss went back and talked to him several more times before the crusade was over and he had to leave town.

7 FROM THE HEART OF THE LILY COMES A FRAGRANCE THAT ATTRACTS.

In another city the pastor who had organized the local churches for the evangelistic campaign was the one who was most deeply affected. For several weeks Mr. Bliss and Major Whittle lived in the pastor's home. After having had this opportunity to observe their personal lives, the pastor's son said, "The calm, peace, and joy in the Holy Spirit that pervaded their lives spoke even more loudly than their sermons and songs."

Eventually the power of their Godly examples bore fruit in that pastor's life as he came to the point of yielding to the Lord his literary ambitions. From then on God was able to use him in a much more effective way.

So it went in Milwaukee, Madison, Memphis, Montgomery, Minneapolis, and Mobile—over two dozen cities by the end of 1876. Mr. Bliss said, "I can testify to you that this life of service to Him who hath bought us is a very delightful one. My cup of joy has always been full, but in these glorious meetings it often runs over. . . ."

One time when he was in Chicago for a few days between meetings, Mr. Bliss went to a prayer meeting at his home church. Coming in late, he sat in the back, but the pastor saw him, called him to the front, and asked him to sing a hymn called "My Prayer." He came and sat at the piano. After playing a few chords, he stopped and read to the congregation a line from the last stanza, "More joy in His service." He went on to say, "I don't think I can sing that as a prayer any more. It seems to me I have as much joy in serving the blessed Master as it is possible for me to bear."

Indeed 1876 was a joyful year for the Bliss family. That Christmas Mr. and Mrs. Bliss were delighted after months of traveling to be together with their two boys at the home of Mrs. Bliss's parents in Rome. Mr. Bliss's mother was also there, along with many other relatives. The songwriter took special delight in giving a carefully selected gift to each member of the family. He even sent gifts to several needy families in the village as well.

All too soon Christmas was over, and Mr. Bliss turned his attention to other matters: songs he was composing, music to be sent to the publisher, and the possibility of going to England with Mr. Moody in 1877. Each day, though, in spite of his busy schedule, Mr. Bliss took time to go visiting in the neighborhood to witness to any unsaved person he could find. As a result of his efforts and the sacrifices he made during those days, more than twenty people came to know the Lord.

At the midweek service at his church that week he sang many of his own hymns. Those present felt that he sang with even more power than usual. He closed the meeting with a new song called "Hold Fast Till I Come." He introduced it by saying that this was one of the first times he had sung it, and it might be the last song he would ever sing to them.

Mr. Bliss had wanted to stay in Rome with his family until after New Year's Day and wrote to the major telling him of his plans. Late Wednesday evening, however, Mr. Bliss received a telegram saying it had been advertised that he would sing at the New Year's Eve service in Mr. Moody's Tabernacle in Chicago on Sunday afternoon.

Rather than fretting about having to change his plans and cut his holiday short, he began making preparations for a hasty departure the next day. Thursday morning he took his two little boys aside, talked and prayed with them, and kissed them good-bye. They were going to stay in Rome with their grandparents. Then bidding farewell to a roomful of relatives, he said, "I would much rather stay here, but I must be about the Master's work."

He and Mrs. Bliss took an afternoon train in order to reach Buffalo in time to catch an express leaving for Chicago at midnight. Due to a problem with the engine, however, they were not able to get to Buffalo that day and they missed their connection. They had checked their baggage through to Chicago so it ended up on a different train and went on ahead of them.

They decided to spend the night in Hornellsville, New York, and continue on the next morning. It was snowing when they reached Buffalo and changed trains, and the closer they got to Lake Erie, the heavier the snowfall became. It was at least two feet deep everywhere, with high drifts in many places.



Railroads: Today and Yesterday, © 1967 Walter Busch, G.P. Putnam's Sons

Every car had two stoves, one by each door. It was so cold that day the conductor stayed busy putting wood in them.

Late in the afternoon a second engine was added to help pull the Chicago-bound train, but progress through the blizzard was still very slow.

At 7:45 p.m. a passenger named Mr. Burchell, a businessman from Chicago, made his way from one end of the train to the other. Passing through the parlor car, he happened to recognize P. P. Bliss and his wife. He mistakenly thought the children he saw nearby were the Blisses' boys.



Courtesy of New York Public Library

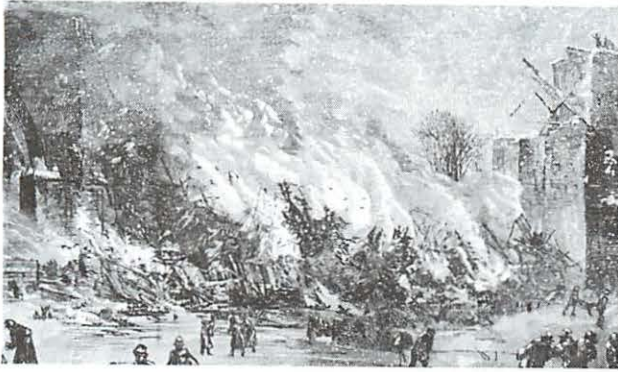
Mr. and Mrs. Bliss were riding in the parlor car as the train approached the Ashtabula bridge.

A few minutes later as the engineer slowed the train to about ten miles per hour, they started across the bridge high above the Ashtabula River. Suddenly the trestle collapsed, hurtling the entire train, except the lead engine, to the bottom of a seventy-foot-deep ravine.

The parlor car, being in the middle of the span, apparently landed in the creek first, and the other cars crashed down on top of it. The tangled mass of trusswork and smashed train cars lay half-submerged in the icy water. The broken stoves, kerosene lamps, and wall candles, as well as burning pieces of coal from the overturned locomotive set the entire wreck ablaze within minutes. Many of those who survived the crash itself were trapped in the wreckage and either suffocated or were burned to death.

Those who managed to crawl out through the shattered windows found themselves in waist-deep, icy water or in snowdrifts. After the crash Mr. Burchell thought he saw Mr. Bliss. Evidently he had somehow escaped from the crushed parlor car, but when he saw that Mrs. Bliss could not get out, he went back in to try to rescue her. They both perished in the flames.

The next morning Major Whittle read of the disaster in the Chicago newspaper and feared the worst. He tried all day to ascertain whether the Blisses had left Rome. That afternoon a telegram from Ashtabula brought the heartbreaking news of their deaths. He went immediately to the scene of the accident but was unable to find any trace of his dear friends.



Deep snow and high winds hindered the rescue efforts. A number of the survivors who were taken to the hotel in Ashtabula died during the night.

At least 100 people died in the wreck, and the subsequent fire consumed the bodies so that only ashes remained. Many watches, rings, buttons, and other metal objects were raked up from the bottom of the creek, but Mr. Whittle could identify nothing that belonged to Mr. or Mrs. Bliss.



P. P. Bliss—A Centennial Sketch of His Life and Work, Victor C. Derry

Philip Paul Bliss
1838-1876

8 **EVEN AFTER A LILY IS GONE, OTHER FLOWERS SPRING FROM ITS "DEAD" ROOTS.**

Thinking that their baggage had been destroyed by the fire as well, Major Whittle was

surprised a few days later when Mr. and Mrs. Bliss's trunk turned up in Chicago in an unclaimed baggage area. He did not know it had been on a different train. Among the personal papers it contained was a poem Mr. Bliss had written just a few days before. As the poet wrote the words, "I will sing of my Redeemer," he did not know that before the week was out he would be singing his Redeemer's praises as a member of the Heavenly choir.

James McGranahan, a close friend of Mr. Bliss, took the words and set them to music. The hymn quickly became one of the favorites of Christians everywhere. Its title could be considered the motto of P. P. Bliss's short but powerful life. The last two stanzas say:

I will praise my dear Redeemer,
His triumphant power I'll tell,
How the victory He giveth
Over sin, and death, and hell.

I will sing of my Redeemer,
And His heavenly love to me;
He from death to life hath brought me,
Son of God, with Him to be.

For quite some time Mr. Bliss had been urging Mr. McGranahan to go into full-time music evangelism. The Lord used the death of his friend to finally convince Mr. McGranahan to get involved in this work. In fact, he began traveling and ministering with Major Whittle in Mr. Bliss's place.

During the meetings Mr. Bliss and Major Whittle had conducted in Louisville, a young pastor by the name of A. B. Simpson was convicted of his own lack of spiritual power. Following their examples, he sought the Holy Spirit, and the Lord laid it on his heart to "preach to the masses." Later he led his church to build a large tabernacle where he held evangelistic services for the lost people of the city. He made sure that music was an important part of these meetings and even began writing Gospel hymns himself.

Only God knows how many others were motivated by the Godly lives of Mr. and Mrs. Bliss to dedicate themselves more fully to the Lord's work. After the tragedy at Ashtabula, Mr. Bliss's sister and brother-in-law, for example, went into evangelistic work. She was a gifted singer and later composed several Gospel hymns.

9 THE MESSAGE OF A LILY GIVEN AS A LOVE GIFT REMAINS LONG AFTER THE FLOWER HAS FADED.

Major Whittle spent the weeks following the train wreck gathering material for a book he wanted to write about his dear friend and coworker. He received many letters that testified of how a particular hymn or song of Mr. Bliss's had brought someone to Christ or encouraged Christians to greater commitment and service.

A man in rural New York state wrote about what had happened when an unknown preacher came to hold a series of revival meetings at a church near his home. The man did not go to the meetings at first, but when he finally did he found that the attendance was poor and the singing was very weak. Since he was a good singer himself, the preacher put him in charge of the music.

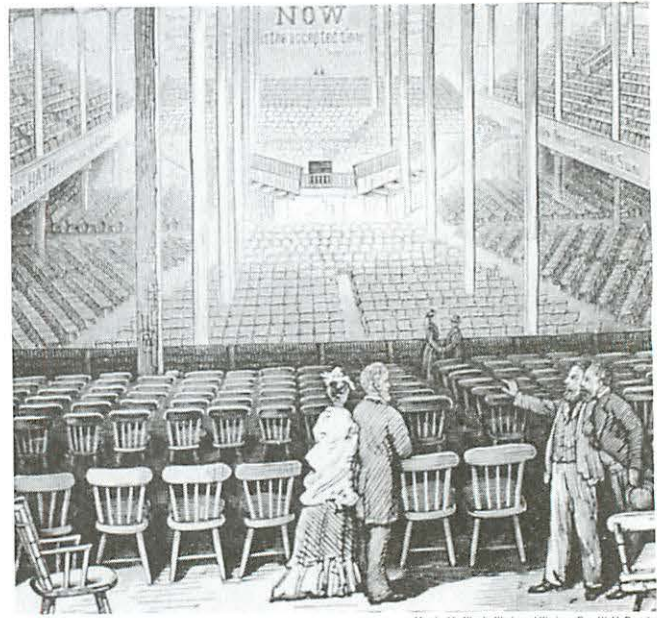
He led the singing for about a week, but noticed that the singing improved only slightly, and the attendance not at all. Then he decided to use Mr. Bliss's recently published collection of Gospel songs instead of the regular hymnals.

The effect was quite dramatic. People started coming from miles around to hear the music. About seventy were converted, and many backsliders made things right with God. Everyone including the evangelist agreed that the hymns by Mr. Bliss had done more to revive them than had the preaching.

Major Whittle also received a very moving letter from a young man who had left home at the beginning of the Civil War to join the Union army. Under the influence of the other men in his company he began to drink and gamble even though he had never engaged in these activities before. Defeat on the "battlefield of wrong actions" quickly led him to the "battlefield of wrong habits." He told his friends and family he could stop drinking and gambling whenever he wanted to, but he soon realized he was enslaved.

When the war was over he left the military and tried to make a fresh start at life, but all his feeble efforts failed miserably. For the next six years he kept getting worse. Eventually, he left his home and family and ended up on skid row in Chicago. Drinking had destroyed his health, and he fully expected to die.

One day he was walking around in a drunken stupor and wandered into the Moody Tabernacle, hardly conscious of what was going on around him. He saw people's smiling faces and hated them.



The Moody Tabernacle in Chicago is where Mr. Bliss was to have sung the weekend he was killed in the train accident.

The sound of singing cut through the fog in the young man's drugged brain as Mr. Sankey sang a song Mr. Bliss had written about reaping what we sow:

Sowing the seed of a lingering pain,
Sowing the seed of a maddened brain,
Sowing the seed of a tarnished name,
Sowing the seed of eternal shame,
Oh, what shall the harvest be?

The words spoke to the young man's spirit as though they had been written precisely for him. He thought of the years he had wasted and the wife and children he had hurt by his selfishness.

The pain of his guilty conscience was so great that he got up and stumbled out of the tabernacle with only one desire—more whiskey to drown the memories and the guilt. It was no use. For the next two weeks, no matter where he went or how much he drank, he could not get the words of that refrain out of his mind: "What shall the harvest be?" Finally, in desperation, he fell to his knees and confessed his sin. Asking the Lord Jesus Christ to forgive and cleanse him, he was miraculously set free from the old desires and habits.

Whenever he had the opportunity during the last three years of his life, Mr. Bliss spoke to pastors and preachers about the value of music in worship

and evangelism. Preaching is essential, he said, but often music is the key to reaching a person's heart. People can rarely recall even a phrase or two from yesterday's sermon, but the words of a melodious Gospel song will be repeated over and over in the mind and heart.

Through the music he left behind, Mr. Bliss's influence extended far beyond the limited circle of those who knew him personally and even beyond those who heard him sing and testify in evangelistic services.

More than 12,000 people thronged to the Moody Tabernacle for the memorial service held the Sunday after Mr. and Mrs. Bliss died. Later on, other memorial services were held in their hometown in Pennsylvania and in several cities and towns where Mr. Bliss had ministered. Many eulogies were spoken, and numerous songs and poems were written in his memory.



P. P. Bliss—A Centennial Sketch of His Life and Work, Victor C. Derry

In the cemetery in Rome, Pennsylvania, friends erected a large monument, paid for with pennies donated by thousands of American and British children who loved to sing Mr. Bliss's Sunday school songs.

Yet greater than any memorial or monument are the testimonies of those who over the years have been brought to the Saviour through the hymns that Mr. Bliss wrote.

Early in his life, P. P. Bliss wrote a lot of secular music, but he ultimately chose to "take no thought" for the glamorous and lucrative career he could have had as a singer and composer of popular music. Today, hardly anyone ever sings or even remembers any of those songs. Yet, the great Gospel hymns he wrote are sung every week by thousands of Christians all over the world.

Dwight L. Moody summed up the life and work of Philip Paul Bliss with these words: "I believe he was raised up of God to write hymns for the Church of Christ in this age, as Charles Wesley was for the Church in his day. His songs have gone around the world, and have led and will continue to lead hundreds of souls to Christ. In my estimation he was the most highly honored of God, of any man of his time, as a writer and singer of Gospel songs, and with all his gifts he was the most humble man I ever knew."

PROJECT

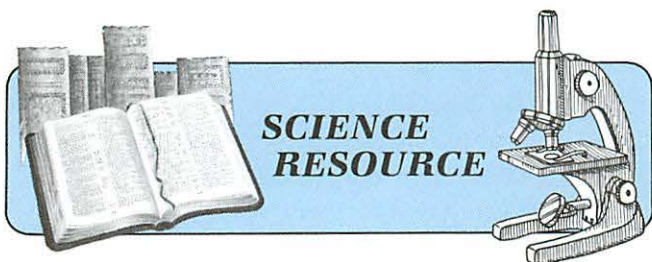
Many of Mr. Bliss's hymns were written after he saw a spiritual truth in some particularly dramatic incident. As an example, learn the story of "Let the Lower Lights Be Burning" (*Hymn Histories*, pages 182–183, or *How to Make Melody in Your Heart to the Lord*, cassette 10, number 17).

Many other songs he wrote were based on sermons. For example, around the year 1870 a British preacher named Henry Moorehouse came to Chicago and preached in Mr. Moody's meetings for a week. In every service he used the very same Bible verse as his text—seven sermons in a row on John 3:16! One of these sermons inspired Mr. Bliss to write "Whosoever Will."

Sometimes a phrase from Scripture would serve as the basis for a song. For instance, Mr. Bliss once heard a message about King Agrippa's response to Paul's testimony: "... *Almost thou persuadest me to be a Christian*" (Acts 26:28). The preacher closed by saying, "To be almost persuaded is to be almost saved; to be almost saved is to be eternally lost." As Mr. Bliss meditated on the implications of that verse, the Lord gave him the song "Almost Persuaded."

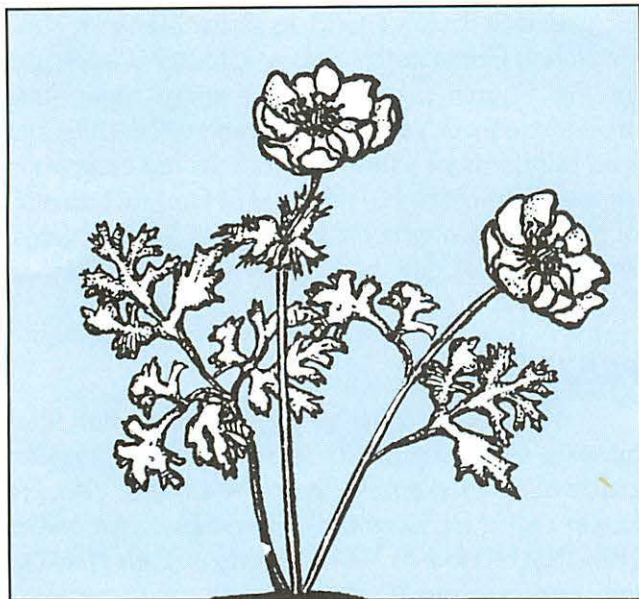
Recall an event which deeply affected your life. Describe the event in a poem following the style of P. P. Bliss. Next, put the poem to melody. If you are not able to make a melody of your own, use one composed by P. P. Bliss.

Date completed _____ Evaluation _____



SCIENCE RESOURCE

HOW DO THE LILIES OF THE FIELD FUNCTION WITHOUT FATIGUE?



The Flower Family Album, Helen F. Fischer and Gretchen F. Harshbarger, ©1941 University of Minnesota

Most botanists believe that the lilies of the field to which Jesus referred were the flowers called *Anemone coronaria*, pictured above.

The *Anemone coronaria*, (uh-NEM-uh-nee korr-uh-NARE-ee-uh), also known as the *poppy anemone*, has a spectacular red bloom which characterizes the countryside of Galilee and is so abundant and conspicuous that it attracts the attention of all who are anywhere nearby.

While these anemones do not toil or spin, they do, in fact, work hard. The Greek word for “toil” is κοπιάω (kaw-pee-AH-oh). It means “to feel fatigue as the result of hard work.” Jesus used the lilies of the field to reveal an important secret—the secret of working hard without becoming exhausted.

Unlike animal cells, which stop growing and wear out as they mature, the lilies of the field never grow old. They remain vigorous and youthful until the moment they die. Throughout their lifetime they constantly reproduce new cells without showing any signs of exhaustion. Other plants, such as the bristlecone pine, live for more than four thousand years, and the Italian poplar tree is theoretically immortal. Cuttings from its branches are so vibrant they take root and grow regardless of their age.

Learn how the lilies of the field as well as thousands of other plants illustrate the secret of laboring without becoming exhausted.

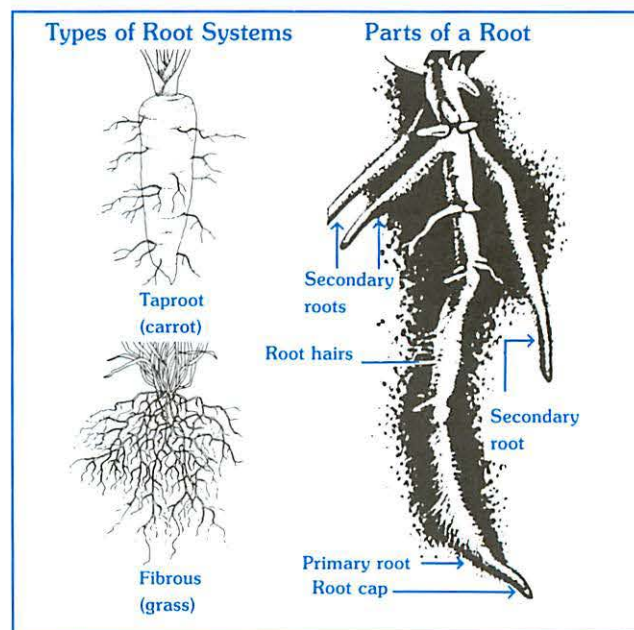


Ewing Galloway

Daisies cover a meadow in Wisconsin in much the same way that the lilies of the field cover the countryside of Galilee.

1 Lilies are nourished through a vast and deep root system.

Roots are often thought of as massive, brown, twisted structures, but these are older roots which are composed mostly of non-functioning woody tissue. The vital parts of roots are actually the tips which pry through soil, reaching as deep as they can into its rich resources. These roots are less than



©World Book, Inc.

an inch long and thinner than a piece of string. They attach themselves so tenaciously to grains of soil that they break before they yield their grip. Each root tip is covered with a thimble-like protective cap and coated with an oily solution which lubricates it as it penetrates the earth with a corkscrew motion. Roots serve to anchor a plant firmly in place, store energy for future growth, and in some species actually reproduce new plants.

Of a root's many functions, none is more important than gathering water and minerals. A single corn plant must gather 440 pounds of nutrients each summer. The roots of an acre of corn plants collect more than 1300 tons of nutrients in just three months. Roots are responsible for gathering at least fifteen nutrients from the soil. Without these nutrients plants wither and die. For every one hundred atoms which make up a plant, approximately seventy enter through the root system. Only thirty enter through the leaves in the form of carbon dioxide.

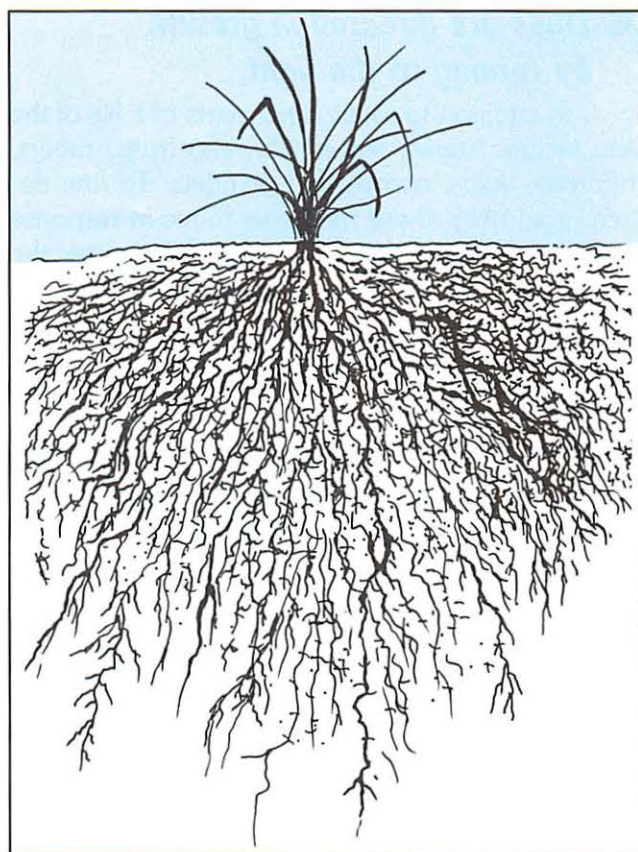
CHEMICALS ESSENTIAL TO THE LILIES OF THE FIELD

Element	Symbol	Concentration in dry tissue		Relative number of atoms compared to molybdenum
		ppm	percent	
Molybdenum	Mo	0.1	0.00001	1
Copper	Cu	6	0.0006	100
Zinc	Zn	20	0.0020	300
Manganese	Mn	50	0.0050	1,000
Iron	Fe	100	0.010	2,000
Boron	B	20	0.002	2,000
Chlorine	Cl	100	0.010	3,000
Sulfur	S	1,000	0.1	30,000
Phosphorus	P	2,000	0.2	60,000
Magnesium	Mg	2,000	0.2	80,000
Calcium	Ca	5,000	0.5	125,000
Potassium	K	10,000	1.0	250,000
Nitrogen	N	15,000	1.5	1,000,000
Oxygen	O	450,000	45	30,000,000
Carbon	C	450,000	45	35,000,000
Hydrogen	H	60,000	6	60,000,000

Plant Physiology, Frank Salisbury and Cleon Ross

In spite of the massive task of gathering a plant's daily "grocery list," roots function without fatigue or exhaustion. They continue steadfastly in their role of serving without growing weary. To accomplish these incredible feats, roots must ground themselves firmly in rich soil.

Two-year-old alfalfa roots, for example, may work their way into crevices as far as twenty-five feet from the surface. Mesquite shrubs searching for rare sources of water and minerals in near desert-like conditions may sink their roots as deep as 175 feet. In fact, the mesquite is such a good indicator of water that many desert residents have learned to dig wells where it grows.



A single rye plant may have almost fourteen million roots with a combined length of about 380 miles and an absorbing surface of more than 6000 square feet.

Tiny root hairs are responsible for increasing the surface area of a root five to twenty times that of the root itself. Each root hair consists of a single cell growing at right angles to the main root. These root hairs die within a few days or weeks once they have depleted the nutrients in their immediate vicinity. As they slough off, new root hairs explore untapped resources deeper in the soil. These new root hairs may appear at a rate of 100 million a day, adding as much as three miles of combined length to the root system.

As a result of such phenomenal growth, a root system may be several hundred times larger than a plant's leaf structure. This means that for every leaf you see above ground there are several hundred roots beneath the ground gathering nutrients to keep the leaf green and beautiful.

By grounding its root system firmly in rich soil, the lilies of the field are assured of an abundant supply of nourishment which is not subject to day-by-day changes.

2 Lilies are directed in growth by turning to the light.

In addition to roots, other parts of a lily of the field include stems, leaves, flowers, fruits, tubers, rhizomes, bulbs, corms, and plantlets. To one degree or another, these members move in response to light, the pull of gravity, the presence of water, the action of chemicals, and even the sensation of touch.



Ernst Galloway

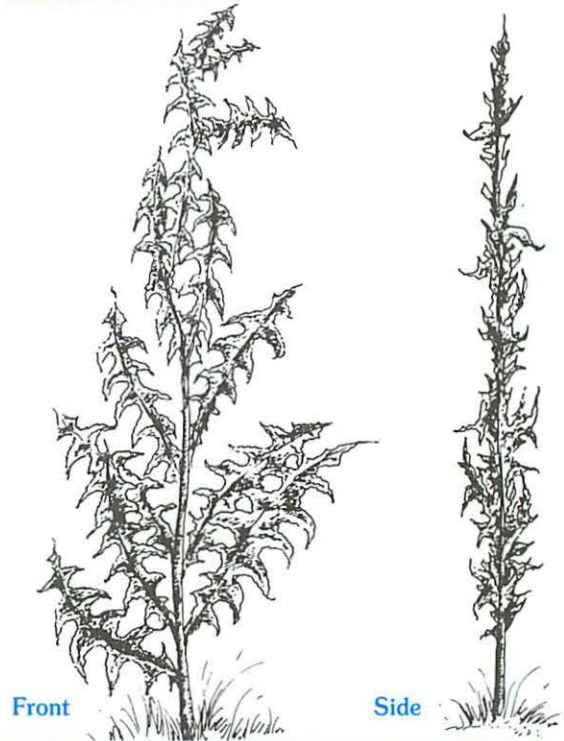
These aspens bear the twisted evidence of winter winds and deep snowdrifts. However, as the snow melts each spring, the light from above redirects their growth upward.

Scientists call these movements *tropism* (TROE-pizm). The word *tropism* comes from the Greek word *τρόπος* (TRAW-poss), meaning “a turn.” Stems and leaves which find direction by turning toward light are called *phototropic*. Roots, on the other hand, find direction by turning toward the pull of gravity (*geotropism*), or by turning toward water (*hydrotropism*). Some parts of a plant turn toward concentrated chemicals (*chemotropism*), while others turn quickly in response to even the slightest touch (*thigmotropism*).

Many flowers and leaves also move in harmony with the rising and setting of the sun. For example, morning glories open at daybreak and close at dawn. Shamrock leaves also unfurl to greet the light of day and fold together with the chill of evening.

These movements often go unnoticed because they are slow and gradual. However, using time-lapse photography, their movements are accelerated and appear as graceful and athletic as any movement of a member of the animal kingdom.

PRICKLY LETTUCE



The growth of prickly lettuce follows the east-west path of the sun. This growth pattern allows it to catch a maximum amount of sunlight throughout the day.

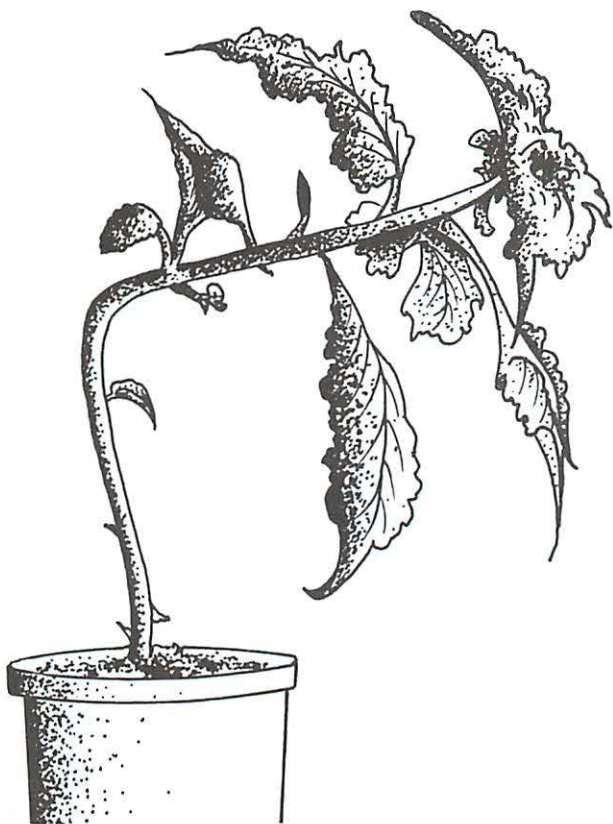
Yet, plants move without sweat, fatigue, or exhaustion. In fact, the lilies of the field follow the light of the sun day after day without fail. Such rigorous “exercise” is made possible by light-sensitive chemicals within the plant which selectively stimulate growth in one member and inhibit growth in another.

These chemicals are plant hormones, and they work like hormones in the human body. Scientists have identified at least four different types of plant hormones: auxins (AWK-sinz), gibberellins (jib-uh-RELL-inz), kinetins (KYE-nuh-tinz) and dormins (DOOR-minz). They are produced in specialized tissue and are distributed to other members, where they influence their growth.

The first experiments suggesting the presence of plant hormones were done in the 1890s, when it was discovered that only the tips of grass direct the growth of the whole blade. As researchers removed the tips of young shoots, growth stopped even

though the plant remained alive. When the tips were reattached, each blade again began to grow toward the light.

In the 1920s, scientists successfully collected some of these chemicals and used them to stimulate growth artificially. However, it was not until the middle of the 1930s that they were able to isolate and identify the chemical which controls a plant's response to light. Chemists called it *indoleacetic* (IN-dole-uh-SEE-tick) acid, while botanists gave it the name **auxin**.



Auxin builds up in cells opposite the source of light. As these cells grow in response to the hormone, the plant's stem bends toward the light.

Researchers found that auxin was so powerful that just one drop of indoleacetic acid diluted a millionfold could produce measurable growth in a lily of the field. The growth stimulated by a single ounce of auxin would be enough for a lily to encircle the globe.

A second group of plant hormones, called ***gibberellins***, also promote plant growth. They were first discovered in Japan where farmers noticed that some rice plants grew excessively tall. They eventually died, because they grew so fast that they could not support themselves. The Japanese used a word for these plants which means "foolish seedlings." Researchers discovered that a fungus

had infected these rapidly growing plants and produced an artificial type of growth hormone called ***gibberellin***. By 1969 scientists had found twenty-four different forms of gibberellin.

Gibberellins serve to break the dormancy of buds and seeds after a long winter. They are also sensitive to changing amounts of light. By responding to the shortening of daylight in the fall and the lengthening of daylight hours in the spring, gibberellins appear to govern the blooming of flowers. Because some flowers bloom when the days are long, and others bloom when the days are short, gibberellins cause each species to bloom at its appointed time throughout the year.

Kinetins are thought to increase the sensitivity of leaves and seeds in low-light situations. When light is blocked out by larger plants, kinetins allow plants to survive with far less light than they would normally require. Such hormones preserve the vitality of a plant until it can grow tall enough to receive an adequate amount of light.

Hormones called ***dormins*** are also sensitive to light. They appear to cause buds to become dormant in preparation for cold or dry seasons. They cause leaves to fall off in the autumn and prompt flowers to fade after they have bloomed.

The lilies of the field yield to the influence of light so growth is stimulated in one direction and inhibited in another.

3 Lilies are filled with life-giving water by becoming empty.

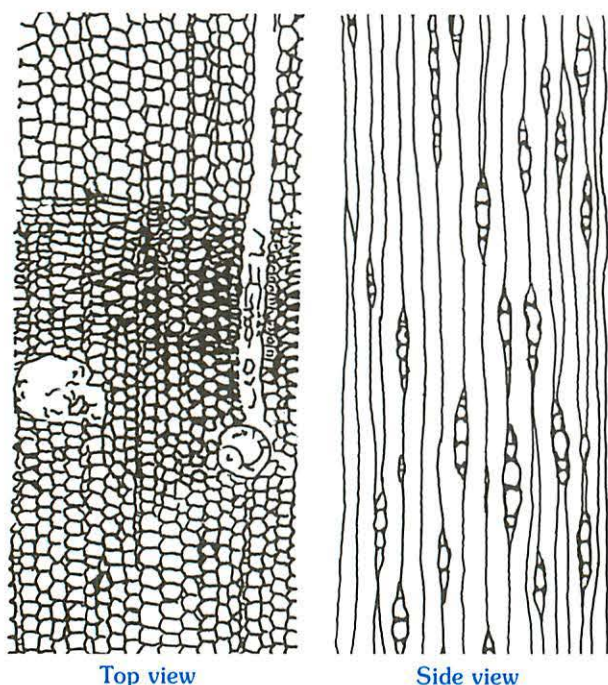
The lilies of the field are capable of raising water about a hundred times more efficiently than the best suction pump ever made. They use the same mechanism which daily lifts as much as 900 gallons of water up the trunk of a birch tree, generates enough pressure to boost sap 450 feet to the leaves of the giant California sequoia, and sends water coursing throughout a plant's members at rates of almost 150 feet an hour.

The process continues day after day throughout the growing season, yet, the lilies of the field fulfill this important task without toiling or spinning.

The secret of lifting water lies in tiny cells called ***tracheids*** (TRAY-kee-idz). Tracheids are

long, cylindrical cells with thick walls. They develop quickly, forming long rods which resemble bundles of toothpicks stacked end to end. When the cells are fully grown, the central cores and end walls of each rod dissolve, leaving a continuous series of empty, hollowed-out tubes running the entire length of the plant.

MICROSCOPIC VIEW OF TRACHEID CELLS



These tubes form a plumbing system which may be thousands of miles long in larger plants. Like any other plumbing system, its value lies in its emptiness. Water flows through the hollow cores of the tracheid cells, bringing its life-giving nutrients to all the members of the plant.

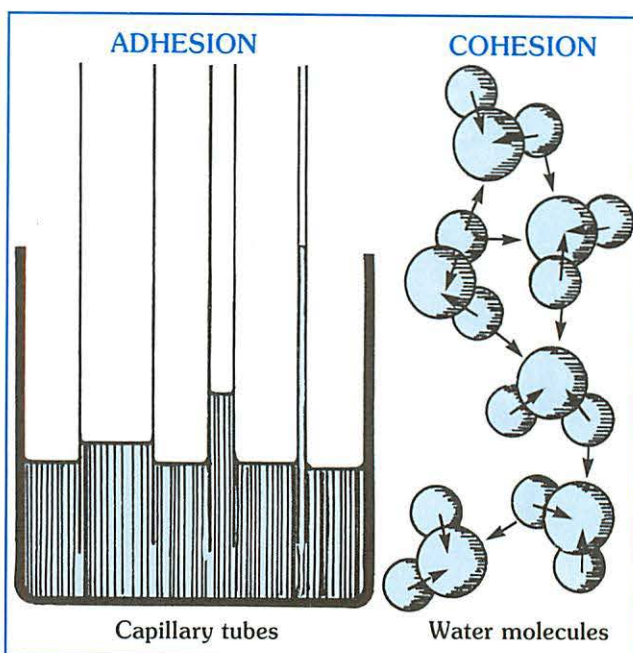
Although the process of lifting water has been studied for hundreds of years, scientists still are not sure what power lifts the water. They know only that it is not lifted by the strength of the cells within the plant. It is not sucked up by leaves, pushed up by roots, or pumped by a stem or trunk.

Part of the explanation is in the cohesiveness of water itself. *Cohesion* is the result of water molecules clinging tightly to one another. As atoms of hydrogen and oxygen attract one another, they produce a tensile strength of as much as five thousand pounds or more per square inch. *Tensile strength* is the measure of the greatest stress a substance can take without tearing apart.

In experiment after experiment the only common factor which explains the incredible ability of plants to conduct water lies in the properties of water itself. The lilies of the field merely provide an

empty vessel through which water can flow. The flow stops only when the hollow tracheid cells become plugged with disease or impurities.

However, it is not totally accurate to suggest that water flows completely on its own. Roots must supply a continual source of fresh water to the leaves, and the leaves must provide a continual outlet for water to evaporate—a process called *transpiration*. When roots dry up or leaves shrivel, water flow decreases proportionally.



Cohesion is different from adhesion. Adhesion is the property of water to *adhere* to substances other than itself. Water draws itself up in capillary tubes by adhering to the glass walls of the tube. This type of adhesion can raise water only about three feet. Cohesion is the property of water to *adhere* to molecules of its own kind. Cohesion can raise water more than four hundred feet.

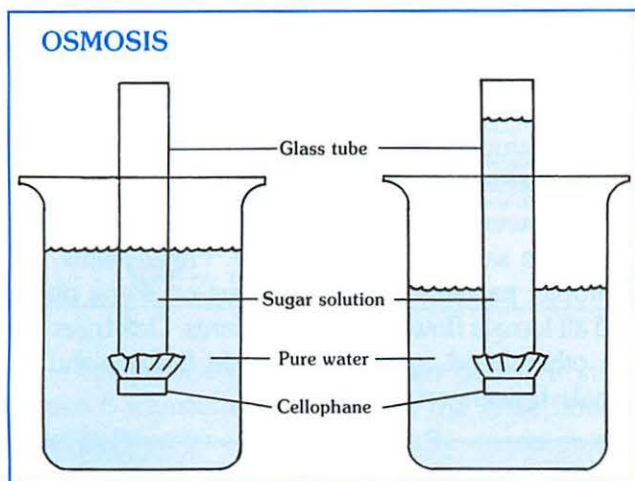
By allowing water to fill its emptiness, the lily of the field exhibits a power greater than any of its members can exert alone.

4 Lilies remain upright because of pressure.

Inside every lily are many restrictive membranes which allow water to pass through freely but block the flow of minerals and dissolved substances. These selective membranes can cause considerable pressure to build up inside the plant. Scientists call this pressure *osmotic* (ahz-MOH-tik) pressure.

Osmosis is the process through which water moves back and forth across a cell membrane to resolve an imbalance. Water moves from low concentrations toward higher concentrations, from a cooler side to a warmer side, or from a greater pressure toward a lesser pressure.

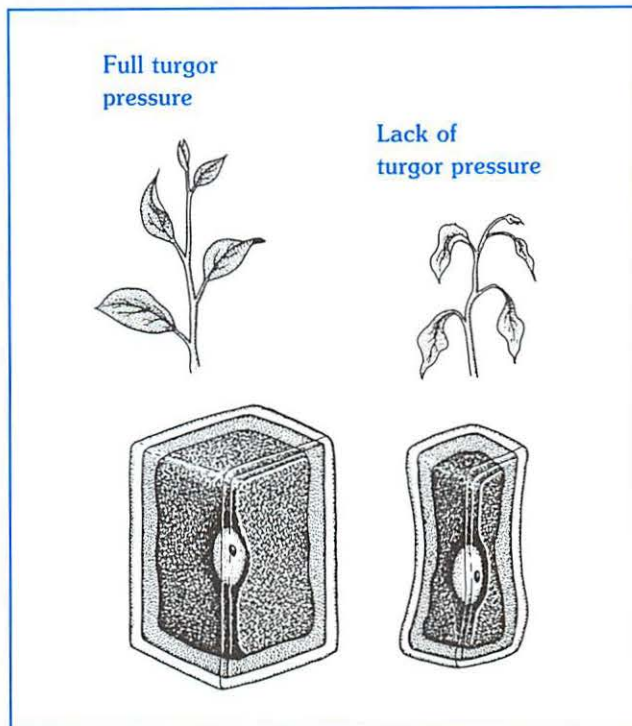
For example, as water moves out of a cell containing only a few minerals, the loss of water inside the cell increases the concentration of its minerals. As water enters a cell containing large amounts of minerals, it dilutes the minerals and decreases the concentration inside that cell. Theoretically, this osmotic process continues until all cells have equal concentrations of minerals.



In the beaker on the right, osmosis has caused the water to flow into the glass tube. The pressure is sufficient to actually lift the water above its original level.

However, as water continues to leave one cell and to flood into another, the pressure inside the two cells changes dramatically. The first cell shrivels from the loss of water while the second cell swells from excess water. Because most plant cells accumulate an abundant store of minerals inside them, they normally take in more water than they lose. This creates a pressure inside the cell which botanists call *turgor* (TER-gər). Turgor pressure within a plant cell pushes outward, keeping the cell's walls firm and strong.

A plant cell is much like a big water balloon. The pressure within the cell keeps it inflated to its proper size. If a cell loses its turgor, its walls collapse and the plant begins to wilt. This is precisely what happens when a plant is exposed to frost. As water inside a cell freezes, the cell walls become brittle and then break, allowing water to leak out once it thaws. The lack of turgor pressure then causes the plant to fall over helplessly.



Unlike animals, plants have no bones to hold themselves erect. During periods of drought, when there is insufficient water to maintain proper turgor within a cell, the walls buckle and the plant wilts.

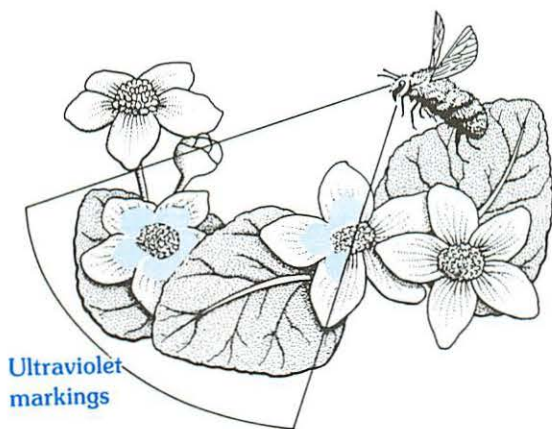
Pressure within the cells of a plant not only holds the plant upright, but it also plays an important role in plant growth. In fact, turgor within a cell is responsible for increasing the cell's size up to one hundred times. This is perhaps most evident when a seed germinates. As osmotic pressure fills the miniature cells within a seed's embryo, the tiny plant actually inflates like a rubber raft. Pressure unfurls each leaf to its full potential without the need for any sudden growth of new cells.

Once a young seedling is established, growth cells called *meristem* (MER-uh-stem) cells begin to divide rapidly. Meristem cells are found only in buds, root tips, and along a thin layer of tissue surrounding the stem, called the *cambium* (KAM-bee-um). However, as meristem cells divide, the cells they produce are so small that they add little to the overall stature of a plant.

The real growth takes place behind the meristem cells in what botanists call the *zone of elongation*. This is the area in which pressure stretches young cells to their proper size. In some instances there may be only a tenfold stretching, but in other cases cells may stretch up to one hundred times their original length.

Beyond the zone of elongation, cells reach equilibrium and remain approximately the same size for the rest of their lives. This means that a root,

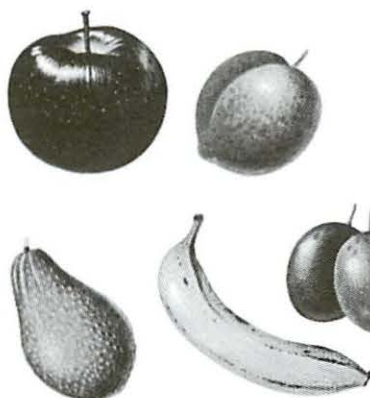
The brightly colored lines, dots, and markings of some flowers actually direct a bee to its food. Bees are most sensitive to blue, yellow, and purple, while other insects are more attracted to red, orange, and white. White flowers show up well at night and are particularly attractive to moths, which are most active after dark.



Many plants use ultraviolet light to attract insects. Because all insects are not sensitive to this light, the markings attract only those insects best suited to cross-pollinate that species.

Although pollinated seeds grow to maturity within a flower, they are still doomed to failure unless they can be spread across rivers, seas, mountains, and other barriers to fresh new resources. Just as the lilies of the field encourage others to cross-pollinate them, they also encourage others to help distribute their seeds.

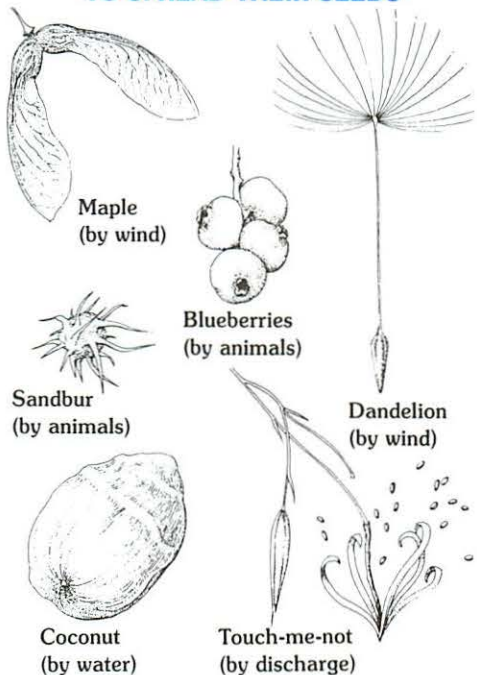
Fruits such as apples, peaches, berries, cherries, and oranges contain hard-coated seeds surrounded by nutritious and colorful pulp and peel. Once ripe, the beautiful, fragrant fruit which surrounds the seeds of angiosperms encourages birds and other animals to scatter their seeds. When animals eat these fruits, the seeds pass through their bodies unharmed, sometimes miles away from the mother plant.



Even Satan used attractive fruit to encourage others to follow his ways.

In contrast, unripened fruit is relatively unattractive. In fact, it is typically green, bitter, and scentless. Only when seeds are ready for dispersal does a plant's fruit ripen and take on the alluring characteristics which encourage others to eat it.

PLANTS WHICH ENCOURAGE OTHERS TO SPREAD THEIR SEEDS



©World Book, Inc.

Many plants produce seeds which take advantage of the wind. These seeds have wings, parachutes, propellers, and gliders which help the wind to lift them and carry them away. Some, such as coconuts, are light enough to float in the ocean for months before reaching suitable shores up to a hundred miles away.

Without the aid of others to help cross-pollinate them, flowers grow smaller and weaker, and bear far less fruit.

PROJECT

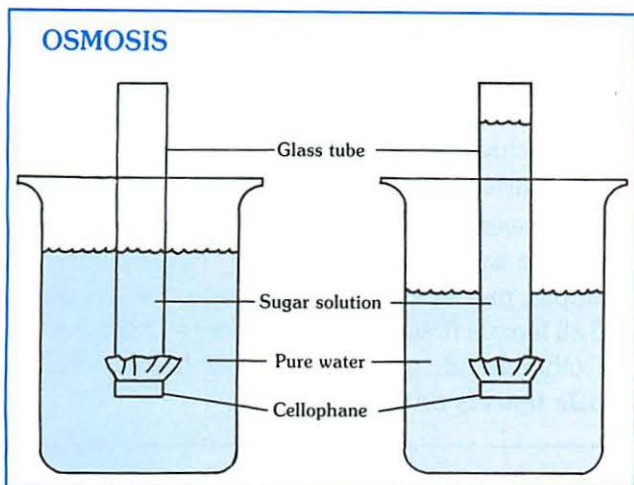
Study the following verses which use the Greek word *κοπιάω*. How does each verse reveal a secret of serving the Lord without becoming exhausted?

- | | |
|-----------------------|---------------------------|
| • Matthew 11:28 | • Ephesians 4:28 |
| • Luke 5:5 | • Philippians 2:16 |
| • John 4:6-38 | • Colossians 1:29 |
| • Acts 20:35 | • I Thessalonians 5:12-13 |
| • Romans 16:6-12 | • I Timothy 4:10 |
| • I Corinthians 4:12 | • I Timothy 5:17 |
| • I Corinthians 15:10 | • II Timothy 2:6 |
| • I Corinthians 16:16 | • Revelation 2:2-4 |

Date completed _____ Evaluation _____

Osmosis is the process through which water moves back and forth across a cell membrane to resolve an imbalance. Water moves from low concentrations toward higher concentrations, from a cooler side to a warmer side, or from a greater pressure toward a lesser pressure.

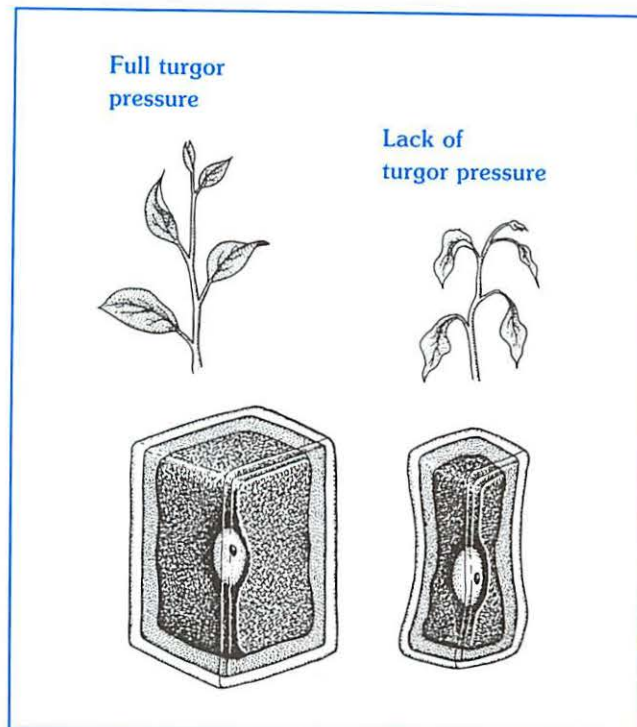
For example, as water moves out of a cell containing only a few minerals, the loss of water inside the cell increases the concentration of its minerals. As water enters a cell containing large amounts of minerals, it dilutes the minerals and decreases the concentration inside that cell. Theoretically, this osmotic process continues until all cells have equal concentrations of minerals.



In the beaker on the right, osmosis has caused the water to flow into the glass tube. The pressure is sufficient to actually lift the water above its original level.

However, as water continues to leave one cell and to flood into another, the pressure inside the two cells changes dramatically. The first cell shrivels from the loss of water while the second cell swells from excess water. Because most plant cells accumulate an abundant store of minerals inside them, they normally take in more water than they lose. This creates a pressure inside the cell which botanists call *turgor* (TER-gər). Turgor pressure within a plant cell pushes outward, keeping the cell's walls firm and strong.

A plant cell is much like a big water balloon. The pressure within the cell keeps it inflated to its proper size. If a cell loses its turgor, its walls collapse and the plant begins to wilt. This is precisely what happens when a plant is exposed to frost. As water inside a cell freezes, the cell walls become brittle and then break, allowing water to leak out once it thaws. The lack of turgor pressure then causes the plant to fall over helplessly.



Unlike animals, plants have no bones to hold themselves erect. During periods of drought, when there is insufficient water to maintain proper turgor within a cell, the walls buckle and the plant wilts.

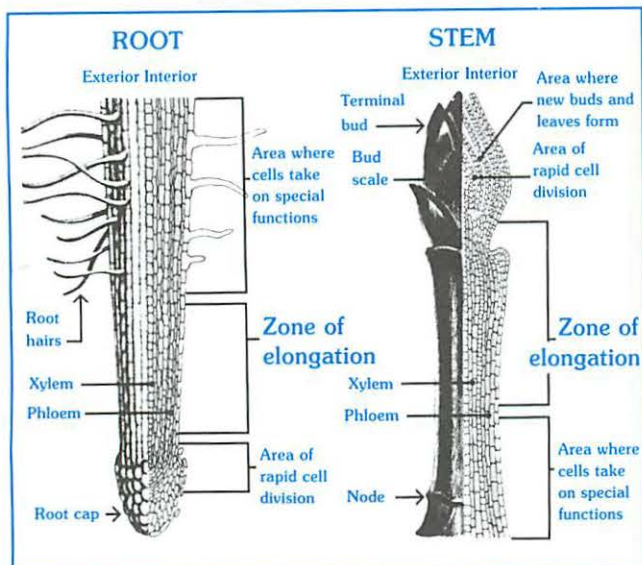
Pressure within the cells of a plant not only holds the plant upright, but it also plays an important role in plant growth. In fact, turgor within a cell is responsible for increasing the cell's size up to one hundred times. This is perhaps most evident when a seed germinates. As osmotic pressure fills the miniature cells within a seed's embryo, the tiny plant actually inflates like a rubber raft. Pressure unfurls each leaf to its full potential without the need for any sudden growth of new cells.

Once a young seedling is established, growth cells called *meristem* (MER-uh-stem) cells begin to divide rapidly. Meristem cells are found only in buds, root tips, and along a thin layer of tissue surrounding the stem, called the *cambium* (KAM-bee-um). However, as meristem cells divide, the cells they produce are so small that they add little to the overall stature of a plant.

The real growth takes place behind the meristem cells in what botanists call the *zone of elongation*. This is the area in which pressure stretches young cells to their proper size. In some instances there may be only a tenfold stretching, but in other cases cells may stretch up to one hundred times their original length.

Beyond the zone of elongation, cells reach equilibrium and remain approximately the same size for the rest of their lives. This means that a root,

stem, or leaf grows only at its tip. For example, if you tie a ribbon around the stem of a tomato plant, the ribbon will remain stationary even though the plant grows taller. A mark on the trunk of a tree never grows any higher for the same reason.



In the case of a root, the zone of elongation is approximately two millimeters behind the tip. In the case of a stem, the zone of elongation covers several centimeters.

An electron microscope reveals that cell walls are threaded crosswise with long chains of sugar molecules. Because these chains have little or no flexibility, they allow pressure to stretch the cell in only one direction. This action is similar to that of the spiraling steel insert in the hose of a vacuum cleaner. The insert allows the hose to stretch but prevents it from yielding in any other direction. If a plant cell loses the ability to stretch lengthwise, it may actually rupture and die.

Because pressures stretch the lilies of the field, they can resist other pressures which would bring damage to them.

5 Lilies are reproduced when they have inward fragrance.

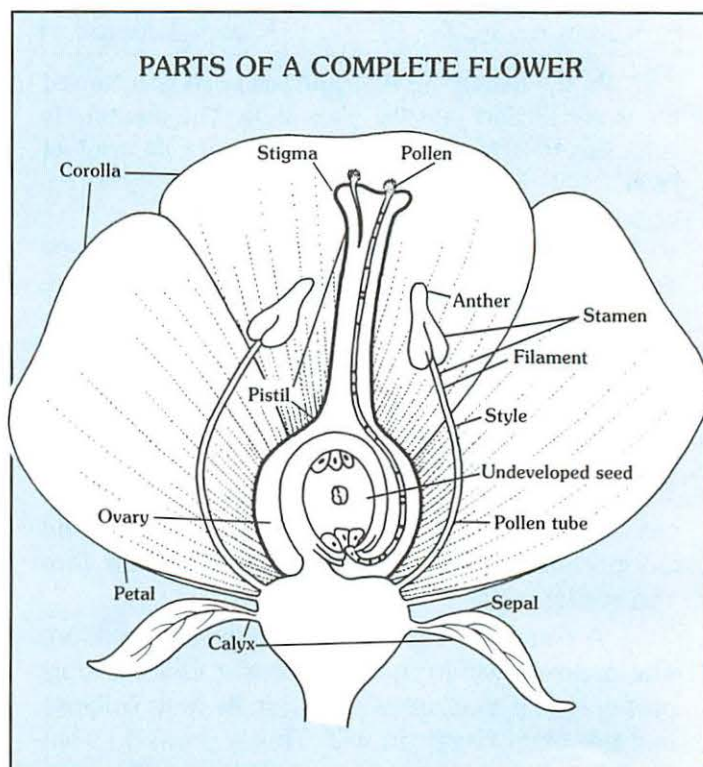
The lily family belongs to the class *Angiospermae*, also called the angiosperms (AN-jee-oh-sperms). Angiosperms are plants which produce seeds inside beautiful flowers. The word *angiosperm* comes from the two Greek roots ἀγγεῖον (ang-EYE-on), meaning "a vessel," and σπέρμα (SPER-mah), meaning "a seed." An angiosperm therefore, is a plant which bears seeds within a protective vessel.

If left to reproduce on their own, angiosperms soon weaken, become susceptible to disease, and lose the sweetness of their fruit. The lily does become pollinated, however, because the attractive fragrance it produces as it blooms draws assistance from other flowers and insects according to God's perfect design.

The flower of an angiosperm usually contains four main parts. The **calyx** (KAY-lik) is made up of green leaves, called *sepals*, which surround and protect a flower while it is still a bud. The **corolla** (cuh-ROLE-uh) is made up of brightly colored petals which unfurl to reveal the seed-bearing parts of the flower hidden inside.

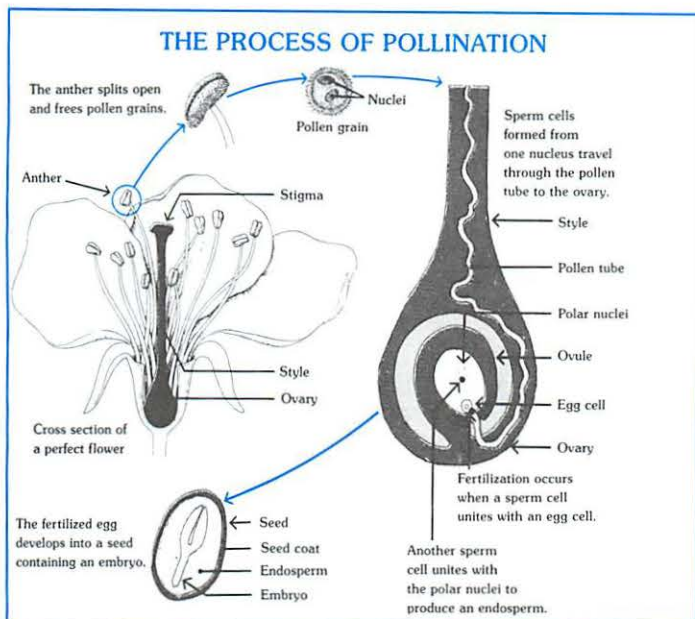
Complete flowers contain both **stamens** (STAY-menz), which produce pollen, and **pistils** (PIS-tilz), which contain the immature seeds within a protective ovary. The vast majority of flowering plants, including the lilies of the field, have male and female parts within the same flower.

Flowers which have only stamens or only pistils are said to be incomplete. Holly plants, for example, produce all male flowers on some plants and all female flowers on other plants. Oak trees, on the other hand, produce all male flowers and all female flowers on the same tree.



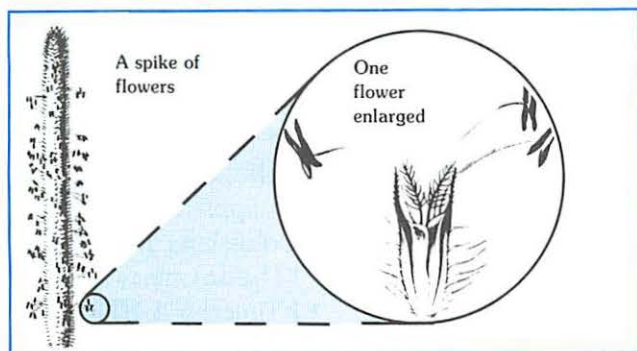
Before a seed can begin to mature, it must be fertilized by pollen. This means that pollen grains must somehow find their way from the stamen to the pistil. While the distance may be only a fraction

of an inch, it is still thousands of times greater than the diameter of an individual grain of pollen. One of the many miracles of God's design is that it is impossible for pollen to make the trip without assistance.



Self-pollination occurs when pollen from a stamen is transferred to a pistil of the same flower. Cross-pollination occurs when pollen lands on the pistil of a completely different flower of the same species. Unfortunately, repeated self-pollination tends to produce smaller, less vigorous plants which have tasteless and less nutritious fruit.

Cross-pollination produces much healthier plants and more abundant fruit. However, cross-pollination requires pollen to travel incredible distances in order to fertilize another flower. For example, a pollen grain traveling even a few feet is equivalent to a person traveling from the East Coast to the West Coast in search of an object the size of a pinhead.

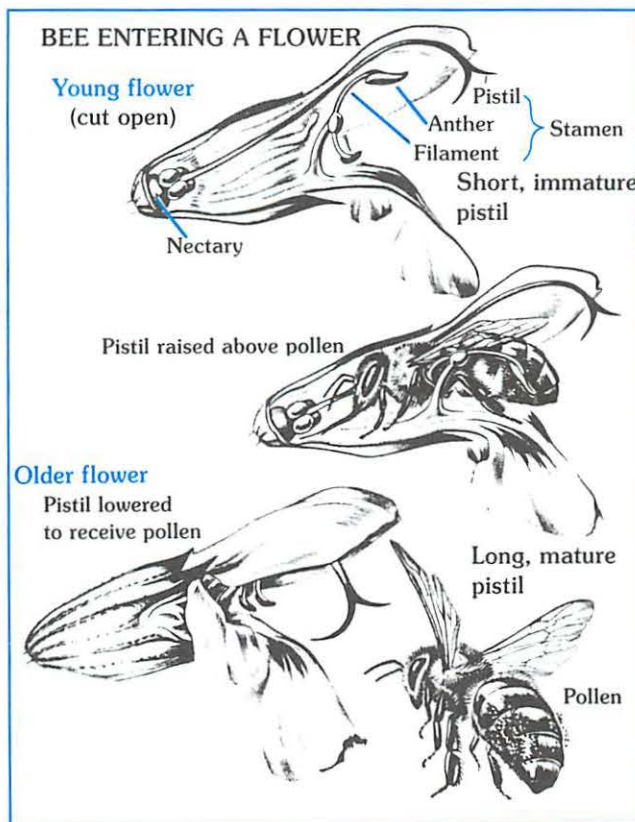


Many grasses such as timothy expose thousands of individual flowers to the wind. The wind carries pollen from one plant to another so their seeds are cross-pollinated.

Because pollen grains have no means of moving on their own, many flowers rely completely upon the wind to carry their pollen from blossom to blossom. These flowers typically display long, hanging stamens which shake about a million pollen grains into the air for each available potential seed.

The grains are especially lightweight and dry so they can be carried aloft by even the slightest breezes. Their incredible numbers ensure that at least a few grains of pollen will find another flower to pollinate.

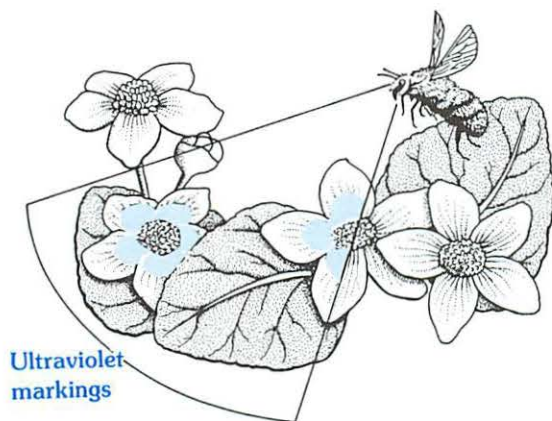
Flowers which rely upon insects and birds to carry their pollen produce a sweet, fragrant nectar and are arrayed in bright colors. Some of these flowers even offer "landing platforms" which invite visitors to "come right in and enjoy." The nectar attracts insects and birds, drawing them close enough to brush against the flower's stamens, knocking off the pollen onto themselves. As the visitors move from flower to flower, they carry the pollen with them, cross-pollinating as they go.



As a bee crawls into a salvia flower, the uniquely designed stamen covers the bee's back with pollen. However, the pistil is too high in an immature flower to pick up the pollen on the bee's back. In an older flower the elongated pistil picks up the pollen.

Each species of flower has unique attractors which encourage others to cross-pollinate them. Several plants even emit the "aroma" of rotten meat to attract flies and other insects to their flowers.

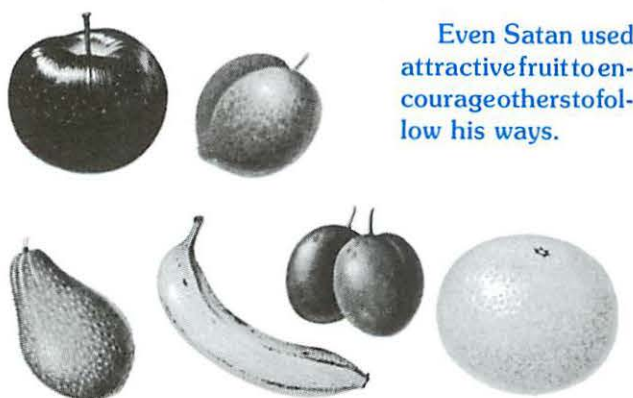
The brightly colored lines, dots, and markings of some flowers actually direct a bee to its food. Bees are most sensitive to blue, yellow, and purple, while other insects are more attracted to red, orange, and white. White flowers show up well at night and are particularly attractive to moths, which are most active after dark.



Many plants use ultraviolet light to attract insects. Because all insects are not sensitive to this light, the markings attract only those insects best suited to cross-pollinate that species.

Although pollinated seeds grow to maturity within a flower, they are still doomed to failure unless they can be spread across rivers, seas, mountains, and other barriers to fresh new resources. Just as the lilies of the field encourage others to cross-pollinate them, they also encourage others to help distribute their seeds.

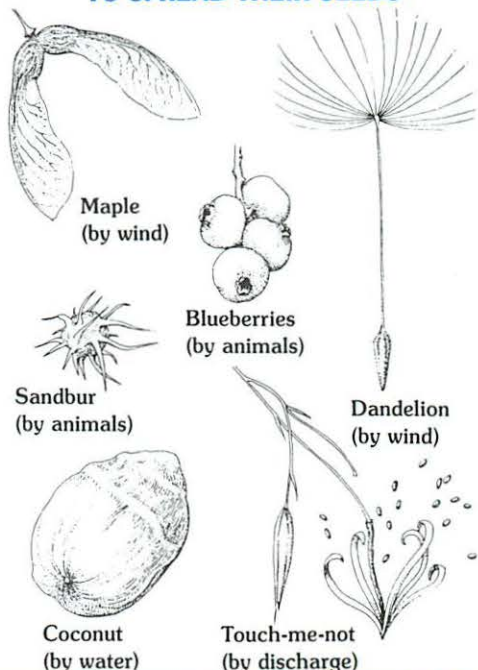
Fruits such as apples, peaches, berries, cherries, and oranges contain hard-coated seeds surrounded by nutritious and colorful pulp and peel. Once ripe, the beautiful, fragrant fruit which surrounds the seeds of angiosperms encourages birds and other animals to scatter their seeds. When animals eat these fruits, the seeds pass through their bodies unharmed, sometimes miles away from the mother plant.



Even Satan used attractive fruit to encourage others to follow his ways.

In contrast, unripened fruit is relatively unattractive. In fact, it is typically green, bitter, and scentless. Only when seeds are ready for dispersal does a plant's fruit ripen and take on the alluring characteristics which encourage others to eat it.

PLANTS WHICH ENCOURAGE OTHERS TO SPREAD THEIR SEEDS



Many plants produce seeds which take advantage of the wind. These seeds have wings, parachutes, propellers, and gliders which help the wind to lift them and carry them away. Some, such as coconuts, are light enough to float in the ocean for months before reaching suitable shores up to a hundred miles away.

Without the aid of others to help cross-pollinate them, flowers grow smaller and weaker, and bear far less fruit.

PROJECT

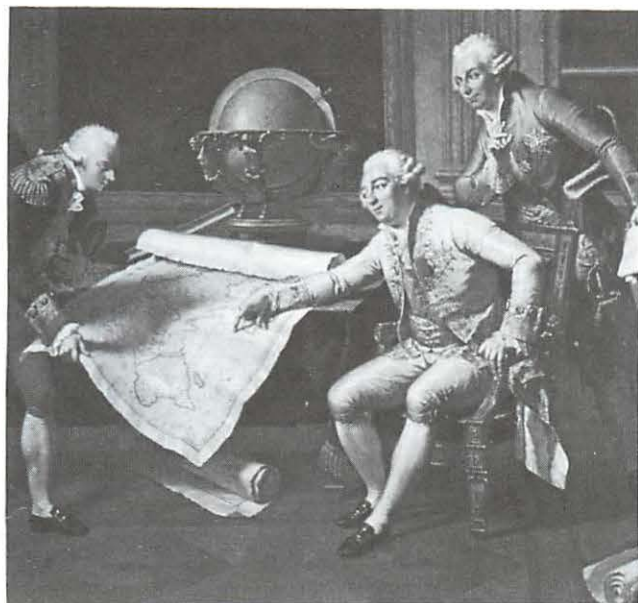
Study the following verses which use the Greek word *κοπιάω*. How does each verse reveal a secret of serving the Lord without becoming exhausted?

- | | |
|-----------------------|---------------------------|
| • Matthew 11:28 | • Ephesians 4:28 |
| • Luke 5:5 | • Philippians 2:16 |
| • John 4:6-38 | • Colossians 1:29 |
| • Acts 20:35 | • I Thessalonians 5:12-13 |
| • Romans 16:6-12 | • I Timothy 4:10 |
| • I Corinthians 4:12 | • I Timothy 5:17 |
| • I Corinthians 15:10 | • II Timothy 2:6 |
| • I Corinthians 16:16 | • Revelation 2:2-4 |

Date completed _____ Evaluation _____



HOW DOES THE STUDY OF TOPOGRAPHY REVEAL GOD'S DESIGN FOR CLOTHING THE EARTH?



Musée Chateau de Versailles

Topography is the science of observing both natural and artificially created features of the earth's surface. This study includes making accurate, detailed maps. The branch of mathematics related to topography is **topology**, which explores the properties of geometric figures which do not change when the shapes are bent or stretched. In topology, a sphere and a cube are not distinguished from each other because one can be molded by "deforming" the other.

1 *God has provided the earth with a foundation by clothing it with oceans and seas.*

"The earth is the Lord's, and the fulness thereof; the world, and they that dwell therein. For he hath founded it upon the seas, and established it upon the floods" (Psalm 24:1-2).

The earth is uniquely created in that it is the only planet in our solar system to have water in all

three of its forms. Having water available to us in its liquid form is the foundation for life. All the other planets are either so cold that all the water is ice, or so hot that all the water is gas. Ours is the only planet where the temperatures, for the most part, stay between 32°F and 212°F, the range in which water is a liquid.

It has been suggested that our planet should be called "ocean" rather than "earth," since 70 percent of the earth is covered with water. It is interesting to note that our bodies are also made up of 70 percent water.



© Rand McNally

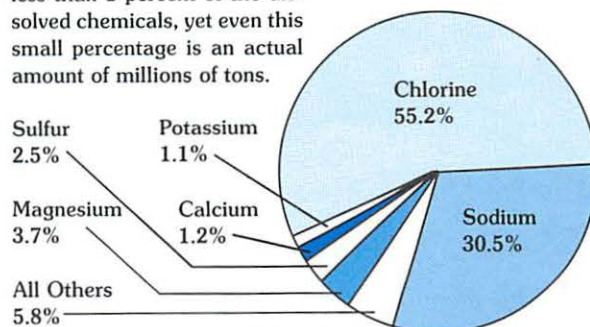
The oceans of the world are really parts of one contiguous body of water, known as the **world ocean**.

Water retains heat very well. A lake will absorb heat from the air on a hot summer day and radiate heat on a cold winter night. This is why weather forecasters for areas close to large bodies of water predict cooler temperatures "near the lake" in the summer, and warmer temperatures "near the lake" in the winter.

More substances dissolve in water than in any other liquid known. This fact helps us understand why the oceans, seas, and lakes are so important to life. The water in them is needed to carry on all the chemical reactions which occur in living organisms.

THE CHEMICAL COMPOSITION OF SEAWATER

All of the naturally occurring elements may be found in seawater. Gold and silver make up less than 1 percent of the dissolved chemicals, yet even this small percentage is an actual amount of millions of tons.



© World Book, Inc.

Dissolved in the ocean's waters are a great variety of salts and minerals. A cubic mile of ocean water contains 166 million tons of salt. If all the salt were removed from the ocean water, it would cover the land surface of the earth with a layer five hundred feet deep!

In addition to salt, the oceans also contain rich deposits of oil and natural gas. Huge supplies of copper, aluminum, phosphorus, manganese and even diamonds can be found on the ocean floor.

It is estimated that square mile per square mile, the ocean has a greater capacity to supply food than land does. The seventy million tons of food we take each year from the ocean represents only 1 or 2 percent of the food we eat. Countries such as Japan, which have little land available for agriculture, are hoping that *aquaculture*, the farming of the oceans, can increase their food supplies.

Just as the earth's surface has mountains, valleys, and plains, so does the ocean floor. Beneath both the Atlantic and Pacific oceans is a 47,000-mile-long range of mountains called the "Mid-Ocean Ridge." This underwater mountain range

goes down the center of the Atlantic Ocean, taking up one third of the ocean floor and varying from 300 to 1200 miles wide. The tops of some of these mountains break through the water's surface as the Azore Islands and the country of Iceland.

Under the Pacific Ocean, the Mid-Ocean Ridge contains both the highest and the deepest points on the earth. The tallest mountain, measured from the ocean floor to the highest peak, is the 32,000-foot peak of Hawaii. The deepest valley is the 35,840-foot-deep Mariana Trench. This trench could hold Mount Everest, the tallest mountain on the surface of the earth at 29,002 feet, without the top of the mountain reaching the surface of the water.

Below the surface of the southwestern Pacific Ocean is the Tonga-Kermadec Trench, which is 1600 miles long and 34,876 feet deep—deep enough to hold six Grand Canyons!

WATER PRESSURE IN THE OCEANS

DEPTH IN FEET	PRESSURE IN POUNDS PER SQUARE INCH
Surface	14.7
600	269
1,200	536
3,000	1,338
7,200	3,208
18,000	8,019
30,000	13,363
36,198 (deepest spot)	16,124

© World Book, Inc.

Water pressure increases 14.7 PPI (pounds per square inch) for every 33 feet of depth. At 30,000 feet, the pressure per square inch is 13,363 pounds—the equivalent of having an elephant standing on every square inch of your body.

If all the hills and valleys, both above sea level and below, were evened out so that all the land was level, no land would show at all. The oceans would cover the entire earth to a depth of 12,000 feet.



© World Book, Inc.

If the polar icecaps were to melt, the world ocean would rise about 200 feet. New York City would be almost entirely submerged, with only the tops of the tallest buildings showing above the water.



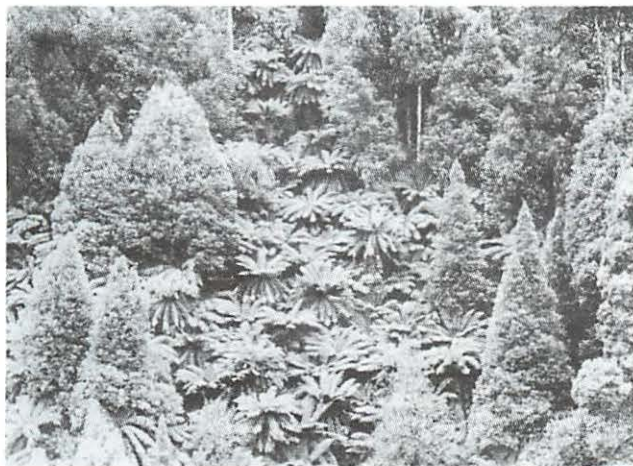
© Librairie Hachette

The mountain ranges and other geographical features under the surface of oceans are similar to land forms we observe.

2 God has preserved the earth by clothing it with forests.

"Blessed is the man that trusteth in the Lord, and whose hope the Lord is. For he shall be as a tree planted by the waters, and that spreadeth out her roots by the river, and shall not see when heat cometh, but her leaf shall be green; and shall not be careful in the year of drought, neither shall cease from yielding fruit" (Jeremiah 17:7-8).

The covering of forests is essential in maintaining the earth's oxygen supply and in preserving the earth's soil. Next to the oceans, forest soil holds the greatest amount of water—about 14 times that of the open fields. It acts like a giant sponge, holding water runoff from rain or melted snow, thus preventing flooding and erosion.



Vegetation is abundant in tropical rain forests.

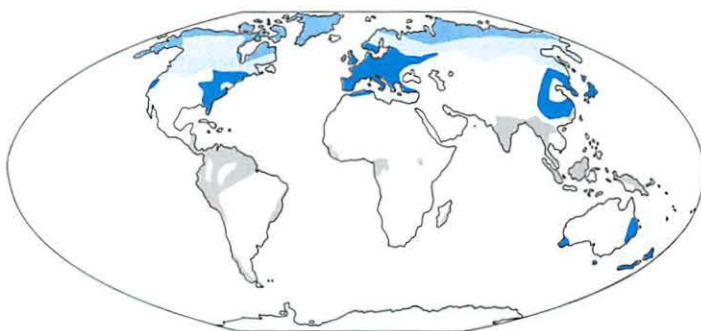
Forests cover approximately one-third of the land surface of the earth. The locality of a forest is determined mostly by amount of rainfall and length of growing season. Generally, trees need a yearly rainfall of 15 to 20 inches and a growing season of about 14 weeks where no frost occurs.

There are 3 different types of forests: *coniferous*, *deciduous*, and *tropical*.

The coniferous forests of the world begin at the southern edge of the tundra in northern Canada. Here, it is still bitterly cold, but the growing season is long enough for these trees to grow. This belt of forests crosses Norway, Sweden, Finland, the Soviet Union, Alaska, and much of Canada.

FORESTS OF THE WORLD

Tundra Coniferous forest Deciduous forest Tropical rain forest



Location of different types of trees is determined by available rainfall and length of growing season.



Deciduous trees lose their leaves each fall.



Conifers lose and replace their leaves gradually throughout the year.

Coniferous trees are cone-bearing; that is, they reproduce from seeds which grow inside cones. Most conifers are *evergreens*, which means they lose and replace their leaves gradually throughout the entire year, not just at one season. The largest trees in the world are conifers—the redwood and the Douglas fir.

Farther south, the forests of evergreens turn into the great temperate forests of deciduous trees. These are the trees which lose their leaves in the fall and lie dormant during the winter when water and nutrients are generally unavailable from the soil.

Circling our planet at the equator are the tropical rain forests. These forests have the same length of day and night throughout the year and have more abundant and dependable rainfall than do forests at other latitudes.

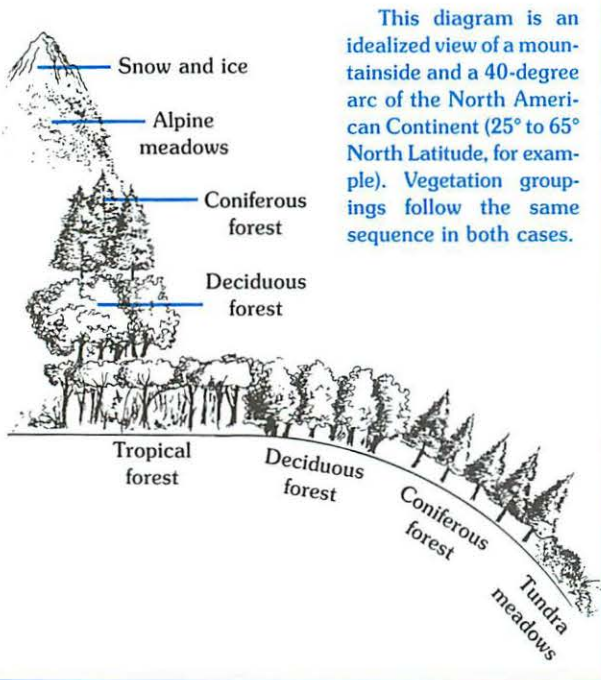
Where the weather is always warm and humid we find the lowland rain forests of South America and parts of Africa, India, southeast Asia and Australia. The trees in these forests are always green because temperatures and rainfall are constant throughout the year.

Although there is lush green plant growth in the tropical rain forests, the soil beneath these forests is very poor. While the constant rainfall feeds the trees continually, it also leeches the minerals and nutrients out of the soil.

Some tropical forests have alternating wet and dry seasons. The trees that grow there lose their leaves at the beginning of the dry season and grow them again during the rainy season.

Distance from the equator (latitude) and distance above sea level are key factors in determining where particular types of trees grow.

COMPARISON OF VEGETATION ON A MOUNTAINSIDE AND ON FLATLANDS



At the base of a mountain in the Rockies, about 4,000 feet above sea level, short grasses and wildflowers grow. As you go up the mountain, you find the low growing trees—willows and alders. More trees begin to grow at about 6,000 feet, the altitude where more rainfall begins. At first the trees grow far apart but as the altitude increases they grow closer together. At 8,000 feet the forest changes to thick stands of Douglas firs which grow very close together. Such proximity serves as mutual protection from the increased wind.

At about 10,000 feet the subalpine zone begins. Here the climate is similar to that found around Hudson Bay in Canada. The Douglas fir is replaced by the Engelmann spruce and the alpine fir.

At 11,500 feet above sea level is the timberline and the beginning of the alpine zone, where the harsh climate makes it very difficult for trees to grow.

Whole forests may reach only to the ankle, even though the trees are more than twenty years old.



The rugged terrain of high mountains, such as the Canadian Rockies pictured above, causes trees and other vegetation to become more sparse until at the peaks no vegetation appears at all.

At the very tops of the mountains, no tree can stand the cold temperatures and strong winds. Here the only water available is in the form of snow—a form the trees cannot use.

These changes occur whether you climb a mountain in the Canadian Rockies or a mountain in Mexico. Each 1,000 feet above sea level brings about the same changes in the forest as each 300 miles traveled from the equator. This is why trees found on a mountaintop near the equator are the same as those found in the Arctic lowlands.

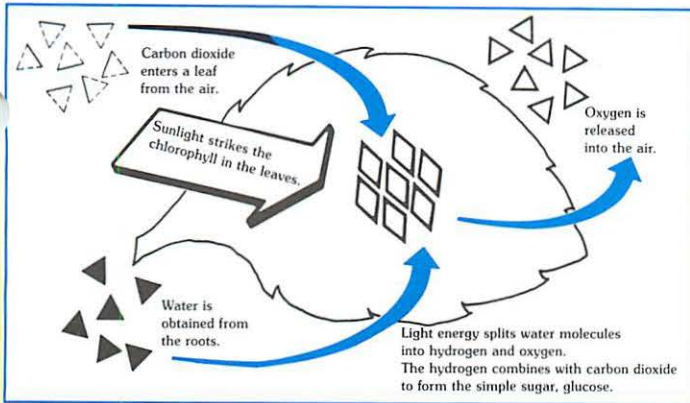


The parallels of latitude encircle the globe, and all points along their paths are an equal distance from the equator and the poles. Latitude is measured from 0° to 90°, north or south, with the equator being 0° and the poles, 90°.

The meridians of longitude (not pictured here) run north and south and meet at the poles. Longitude is measured from 0° to 180°, east or west, with 0°, the Prime Meridian, running through Greenwich, England, and 180° being the International Date Line. The 24 time zones of the earth are based on longitude.

Any point on the globe may be designated by (first) its latitude measurement, then its longitude measurement.

Through the process of photosynthesis, all the trees and plant life of the world take carbon dioxide from the air and use it to manufacture oxygen us for to breathe.



The green leaves of a tree make food through the process of photosynthesis. Oxygen is released as a by-product of this nourishment. Thus, God has designed a perfect circle in which trees replenish the earth's oxygen supply, while mankind's breathing supplies the trees with carbon dioxide.

The trees of the forests also preserve the soil. The canopy of leaves formed by the trees keeps the full brunt of a heavy rain from hitting the forest floor and washing away the dead leaves and brush underneath. These dead leaves, needles, and twigs, in turn, form a protective covering for the soil and help to fertilize it.

The vast root systems of forest trees keep the soil from washing away. The maximum length the roots of a single tree can grow is uncertain, however the estimates are in the hundreds of miles. All these



Field Museum of Natural History, Chicago

The dense vegetation in the forests benefits plant and animal life in many ways.

roots serve to hold the tree up, giving it a firm anchor, while at the same time holding the soil firmly in place.

By preserving the soil, forest trees also preserve the life which exists under the soil. A count was made of the living creatures in several soil sections one foot square and one inch deep. There was an average of 1,356 mites, millipedes, beetles, and other invertebrates in each section. These soil creatures take the two tons of animal and plant refuse that fall annually on each acre of forest floor and "plow" it back into the soil. There it is broken down again into simple chemicals which are used by the trees for nourishment.

Although the forest covering preserves the earth, it is the abundance of water which supplies the most basic sustenance for the trees to grow. During the 1700s a Dutch physician performed an experiment. He planted a 5-pound willow tree in a barrel of exactly 200 pounds of soil. He watered the soil for 5 years and then removed the tree and its roots from the barrel at which time the tree weighed 169 pounds, 3 ounces. The soil in the barrel weighed 199 pounds, 14 ounces! The growth of the tree (except for the 2 ounces of minerals it took from the soil) resulted almost entirely from the water it took in!

3 *God has provided abundance for the earth by clothing it in grasslands.*

"And I will send grass in thy fields for thy cattle, that thou mayest eat and be full"
(Deuteronomy 11:15).



Grant Helmen

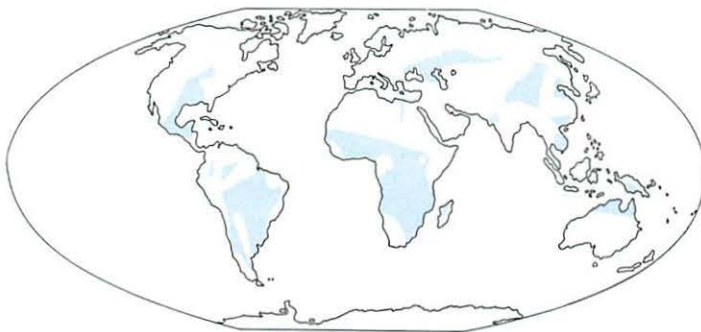
The prairie grasslands of North America alone produce over \$150 billion worth of crops each year—nearly one-half of the world's corn and much of its wheat.



Crops grown on grasslands around the world produce three-fourths of the world's food, plus provide pasture for cattle and poultry, and the subsequent dairy products and eggs. It is the abundance of that which comes from the grasslands that feeds us.

Grasslands cover about one-third of the land surface of the earth. They tend to be located in the interiors of continents rather than on the coasts, have large swings in daily temperatures, experience extremes of weather such as droughts and tornadoes, and receive from 10 to 40 inches of rainfall annually. Grasslands that receive more than 40 inches of rainfall become forests. Those that receive less than 10 inches become deserts.

Just as there are 3 different kinds of forests, there are also 3 different kinds of grasslands: tropical, temperate, and Arctic.



Grasslands of the world

The tropical grassland is also known as the *savanna*. Savannas cover 6 million square miles of the earth's surface, and are found, for the most part, in a wide belt around the equator where the weather is always warm.

The savannas have distinct wet and dry seasons. Although grasses grow everywhere on the savanna, the parts that have longer wet seasons tend to grow more trees than the parts which have shorter wet seasons.

The most well known savanna is the Serengeti Plain of Tanzania, East Africa. Here the land is dry and brown for approximately half the year until the rains come. For the 5 or 6 months that the rain lasts, the Serengeti is filled with tall, wild grasses and the herds of animals which feed on them. When the ground dries out, the grasses stiffen and become dormant, waiting until the next rains come. As the grasses dry out, the animals go elsewhere in search of food.

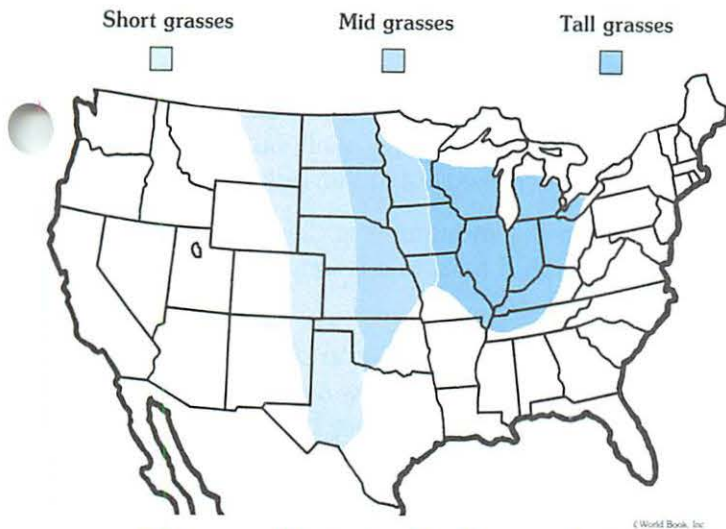
The savanna of the Serengeti Plain supports a greater abundance of wildlife than any other grassland in the world, while at the same time, it is very difficult to raise crops there. Farmers in that area are known as *subsistence farmers*—that is, they are able only to raise enough to feed themselves. While the animals are free to move to places where the rains have provided enough moisture for food to grow, the crops farmers have planted are not. When the rains come, there is abundance. When the rains do not come, there is little.

The temperate grasslands of the world are called by different names in different areas. In the United States, the grasslands of the west are called the *prairie*, the French word for "meadow." In southern Africa the grassland is called a *veld*. South America has its *pampas*, and Europe and Asia have the *steppes*.

The temperate grasslands are divided into 3 main types according to the height of the grass: short grasses (less than 2 feet tall), mid grasses (2 to 4 feet tall), and tall grasses (more than 4 feet tall).

Look at the map of the United States on the facing page. The North American prairie starts at the eastern edge of the Rocky Mountains. The first part of the prairie, beginning at the mountains and moving eastward for about 200 miles, receives as little as 10 inches of rain in a year. As a result, only short grasses grow here. Part of this area would be, for example, the eastern part of the state of Colorado.

Farther east of the Rockies, in Kansas and Nebraska, rainfall increases to about 20 inches. Although this part of the prairie contains all 3 kinds of grasses it is covered mostly by the mid grasses.



This map illustrates the three main types of temperate grasslands in the United States.

About 400 miles more to the east is the tall grass prairie, the area that receives the most rainfall. It is the home of the tallest grasses (some of which grow to 12 feet) and the greatest number of grasses (as many as 300 different kinds).

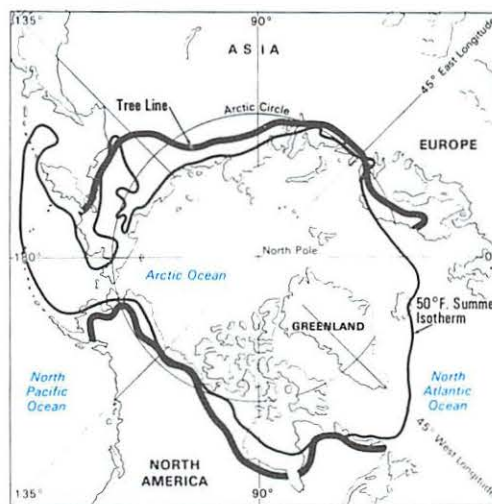
All of the prairie grasses grow very close together, both above and below the ground. The pioneers broke their shovels and plows trying to make their first cuts through the prairie sod. That is why these early settlers were called "sodbusters." So tightly grown together were the grasses and roots that even after the farmers cut through them, the sod still needed 2 or 3 years to rot before it could be used for planting.



With so few trees growing on the prairie, the pioneers used slabs of prairie sod to build their homes. They cut the sod into long thin strips and stacked the strips on top of each other to make the walls for their houses which protected them from the prairie's strong winds and cold winters. A typical sod home of early settlers is pictured above.

The color and richness of the prairie soil corresponds to the length of the grass which grows there. The lightest, poorest soil is found the furthest west where there is the least rainfall and the shortest grasses. The darkest, richest soil is found to the east, where there is the most rainfall and the tallest grasses. Anyone who has ever grown a vegetable garden in central Illinois knows how abundantly this eastern part of the prairie produces food.

The third kind of grassland is the Arctic grassland more commonly called the *tundra*. It is found in the far north, beginning where the coniferous forests end. As it wraps around the top of the world through Greenland, Canada, Alaska, Siberia, and Scandinavia, it forms a hat—a hat with a hole in the center for the North Pole.



The climatic boundary (diagramed here) which separates the Arctic from the northern coniferous forests is the summer isotherm (50°F or 10°C). An isotherm is a line on a map connecting points having the same mean temperature over a period of time.

The tundra is partly grassland and partly barren. Although there is 12 to 20 inches of rainfall here and very little snow, it is the bitter cold, strong winds, and very short growing season which make growing anything in this region very difficult.

Just a few inches below the tundra's surface, the ground is frozen year round. Almost 85 percent of Alaska and 50 percent of Canada and the Soviet Union are made up of this *permafrost*. Even in the summer, when the sun shines for as much as 24 hours a day, the heat from the sun is not enough to melt both the snow and ice or to warm more than just the surface of the ground.

This layer of permafrost helps to conserve the small amounts of rain that fall on the tundra during its 2 to 3½-month growing season. The frozen layer

forms a barrier which prevents the water from soaking into the ground or running off. Instead, the water forms puddles, bogs, and shallow lakes which provide growing plants with moisture.

In a way, plants never suffer from a lack of water either during the brief summers or the long, severe winters of the tundra. However, the water that is available is not usable. It is locked above and beneath the surface in the form of snow and ice.



United States Department of the Interior, Fish and Wildlife Service



Leonard Rue III

The tundra changes drastically from winter to summer. Much of the Arctic has no snow in July and August, allowing fields of flowers to flourish during the brief growing season.

Although the tundra cannot provide an abundance of crops as the other grasslands can, it does have an abundance of coal, natural gas, oil, iron ore, lead, and zinc below its surface. In 1986 Alaska ranked second only to Texas as the chief oil-producing state in the United States. Alaska also ranked eighth in the production of natural gas.

4 God has provided a refuge by clothing the earth with mountains.

"I will lift up mine eyes unto the hills, from whence cometh my help. My help cometh from the Lord, which made heaven and earth" (Psalm 121:1-2).



H. Armstrong Roberts

In Psalm 125:2 God expresses His protection for His children with an analogy picturing mountains.

Mountains have always been thought of as places of refuge. When enemies have invaded lowlands, the people living there fled to the hills for safety. Even many so-called mountain animals are not really mountain animals at all, but retreat to the mountains when they are driven out of their homes.

Life in the mountains is difficult. The terrain is dangerous and hard to cultivate, and the climate is harsh.

Think of what it is like to plow a flat garden. How much harder is it to plow a garden with even a small hill on it? A much larger hill? A much larger, steeper hill? A larger, steeper hill with a drop off at the edge? A larger, steeper hill with a drop off at the edge and a 60-mile-an-hour wind blowing in your face? Such is life on the mountains.

It is hard to define how high a hill must be before it can qualify as a mountain. The Watchung "mountains" in New Jersey are 400 to 500 feet high. Some of the lower mountains in the Himalayan chain are over 12,000 feet, but no one has bothered to name them because they are considered just the foothills to the higher mountains in the chain.



©World Book, Inc.

This map shows which parts of the world are at least 3000 feet above sea level. These are the major mountain chains of the world, and they cover about one-fourth of the world's land surface.

Find the major mountain chain in the western United States. This chain is made up of the Rockies, the Cascades, and the Sierra Nevada ranges. In the United States, the winds blow off the Pacific Ocean against the west coast, carrying all the moisture they have gathered from the ocean. As they cross Washington, Oregon and California, they meet the mountain ranges and are pushed up. As they go up, they grow colder, and the moisture in them condenses into rain, which falls on the western slopes of the mountains—as much as 12 feet in a single year.

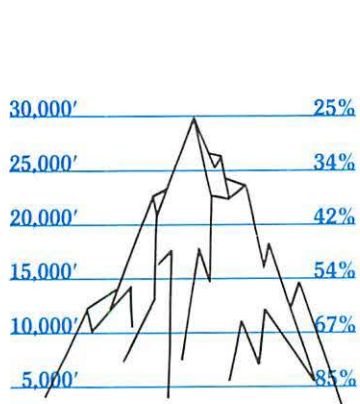
When the winds reach the eastern side of the mountains, they have little or no moisture left in them. As the winds blow farther east, they regain

moisture from the ground or from winds blowing off the Gulf of Mexico. This is why the grasslands just east of the mountains have the least amount of rainfall, and the grasslands near the Mississippi River have the most.

The higher you climb up a mountain, the colder you get, even though you are actually moving closer to the sun. This is because the air is drier at higher elevations and holds less of the warming infrared rays of the sun. Though the air is colder you still can get a sunburn because the sun's ultraviolet rays are less filtered by the dry air.

The simple act of breathing is difficult in the mountains. Each breath of air you take at sea level enters your lungs, and the oxygen squeezes through their membranes and into the blood at a pressure of about 15 pounds per square inch. At 10,000 feet above sea level, there is only about 10 pounds per square inch of pressure to force the oxygen through the membranes of the lungs into the blood.

The result is often headaches, dizziness, and tiredness. At 18,000 feet, the air pressure is only one-half of what it is at sea level. Now you must plow that steeply sloped garden with the drop off at the edge in a 60-mile-an-hour wind with only one-half the oxygen you are accustomed to breathing.



Alveolar (al-VEE-uh-ler) pressure is an indicator of the amount of oxygen which enters the blood at varying altitudes.

The term *alveolar* refers to *alveoli* (al-VEE-uh-lie), the small air sacs in the lungs, through whose membranes oxygen is absorbed into the blood.

In this diagram, sea level alveolar pressure is assigned the value of 100 percent. As altitude increases, alveolar pressure decreases correspondingly.

Volcanic mountains are not usually thought of as a place of refuge. Yet, people have always lived near them because of the high quality of soil formed by the lava flow. Today, volcanoes are recognized as having some benefits. They add nitrogen, hydrogen, and carbon dioxide to the air and are an important source of water in the form of the steam they release.

Mountains are not easy places to live. The higher elevations of the taller mountains, where the

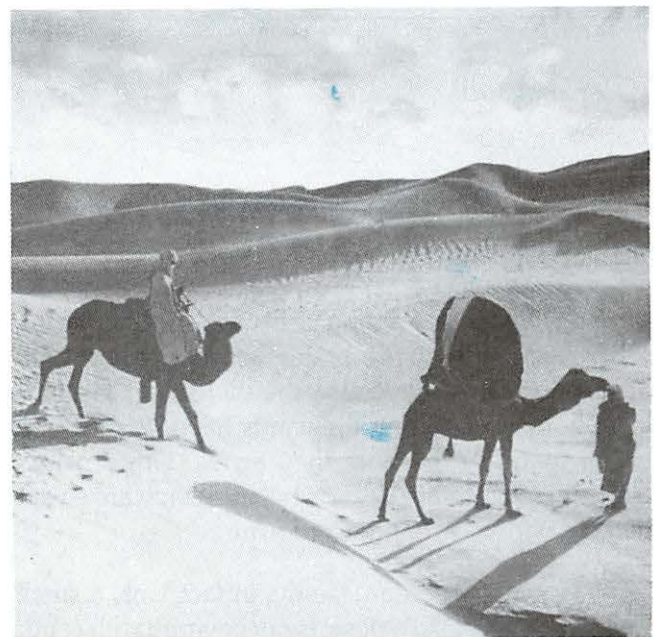
ground is covered with snow and swept with incredible winds year-round, are impossible places to live.

Yet, at least 2 present-day countries were established as refuges in the mountains. The country of Switzerland exists in the Alps and the Jura Mountains in order to protect and maintain its freedom and independence. The country of Tibet—often referred to as “the roof of the world” since the average altitude is 15,000 feet above sea level—lies in the Himalayan Mountains, the tallest chain of mountains in the world. This country was established by its people as a refuge—a place where they could be secure against invading forces.

5 God has placed a curse on the earth by leaving parts of it unclothed.

“Thus saith the Lord; Cursed be the man that trusteth in man, and maketh flesh his arm, and whose heart departeth from the Lord. For he shall be like the heath in the desert, and shall not see when good cometh; but shall inhabit the parched places in the wilderness, in a salt land and not inhabited” (Jeremiah 17:5–6).

The parts of the earth that are unclothed are the deserts. Over 8 million square miles of the earth's surface, roughly one-seventh of the total land surface, qualifies as desert.



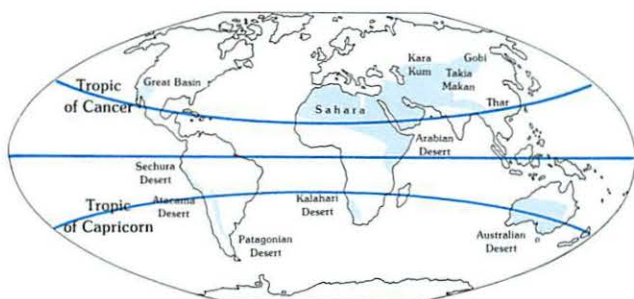
A camel caravan led by nomads is a common sight in the Sahara Desert.

The word *desert* comes from a Latin word which means “abandoned.” That is just what the desert regions are—abandoned of water and vegetation! As a result, the surface of the land is left unclothed.

One definition of a desert is “an area which receives less than 10 inches of rain a year.” Although some places receive more than 10 inches yearly, they still qualify as deserts since they receive all their rain in only 1 or 2 downpours.

A second way of defining a desert compares the amount of rainfall received to the amount of water the sun evaporates. In the eastern Sahara and in the desert of Peru, the sun evaporates 200 times the amount of rainfall these areas receive in a year. These are the 2 driest places on the earth. By contrast, in the area east of the Rocky Mountains, the sun evaporates only 1.5 to 4 times the amount of rainfall received in a year. Yet, all 3 places are considered deserts.

Look at the map. The desert regions of the earth are found in 2 wide belts: one that circles the earth near the Tropic of Cancer and a second one that circles the earth near the Tropic of Capricorn.



Major deserts of the world

Some places are deserts because a nearby mountain range has wrung all the moisture out of the winds before they reach the desert areas. Some places are deserts because they lie so far inside a large body of land that the winds have no moisture left in them by the time they arrive. Other places along the oceans are deserts because they are swept by cold winds carrying no moisture.

Not all deserts are sandy. In fact, only a small fraction of the earth's deserts are covered with sand. Even the giant Sahara is only one-tenth sand. Deserts are covered mostly with rock, stones, salt,

clay, and mountains. The Gobi desert in China is even covered with snow in the winter.

Deserts are extremely hot during the day because they lack the covering of clouds which are full of moisture. Where the earth is clothed with moist clouds, only 40 percent of the heat from the sun reaches the earth. Without this covering, over 90 percent of the heat from the sun reaches the desert. The highest temperature ever recorded on the earth was 134.6°F in the Sahara desert.

The same moist clouds which keep the sun's heat away from the earth during the day also work to keep in about one-half the earth's heat at night. But in the desert, the lack of a cloud covering allows 90 percent of the heat to escape at night. It is not unusual for the temperature in the desert to drop 60° between afternoon and night.

This complete lack of moisture is what makes the desert so dangerous to people. A person caught in the desert without water and shelter has only a few hours to live. On hot days, the human body can lose up to a gallon of water through sweat. If the water is not replaced, the body starts to release water that is stored in fat, tissue, and even blood. The blood thickens, losing its ability to cool the organs of the body. When the sweat glands fail because of the lack of moisture, high fever, delirium, and circulatory failure lead to death.

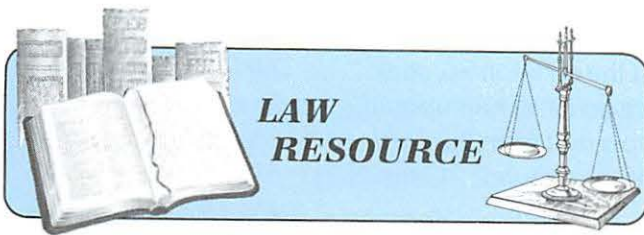
Sometimes man creates a desert. The grassland prairies of the American West suffered a drought in the 1930s. Parts of Kansas, Oklahoma, Colorado, New Mexico and Texas became known as the Dust Bowl. Land that had been clothed in fields and grasses lost its vegetative covering. Left uncovered, the soil was whipped into huge dust storms. A single storm dumped 12 million tons of dust on the city of Chicago—hundreds of miles away.

When the drought was over in 1940 and the prairie began to revert from desert to grassland, it became apparent that man had contributed to the disaster. These grasslands had been overgrazed and overcultivated, and therefore, stripped of their covering.

PROJECT

Use your concordance to locate Scripture references about God judging His people and the nations by making their land barren or exposing their nakedness to bring them to open shame. What lessons can you learn from these passages?

Date completed _____ Evaluation _____



HOW DO LAWS WHICH PROTECT THE ENVIRONMENT HELP TO "CLOTHE" THE EARTH?



My Land is Dying. © 1971 Harry M. Cassill, E. P. Dutton & Co., Inc.

Surface mining techniques strip away the earth's covering of vegetation and severely damage the productivity of its soil. Unwise lumbering and farming practices have equally devastating effects.

One brisk spring morning in 1965 Dan Gibson trudged slowly up the steep slope behind the house where he and his wife lived. It was just after sunrise, but he was expecting visitors. Mr. Gibson planned to meet them at the property line and let them

know they were not welcome. To make sure they understood, he carried his .22-caliber rifle.

Breathing hard as he approached the top of the heavily wooded ridge, the old man paused and looked out across Clear Creek Valley. During his eighty years, he had seen it happen time and time again to his neighbors here in the heart of Appalachia. Like Mr. Gibson, they lived on land that had been in their families for generations, but the mineral rights had long ago been sold to outsiders for a few cents an acre.

This meant that a mining company could legally, whenever it chose, enter the property and remove the coal or other minerals and not owe the owner a penny. Not only could the company do this without paying the landowner, they did not even have to ask his permission to begin mining. Worst of all, according to the signed agreements, they could do anything they needed to in order to get the coal out of the ground without having to repair the damage or compensate the owner in any way.

Mr. Gibson had seen the destruction left behind by these surface mining operations, appropriately termed "strip mines." Bulldozers would literally strip the trees and other vegetation from a hillside in order to expose a vein of coal. The rock and dirt thus scraped away was allowed to slide down the hill to clog the stream below. The miners often used powerful explosives to blast away additional layers of earth.

Then after huge machines had augered out the rich ore and dump trucks had hauled it off, the barren mountainside would be left to erode away—sometimes in devastating mud slides.

That morning Mr. Gibson was determined it would not happen on his land. As he expected, it was not long before his "visitors" arrived on their bulldozers. They were strip miners, under contract with the Tennessee Valley Authority, the largest single user of coal in the world. Mr. Gibson politely informed them they could not come onto his land and sat down in front of the bulldozers with his rifle across his knees.

After conferring briefly the workmen left, but company officials felt that the law was on their side. Soon three cars carrying ten armed policemen and sheriff's deputies made their way up the valley. They had a warrant charging Mr. Gibson with breach of the peace. Mr. Gibson offered no resistance when

the officers arrested him. As his neighbors watched in stunned silence, he was led down the mountain to a patrol car and taken to jail.

The next day at dawn the bulldozers were back, but so were Mr. Gibson's neighbors. Instead of one old man blocking their way, now the mine workers confronted a whole group of men and women. Most of them were elderly, and all of them were determined to stand their ground.

A few weeks later Dan Gibson and nearly a hundred other Clear Creek Valley residents journeyed over the mountains to the state capital to meet with the governor. He listened to their grievances and even agreed to come and see the devastation for himself. He later revoked all strip mining permits issued for the valley, thus, saving Dan Gibson's land from the bulldozers.

The ensuing court battles, protests, lawsuits, and debates were merely one small part of the furor over ecological issues that erupted in the late sixties and all during the seventies. Across the nation Americans were waking up to the reality that our environment was being ruined. Some said the land was being raped.

Legislation which emerged from this period clearly confirms that God intended the earth to be "clothed" with vegetation, and when we act in ways contrary to His design, we ultimately reap very drastic consequences.

• **What is God's design for the land?**

Scripture makes it clear that God did not create deserts. It was not His intention that parts of the earth be barren and dry. This is indicated

in the creation account: "... *The Lord God had not caused it to rain upon the earth. . . . But there went up a mist from the earth, and watered the whole face of the ground*" (Genesis 2:5-6).

The Bible does not say that only some of the land was watered but rather the entire surface of the earth. This is completely consistent with the earlier statement that God commanded the earth to bring forth vegetation. (See Genesis 1:11-12.) It does not say that His command applied only to certain parts of the earth. Instead the implication is that the whole earth was to be covered with green, growing things.

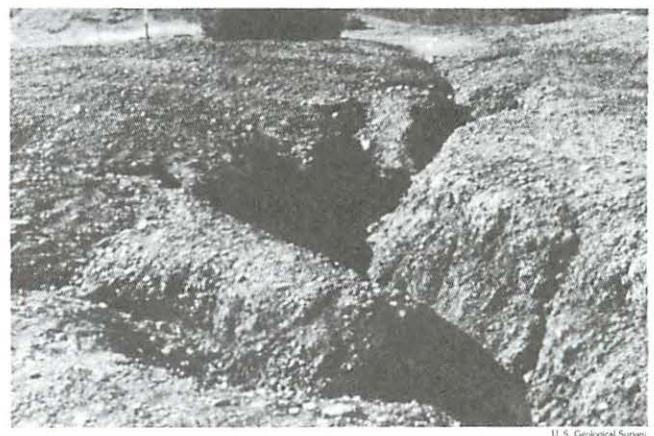
Throughout the Bible the productivity of the land is evidence of God's blessing on an obedient individual or nation: "*If ye walk in my statutes, and keep my commandments, and do them; Then I will give you rain in due season, and the land shall yield her increase, and the trees of the field shall yield their fruit*" (Leviticus 26:3-4).

Conversely, those who reject God's ways experience His judgment. He promises to make "... *your earth as brass: And your strength shall be spent in vain: for your land shall not yield her increase, neither shall the trees of the land yield their fruits*" (Leviticus 26:19-20).

Thus, deserts are a sign of God's judgment. (See Psalm 107:33-34.) One confirmation of this fact is the conclusion scientists have drawn in recent years regarding the process of desertification. They used to believe that drought and other climatic factors were responsible for agricultural or grazing lands becoming deserts. It has become clear, however, that man's abuse of the land is largely to blame.



When the earth is uncovered, wind and water can very quickly erode away precious topsoil.



This photograph of the same site five years later demonstrates that it is possible for man to so abuse the land that it cannot renew its natural covering of trees and vegetation on its own—it must be seeded.



Scientists have discovered evidence that even the vast Sahara was once covered by dense forests.

• What is man's responsibility?

God gave Adam and Eve (and their descendants) four commands concerning the earth. The first three carry the idea of filling it up with people: *"And God blessed them, and God said unto them, Be fruitful, and multiply, and replenish the earth . . ."* (Genesis 1:28). The other command, included in the same verse, was to subdue the earth and to have dominion over every living thing.

The Hebrew word for "subdue" literally means "to tread down; to conquer." Although it has to do with enslaving or bringing into bondage, this word is not, as some have argued, a mandate to exploit God's creation in an irresponsible manner. It implies controlling and using something wisely, without consuming it, in order to gain the maximum benefit from it.

The way man has often gone astray in obeying and fulfilling the command to subdue is in forgetting the principle of ownership: *"The earth is the Lord's, and the fulness thereof . . ."* (Psalm 24:1). In reality, man is just a steward of the land which God has created.

Stewardship involves placing oneself under and operating under the authority of the owner of the property given in trust. A steward has the responsibility of using the property for the benefit and the blessing of the owner to whom he is accountable. A wise steward will be careful to use any property entrusted to him in a manner consistent with the character and the instructions of the owner. (See Matthew 25:14–30.)

• What are God's instructions?

God gave His people a number of laws concerning how the land was to be treated. Most of them relate to the following two principles:

1. Ownership. The land belonged not to the families who lived on it or to the state but to the Lord who had given it to them. *"The land shall not be sold for ever: for the land is mine . . ."* (Leviticus 25:23).

God owns not only the land but also the animals that live on it, both wild and domesticated: *"For every beast of the forest is mine, and the cattle upon a thousand hills. I know all the fowls of the mountains: and the wild beasts of the field are mine"* (Psalm 50:10–11).

All plant life is His as well. He gave it to man and beast as their food. (See Genesis 1:29–30.) As a reminder of His ownership, man was commanded to bring sacrifices of the firstfruits of his fields and flocks. (See Nehemiah 10:34–36.)

2. Responsibility. The people were sternly warned not to pollute or defile the land by murder, prostitution, or other immoral activities. (See Psalm 106:38 and Jeremiah 3:1.)

Every seventh year farmers were to leave their fields uncultivated. This sabbath rest was a reminder that the earth itself belonged to God, and it also allowed the land to renew itself and remain productive. (See Leviticus 25:1–7.)

In the laws of warfare there is a prohibition against cutting down fruit trees to build instruments of attack. (See Deuteronomy 20:19–20.) This is case law, which means it is a specific example of a universal principle. The general guideline is that man is not to destroy that which belongs to God. He may utilize it to meet his needs, but he is not to waste it, abuse it, or wreck its future usefulness.

Frequently in the course of history man has violated this principle by removing the earth's covering. The consequences, though they may not become apparent immediately, are devastating. In the past people would often just move and start over in a new place.

The recent realization that there are very few unexploited areas left has provided the motivation for passing certain conservation measures. So even though these laws are not based directly on Scriptural principles, they do confirm God's design for the earth to be covered with vegetation.

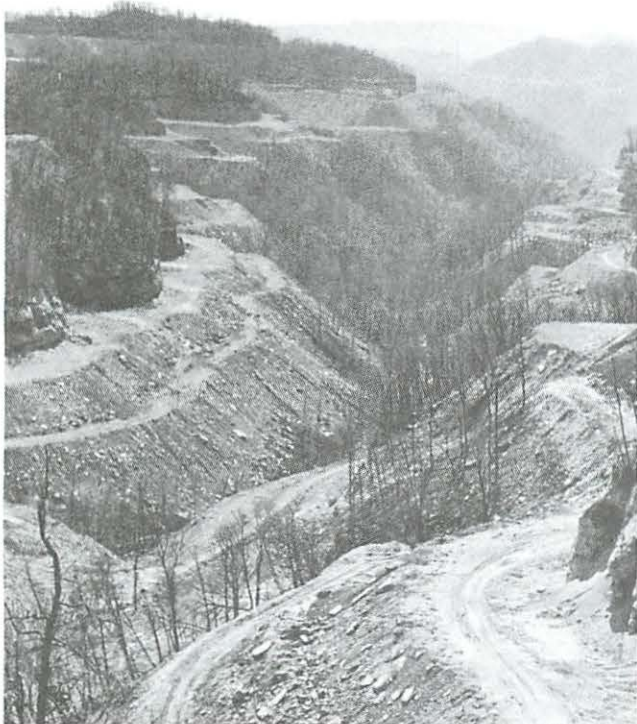
1 MINING RECLAMATION LAWS REQUIRE THAT THE LAND NOT BE LEFT BARE.

Long before modern technology made strip mining a profitable practice, there was concern about the ecological effects of mining. Georgius Agricola, a German scientist who is regarded as the father of the science of mineralogy, wrote in 1555:

"Yields are devastated by mining operations, for which reason formerly Italians were warned by law that no one should dig the earth for metals and so injure their very fertile fields, their vineyards, and their olive groves. . . .

"The woods and groves are cut down, for there is need of an endless amount of wood for timbers, machines, and the smelting of metals. And then the woods and groves are felled, then are exterminated the beasts and birds, very many of which furnish a pleasant and agreeable food for man. Further, when the ores are washed, the water which has been used poisons the brooks and streams, and either destroys the fish or drives them away."

Over four hundred years later circumstances have not changed very much.



My Land is Dying. © 1971 Henry M. Caudill. E. P. Dutton & Co., Inc.

When the earth's covering is ruined by strip mining, the scars remain for years. By 1977, over 3,000 square miles of landslides and 25,000 square miles of unreclaimed highwalls (steep hillside cuts left by strip miners) marred the landscape of America.

The Surface Mining Control and Reclamation Act (SMCRA) was passed by Congress in 1977. In theory the law is quite simple: No strip mining will be allowed unless the land is *reclaimed*, that is, restored to its original condition.

The act makes the Office of Surface Mining (OSM) of the Department of the Interior responsible for developing standards for restoring mine sites to their former productivity levels. The states under OSM supervision are to make sure that these standards are met.

Mining companies are required to post bond. In other words, they give the government a deposit of enough money to cover the cost of reclamation. If they properly restore the land after mining, the money is refunded. If not, the funds are available to pay someone else to do the work.

More than a decade after the SMCRA was passed, however, this legislation is still failing to keep the strip miners from leaving the land bare and, therefore, barren. One congressman from a western state where surface mining has become all too common had this to say: "America has more unreclaimed mines in 1987 than ever before. The lack of enforcement at both the state and federal levels is allowing more unreclaimed mined land to be created than is being repaired."

Part of the problem is inconsistency and inefficiency in enforcing the SMCRA regulations. The understaffed OSM has been unable to keep up not only with the violation reports which are turned in, but also with actually collecting the fines which have been assessed. In a recent two-year period the OSM issued fines totaling over eight million dollars, but collected only \$17,000.

Some miners, knowing they have a good chance of not getting caught, just ignore the law. With the sophisticated earth-moving equipment available today, a crew of four or five men can extract thousands of dollars' worth of coal in a very short period of time. Several acres of land are spoiled, with the miners having moved on before a mine inspector ever finds out about it.

Other mining companies try to use exemptions provided for by law in order to avoid having to reclaim the land they ruin. Mining operations smaller than two acres are exempt, so many operators falsely claim that their mines cover less than that minimum. In 1987 about 4,000 mines escaped regulation under the two-acre exemption, but inspectors found that more than half the companies actually exceeded that limit.

Still other mine operators stay within the letter of the law but violate its spirit. The two-acre exemption was intended to keep very small operators from being forced out of business by having to pay reclamation costs, but large companies sometimes divide a big mine into two-acre segments, leaving only a narrow band of grassy or wooded land between. The resulting devastation is as great as that caused by one large contiguous open-pit operation.

Another exemption that has been abused is one that allows mining on the sites of future construction projects. One firm filed a plan to build a condominium development on a slope above the Rockcastle River in Kentucky. Months later the site boasted no condos—only abandoned coal pits, which triggered occasional landslides.

An additional problem is that the amount of bond collected by the OSM has been far from adequate to pay for reclamation in the majority of cases. In one state it was found that on the average, the amount of the bond posted equaled only 12 percent of the actual restoration cost. This disparity has led many mine operators to simply forfeit their bond money because it was cheaper than regrading and replanting.

The result is that many mine sites are not being reclaimed, and the taxpayers foot the bill for the few that are. For example, in Kentucky, one corporation was ordered to forfeit its bond for failure to reclaim a hillside mining site adequately. As officials had feared, the site soon began to pose a landslide threat to homes in the valley below. It cost \$400,000 to restructure the damaged slope, but the bond amount paid by the corporation totaled only \$6,900.



Tennessee Valley Authority

This grassland is reclaimed mine land in the Appalachians. Do you think it will support the native wildlife?

Even when mining companies conscientiously try to restore the land, it has become apparent in the years since the SMCRA was passed that current technology is not capable of accomplishing this on many sites, especially in more arid regions or on slopes steeper than 20 degrees.

When prime cropland is ripped up to extract coal or other minerals, it is difficult to restore the fields to their former productivity levels. The main hindrance is that the heavy earth-moving equipment causes soil compaction.

2 FORESTRY LEGISLATION PROTECTS THE EARTH'S COVERING OF TIMBER.

At the height of his glory as king of Israel, Solomon was sending ten thousand workmen every month to fell trees in the forests of Lebanon. The great logs were carried down to the Mediterranean Sea and floated along the coast in huge rafts. (See I Kings 5.)

The pagan empires which later conquered this area exploited its timber resources so that by the time of Justinian (A.D. 483–565) only a few groves remained. These trees were then used to supply fuel for the Damascus-Beirut railway around the time of World War I.



U.S. Soil Conservation Service, photo by C.W. Lowdermilk

This tiny grove of cedars is all that remains of the dense forests that once blanketed the mountains of Lebanon. The prophet Isaiah wrote: "The earth mourneth and languisheth: Lebanon is ashamed and hewn down..." (Isaiah 33:9).

The same process was carried out in all the wooded lands surrounding the Mediterranean Sea. In many areas where forests once flourished, there are now deserts.

When settlers first came to North America, they saw the extensive forests at worst as an enemy to be conquered and at best as an inexhaustible supply of fuel and lumber. So for centuries Americans continued chopping down and burning up the earth's covering of trees.

In the 1800s the wholesale destruction of the forests accelerated as the logging industry gained political power. As development of the pulpwood process for making paper added to the demand for wood, invention of the circular saw and steam sawmill made the forests even more vulnerable to loggers. By 1870 the lumberjacks had chopped and sawed their way across the New England states and then headed west.

The timber lobbyists pushed loose homestead laws through Congress. For example, the Homestead Act of 1862 offered 84 million acres of public land at \$1.25 an acre to anyone who would erect a dwelling on the site. It was not uncommon for loggers to buy a section strictly for the timber. To satisfy the law they would use sticks to construct a "home" measuring fourteen by sixteen inches! The Timber Culture Act of 1873 had the opposite effect of what was intended. The law offered 160 acres to anyone who would cultivate trees on 40 acres. Loggers would cut down all the trees on 120 acres and "cultivate" the rest.

The timber industry acquired vast areas of virgin forest for only pennies per acre, only to leave the cut-over lands barren and susceptible to erosion. In 1877 Carl Schurz, Secretary of the Interior, tried to call a halt to this wanton destruction, but Congress even then was more responsive to the pressures of business interests than it was to common sense.

Mr. Schurz predicted: "The machinery left to the government to prevent . . . waste and destruction through enforcement of the regulations will prove entirely inadequate, and as a final result in a few years the mountainsides in those states and territories will be stripped bare."

Finally in 1891 Congress heeded the warning and gave the President statutory power to establish forest preserves, later called national forests, where no logging was allowed. The next three Presidents set aside a total of 132 million acres, making the timber barons quite unhappy.

The Organic Administration Act of 1897 was passed by Congress for the purpose of protecting the forests. However, its wording was ambiguous: "No forest shall be established except to improve and

protect the forest within the reservation for the purpose of securing favorable conditions of water flows, and to furnish a continuous supply of timber for the use and necessities of the United States."

The Forest Service, created just a few years later to implement the Organic Administration Act, interpreted it as a conservation mandate. For the next three or four decades the Service functioned as a protector. Even though logging was allowed on these public lands, it was restored to a minimal amount. Millions of acres were added to the national forest system.



U. S. Department of Agriculture, Soil Conservation Service

During the Depression years, the Forest Service sponsored the Civilian Conservation Corps (CCC). Thousands of unemployed citizens planted over two billion trees to reclaim huge tracts of land that had been devastated by irresponsible logging.

World War II and the housing boom that came on its heels created an unprecedented demand for lumber. The timber industry panicked. The big companies had cut down virtually all of their privately owned forests and could no longer find cheap wooded land to purchase.

As of 1950 only 15 percent of the nation's timber output was coming from the national forests. The timber lobby demanded that this percentage be increased drastically. When the price of lumber quadrupled practically overnight, the Forest Service began to change. Many foresters became more concerned about how much timber they could sell off public lands than they were about protecting the earth's covering.

Between 1950 and 1965 the Forest Service took approximately 800,000 acres of protected forest land and put it in the timber-cutting category.

By the 1970s 40 percent of the U.S. lumber supply was coming out of the national forest reserves. Suddenly the agency was becoming an ally of the industry it was created to police.

During this period the Forest Service received its first and only major policy directive from Congress since the Organic Administration Act in 1897. The directive came in the form of the Multiple Use-Sustained Yield Act of 1960. This legislation was intended to spell out the policy that had guided the agency from its inception until it shifted direction.

The Act stated: "It is the policy of the Congress that the national forests are established and shall be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes. . . . Due consideration shall be given to the relative values of the various resources in particular areas."

Timber was only one of the five multiple uses Congress wanted the Forest Service to protect. The Act also clearly indicated that economic considerations were not to outweigh other values in managing the forests. The sustained-yield portion of the act provided for the careful use of renewable resources so future generations of Americans would not be deprived of them.

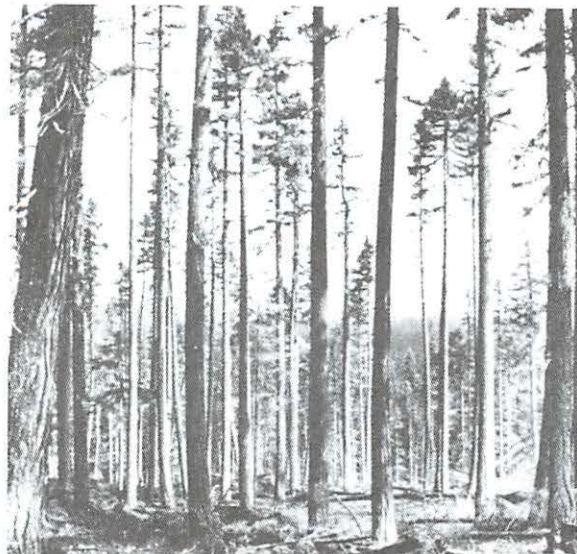
For the most part the Forest Service ignored these policy directives, finding it more convenient and profitable to cooperate with the timber industry in cutting down the trees on millions of acres.

However, various environmental groups began to put pressure on the Forest Service by filing lawsuits in the early 1970s. The focus of many of these court actions was the method most often used in logging the national forests.

Government foresters called this method "even-aged management." Basically, it meant removing all the timber and vegetation from a large tract of land. The earth was then scraped clean by bulldozers and seeded with a high-quality, fast-growing species of tree. The area was often treated with a herbicide to restrict the growth of "undesirable vegetation." Forty or so years later a uniform crop of "even age" trees would be ready to be "harvested." The common term for this practice of removing all the trees in a given area at the same time is inherently suggestive of its devastating consequences: "clear-cutting."

Clear-cutting has several consequences, which, although they are not as visible as the ugly scars they leave on the landscape, are just as damaging to the environment.

Alternatives to clear-cutting include several less damaging methods of removing timber.



U. S. Forest Service

Shelterwood cutting leaves enough trees standing to protect seedlings from frost but allows sunlight to penetrate to the forest floor so that shade-intolerant Douglas firs can grow. After the seedlings are established, the shelterwood trees will be removed. Seed-tree cutting is similar except that only enough trees of the desired species are left to reseed the area.

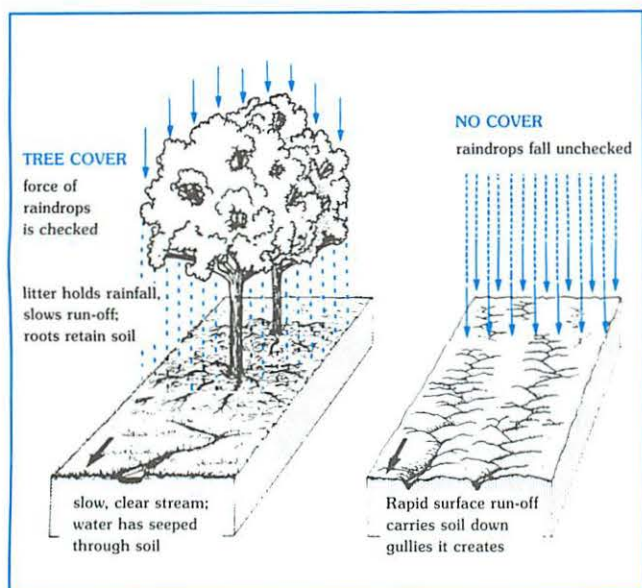


U. S. Forest Service

The group cutting method shown here removes patches of trees of varied ages and species. The individual selection method involves cutting down single mature trees at periodic intervals. In both methods reforestation usually occurs naturally.

Exposing and disturbing the centuries-old forest floor destroys the nutrients in the soil, eventually leaving it incapable of supporting anything larger than scrub. The denuded area can no longer provide food and shelter for wildlife.

Without vegetation to hold it in place, the soil is now subject to wind and water erosion, which leads to another consequence of clear-cutting: sedimentation in streams.



Trees and Man. © 1976 Herbert Edlin, Wendell and Nicolson

This diagram shows how the forest covering retards erosion of the soil.

Where logging occurs on unstable soils or steep slopes, erosion carries away a tremendous volume of topsoil. It has been found that streams in clear-cut areas may contain as much as seven thousand times more sediment than before the vegetation was stripped from the land.



U.S. Soil Conservation Service, photo by W. M. Lathrop

Greater spring runoff from clear-cut areas also increases the danger of flooding.

Often streambeds many miles downstream from the cleared area become choked with this sediment. Such waterways can no longer serve as suitable habitats for fish and underwater plant life.



The Forest Killers. © 1975 Jack Shepherd, Weybright and Talley

Worst of all, reforesting a clear-cut area is often problematic, requiring much greater expense and a longer period of time than anticipated. This photograph was taken four years after the "new forest" was planted.

In 1973 a group of citizens upset over the devastation of West Virginia's Monongahela National Forest sued the Forest Service, charging that clear-cutting violated the Organic Administration Act of 1897. A federal district court ruled that the Forest Service would have to obey that law, especially the section that required the selection and marking of individual trees to be cut rather than designating entire areas to be logged.

Such lawsuits and the public outcry over clear-cutting on public lands eventually led to the passage of two important pieces of legislation. The Forest and Rangeland Renewable Resources Planning Act of 1974 set up a systematic procedure for establishing limits on the amount of timber that could be logged from public lands. The National Forest Management Act of 1976 reaffirmed the government's commitment to the multiple use-sustained yield philosophy and added a number of stipulations to the earlier law.

So the 187 million acres of national forests now have some measure of protection from clear-cutting; however, this does not prohibit clear-cutting on the millions of acres of forests owned by the big timber companies.



The Forest Killers. © 1975 Jack Shepherd, Weybright and Talley

Big timber companies often show their disdain for the law by clear-cutting an area right up to the edge of a national forest or wilderness tract.

3 SOIL CONSERVATION REGULATIONS ENCOURAGE FARMERS TO KEEP CROPLAND "CLOTHED."

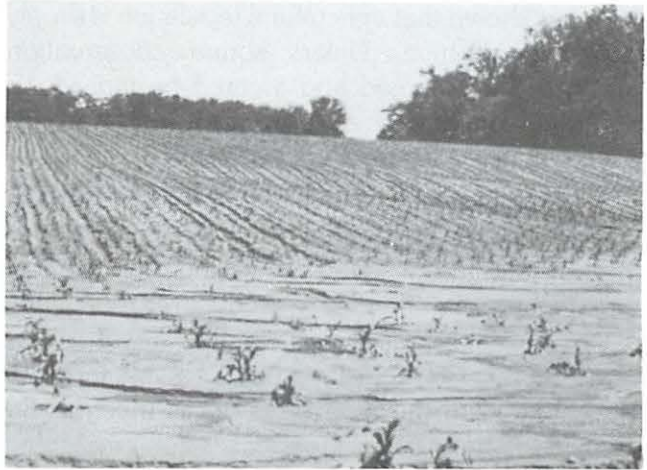
Just as it is essential that mining and logging operations not be allowed to remove the earth's natural covering of vegetation permanently, it is also vital that agricultural land not be left bare.

As the early settlers in this country began to clear the land for planting, they discovered that a wide variety of plants had been successfully grown here by the Indians. These crops, all native to the Americas, included corn, potatoes, tobacco, cotton, sweet potatoes, tomatoes, and beans.

The methods for cultivating all these crops had two things in common. In preparation for planting, a farmer would plow up the entire field, leaving the land bare. Then he would plant the seeds in widely

spaced rows, which meant that he had to cultivate the exposed area between rows during the early part of the growing season to control weeds.

Both of these features promoted soil erosion, especially as improvements in the plow made it possible for the farmer to plant large fields of these crops in long straight rows. Often the straight-planted rows ran up and down the slope of the land, thus accelerating the runoff and increasing erosion.



U.S. Soil Conservation Service

Plowing up and down the slope promotes erosion. Silt collects at the bottom of the hill or is washed away into streams.

For a long time farmers were not really aware of what was happening to their topsoil. Even if they were, it did not matter very much to them because when one field was "worn out" they could just move farther west and start over. Once the eroded land was abandoned, it would, in accordance with God's design, rather quickly be covered over with a growth of weeds and grasses if there was sufficient rainfall. Then within a few years shrubs and trees would take over.

It did not work that way, however, in the drier climate of the Great Plains, where it took longer for the natural sod cover to reestablish itself. This factor, in combination with periodic droughts, caused the Dust Bowl problem in the 1930s. Dust storms would pick up tons of topsoil and carry it eastward across the country.

The use of short-sighted cultivation methods was not the only culprit. Overgrazing was also to blame. During dry times livestock would eat right down to the roots, leaving the ground unprotected.

In 1935 Congress passed the Soil Conservation Act. This act has been called "the most

important piece of national legislation with respect to the conservation of land resources the world has ever known.” The act created the Soil Conservation Service (SCS) under the U. S. Department of Agriculture.

The role of the SCS has been one of education more than one of regulation. There are two reasons for this. First, it has been considered wrong to force farmers to adopt new methods based on unproven theories. More significantly, experience has shown that agricultural legislation is simply not that effective. Unless sound conservation methods are accepted and favored by individuals and the community as a whole, most farmers continue to use destructive methods.

Accordingly, soil conservation programs in the U. S. have been based on offering economic incentives to farmers who are willing to implement new techniques intended to reduce erosion. One example of this approach is the Great Plains Conservation Program set up by Congress in 1956. Under this plan the SCS picks up as much as 80 percent of the farmer’s expenses for employing approved conservation practices.

By 1980 over 50,000 farmers had participated in the Great Plains Program. Between 1956 and 1980 more than nine million acres were at least temporarily returned to grassland.



U. S. Forest Service, photo by M. W. Taber

Farmers who converted fields to grassland were allowing the land its sabbath rest as they would have had they been following God’s law.

Through this and similar incentive-based programs the government has introduced a variety of conservation techniques. The most successful ones have been those which provide a covering for the earth, such as planting windbreaks and constructing grassed waterways for drainage. Strip-cropping,

contouring, and terracing are also effectively used, but recently, the fastest growing soil-conserving practice has been conservation tillage.

Conservation tillage means leaving the roots and stalks of the harvested crop in the field instead of plowing it under and leaving the bare soil exposed all winter. At planting time the field is sown without plowing so the spaces between rows are still protected. This system works especially well in the drier parts of the country.

More recently the 1985 Farm Bill included a different sort of incentive. While participation is voluntary, farmers who choose not to follow soil conservation methods will lose their eligibility for other federal assistance programs.

One feature that strip mining, clear-cutting, and unwise cultivation practices all have in common is the motivation behind them. Although some abuses may occur because of inadequate information, the main problem is greed.

Strip mine operators do not want to accept the responsibility for restoring the land they mine because it costs them too much money. The timber industry prefers clear-cutting because it is easier and more profitable than other approaches. Farmers often resist implementing soil conservation techniques because the short-term economic gain is very slight.

Jesus warned against this kind of self-seeking attitude: *“Therefore take no thought, saying, What shall we eat? or, What shall we drink? or, Wherewithal shall we be clothed? (For after all these things do the Gentiles seek) . . .”* (Matthew 6:31–32).

As long as miners, loggers, and farmers are more concerned about profits than they are about following God’s principles, environmental protection legislation will continue to be only marginally effective in protecting the earth’s God-given coverings.

PROJECT

Write down at least fifteen analogies between the consequences of strip mining and the parallel consequences of nakedness.

Examples:

- Both conditions cause the erosion of that which produces fruitful growth.
- Both remove inward treasures.

Date completed _____ Evaluation _____



MEDICINE RESOURCE

HOW DO HYPOTHERMIA'S DANGERS CONFIRM OUR NEED FOR THE PROTECTION OF CLOTHING?



Painting by Willy Stöwer. UPI/Bettmann Newsphotos

The captain of the Titanic watched as hundreds of his passengers fell victim to hypothermia.

At first the insidious killer simply confused its victims. Then it lulled them into a false sense of security before finally squeezing its icy fingers around their hearts in a vise-like stranglehold. In some instances death came quickly. In other cases the killer terrorized its victims over a period of several days. In all cases, the results were the same.

This enemy is one of the most vicious marauders of the twentieth century. In fact, more wilderness deaths are attributed to its hostile nature each year than to all other causes combined.

Yet, this intruder is not a newcomer. Its history extends back many generations. The captain of the Titanic watched helplessly as it snuffed out the lives of hundreds of his passengers. George Washington saw it decimate his troops.

The killer swung into action as an iceberg sliced into the Titanic. It claimed credit for taking more than half of the 1,522 lives which were lost.

During the winters of 1777–80, George Washington watched the killer stalk thousands of his men and almost change the course of history.



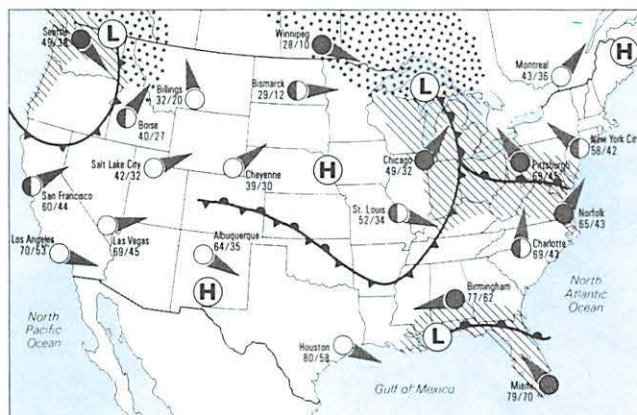
Valley Forge Historical Society

Hypothermia was a feared enemy of George Washington and his troops. Their ragged uniforms were a very inadequate protection from the cold, and the deadly symptoms of hypothermia often appeared.

1 Hypothermia produces numbness which leaves its victims insensitive to exposure.

The term *hypothermia* comes from the Greek prefix *υπό*, meaning “under” and the Greek root *θερμη*, meaning “heat.” A person suffering from hypothermia is one whose temperature is below normal. As body temperature falls below 98.6°F (37°C), a person’s organs cease to function properly, leaving him vulnerable to a host of life-threatening conditions.

In essence, hypothermia results from nakedness. Nakedness is not merely a lack of clothing; it is more precisely the absence of proper clothing. A hunter, a hiker, or anyone who ventures into the wilderness can be covered, yet remain “naked” because his covering is inadequate.



Unexpected changes in the weather such as a rainstorm, a cold front, snow, or heavy winds can also contribute to a person’s nakedness. Only those with covering which protects from all extremes can avoid hypothermia.

The first symptom of hypothermia comes from cold receptors located under the skin. As the temperature of exposed skin begins to drop, these cold receptors alert the brain with "pain" signals. Those who heed the warnings put on adequate covering or come in from the cold. Others, however, may continue to expose themselves until the elements numb their extremities. Once their extremities are numbed, victims of hypothermia are unaware of and insensitive to further damage and quickly succumb to its powers.

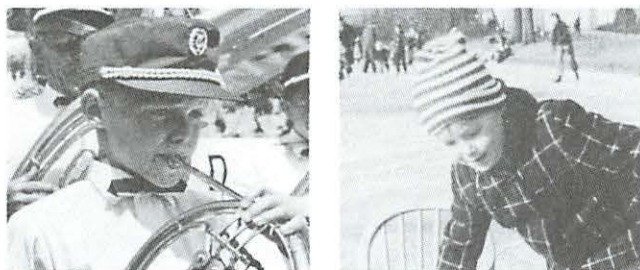
It is estimated that as many as 85 percent of wilderness deaths are the direct result of inadequate dress worn in relatively warm conditions. In fact, most cases of hypothermia occur between the temperatures of 35°F and 50°F. Some occur at temperatures as high as 65°F.

2 Hypothermia multiplies its destruction as exposure increases.

Exposure resulting from inadequate covering causes heat loss in one or more of the following ways: radiation, conduction, or convection. As any one of these intensifies, hypothermia greatly multiplies its effects.

Radiation is by far the most dangerous type of heat loss because it requires no direct contact with the cold. Radiant energy leaves the body in the form of invisible waves. These radiant heat waves can travel even through a vacuum and are responsible for a major part of a person's total body heat loss at moderate temperatures.

Most radiant heat escapes by way of the head. Because of its high concentration of blood vessels, an uncovered head may radiate up to 75 percent of the body's total heat loss in cold weather. This means that a naked head, that is, one not properly covered, leaves the whole body vulnerable to hypothermia.

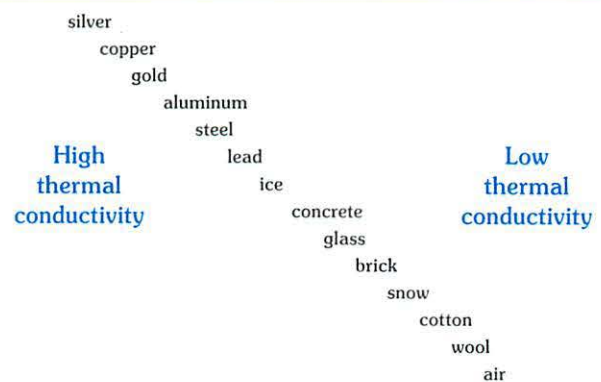


The old adage, "IF YOUR FEET ARE COLD, PUT ON A HAT!" is quite true. Wearing a hat that covers the ears can reduce heat loss by 75 percent. Because the head is the body's most vulnerable member, a hat can also protect against heat.

Conduction is another form of heat loss. Conduction requires contact with a cold object and is directly proportional to the common surface area between the two. By eliminating contact with objects that conduct heat, clothing can dramatically reduce heat loss.

Clothing also traps thousands of tiny air pockets between its threads. Because these air pockets are extremely poor conductors of heat, they insulate against the flow of heat away from a person's body. The more air pockets a fabric traps, the greater its insulating qualities. Some synthetic fibers trap so much air that even a thin layer is as warm as a thick wool blanket.

COMPARATIVE THERMAL CONDUCTIVITIES



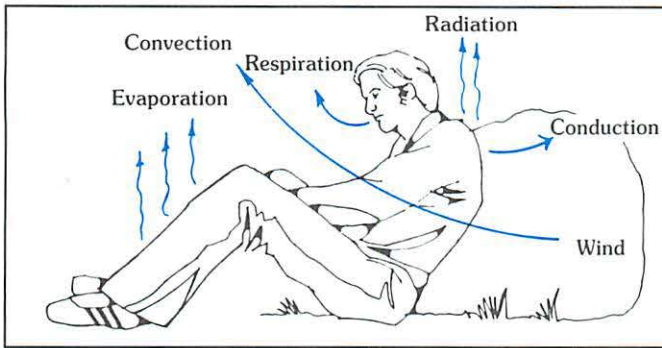
Gloves keep hands warm in two ways. They eliminate contact with cold objects such as the steering wheel of a car or the metal of a cold door-knob. They also trap many tiny pockets of air which are poor conductors of heat.

Because the thermal conductivity of water is 240 times that of air, wet clothes conduct heat away from a person's body much faster than dry clothes. Water fills the hollow air pockets that normally block heat loss, thus providing an unimpeded pathway through which heat can steal away. Additionally, wet clothes cling to a person's body, increasing the total contact area from which heat can escape.

Water evaporating from skin or clothing can also increase heat loss dramatically. In fact, the amount of heat lost through water evaporation is five times greater than that lost through water as a liquid. You can demonstrate this by dipping your finger into a glass of water and then blowing on it. The more you blow, the faster the water evaporates and the colder your finger becomes.

Convection is the third type of heat loss. As air blows across unprotected skin, it sweeps away heat. The stronger the wind, the more heat gets swept

away. Weathermen call this type of heat loss *wind-chill*. For example, 45°F air blowing at 20 miles per hour has the same cooling effect on exposed skin as calm air at 25°F.

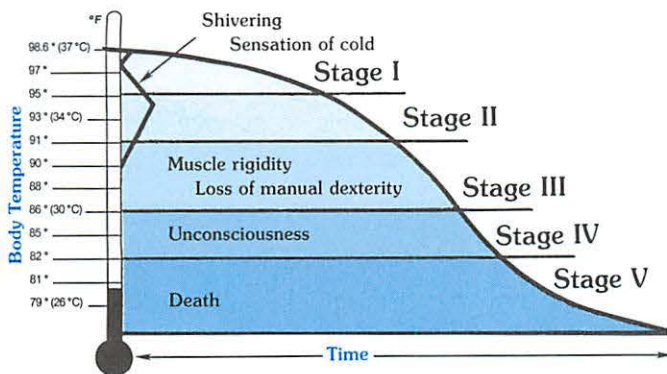


First Aid for Health Emergencies, Brent Q. Halen, West Publishing

Hypothermia is the result of many different factors when a person is not adequately protected against cold.

3 Hypothermia breaks down the resistance of its victims in progressive stages.

Hypothermia is a progressive condition with many stages. Under severe conditions it may go through all its stages in a matter of minutes, or a single stage may linger for several days under milder conditions. For the most part, however, the symptoms remain the same and appear in a distinct order.



Hypothermia: Causes, Effects, Prevention, Robert S. Pizzo and David O. Born, New Century Publishing Co

• Stage I: 96.8°–95°F (36°–35°C)

As the temperature of internal organs begins to drop, heat-regulating mechanisms in the hypothalamus attempt to increase heat production to offset excessive heat loss. Heart rate increases. Blood pressure rises. Metabolic rate picks up, and a person begins to shiver.

Involuntary shivering is the first obvious warning sign of impending hypothermia. Muscles quiver in an attempt to generate heat. A shivering

muscle can generate up to three times as much heat as a relaxed muscle.

While the symptoms of this first stage are quite minor, every 1°C drop in body temperature increases the viscosity of the blood by one percent. Even a very slight thickening of the blood requires the heart to work harder and retards circulation through the capillaries.

At this point it is much better to put on extra clothing or find shelter from the cold than to continue to shiver. By being alert to the symptoms of this first stage, a victim can seek help before it is too late. If body temperature continues to drop, a victim may be unable to save himself later on.

• Stage II: 95°–91.4°F (35°–33°C)

At this stage shivering becomes intense and uncontrollable. Speech becomes slurred, and a victim often forgets things. These symptoms reveal actual changes in the chemistry of the brain. As the brain cools, chemical reactions slow down and nerve impulses travel slower. This retards a person's reflexes and makes coordinated movements such as walking extremely difficult. Victims of this stage stumble and lurch unexpectedly as they try to maintain balance. A person may also lose so much manual dexterity that he cannot tie a knot or even light a match.

In order to conserve as much heat as possible, hormones cause blood vessels close to the surface to shrink. This process redirects the blood to the lungs, heart, kidneys, and liver, while the toes, fingers, nose, and ears continue to grow colder.

A drop in body core temperature even reduces gastrointestinal secretions and literally shuts down the digestive system. Hypothermia also depresses the liver, which normally purifies the blood by neutralizing or removing toxins. Finally, the cold affects the pancreas, which secretes insulin and other hormones which regulate the glucose level. Without these hormones, blood glucose levels drop rapidly and cells lose their major source of energy.

The lack of glucose also starves brain cells and leads to irrational behavior. One example of such behavior is a phenomenon called "paradoxical undressing." For some unexplained reason, some victims begin removing their clothes. They leave a meandering trail of coats, shoes, shirts, pants, and other garments as they wander aimlessly.

This stage begins a vicious cycle. As one system after another fails, the body is less capable of protecting itself against the cold. It cannot replenish

its supply of energy, cannot use the energy it does have, cannot purify itself from toxic wastes, and is exposed to greater dangers as the mind becomes more irrational. If treatment is not begun immediately, the core temperature begins to spiral downward at an ever-increasing rate.

• Stage III: 91.4°–82.4°F (33°–28°C)

As body temperature continues to drop, muscles stop shivering and become rigid. In fact, the whole body stiffens. Joints will not bend, muscles feel hard and tight, and the neck is even hard to turn. Pupils dilate and fail to respond to light. The heart rate slows to a snail's pace. Breathing grows erratic, and the skin takes on a puffy, blue appearance. Muscles may shudder or twitch uncontrollably, then resume their stiffness.

Excess lactic acid produced by the shivering muscles of Stage II begins to lower the pH of the blood, a condition called *acidosis*. Shallow breathing, on the other hand, tends to make the blood more alkaline. While these two processes normally work to offset one another, they rarely achieve a balance in cases of hypothermia. pH levels actually fluctuate wildly, poisoning the nervous system and accelerating irrational behavior.

At this point it may be impossible to obtain any blood pressure reading at all. The heart rate is reduced by half, and the heartbeat may not even be audible. In some cases the heart may appear to have stopped beating altogether, but in other cases its cold muscle fibers become so irritable that they “flutter” violently. Doctors call this “fluttering” *ventricular fibrillation* (ven-TRICK-yuh-ler fih-bruhl-LAY-shun).

Ventricular fibrillation is a condition in which individual muscle cells in the heart contract randomly and independently instead of in a coordinated pumping action. Circulation comes to a complete standstill, and death follows quickly.

Somewhere between 86°–82°F, a victim of hypothermia either loses consciousness or becomes so apathetic that he no longer cares what happens to him. Many times he simply lies down and goes to sleep, never to awake again.



A victim who has lost consciousness is at the mercy of hypothermia. He cannot save himself and must rely completely on others for his rescue.

• Stage IV: 82.4°–69.8°F (28°–21°C)

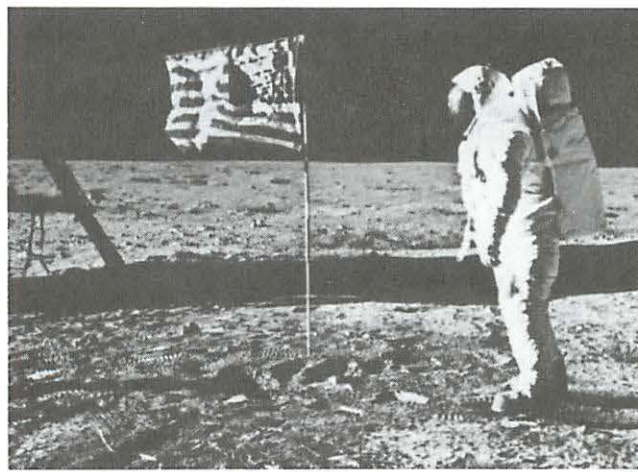
Victims at this stage of hypothermia give the appearance of death. Breathing stops, and the lungs fill with fluid. The blood becomes so viscous that the victim does not even bleed when cut. There are no longer any observable muscle reflexes, and the core temperature will continue to drop even if the victim is rescued and removed from the cold.

The heart comes to a complete standstill. Doctors call this condition *asystole* (uh-SISS-toll-ee). The term comes from the Greek parts *α*, meaning “no” or “not” and *συστέλλω*, meaning “contracting.” However, any sudden jarring may trigger ventricular fibrillation again. At such cold temperatures, heart tissue is very susceptible to any mechanical vibrations. Dragging or lifting a victim carelessly may cause serious heart damage.

• Stage V: 69.8°–64.4°F (21°–18°C)

The final system to fail is the brain. During this stage, electrical activity of the brain comes to a complete standstill. There are no brain waves. However, a hypothermia victim may still be alive. In fact, victims have been revived after having had body temperatures as low as 48°F.

Such recoveries are the result of what physicians call the *diving reflex*. Even though the brain receives little or no oxygen, the cold shuts down the body's metabolism to the point that the person can survive for at least a few minutes in a state of suspended animation. Depriving the brain of oxygen at higher temperatures results in death after just three minutes. However, once chilled to this point, the brain may be able to survive for up to forty-five minutes without oxygen.



An astronaut exposed to the extreme temperatures of the moon would normally perish within minutes. Yet, with proper covering he can endure both heat and cold.

4 Hypothermia demands immediate, persistent, and gentle treatment.

Because most victims of hypothermia are very close to death, they require extraordinary efforts to revive them. For example, one victim of hypothermia had been in cardiac arrest for an hour and his core temperature had dropped to 50°F. Rescuers had to work for more than ninety-six hours before they were able to stabilize him.

Unfortunately, more than 65 percent of the victims of severe hypothermia who survive the ordeal die during the rewarming process. Proper rewarming requires careful attention to at least six major factors.



UPI/Bettmann Newsphotos

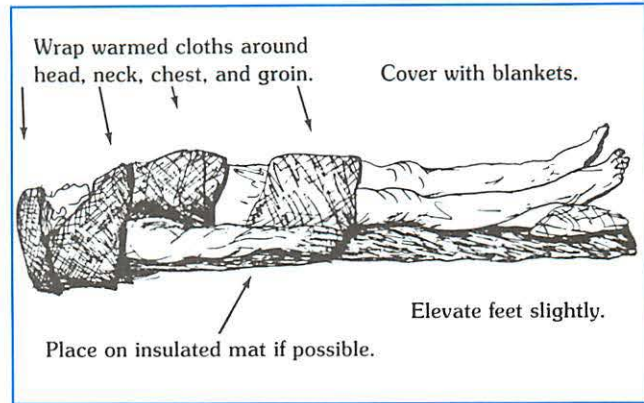
The lives of stranded mountain climbers depend on how their rescuers care for them.

• END EXPOSURE AND PROPERLY COVER THE VICTIM.

Of foremost importance is to remove the victim from further exposure and to begin the rewarming process as soon as possible. In mild cases a warm blanket or dry clothes may be sufficient. Other victims, those with temperatures below 85°F, may be unable to warm themselves and may need a warm bath or an electric blanket to provide the heat they cannot generate on their own.

Normally rewarming must be slow, no more than one degree per hour. Rapid rewarming can be fatal. It dilates blood vessels in the skin, which draws warm blood away from internal organs and causes blood pressure to fall so rapidly that cardiovascular shock can be triggered.

In cases of deep hypothermia, a victim may require rewarming from the inside out. This is considered a medical emergency and requires attention from skilled personnel.



Hypothermia: Causes, Effects, Prevention, Robert S. Pozos and David O. Born, New Century Publishing Co.

Many victims of hypothermia cannot rewarm themselves. For them, a covering alone is not enough. They must be aided with an external source of heat. Setting a bowl of hot water next to a victim warms him from the inside out as the warm vapor enters his lungs.

• MAINTAIN PROPER BALANCE.

One of the most critical factors governing the rewarming process is the need to maintain a proper balance in the blood chemistry. Because blood pH has fluctuated wildly during hypothermia, substances such as sodium, potassium, lactic acid, carbon dioxide, and oxygen may be out of balance. Since sodium is particularly important for regular heart rhythm, an imbalance can aggravate an already weakened heart.

Toxic waste products which were trapped in the hands and feet while there was no circulation may suddenly flood the system as circulation returns. Without careful monitoring, these substances can "overload" the circulatory system before the body is capable of cleansing itself.

• PREVENT OBSTRUCTION BY FOREIGN MATERIAL.

A simple thing such as choking on the contents of the stomach may be prevented by aspirating any fluids from the victim's mouth. Failing to ensure that the airway is clear is a mistake which has caused many deaths. Never give liquids by mouth until the victim has regained consciousness.

• ANTICIPATE THE POSSIBILITY OF A RECURRENCE.

When rewarming occurs too rapidly, the victim's core temperature may suddenly plunge. As normal circulation returns, cold, stagnant blood from the extremities returns to the core, reexposing the victim's internal organs to more cold. Doctors refer to this as "after drop."

• **HANDLE AS GENTLY AS CIRCUMSTANCES ALLOW.**

Hypothermia victims must be handled gently and should not be allowed to walk. Any stress, even the bumps and jolts of being carried, may trigger a fatal heart attack or ventricular fibrillation.

Frozen extremities should not be rubbed or worked back and forth to restore circulation. Such movements may tear or break delicate muscle tissue or skin which has been frostbitten.

• **REFUSE TO GIVE UP HOPE FOR RECOVERY.**

One of the keys to treating hypothermia successfully is persistence. In some cases rescuers have worked up to an hour before observing the first signs of life. To give up on a victim on the basis of outward appearance may be to give up on a person who desperately needs help. Treatment must continue, sometimes for several days, until the patient's temperature is completely back to normal.

PROJECT 1

Read the following excerpts from Robert Scott's Antarctic expedition record, and see if you can determine which stages of hypothermia are being described.



Robert Scott and his team reached the South Pole in 1912, but they were destroyed by hypothermia on the return trip.

January 21, 1912—"Oates is feeling the cold and fatigue. There is no doubt Evans is a good deal run down. Things beginning to look a little serious."

STAGE 1

January 25, 1912—"Oates suffers from a very cold foot; Evans' fingers and nose are in bad state, and tonight Wilson is suffering tortures from his eyes."

STAGE 2

February 17, 1912—"I was the first to reach the poor man and was shocked at his appearance. He was on his knees with clothing disarranged, hands uncovered and frostbitten, and a wild look in his eyes."

STAGE 2

February 18, 1912—"Evans fell into a deep coma, and during the night he died."

STAGE 3

March 17, 1912—"Oates' feet were so badly frostbitten that he could scarcely get his boots on. He walked out into the blizzard saying, 'I am just going outside and may be some time.' We knew that poor Oates was walking to his death."

STAGE 3

March 20, 1912—"Temperatures are 40 below. All of us have frostbitten feet. Amputation is the least I can hope for now."

STAGE 3

March 29, 1912—"Since the 21st we have had a continuous gale. . . . We shall stick it out to the end, but we are getting weaker, of course, and the end cannot be far."

STAGE 4

Why Scott was conquered by hypothermia



Robert Scott

Robert Scott and his men wore heavy woolen garments which became damp and uncomfortable in the cold weather. His Norwegian challenger, Roald Amundsen, and his men wore loose-fitting, fur garments which were light, warm, and waterproof.

PROJECT 2

For each of the stages of hypothermia, identify a spiritual parallel which occurs when a person willfully violates God's moral standards on clothing and wears improper dress, developing into stages of lewdness and nakedness.

EXAMPLE: Stage I

Temperature of internal organs begins to drop: Our hearts begin to grow cold toward God and others.

Date completed _____ Evaluation _____