



WISDOM QUIZ

Matthew 5:29–30

“And if thy right eye offend thee, pluck it out, and cast it from thee: for it is profitable for thee that one of thy members should perish, and not that thy whole body should be cast into hell.

“And if thy right hand offend thee, cut it off, and cast it from thee: for it is profitable for thee that one of thy members should perish, and not that thy whole body should be cast into hell.”



How well do you understand the concept of casting away an offending member?

True/False

1 A person cannot conquer lust by plucking out his eye or cutting off his hand.

(Read Romans 8:2–3.)

- Lust comes from the heart: “. . . Out of the heart of men, proceed evil thoughts . . .” (Mark 7:21). The heart activates the law of sin which is in our members. (See Romans 7:23.) To cut off a member without transforming the heart is like cutting off one or two tentacles of an octopus.

How do we transform our hearts? (See Romans 10:9–13 and I Peter 1:21–23.)

2 God expects us to take whatever steps are necessary to conquer lust. (Read Philippians 2:13.)

- First, we are told not to conquer lust, but to flee it. (See II Timothy 2:22.) Second, we cannot conquer lust in our own efforts. Christ has already conquered lust for us through His death, burial, and resurrection. When we receive Christ as our Savior, we can enter into His victory.

If we cannot conquer lust, why did God command us not to lust? (See Romans 7:13.)

3 An offending eye or hand refers to that which hinders someone from becoming a Christian.

(Read Matthew 18:3–10; Mark 9:43–48.)

- The lust of the eyes and the lust of the flesh can hinder us from receiving salvation. (See I John 2:15–16.)

Should we make whatever sacrifice is necessary to become a Christian? (See Matthew 10:37.)

4 It is possible for a Christian to be rejected by God for service because of lust.

(Read I Corinthians 9:27.)

- A Christian who keeps himself pure will be a vessel unto honor. (See II Timothy 2:20–21.)

How will God discipline a Christian who lusts? (See I Corinthians 11:28–30.)

Total Correct 2

All for Jesus

MARY D. JAMES

SOURCE UNKNOWN



- All for Je - sus, all for Je - sus! All my be-ing's ransomed pow'rs;
- Let my hands perform His bid - ding, Let my feet run in His ways;
- Since my eyes were fixed on Je - sus, I've lost sight of all be - side;
- Oh, what won-der! how a - maz - ing! Je - sus, glo-rious King of kings,



All my tho'ts and words and do - ings, All my days and all my hours.
Let my eyes see Je - sus on - ly, Let my lips speak forth His praise;
So en-chained my spir-it's vi - sion, Look-ing at the Cru-ci - fied.
Deigns to call me His be - lov - ed, Lets me rest be-neath His wings.

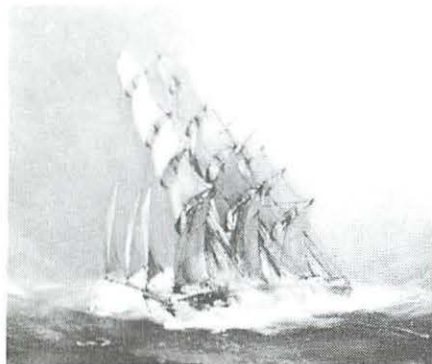


All for Je-sus! all for Je - sus! All my days and all my hours; hours.
All for Je-sus! all for Je - sus! Let my lips speak forth His praise; praise.
All for Je-sus! all for Je - sus! Look-ing at the Cru-ci - fied; fied.
All for Je-sus! all for Je - sus! Rest-ing now beneath His wings; wings.

WISDOM WORKSHEET ON MATTHEW 5:29-30



"And if thy right eye offend thee, pluck it out, and cast it from thee: for it is profitable for thee that one of thy members should perish, and not that thy whole body should be cast into hell."



The profitability of casting off that which is valuable in order to save what is essential is illustrated by a ship's captain throwing cargo, food, and furnishings overboard in order to keep the ship afloat during a storm.

"And if thy right hand offend thee, cut it off, and cast it from thee: for it is profitable for thee that one of thy members should perish, and not that thy whole body should be cast into hell."



This verse can be understood only by realizing the reality of hell. Whatever losses we experience are insignificant if by those losses we escape the eternal torments of hell.

Linguistics

Languages,
Grammar, Vocabulary,
Communication



RIGHT EYE

Greek: ὁ ὀφθαλμός
(haw awf-thahl-MOSS)

ὁ δεξιός (haw dek-sih-OSS)

INSIGHTS: The right eye is usually the dominant eye. It is the leading channel to the mind and heart, the image-maker for the brain. The English word *ophthalmology* (the study of the eye) comes from ὀφθαλμός.

OFFEND

Greek: σκανδαλίζω
(skahn-dah-LID-zoe)

DEFINITION: To entrap; to ensnare; to trip up; to cause to stumble. From the word σκάνδαλον (SKAHN-dah-lawn): the trigger of a trap upon which the bait is attached; source of the English words *scandal* and *slander*.



σκάνδαλον

Do Resource A.

PLUCK OUT

Greek: ἐξαιρέω (ex-eye-REH-oh)

DEFINITION: To take out; to tear out.

CAST

Greek: βάλλω (BAHL-loe)

DEFINITION: To throw; to sow, scatter, cast.

PROFITABLE

Greek: συμφέρω (soom-FEH-roe)

DEFINITION: To be expedient, advisable, advantageous, desirable, and judicious.

Do Resource B.

PERISH

Greek: ἀπόλλυμι (ah-PAWL-loo-mih)

DEFINITION: Completion of destruction; the idea is not extinction, but ruin.

BODY

Greek: σῶμα (SOE-mah)

DEFINITION: The physical body as distinct from the spirit and soul.

History

Archaeology,
Geography, Prophecy,
Music, Art, Literature



Who failed to control his eyes and had them plucked out by his enemy?

Samson diminished his great potential because he lusted with his eyes: "I have seen a woman. . . she pleaseth me well" (Judges 14:2-3).

Later he saw a harlot, and finally, Delilah.



Samson

Who tried for eighty-five years to conquer lustful thoughts with self-effort?



Anthony of Thebes lived around A.D. 251-356. At age 20, he gave away his money and lived as a hermit in a desert cave for thirty-five years. His struggle to conquer lust, foul thoughts, and evil desires culminated in establishing monasticism as a means of self-discipline. He died at age 105 with no record of achieving any victory.

Anthony failed to conquer his lust because he was trying to accomplish in his own strength the victory Christ had already achieved by His death, burial, and resurrection. This victory is available to every Christian.

How do explorers show the concept of cutting off an offending member?



Robert Peary
1856-1920

On an expedition, Robert Peary faced death with gangrenous toes. He cut them off and later achieved his lifelong goal of reaching the North Pole.

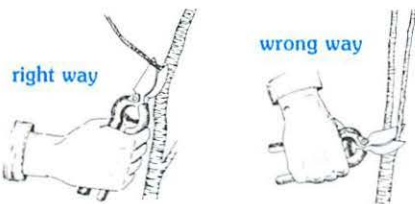
Do Resource C.

Science

Chemistry, Biology,
Astronomy, Geology,
Physics, Mathematics



How does pruning illustrate the principle of cutting off an offending member?



If a fruit tree grows without careful attention, it can literally "strangle" itself and produce only tiny, tasteless fruit. Only as branches which drain a tree of life and strength are cut away will the tree produce the desired fruit and avoid unnecessary diseases.

Do Resource D.

How does eliminating insignificant numbers increase the accuracy of a mathematical solution?

Do Resource E.

How do some animals demonstrate the concept of cutting off a "hand" to save their lives?

Raccoon



If a raccoon is caught in a trap, it will chew off its foot in order to gain its freedom and continue its life.

Bobcat



If a bobcat finds itself trapped, it will not try to escape, but will remain in the trap until it is killed by its trapper.

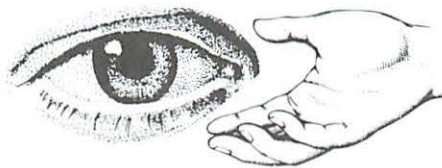
Do Resource F.

Law

Government,
Economics, Logic



What law prohibits us from plucking out an eye or cutting off a hand?



When Jesus stated that it is profitable to pluck out an eye or cut off a hand rather than allow lust to continue its destructive work, His clear message was not to allow either one to take place.

It would be a shocking action to pluck out an eye or cut off a hand. It should be even more shocking and radical to lust in our hearts.

Plucking out an eye or cutting off a hand were actually civil punishments under God's Law to Israel: "Eye for eye, tooth for tooth, hand for hand, foot for foot" (Exodus 21:24).

Only government officials were to carry out these punishments, not individual citizens. Our bodies belong to God, and we are the temples of the Holy Spirit. (See I Corinthians 6:19-20.) We are not even to make cuttings in our flesh. (See Leviticus 19:28.)

How does the law of sin dictate the way we must deal with our eyes and our hands?

The law of sin will cause us to lust even though we do not want to. (See Romans 7:15-18.)



As we yield our members to God and reckon ourselves dead to sin, we appropriate the victory Christ has already won over lust.

READ ROMANS 6, 7, 8, AND 12.

Medicine

Health,
Nutrition, Behavior,
Counseling



Why is the loss of the right eye or the right hand more damaging than the loss of the left eye or the left hand?

For most people the right eye and the right hand are dominant over the left eye and the left hand. This means that the brain depends on them to receive more information than it could get from the left eye or hand.



The eye transmits the sensual stimuli to the brain, which activates the heart, which is "deceitful and desperately wicked." (See Jeremiah 17:9.)

How does a father damage his sons and daughters by lust?

In the same way as genetic diseases are passed from parents to children, the specific sins of the fathers are passed on in the form of weaknesses to their sons and daughters.

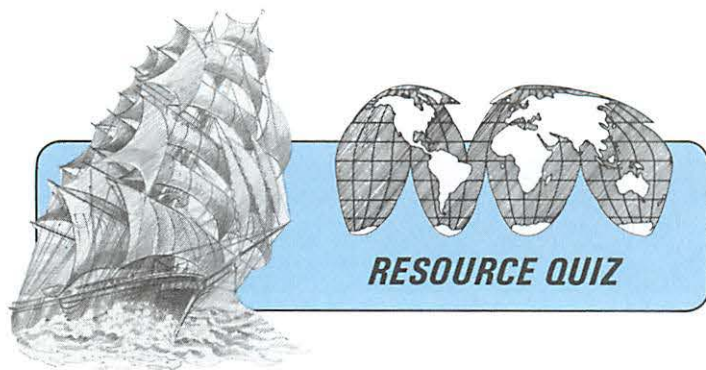
Thus, a father who lusts with his eyes will cause his children to have greater temptation in this area until he confesses past sins and prays a daily hedge around his children.

"... Visiting the iniquity of the fathers upon the children unto the third and fourth generation of them that hate me" (Exodus 20:5).

How does gangrene surgery demonstrate the concept of cutting off an offending member to save the rest of the body?

Do Resource G.





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

HOW CAN LUST TRAP US?



- What is a metaphor? . . . 1143
- How does a metaphor differ from a simile? . . . 1144
- How can our eyes or hands keep us from salvation? . . . 1144
- How can our eyes and hands become a scandal? . . . 1145

WHAT IS THE FEAR OF THE LORD?



- How does the fear of the Lord differ from other fears? . . . 1147
- Why is the fear of God more than a reverential trust? . . . 1148
- What are the rewards for those who fear the Lord? . 1152
- How can we learn to fear the Lord? . . . 1155
- How do God's attributes cause fear and build faith? . . . 1158

HOW DID MOSES FLEE LUST?



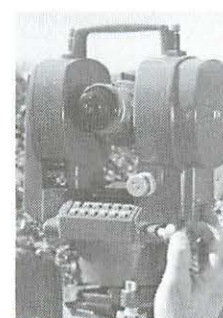
- Which Pharaoh was the adopted grandfather of Moses? . . . 1159
- How did this Pharaoh bring in the "Golden Age" of Egypt? . . . 1159
- What treasures and pleasures did Moses "cut off"? . . . 1161
- What is the significance of Moses' name? . . . 1162

HOW DOES PRUNING INCREASE FRUIT?



- How does pruning extend the life of a tree? . . . 1168
- Why can a fruit not "serve" two "leaders"? . 1170
- How does trimming a tree's roots increase its yield? . . . 1171
- When must pruning begin? . . . 1171

HOW CAN NUMBERS CAUSE ERROR?



- What is an insignificant figure? . . . 1175
- Why do insignificant figures cause error? . . . 1176
- What are the rules for rounding off a number? . 1180
- When is the elimination of insignificant figures most critical? . . . 1182

HOW DO ANIMALS SAVE THEIR LIVES BY LOSING ONE OF THEIR MEMBERS?

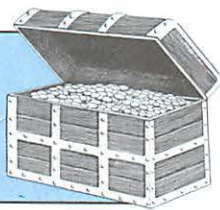


- How does a skink illustrate Matthew 5:30? . . . 1183
- What animal will twist off its foot to save its life? . . 1184
- Why are raccoons easy to trap? . . . 1185
- What ferocious animal is paralyzed by fear when trapped? . . . 1188
- What animal could catch on fire because of its greed? . . . 1190

HOW DOES GANGRENE ILLUSTRATE THE DANGER OF ONE INFECTED MEMBER?



- What causes gangrene? . 1192
- How quickly does gangrene spread? . . . 1192
- How many types of gangrene exist? . . . 1194
- How do doctors diagnose gangrene accurately? . . 1195
- How is gangrene cured? . 1198



HOW DOES THE GREEK WORD FOR "OFFEND" EMPHASIZE THE NEED TO CONTROL OUR EYES AND HANDS?



A great eagle studies the lure of the fish which the hunter has placed in its path. The fish and the eagle's eye both become offenses and endanger the life of the eagle.

The Greek word for "offend" is rich in imagery and application. It amplifies the awful destruction which will come to anyone who makes decisions of eternal consequence based on the lust of the eyes or the lust of the flesh.

The Interlinear Translation of Matthew 5:29

εἰ δὲ ὁ ὀφθαλμός σου ὁ δεξιὸς σκανδαλίζει
But if thine eye, the right, cause to offend

σε, ἔξελε αὐτὸν καὶ βάλε ἀπὸ σοῦ·
thee, pluck out it and cast [it] from thee:

συμφέροι γάρ σοι ἵνα ἀπόληται ἓν
for it is profitable for thee that should perish one

τῶν μελῶν σου, καὶ μὴ ὅλον τὸ σῶμά σου
of thy members, and not whole thy body

βληθῇ εἰς γέενναν.
be cast into Gehenna.

THE DEFINITION OF THE GREEK WORD FOR "OFFEND":

Offend σκανδαλίζω (skahn-dah-LID-zoe)

This word comes from the root σκάνδαλον, (SKAHN-dah-lawn), meaning "offense." It refers to putting a snare or a stumbling block in the way. It is ordinarily associated with an object which arouses an immediate response, becoming a hindrance or causing one to fall by the wayside. It is always used metaphorically in the New Testament.

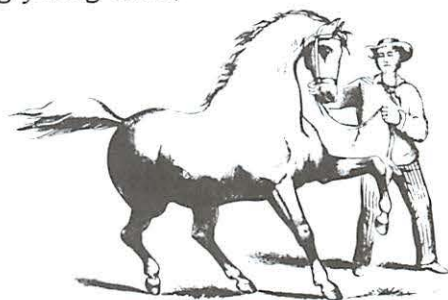
WHAT IS A METAPHOR?

The Greek prefix *meta-* means "change," and the word *phor* comes from φέρω, which means "to carry or bear." Thus the word **metaphor** means "to carry or bear a change."

A metaphor is a figure of speech which presents one object using a term which normally refers to a different object. The metaphor can be as short as a single word, or it can be extended into a phrase or whole sentence.

The following thoughts are expressed metaphorically:

- Our eyes can **trap** us in sin. (Our eyes can do to us what a trap does to an animal.)
- Lust is a **lion** devouring its prey. (What a lion does to its food, lust does to our bodies.)
- An immoral woman is a **clever hunter**, tracking down simple young men. (The trickery a hunter uses for his prey, a harlot uses to seduce unsuspecting young men.)



Dover, Inc.

Do these verses contain metaphors?

Psalm 32:8-9

"I will instruct thee and teach thee in the way which thou shalt go: I will guide thee with mine eye.

"Be ye not as the horse, or as the mule, which have no understanding: whose mouth must be held in with bit and bridle, lest they come near unto thee."

Jeremiah 5:7–8

“How shall I pardon thee for this? thy children have forsaken me, and sworn by them that are no gods: when I had fed them to the full, they then committed adultery, and assembled themselves by troops in the harlots’ houses.

“They were as fed horses in the morning: every one neighed after his neighbour’s wife.”

The phrases “as a horse or as a mule” and “as fed horses in the morning” are not metaphors. They are *similes* because they use the words *like* or *as* to signal the comparison. The word *neighed* is used metaphorically, however, because people do not neigh; horses do.

HOW DOES A METAPHOR DIFFER FROM A SIMILE?

A metaphor is a short simile (sometimes called a *similitude*). A **simile** is a comparison between two things which may be different in many respects, but have some strong points of resemblance. By comparing these points of similarity, the character or qualities are graphically illustrated; for example, “**lust** is like a **raging fire**.”

A **metaphor** is a comparison which is reduced to a single word or phrase without using the signal words *like* or *as*. The statement, “That man is a fox” contains a **metaphor**. The statement, “That man is like a fox,” contains a **simile**.

When we say, “The soldiers were lions in combat,” we are using a metaphor, but when we say, “The soldiers fought like lions,” we are using a simile. The word *lions* in the first sentence is a metaphor; the phrase *like lions* in the second sentence is a simile.

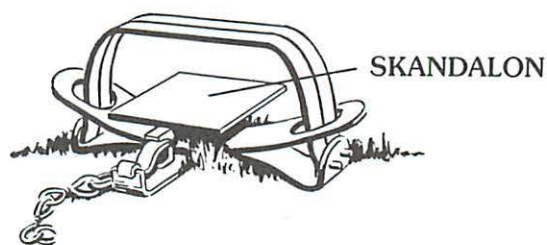
In a metaphor, the similitude is often contained in one word. Thus, calling a man a *fox* suggests he is as crafty as a fox. When we say a man must *bridle* his lust, we mean that a man must control his eyes and his mind in the same way a bridle restrains a horse.

WHAT METAPHOR IS CONTAINED IN THE GREEK WORD FOR “OFFEND”?

The word σκάνδαλον originally meant a part of a trap to which a trapper attached his bait. It symbolizes that which attracts the attention of the prey and lures it into an unsuspected snare.

A trapper designs bait to be so attractive and captivating that an animal does not notice the

trap. When the eager prey reaches out and touches the bait, the σκάνδαλον triggers the trap to clamp shut instantaneously.



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When an animal touches the baited σκάνδαλον, it causes the trap to shut. Similarly, a lustful eye entraps the heart in immorality.

WHAT APPLICATIONS COME FROM THE WORD “OFFEND”?

1 Our eyes and our hands can cause us to reject salvation.

An offense (σκάνδαλον) which causes entrapment can be very good in itself, just as the bait in a trap can be good and wholesome.

One of the further definitions of σκάνδαλον is, therefore, “that which arouses prejudice or becomes a hindrance.” When Christ came to His own people to be their Savior, they looked at Him through evil eyes of unbelief. Their prejudice closed their minds and hearts to His message. Thus, He became a rock of offense to them.

Romans 9:33

“As it is written, Behold, I lay in Sion a stumblingstone and rock of offence: and whosoever believeth on him shall not be ashamed.”

καθὼς	γέγραπται,	Ἴδου	τίθμι	ἐν	Σιὼν
according as it has been written,	Behold	I place	in	Sion	
λίθον	προσκόμματος	καὶ	πέτραν	σκανδάλου·	
a stone	of stumbling	and	rock	of offence:	
καὶ	πᾶς	ὁ	πιστεύων	ἐπ	αὐτῷ
and everyone	that	believes	on	him	
οὐ	καταισχυνηθήσεται.				
shall not be ashamed.					

I Peter 2:6–8

“Wherefore also it is contained in the scripture, Behold, I lay in Sion a chief corner stone, elect,

precious: and he that believeth on him shall not be confounded.

“Unto you therefore which believe he is precious: but unto them which be disobedient, the stone which the builders disallowed, the same is made the head of the corner.

“And a stone of stumbling, and a rock of offence, even to them which stumble at the word, being disobedient: whereunto also they were appointed.”

καὶ λίθος προσκύματος καὶ πέτρα
and a stone of stumbling and a rock
σκανδάλου· οἱ προσκόπτουσιν τῷ λόγῳ
of offence: who stumble at the word,
ἀπειθοῦντες, εἰς ὃ καὶ ἐτέθησαν·
being disobedient, to which also they were appointed.

Not only does Christ become a stumbling block to those who reject God’s Word, but the cross of Christ is also a stumbling block to the unregenerate mind.

I Corinthians 1:23–24

“But we preach Christ crucified, unto the Jews a stumblingblock, and unto the Greeks foolishness;

“But unto them which are called, both Jews and Greeks, Christ the power of God, and the wisdom of God.”

ἡμεῖς δὲ κηρύσσομεν χριστὸν ἐσταυρωμένον,
but we proclaim Christ crucified,
Ἰουδαίοις μὲν σκάνδαλον, Ἑλλήσιν
to Jews indeed a cause of offence, to Greeks
δὲ μωρίαν·
and foolishness;

Galatians 5:11

“And I, brethren, if I yet preach circumcision, why do I yet suffer persecution? then is the offence of the cross ceased.”

Ἐγὼ δέ, ἀδελφοί, εἰ περιτομὴν ἔτι κηρύσσω,
But I, brethren, if circumcision yet I proclaim,
τί ἔτι διώκομαι ἄρα κατήργηται τὸ
why yet am I persecuted? Then has been done away the
σκάνδαλον τοῦ σταυροῦ.
offence of the cross.



Bible Art Series, Standard Publishing, Cincinnati

Jesus entered Jerusalem in triumph. The common people received Him gladly, but the religious rulers were offended because of Him.

Jesus said in Matthew 11:6,

“And blessed is he, whosoever shall not be offended in me.”

καὶ μακάριός ἐστιν, ὃς ἐὰν μὴ σκανδαλισθῇ
And blessed is, whoever shall not be offended
ἐν ἐμοί.
in me.

2 Our eyes and our hands can produce shameful actions.

When we become Christians, there is no more danger of our being “cast into hell”; hence, there is no need to take radical steps to “enter into life.”

It is still possible, however, for a Christian to allow his right eye or his right hand to offend him or cause him to stumble.

The first lesson a new Christian must learn is that he cannot live the Christian life by his own willpower. Only as Christ lives within him can he overcome the lust of the flesh, the lust of the eyes, and the pride of life.

Claiming the victory Christ won on the cross and through His resurrection brings self-control to the Christian. Plucking out the eye or cutting off the hand will never produce such control.

Peter discovered the futility of his own self-effort when he boldly proclaimed that he would not be offended because of Christ.

Matthew 26:31–33

“Then saith Jesus unto them, All ye shall be offended because of me this night: for it is written, I will smite the shepherd, and the sheep of the flock shall be scattered abroad.

“But after I am risen again, I will go before you into Galilee.

“Peter answered and said unto him, Though all men shall be offended because of thee, yet will I never be offended.

“Jesus said unto him, Verily I say unto thee, That this night, before the cock crow, thou shalt deny me thrice.

“Peter said unto him, Though I should die with thee, yet will I not deny thee. Likewise also said all the disciples.”

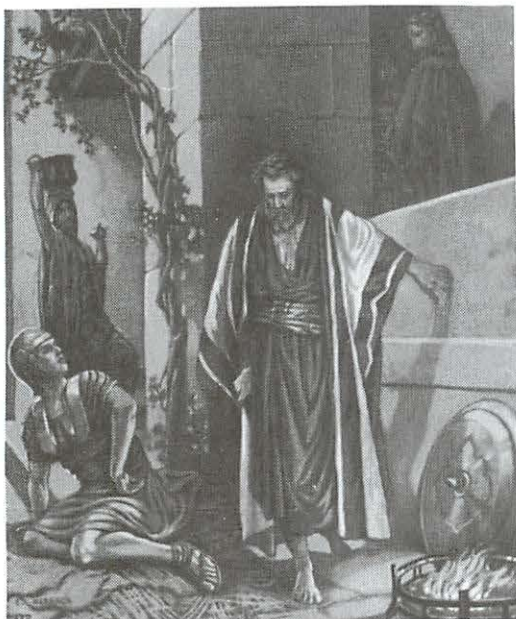
τότε λέγει αὐτοῖς ὁ Ἰησοῦς, Πάντες ὑμεῖς
Then says to them Jesus, All ye

σκανδαλισθήσεσθε ἐν ἐμοὶ ἐν τῇ νυκτὶ ταύτῃ.
will be offended in me during this night.

Ἀποκριθεὶς δὲ ὁ Πέτρος εἶπεν αὐτῷ. Εἰ καὶ
And answering Peter said to him, If even

πάντες σκανδαλισθήσονται ἐν σοί, ἐγὼ
all will be offended in thee, I

οὐδέποτε σκανδαλισθήσομαι.
never will be offended.



Bible Art Series, Standard Publishing, Cincinnati

Peter committed a shameful act (scandal) by denying the Lord three times. His disgraceful action came after he saw Christ's enemies through fearful eyes near the fire and took an oath that he did not know Jesus (possibly by raising his right hand). He repented with bitter tears, later experiencing victory through the power of the Holy Spirit. (See Matthew 26:69–75.)

3 Our eyes and hands can entrap us in delusive and deadly lusts.

Allowing our eyes to visualize sensual scenes or desires and then fulfilling them with our hands or feet makes us slaves of sin. (See Romans 6:12–17.)

Romans 11:9–10

“And David saith, Let their table be made a snare, and a trap, and a stumblingblock, and a recompence unto them: Let their eyes be darkened that they may not see, and bow down their back alway.”

καὶ Δαβὶδ λέγει, Γενηθήτω ἡ τράπεζα
And David says, Let be table
αὐτῶν εἰς παγίδα, καὶ εἰς θήραν, καὶ εἰς
their for a snare, and for a trap, and for
σκάνδαλον, καὶ εἰς ἀνταπόδομα αὐτοῖς.
cause of offence, and for a recompense to them:

4 Our eyes and our hands can cause others to stumble.

There are clear warnings for Christians not to cause a weaker brother to stumble or be offended. (See I Corinthians 8:13 and Romans 14:21.)

In the early Church some believers saw meat on the open market which had been offered to heathen idols. Their practice of buying that discounted meat and eating it offended Christians who had been converted from temple worship.

Another example of causing a stumbling block is given in Numbers 22–25 and 31 with the account of Baalam. Baalam's error was so serious that it is referred to three times in the New Testament. (See II Peter 2:15–16 and Jude 11.)

Revelation 2:14

“But I have a few things against thee, because thou hast there them that hold the doctrine of Balaam, who taught Balac to cast a stumblingblock before the children of Israel, to eat things sacrificed unto idols, and to commit fornication.”

ἀλλ' ἔχω κατὰ σοῦ ὀλίγα, ὅτι ἔχεις
But I have against thee a few things; because thou hast
ἐκεῖ κρατοῦντας τὴν διδασχὴν Βαλαάμ, ὅς
there [those] holding the teaching of Balaam, who
ἐδίδασκεν ἐν τῷ Βαλακ βαλεῖν σκάνδαλον
taught Balak to cast a snare

PROJECT

Discuss how Romans 12:1–2 fulfills the spiritual goal of Matthew 5:29–30.

Date completed _____ Evaluation _____



HOW IS THE FEAR OF THE LORD THE ONLY MOTIVATION STRONG ENOUGH TO KEEP US MORALLY PURE?



U. S. Forest Service

Most people do not have a fear of fire until they are in the path of a raging inferno. Then they are stricken with terror, panic, and dread. Likewise, most people do not have a fear of God until they experience His wrath.

Most Christians have little or no understanding of the "fear of the Lord." Whenever the phrase appears in Scripture (which is often), they interpret it simply as "a reverential trust in the Lord."

This bland definition fails to reveal the power and significance of this concept or to explain the many results and rewards which are described in Scripture for those who do fear the Lord.

Particularly significant is the following verse which relates the fear of the Lord to the achievement of moral purity.

"... By the fear of the Lord men depart from evil" (Proverbs 16:6).

SCRIPTURAL TERMS RELATED TO THE FEAR OF THE LORD

- | | |
|---------------------------------|---------------------------------------|
| <input type="checkbox"/> Terror | <input type="checkbox"/> Astonishment |
| <input type="checkbox"/> Fright | <input type="checkbox"/> Trembling |
| <input type="checkbox"/> Dismay | <input type="checkbox"/> Dread |

LESSON 1

WHAT IS THE FEAR OF THE LORD?

OPERATIONAL DEFINITION:

The continual awareness that I am in the presence of a holy, just, and almighty God, and that every thought, word, action, and deed is open before Him and is being judged by Him.

The assurance that God is watching

If we knew that all our secret thoughts, words, and actions would be displayed publicly so everyone could watch them and evaluate them, it would make a profound difference in the way we live.

We have a natural concern about what others think of us and how they will judge the things we do. It is this concern for the approval of others which is labeled "fear of man."

If we are concerned about what man thinks, how much more should we be concerned about God's evaluation of our thoughts, words, actions, attitudes, and motives.

The fact is that everything we think, say, and do is presently and completely known by God and will one day be displayed for all the world to see and judge.

- "... Thou God seest me . . ." (Genesis 16:13).
- "Thou knowest my downsitting and mine uprising, thou understandest my thought afar off" (Psalm 139:2).
- "For there is not a word in my tongue, but, lo, O Lord, thou knowest it altogether" (Psalm 139:4).

- “Yea, the darkness hideth not from thee; but the night shineth as the day: the darkness and the light are both alike to thee” (Psalm 139:12).
- “The eyes of the Lord are in every place, beholding the evil and the good” (Proverbs 15:3).
- “For we must all appear before the judgment seat of Christ; that every one may receive the things done in his body, according to that he hath done, whether it be good or bad” (II Corinthians 5:10).
- “He that planted the ear, shall he not hear? he that formed the eye, shall he not see?” (Psalm 94:9).
- “For the ways of man are before the eyes of the Lord, and he pondereth all his goings” (Proverbs 5:21).
- “For mine eyes are upon all their ways: they are not hid from my face, neither is their iniquity hid from mine eyes” (Jeremiah 16:17).
- “The Lord is in his holy temple, the Lord’s throne is in heaven: his eyes behold, his eyelids try, the children of men” (Psalm 11:4).

The promise that secrets will be exposed

- “For nothing is secret, that shall not be made manifest; neither any thing hid, that shall not be known and come abroad” (Luke 8:17).
- “Therefore whatsoever ye have spoken in darkness shall be heard in the light; and that which ye have spoken in the ear in closets shall be proclaimed upon the housetops” (Luke 12:3).

How would the fear of God change your life?

If you lived in the daily reality that God is watching and evaluating everything you do, and that He is going to publicly expose and judge every secret sin . . .

- What thoughts would change?
- What words would not be spoken?
- What actions would cease?
- What attitudes would be corrected?
- What motives would be purified?

How does the fear of God differ from other fears?

The same word Jesus used to tell His disciples not to fear Satan was used to command them to fear the Lord.

“And fear not them which kill the body, but are not able to kill the soul: but rather fear him which is able to destroy both soul and body in hell” (Matthew 10:28).

The fear of man or of Satan brings a snare, but the fear of God brings a blessing.

The Hebrew root for **fear** is יָרָא (yaw-RAY). It means primarily, “to frighten, to affright, be (made) afraid, dread, put in fear, to give reverence.”

David said, “My flesh trembleth for fear of thee; and I am **afraid** of thy judgments” (Psalm 119:120).

We are commanded: “Ye that **fear** the Lord, trust in the Lord: he is their help and their shield” (Psalm 115:11). “Ye that **fear** the Lord, praise him; all ye the seed of Jacob, glorify him; and fear him, all ye the seed of Israel” (Psalm 22:23).

The Greek word for **fear** is φόβος (FAW-boss). Originally this word had the meaning of “flight” or “that which causes a person to flee in dread and terror.”

Fear of the Lord, therefore, goes far beyond the idea of reverential trust. It includes a controlling awe of His power and righteous retribution and a wholesome dread of displeasing Him.

What responses does the appearance of God produce?

1 TERROR

DEFINITION:

Terror describes the most extreme degree of fear. It is totally disabling, leaving a person with neither physical strength nor mental ability.



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The Hebrew word for terror means “prostrate.”

The root word for **terror** in the Hebrew language is בְּעוֹתִים (bee-oo-THEME). It means “to prostrate by confusion and fear.”

φόβος is also translated as “terror.” This terror is precisely the experience which the Apostle John had when he looked upon the reality of God.

“And I turned to see the voice that spake with me. . . . And when I saw him, I fell at his feet as dead. And he laid his right hand upon me, saying unto me, Fear not . . .” (Revelation 1:12, 17).

How does terror relate to the fear of the Lord?

The judgments of God are called “terrors” in Scripture. David declared:

*“Thy fierce wrath goeth over me; thy **terrors** have cut me off” (Psalm 88:16).*

There is no doubt that God’s judgments upon sin do bring terror to those who experience them. These judgments should be spoken of and described especially among God’s people so that even the thought of sin would strike terror in every heart.

This concept lies behind the warnings the Apostle Paul gave to the church at Corinth:

“For we must all appear before the judgment seat of Christ; that every one may receive the things done in his body, according to that he hath done, whether it be good or bad” (II Corinthians 5:10).

“Knowing therefore the terror of the Lord, we persuade men . . .” (II Corinthians 5:11).

2 FRIGHT

DEFINITION:

The Greek word for **fright** is ἐκθαμβέω (ek-thahm-BEH-oh), which literally means “to shrink or shiver with fear.” It is a sudden, violent fear caused by the appearance of danger and is distinguished from the words *fear* and *dread* by its sudden invasion and temporary existence.

How does fright relate to the fear of God?

Fright often comes when we encounter a power which is far greater than we are and which

we do not understand. This fear has been consistently demonstrated in Scripture as people witnessed God’s supernatural power.

When the Lord through Peter healed the lame man outside the Temple, “. . . the people ran together unto them . . . greatly **wondering**” (Acts 3:11).

In another instance fright was shown when the multitudes simply saw Him, and because He is God they experienced ἐκθαμβέω. *“And straightway all the people, when they beheld him, were **greatly amazed** . . .” (Mark 9:15).*

When the three women came to anoint the Lord on the first day of the week they saw the stone rolled away, *“And entering into the sepulchre . . . they were **affrighted**” (Mark 16:5).*



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Mary Magdalene, Mary, the mother of James, and Salome experienced fright at seeing a man sitting in the tomb where Jesus had been laid.

3 DISMAY

DEFINITION:

Whereas terror and fright immediately affect physical strength, dismay alters the mental ability of a person.

The Hebrew word translated **dismayed** describes a person so drained of confidence and courage that he literally faints.

Our English word **dismay** probably comes from *des*, which is a negative, and the old English word *magan*, which means “to be strong” or “able.” Thus, to dismay is “to remove the strength or firmness of mind which constitutes courage.”

Faced with the presence of God’s power, majesty, and splendor, a person would be dismayed. Daniel testified that when God appeared to him in a vision, there remained no strength in him, and he was prostrate before the Lord.



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When Daniel spent extended time in prayer and fasting and then received understanding from the Lord, he experienced dismay.

“Therefore I was left alone, and saw this great vision, and there remained no strength in me: for my comeliness was turned in me into corruption, and I retained no strength.

“Yet heard I the voice of his words: and when I heard the voice of his words, then was I in a deep sleep on my face, and my face toward the ground.

“And, behold, an hand touched me, which set me upon my knees and upon the palms of my hands.

“And he said unto me, O Daniel, a man greatly beloved, understand the words that I speak unto thee, and stand upright: for unto thee am I now sent. And when he had spoken this word unto me, I stood trembling” (Daniel 10:8–11).

How does dismay relate to the fear of the Lord?

There is a great tendency among God’s people to be dismayed at the strength of the wicked.

Thus, Scripture gives the command repeatedly, “. . . Be not afraid, neither be thou dismayed . . .” (Joshua 1:9).

When we see the judgments of God on the children of disobedience, we should be dismayed and have no strength, like Daniel. However, when we hear the voice of God giving reassurance and direction, we should be revived.

“Then there came again and touched me one like the appearance of a man, and he strengthened me, And said, O man greatly beloved, fear not: peace be unto thee, be strong, yea, be strong. And when he had spoken unto me, I was strengthened, and said, Let my lord speak; for thou hast strengthened me” (Daniel 10:18–19).

4 ASTONISH

DEFINITION:

Astonishment relates to the inability to speak in the face of an awesome and overwhelming situation. The Greek word for **astonish** is θαμβέω (thahm-BEH-oh), meaning “to stupefy.”

Our English word comes from the French *estoner*. This word is derived from the Latin *ex*, meaning “out,” and *tonare*, meaning “to thunder.” It literally means “to be thunderstruck; to be struck dumb.”



Paul was astonished on the road to Damascus.

One who is truly astonished is stunned with sudden fear, wonder, and amazement.

When Paul was on the road to Damascus, he was astonished at the appearance of Christ and His

message to him. “And he said, Who art thou, Lord? And the Lord said, I am Jesus whom thou persecutest: it is hard for thee to kick against the pricks. And he trembling and **astonished** said, Lord, what wilt thou have me to do? . . .” (Acts 9:5–6).

How does astonishment relate to fearing God?

In the presence of the omnipotent (all powerful) and omniscient (all knowing) God, we should hold our tongues in astonishment. God advises us, “Be still, and know that I am God . . .” (Psalm 46:10).

The writer of Ecclesiastes warns us further to hold our tongues in God’s presence and be more ready to hear than to speak. “Be not rash with thy mouth, and let not thine heart be hasty to utter any thing before God: for God is in heaven, and thou upon earth: therefore let thy words be few” (Ecclesiastes 5:2).

5 TREMBLING

DEFINITION:

Trembling relates to the physical result of overpowering fear. The English word comes from the Latin *tremulus*, meaning “to shake involuntarily; to quiver; to quake.”

A graphic illustration of trembling occurred in the life of Belshazzar.



King Belshazzar experienced trembling when he saw the handwriting on the wall.

“In the same hour came forth fingers of a man’s hand, and wrote over against the candlestick upon the plaster of the wall of the king’s palace: and the king saw the part of the hand that wrote.

“Then the king’s countenance was changed, and his thoughts troubled him, so that the joints of his loins were loosed, and his knees smote one against another. . . and his lords were **astonied** [astonished]” (Daniel 5:5–6, 9).

Another example of trembling and trepidation is given in the account of the resurrection of Christ.

“His countenance was like lightning, and his raiment white as snow: And for fear of him the keepers did shake, and became as dead men” (Matthew 28:3–4).

6 DREAD

DEFINITION:

The word **dread** expresses more than fear but less than terror and fright. It refers to an intense uneasiness or alarm excited by expected pain, loss, or other harm. **Dread** is less sudden and more sustained than **terror**.

Dread may be used as a noun, a verb, or an adjective.

- **Noun:** “. . . Let him be your **dread**” (Isaiah 8:13).
- **Verb:** “. . . **Dread** not, neither be afraid of them” (Deuteronomy 1:29).
- **Adjective:** He approached the **dread** sovereign.

Daniel used another of the adjective forms in his prayer: “And I prayed unto the Lord my God, and made my confession, and said, O Lord, the great and **dreadful** God, keeping the covenant and mercy to them that love him, and to them that keep his commandments” (Daniel 9:4).

The dread of being in the presence of a holy God is clearly described by Isaiah:

“Then said I, Woe is me! for I am undone; because I am a man of unclean lips, and I dwell in the midst of a people of unclean lips: for mine eyes have seen the King, the Lord of hosts” (Isaiah 6:5).

How does dread relate to the fear of the Lord?

We should have such an awe of the power and authority of God that sinning against Him produces a fearful dread of sure judgment. On the other hand, the dread of God should not make us afraid if we are justified by Christ.

Job stated of God, “Shall not his excellency make you afraid? and his **dread** fall upon you?” (Job 13:11). As for himself, he acknowledged his sin:

"How many are mine iniquities and sins? make me to know my transgression and my sin" (Job 13:23).

However, he also said, "... I know that I shall be justified" (Job 13:18). Therefore, he prayed, "... let not thy dread make me afraid" (Job 13:21).



PROJECTS

1. Match the following vocabulary words with the most precise definition for each one.

DEFINITIONS:

- | | |
|---|---|
| <input type="checkbox"/> F 1. TERROR | A. To be thunderstruck and speechless. |
| <input checked="" type="checkbox"/> C 2. FRIGHT | B. Intense uneasiness excited by expected harm. |
| <input type="checkbox"/> E 3. DISMAY | C. A sudden, violent fear. |
| <input type="checkbox"/> A 4. ASTONISH | D. To lose muscle control. |
| <input type="checkbox"/> D 5. TREMBLING | E. The draining of courage and confidence. |
| <input type="checkbox"/> B 6. DREAD | F. The most extreme degree of human fear. |

2. In light of the responses which Paul, John, Daniel, and others had in the presence of God, discuss the inadequacy of the commonly accepted definition of the fear of God.

COMMON DEFINITION:

A reverential trust in God.

3. Test this definition against the following verses: Psalm 2:11; Philippians 2:12-13; Hebrews 10:31; II Corinthians 7:1; and Matthew 10:28.

LESSON 2

IN WHAT SPECIFIC WAYS IS THE FEAR OF THE LORD PROFITABLE?



All the things a person would hope to find in the proverbial pot of gold come with the fear of the Lord. They come, however, with a spiritual dimension which goes beyond the limitations of worldly riches, health, and honor.

The amazing rewards of learning the fear of the Lord are emphasized throughout Scripture. The following list covers only the references found in Psalms and Proverbs.

Check the benefits you want to experience in your own life:

☐ To overcome sinful habits

"By mercy and truth iniquity is purged: and by the fear of the Lord men depart from evil" (Proverbs 16:6).

☐ To begin learning knowledge

"The fear of the Lord is the beginning of knowledge . . ." (Proverbs 1:7).

☐ To start being wise

"The fear of the Lord is the beginning of wisdom: and the knowledge of the holy is understanding" (Proverbs 9:10).

☐ To have a longer life

"The fear of the Lord prolongeth days: but the years of the wicked shall be shortened" (Proverbs 10:27).

☐ To discover the fountain of life

"The fear of the Lord is a fountain of life, to depart from the snares of death" (Proverbs 14:27).

☐ **To learn contentment**

"Better is little with the fear of the Lord than great treasure and trouble therewith" (Proverbs 15:16).

☐ **To grow in wisdom**

"The fear of the Lord is the instruction of wisdom; and before honour is humility" (Proverbs 15:33).

☐ **To get riches, honor, and life**

"By humility and the fear of the Lord are riches, and honour, and life" (Proverbs 22:4).

☐ **To experience true worship**

"But as for me, I will come into thy house in the multitude of thy mercy: and in thy fear will I worship toward thy holy temple" (Psalm 5:7).

☐ **To have no wants**

"O fear the Lord, ye his saints: for there is no want to them that fear him" (Psalm 34:9).

☐ **To experience God's salvation**

"Surely his salvation is nigh them that fear him; that glory may dwell in our land" (Psalm 85:9).

☐ **To receive daily provision**

"He hath given meat unto them that fear him: he will ever be mindful of his covenant" (Psalm 111:5).

☐ **To experience strong confidence**

"In the fear of the Lord is strong confidence: and his children shall have a place of refuge" (Proverbs 14:26).

☐ **To have a satisfying life**

"The fear of the Lord tendeth to life: and he that hath it shall abide satisfied; he shall not be visited with evil" (Proverbs 19:23).

☐ **To share the secrets of the Lord**

"The secret of the Lord is with them that fear him; and he will shew them his covenant" (Psalm 25:14).

☐ **To experience God's goodness**

"Oh how great is thy goodness, which thou hast laid up for them that fear thee; which thou hast wrought for them that trust in thee before the sons of men!" (Psalm 31:19).

☐ **To have constant protection**

"Behold, the eye of the Lord is upon them that fear him, upon them that hope in his mercy; To deliver their soul from death, and to keep them alive in famine" (Psalm 33:18-19).

☐ **To be delivered from trouble**

"The angel of the Lord encampeth round about them that fear him, and delivereth them" (Psalm 34:7).

☐ **To be looked to for truthfulness**

"Thou hast given a banner to them that fear thee, that it may be displayed because of the truth" (Psalm 60:4).

☐ **To receive a special heritage**

"For thou, O God, hast heard my vows: thou hast given me the heritage of those that fear thy name" (Psalm 61:5).

☐ **To be given God's mercy**

"For as the heaven is high above the earth, so great is his mercy toward them that fear him" (Psalm 103:11).

☐ **To have the Lord's pity**

"Like as a father pitieth his children, so the Lord pitieth them that fear him" (Psalm 103:13).

☐ **To bring delight to the Lord**

"The Lord taketh pleasure in them that fear him, in those that hope in his mercy" (Psalm 147:11).

☐ **To have every desire fulfilled**

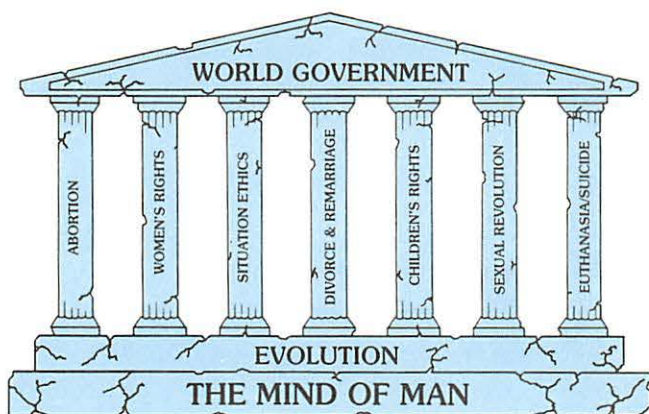
"He will fulfil the desire of them that fear him: he also will hear their cry, and will save them" (Psalm 145:19).

BECOME A SPECIAL TREASURE OF GOD

"Then they that feared the Lord spake often one to another: and the Lord hearkened, and heard it, and a book of remembrance was written before him for them that feared the Lord, and that thought upon his name. And they shall be mine, saith the Lord of hosts, in that day when I make up my jewels . . ." (Malachi 3:16-17).



What are the consequences of not fearing the Lord?



Just as there are amazing rewards for those who have the fear of the Lord, there are also awesome judgments for the person or nation that does not fear God. Some of these judgments are listed below.

☐ There is no restraint of evil.

"As it is written, There is none righteous, no, not one: There is none that understandeth, there is none that seeketh after God. They are all gone out of the way, they are together become unprofitable; there is none that doeth good, no, not one.

"Their throat is an open sepulchre; with their tongues they have used deceit; the poison of asps is under their lips: Whose mouth is full of cursing and bitterness: Their feet are swift to shed blood: Destruction and misery are in their ways: And the way of peace have they not known: There is no fear of God before their eyes" (Romans 3:10–18).

☐ There is no effective church discipline.

"And Ananias hearing these words fell down, and gave up the ghost: and great fear came on all them that heard these things" (Acts 5:5).

"Them that sin rebuke before all, that others also may fear" (I Timothy 5:20).

☐ There is no guard against wrong church members.

"And great fear came upon all the church, and upon as many as heard these things. . . . And of the rest durst no man join himself to them: but the people magnified them" (Acts 5:11, 13).

☐ There is no perfection of holiness.

"Having therefore these promises, dearly beloved, let us cleanse ourselves from all filthiness of the flesh and spirit, perfecting holiness in the fear of God" (II Corinthians 7:1).

☐ There is no Scriptural submission.

"Submitting yourselves one to another in the fear of God" (Ephesians 5:21).

☐ There is no maturity in salvation.

"... Work out your own salvation with fear and trembling. For it is God which worketh in you both to will and to do of his good pleasure" (Philippians 2:12–13).

☐ There is no entrance into God's rest.

"Let us therefore fear, lest, a promise being left us of entering into his rest, any of you should seem to come short of it" (Hebrews 4:1).

☐ There is no influence to unsaved husbands.

"Likewise, ye wives, be in subjection to your own husbands; that, if any obey not the word, they also may without the word be won by the conversation of the wives; While they behold your chaste conversation coupled with fear" (I Peter 3:1–2).

☐ There is no effective witness.

"But sanctify the Lord God in your hearts: and be ready always to give an answer to every man that asketh you a reason of the hope that is in you with meekness and fear" (I Peter 3:15).

☐ There is no perfection of love.

"There is no fear in love; but perfect love casteth out fear: because fear hath torment. He that feareth is not made perfect in love" (I John 4:18).

☐ There is no effective restoration.

"And others save with fear, pulling them out of the fire; hating even the garment spotted by the flesh" (Jude 23).

☐ There is no courage in suffering.

"Fear none of those things which thou shalt suffer: behold, the devil shall cast some of you into prison, that ye may be tried; and ye shall have tribulation ten days: be thou faithful unto death, and I will give thee a crown of life" (Revelation 2:10).

LESSON 3

HOW DOES A PERSON LEARN TO FEAR THE LORD?

Both Christians and unbelievers must learn to fear the Lord. To the degree that we fear the Lord we will have His blessings, and to the degree that we do not fear the Lord we will experience His judgments. Scripture states that there are certain things we can do to learn the fear of the Lord.

Four commands God has given to help us learn to fear Him



U. S. Weather Bureau

1 *Recognize the power of God in nature.*

God's first judgment to a nation is against its crops. He promised the people of Israel He would bless their harvest if they obeyed Him and would destroy their crops if they forsook Him.

"If there be in the land famine, if there be pestilence, blasting, mildew, locust, or if there be caterpillar; if their enemy besiege them in the land of their cities; whatsoever plague, whatsoever sickness there be . . . That they may fear thee all the days that they live in the land . . ." (1 Kings 8:37, 40).

Paul affirms the fact that God shows His mighty power through nature:

"Because that which may be known of God is manifest in them; for God hath shewed it unto them. For the invisible things of him from the creation of the world are clearly seen, being understood by the things that are made, even his eternal power and Godhead; so that they are without excuse" (Romans 1:19–20).

PROJECT

Using your concordance, study the Biblical references to famines. Discern the purposes of God in each famine. Organize the references under such headings as "Forcing people to depend upon Him for daily food," "Bringing a nation to repentance," "Motivating individuals to move," and "Judging a land."

Study the history of Ethiopia, and evaluate the recent famines there in light of that nation's rejection of spiritual light and its slaughter of Christians.

2 *Read the Law of God daily.*

When a king was appointed in Israel, he was instructed to write out his own copy of the Law and then to read from it every day.

"And it shall be, when he sitteth upon the throne of his kingdom, that he shall write him a copy of this law in a book out of that which is before the priests the Levites:

"And it shall be with him, and he shall read therein all the days of his life: that he may learn to fear the Lord his God, to keep all the words of this law and these statutes, to do them" (Deuteronomy 17:18–19).

This passage goes on to cite additional reasons and rewards for making a personal copy of the Law:

"That his heart be not lifted up above his brethren, and that he turn not aside from the commandment, to the right hand, or to the left: to the end that he may prolong his days in his kingdom, he, and his children, in the midst of Israel" (Deuteronomy 17:20).

Not only was the king to write out and read a copy of the Law, but all the people were to listen to it being read every seventh year:

" . . . Thou shalt read this law before all Israel in their hearing.

"Gather the people together, men, and women, and children, and thy stranger that is within thy gates, that they may hear, and that they may learn, and fear the Lord your God, and observe to do all the words of this law:

"And that their children, which have not known any thing, may hear, and learn to fear the Lord your God . . ." (Deuteronomy 31:11–13).

It is in the Law of God that we discover the true nature and character of God so we will know

how to fear Him properly. The Law reveals His justice and His mercy, His truth and His love, His commandments and His promised grace for helping us keep them.

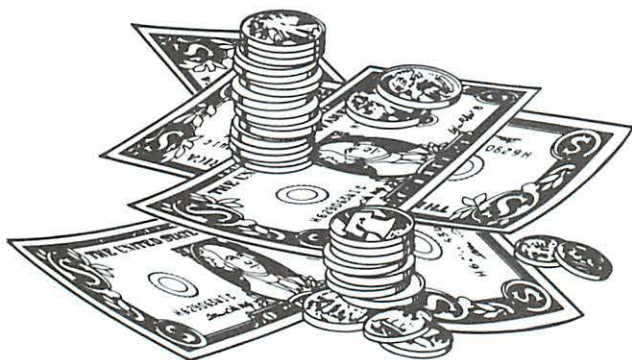


PROJECT

Discover why we as Christians qualify for the instructions which God gave to kings to write out a copy of His Law. (Read Revelation 1:5–6 and II Timothy 2:12.)

Begin writing out your personal copy of the Law of God. Start with those chapters which deal specifically with personal purity: Leviticus 12, 15, 18, and 20.

Put the chapters you write in a special notebook, and add to it as you can. Leave room for notes and personal comments.



3 Give tithes to the Lord each week.

Giving back to God a portion of our increase was a practice established in the very beginning with Cain and Abel. Tithing was carried out by Abraham many years before the Law was ever given to Moses. The procedures for giving the tithes were detailed in the Law God gave Moses:

“Thou shalt truly tithe all the increase of thy seed, that the field bringeth forth year by year. And thou shalt eat before the Lord thy God, in the place which he shall choose to place his name there, the

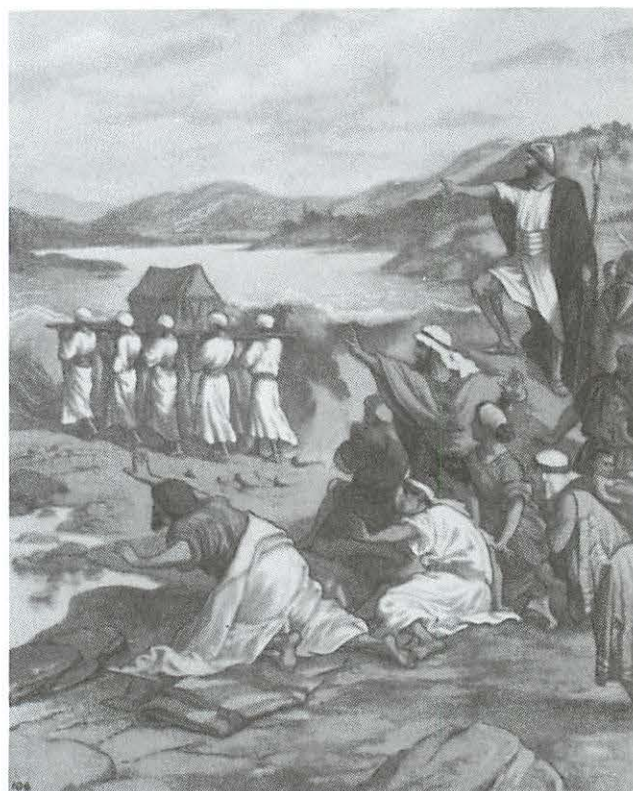
tithe of thy corn, of thy wine, and of thine oil, and the firstlings of thy herds and of thy flocks; that thou mayest learn to fear the Lord thy God always” (Deuteronomy 14:22–23).

In the New Testament, Paul instructed the believers to lay by in store on the first day of the week as God prospered them. (See I Corinthians 16:2.)

PROJECT

Study chapter 6 in *Men’s Manual*, Volume II, pages 64–73, on tithing. Make or confirm your personal commitment on page 70.

4 Remember the mighty works of God.



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God held back the Jordan River while the nation of Israel walked through it on dry ground.

The nation of Israel saw many supernatural works as God delivered them out of the bondage of Egypt, took them through the wilderness, and brought them into the Promised Land.

God knew, however, that His people would soon forget everything He had done for them and would forsake Him and His ways. For this reason, He commanded the Israelites to establish memorials to His mighty acts so they could teach them to their children.

“ . . . When your children shall ask their fathers in time to come, saying, What mean these stones? Then ye shall let your children know, saying, Israel came over this Jordan on dry land. . . . That all the people of the earth might know the hand of the Lord, that it is mighty: that ye might fear the Lord your God for ever” (Joshua 4:21–22, 24).



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The cruel whips of slavery in Egypt were never to be forgotten.

God warned the nation of Israel never to forget the years of bondage in Egypt so they might obey Him and avoid future bondage that would be even more severe.

“Then beware lest thou forget the Lord, which brought thee forth out of the land of Egypt, from the house of bondage. Thou shalt fear the Lord thy God, and serve him . . .” (Deuteronomy 6:12–13).

No one knew better than the Apostle Paul the freedom from guilt which comes with salvation. However, he continued to remind himself and others of his past failures.

He declared, “This is a faithful saying, and worthy of all acceptance, that Christ Jesus came into the world to save sinners; of whom I am chief” (1 Timothy 1:15).

Paul mentions the past shame of the Roman believers when motivating them to enter into the freedom that is in Christ: “For when ye were the servants of sin, ye were free from righteousness.

What fruit had ye then in those things whereof ye are now ashamed? for the end of those things is death” (Romans 6:20–21).

PROJECT

Recall the shame of past bondage, and design some memorial which could be a daily reminder of the hand of the Lord in releasing you from it.

LESSON 4

HOW IS THE WHOLESOME FEAR OF GOD DIFFERENT FROM THE DESTRUCTIVE FEAR OF SATAN?

It is significant that the same Hebrew and Greek words are used for both wholesome fear and destructive fear. Therefore, the difference between the two is not to be found in the type of fear.

The primary Hebrew root word for *fear*, יָרָא (yaw-RAY), is used in each of the following verses:

“And the covenant that I have made with you ye shall not forget; neither shall ye **fear** other gods. But the Lord your God ye shall **fear**; and he shall deliver you out of the hand of all your enemies” (II Kings 17:38–39).

When Jesus taught His disciples what to fear and what not to fear, He used the same Greek word for both.

“And I say unto you my friends, Be not **afraid** of them that kill the body, and after that have no more that they can do. But I will forewarn you whom ye shall **fear**: **Fear** him, which after he hath killed hath power to cast into hell; yea, I say unto you, **Fear** him” (Luke 12:4–5).

Even though the same word is used for the various applications of fear, there are important distinctions:

1 Destructive fear is “fearing the thunder rather than the One Who made the thunder.”

The Lord is a God of cause-and-effect. Therefore, He can demand obedience to His Law. He knows the outcome if we violate it.

It is also for this reason that He continually commands us to focus our fear not on the results of His working, but instead on Him and His Law.

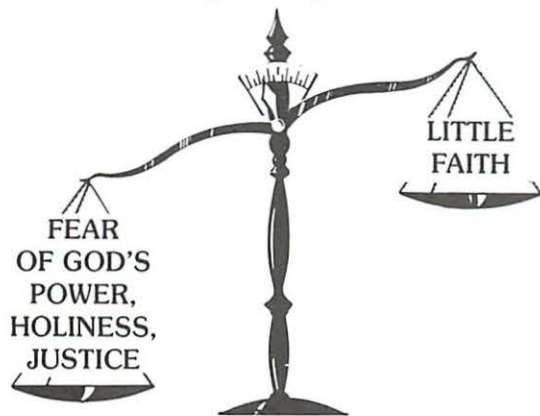
When the storm overtook the disciples on the sea, they feared the wind and the waves. After Jesus instructed them not to fear these things, He showed His power over the elements by calming the storm.

2 Wholesome fear is the basis for dynamic faith.

For the Christian, fear cannot be separated from faith. This relationship is emphasized in Jesus' statement to the disciples after He calmed the sea:

"... Master, carest thou not that we perish? 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**? And they **feared** exceedingly, and said one to another, What manner of man is this, that even the wind and the sea obey him?" (Mark 4:38-41).

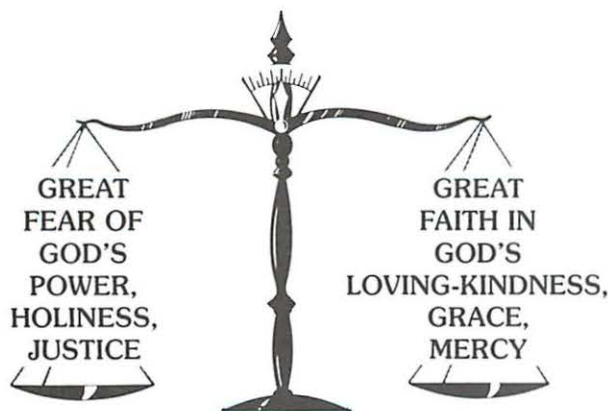
How does Godly fear produce faith?



A person with little faith but with a great awareness of God's power, justice, and holiness will not have a proper fear of God.

When God tells us to fear Him, He is requiring us to acknowledge an aspect of His character such as His justice, His holiness, or His power.

For each one of these attributes, God has a corresponding quality. The more we understand, acknowledge, and fear the first set of attributes, the greater should be our faith, hope, and confidence in the balancing set.

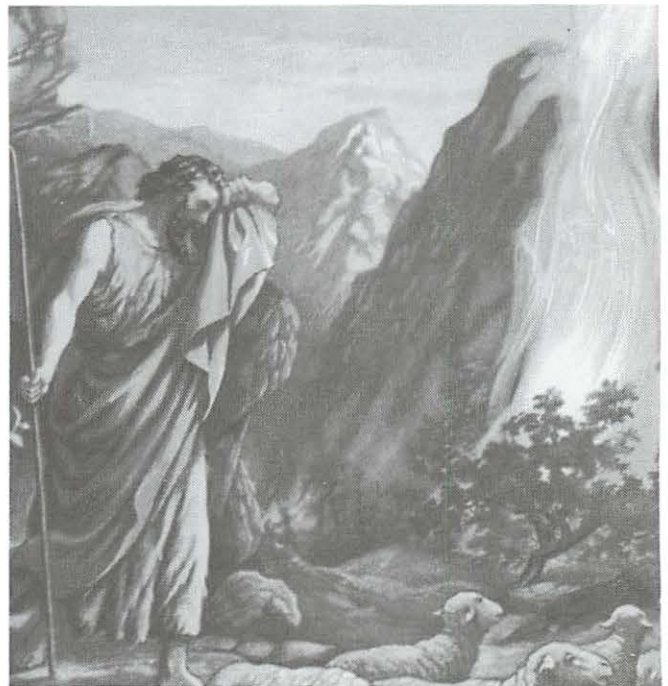


In order to have a proper fear of the Lord, a person must ask the Lord to increase his faith in the attributes which balance the ones he fears.

This balance of fear and faith is illustrated throughout Scripture. Paul related his walk of faith and witness to his fear of God's justice and righteousness in the following Scripture:

"For we walk by faith, not by sight. . . . For we must all appear before the judgment seat of Christ; that every one may receive the things done in his body, according to that he hath done, whether it be good or bad. Knowing therefore the **terror** of the Lord, we persuade men; but we are made manifest unto God . . ." (II Corinthians 5:7, 10-11).

PROJECT



Bible Art Series, Standard Publishing, Cincinnati

Study the account of Moses in Exodus 3:1-4:23. List the attributes of God which He revealed to Moses and which caused Moses to fear the Lord.

Example:

God's attributes which caused Moses to fear the Lord	God's attributes which caused Moses to grow in faith
<p>God's indestructibility (The burning bush was not consumed.)</p> <p>God's holiness (Moses stood on holy ground.)</p>	<p>God's attentiveness (He heard the cry of His people.)</p> <p>God's compassion (He understood their sorrow.)</p>

Date completed _____ Evaluation _____



HOW DID THE PLEASURES AND TREASURES OF EGYPT MAKE MOSES' CHOICE SIGNIFICANT?



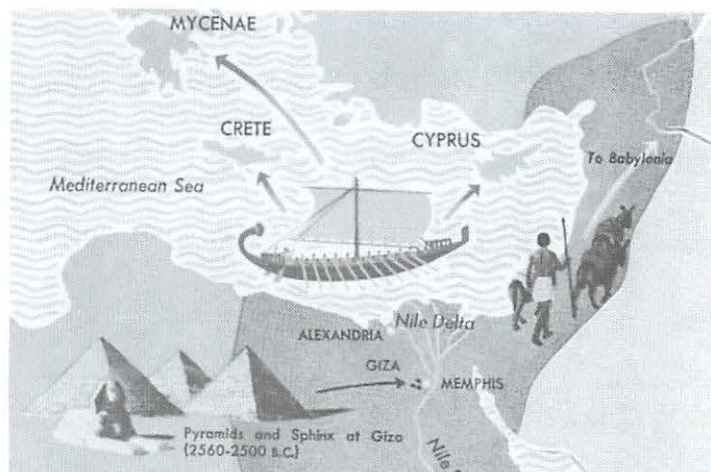
Dover, Inc.

Archaeological records point to Thutmose III as probably the Pharaoh under whom Moses grew up. This Pharaoh was considered one of the greatest, if not the greatest, of all the kings of Egypt.

King Thutmose III led his armies northeast out of Egypt in the twenty-second year of his reign. His objective was "to repel those who had attacked the boundaries of Egypt" and to overthrow those who "were inclined to rebel against his majesty."

As he marched along the great military road to conquest in Palestine, hundreds of thousands of Hebrew slaves continued laboring on his massive building program in Egypt.

When King Thutmose arrived at the mountain range that provided a natural barrier to the enemy forces at the city of Megiddo, there was an important decision to be made: which of three possible routes should the army take?



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The battle route King Thutmose took to go into Palestine was also the trade route which ran from Africa northeast to Babylonia.

The nearest and shortest route was the narrow mountain pass, but that would mean slow progress and sure defeat if the enemy attacked as the Egyptians emerged from the mountains into the valley.

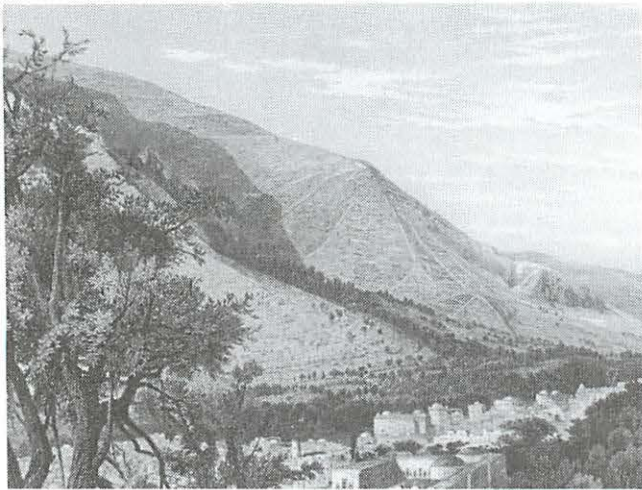
The other two routes were longer but far less dangerous. A strategy council was called by the king; the majority favored the longer and safer routes. King Thutmose realized that the enemy would likewise assume that they would take the safer course.

Therefore he stood before his army and cried out, "I will march on this road [through the mountains]; let him of you who will, go on these other roads which you have mentioned, and let him of you who will, follow my majesty."

The troops fell in behind the king. After a tedious march of three days, the army emerged in early morning hours, and for some unknown reason the enemy made no attempt to stop them. Instead, they stationed themselves before the gates of their city in battle formation.

The next morning King Thutmose mounted his "golden chariot" and led his army toward the enemy, who fled in terror. Because the gates of Megiddo had already been barricaded by the inhabitants, the city's leaders had to be drawn up and over the walls in order to escape immediate death.

The remaining army would have been an easy target for the advancing Egyptian warriors, but suddenly the troops put down their weapons and ran into the enemy camp, grabbing all the plunder they could find. This included an enormous quantity of war chariots, horses, and other valuable items.



Picturesque Sinai and Egypt

King Thutmose led his army over the mountains to the plain of Megiddo.

King Thutmose rebuked his troops for abandoning their opportunity to pursue the foe and to capture the city immediately. Their failure to act required them to set up a seven-month siege against Megiddo to starve out its inhabitants.

When the inevitable capitulation came, the princes of Megiddo walked out of the city and fell at the king's feet to "beg breath for their nostrils."

King Thutmose recorded what took place:



Cairo Museum

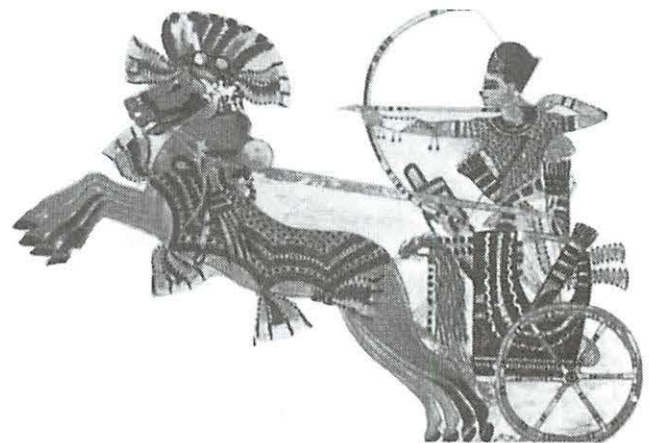
A statue of King Thutmose III, who reigned fifty-four years in Egypt from 1501–1447 B.C.

"Then that fallen one [the chief of Kadesh], together with the chiefs who were with him, caused all their children to come forth to my majesty with

many products of gold and silver, all their horses with their trappings, their great chariots of gold and silver with their painted equipment, all their battle armor, their bows, their arrows, and all their implements of war—those things, indeed, with which they had come to fight against my majesty. And now they brought them as tribute to my majesty while they stood on their walls giving praise to my majesty in order that the breath of life might be given to them.

"Then my majesty caused them to swear an oath, saying: 'Never again will we do evil against Menkheperre [Thutmose III]—may he live forever—our lord, in our lifetime, for we have witnessed his power. Let him only give breath to us according to his desire. . . .'

"Then my majesty allowed to them the road to their cities, and they went, all of them on donkeys. For I had taken their horses and carried off their citizens to Egypt and their property likewise."



The Illustrated Bible Dictionary

Pictured above is King Thutmose's grandson, King Tutankhamun. King Thutmose III used a similar royal chariot in his military campaigns.

The wealth which King Thutmose carried out of Megiddo was recorded as follows: 924 chariots, 2,238 horses, 200 suits of armor, 22,500 small cattle, and immense quantities of gold and silver.

This military campaign was but one of seventeen which King Thutmose III made over a period of nineteen years. Eventually, all the people of Syria were brought under his rule and were forced to pay him an annual tribute.

Because of the amazing courage, military prowess, and achievements of Thutmose III, historians have called him the "Napoleon of Egypt."

It was largely through his efforts that the "Golden Age of Egypt" began.

The most convincing archaeological records identify this king as the Pharaoh under whom Moses grew up. If this was the case, the choice which Moses made when he "was come to years" had great significance.

"By faith Moses, when he was come to years, refused to be called the son of Pharaoh's daughter; Choosing rather to suffer affliction with the people of God, than to enjoy the pleasures of sin for a season; Esteeming the reproach of Christ greater riches than the treasures in Egypt: for he had respect unto the recompence of the reward" (Hebrews 11:24-26).

When Moses was born, his Hebrew parents saw that he was a "goodly" baby. This phrase indicates that he had personal attractiveness and the potential to be an outstanding and talented young man.

Moses' parents hid him for three months because of the edict of Pharaoh commanding Hebrew parents to throw their baby boys into the Nile River. (See Exodus 1:22-2:2.)

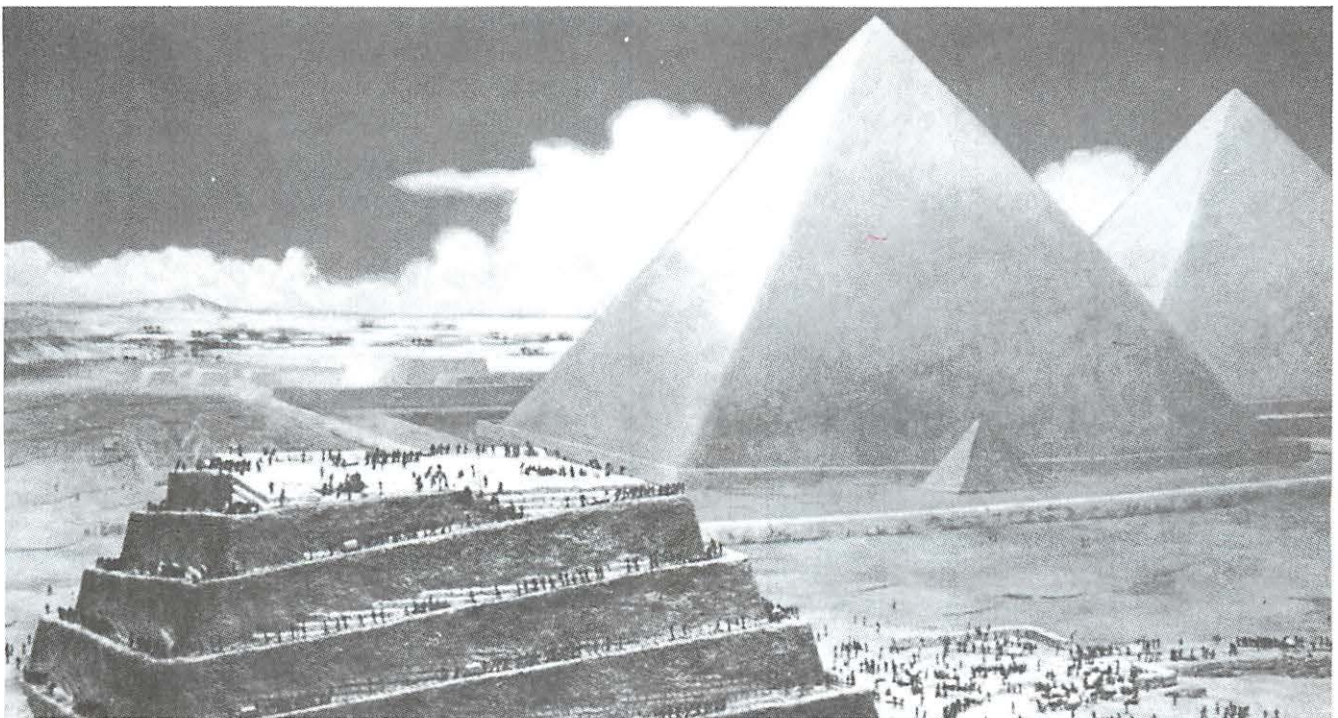
Although Pharaoh's purpose in this order was to diminish the size of the Hebrew families and, thus, their growing strength, it was not uncommon to drown people purposely in the Nile River.

The very life of Egypt depended upon the Nile River overflowing its banks each spring and depositing the rich loam of interior Africa. When the waters receded, the Egyptians were able to grow crops in the fertile soil that remained.

Rather than acknowledging this annual event as a provision of God and an evidence of His control over the Nile, the decadent forces that ruled Egypt influenced the people to worship the Nile itself. During one period of time they would select the most beautiful girl in Egypt as the queen of the Nile and then drown her in the river as an appeasement to this god.

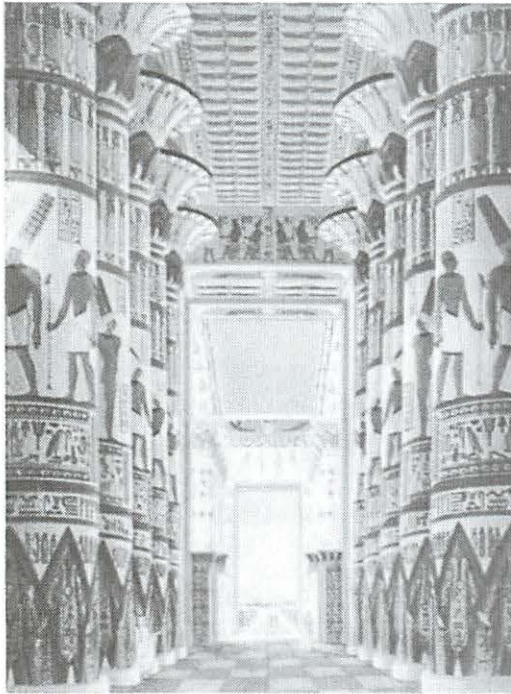
Whatever the reasons Pharaoh gave the Hebrews for offering their boys to the Nile River god, Moses' parents refused to do so. Instead, they placed him in the protection of a basket which was water-proofed with slime and pitch.

When the daughter of Pharaoh came down to the river to bathe with her maidens, she heard Moses' cry, took him out of the water, and adopted him as her own son.



Museum of Science, Boston

The splendor of Egypt which Moses saw included the great pyramids at Giza, constructed 1,200 years earlier. The "Great Pyramid" pictured above contains more than two million stone blocks, each weighing over two tons. It stands 450 feet tall and covers thirteen acres.



British Museum, London

The wealth that the “Golden Age” brought to Egypt allowed future Pharaohs to construct works such as the “Great Hall,” completed by King Ramses II around 1200 B.C. It was the largest columned hall ever built, with seventy-eight-foot-high columns (equivalent to an eight-story building).

THE SIGNIFICANCE OF MOSES' NAME



Bible Art Series, Standard Publishing, Cincinnati

By using the Egyptian word for *Moses*, rather than the Hebrew word, Pharaoh's daughter gave to her adopted son a royal heritage which one day would force him to choose between the treasures of Egypt and the affliction of God's people.

Pharaoh's daughter named the child Moses, “. . . because I [she] drew him out of the water” (Exodus 2:10). She could have selected this name from the Hebrew word *masha*, meaning “to draw out.” However, it is far more likely that Pharaoh's daughter would have used the Egyptian word *mess*, which means “drawn out.”

This is the same word as *mess* in the name Rames or Rameses, which means “born of Ra,” the god of the sun, on which the religion of Egypt was based. Moses' name, therefore, was identified not only with the royal household, but also with the son of the god whom the Egyptians worshiped.

With his superior education, personal ability, and royal position, Moses was in line for top leadership in Egypt.

Nevertheless, when he came of age, he purposed to go before Pharaoh and announce his identification with his Israelite heritage, although he knew this would bring great wrath upon him from both his mother and his grandfather, the king.

Yet Scripture records, “By faith he forsook Egypt, not fearing the wrath of the king: for he endured, as seeing him who is invisible” (Hebrews 11:27).

PROJECT

Moses was tempted in Egypt with the lust of the flesh, the lust of the eyes, and the pride of life. (See I John 2:16.)

Rather than plucking out his eye or cutting off his hand, Moses made the wise decision to remove these temptations from his eyes and his hands.

Instead of lusting after the pleasures of sin, Moses studied the needs of the despised people of God and determined how he could best serve them.

Have you come to the important decision in your life of rejecting pleasures, wealth, and power which the world can give, and instead identifying with Godly Christians, whom the world despises?

What pleasures, approval, and wealth are you turning from now in order to serve God and His people more effectively?

Date completed _____ Evaluation _____



HOW DOES PRUNING ILLUSTRATE THE PROFITABILITY OF CUTTING OUT HINDRANCES IN OUR LIVES?



Courtesy of Stark Brothers Nursery

Life-giving fruit is the product of skillful pruning and constant care.

The limbs of wild trees have no "sense" of direction as they grow. Each sprout seeks its own way and consumes whatever resources are available. If left unpruned, wild sprouts grow into large limbs which ultimately destroy not only the productivity of a tree, but also its life.

Unless a gardener continually "dresses" a tree, it will literally "strangle" itself and produce only tiny, tasteless fruit.

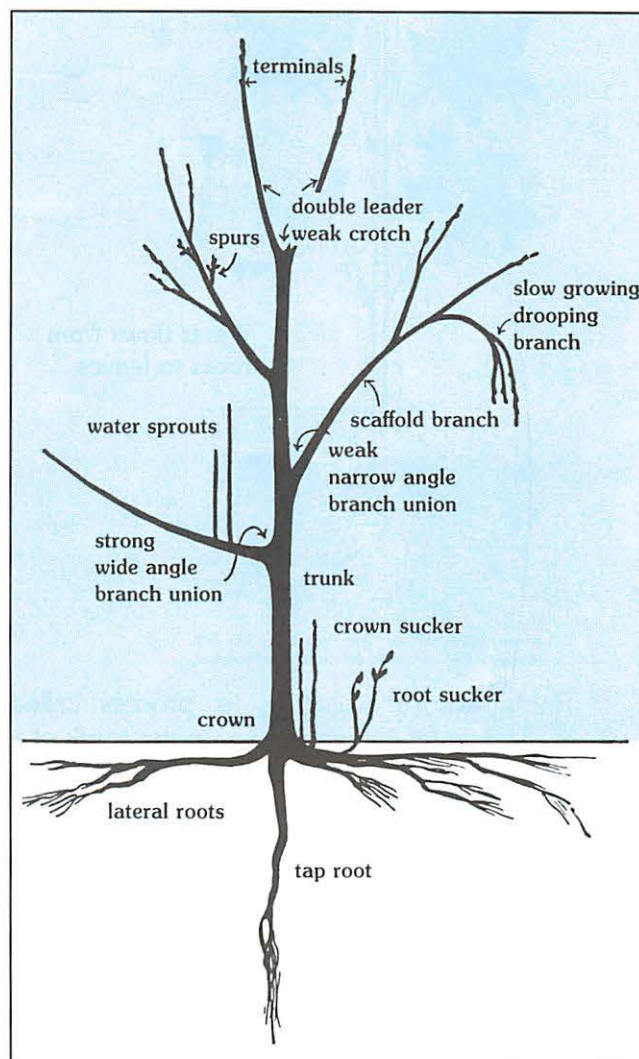
Fruit trees allowed to grow without pruning are more susceptible to disease, are more easily uprooted by storms, and often are unable to carry the fruit they do produce without breaking their weakened limbs.

Skilled pruning requires a thorough understanding of the following factors:

1 PRUNING REQUIRES AN UNDERSTANDING OF EACH PART OF THE FRUIT TREE.

A tree has many members. Some are buried deeply underground or hidden inside the tree. Only the bark, leaves, flowers, and fruit are easy to see. Yet each member, whether hidden or visible, plays a distinct role in the tree's life.

The members of a tree include its roots, trunk, branches, leaves, buds, flowers, fruit, suckers, and sprouts. In order to prune properly, a gardener must understand how each individual member contributes to the tree as a whole.



The Pruning Manual, E.P. Christopher, ©1954 Macmillan Publishing Co., renewed 1982 by E.P. Christopher. Used by permission.

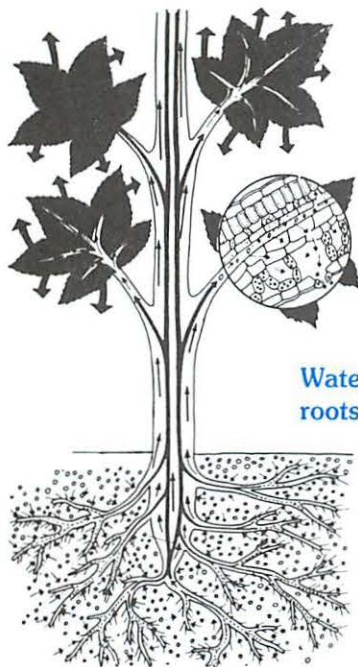
The major gross structure of a tree

How do roots supply life-giving water and food to every member of a tree?

Roots collect water and food for a tree and anchor it securely in the ground. Those roots that grow horizontally just under the soil's surface are known as *lateral roots*. The ones that grow straight down are called *tap roots*.

Lateral roots usually extend slightly beyond a tree's farthest-reaching branches. Horticulturists call this area the *drip line*. Since rainwater slowly drips off leaves and branches, the soil inside the drip line remains moist longer than soil outside the drip line.

Roots also store food. Each summer, roots absorb food and store it for the winter. In the spring, a tree empties its storehouse in order to produce a rapid growth of new leaves, limbs, and flowers.



Water flows from roots to leaves.

Modern Biology, McLaren and Rotundo, ©1985 Holt, Rinehart, and Winston. Used by permission. All rights reserved.

Roots absorb water by a process called *osmosis*. The water is then drawn up the trunk of a tree by the pull created as the water evaporates from the leaves.

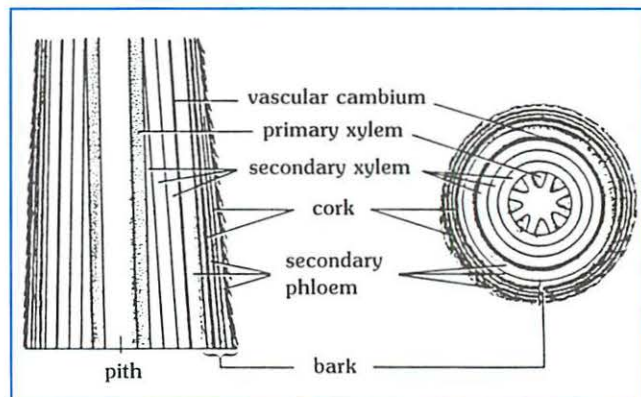
Root tips are very sensitive to air and water conditions in the soil. Tiny root hairs which cover these tips “drown” if they are saturated with water, and break off if they dry out. As a result, whether by receiving too much water or too little, the injured roots fail to absorb water or nutrients, thereby stunting the growth of the entire tree.

How are tree trunks two-way streets?

The trunk of a tree simply connects the roots to the limbs, leaves, and flowers. Yet, it is composed of a very complex system of five different types of wood.

The *cambium layer* is the only part of a tree trunk which grows. It grows both inwardly and outwardly. The inward growth is the *xylem*. In this layer sap, water, and nutrients are carried up the trunk to a tree’s leaves. The outward growth of the cambium is the *phloem*. These cells carry food down the trunk from the leaves to the tree’s root storage system.

As xylem cells die, they build up the heart wood of a tree, which gives the trunk its strength. Dead phloem cells provide a protective shield around the outside of the tree called *bark*.

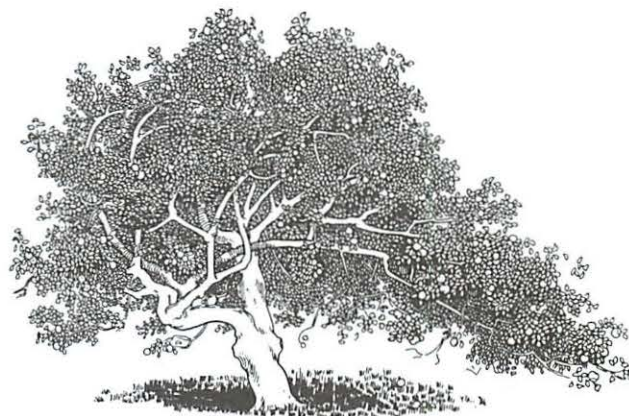


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Each year as a tree alternates between growth and dormancy, it lays down dark and light rings which reveal its age. Thin rings reveal “tough” years with only a little growth. Wide rings reveal “good” years with rapid growth.

If during pruning the cambium of a tree trunk is injured, the bark, phloem, xylem, and heart wood are affected as long as the tree lives. Such injuries are recorded permanently among the tree’s annual growth rings.

How do branches often crowd out one another?

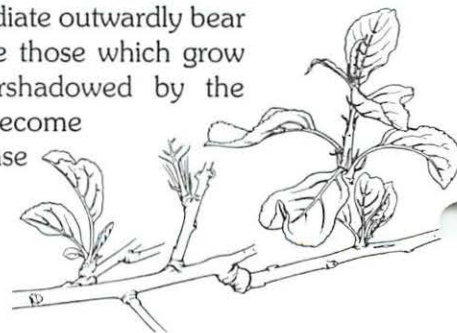


Dover, Inc.

The branches of an apple tree

Branches form the framework upon which the leaves of a tree are arranged. They always grow toward the light without regard for one another. Branches which radiate outwardly bear many leaves, while those which grow inwardly are overshadowed by the outer leaves and become susceptible to disease and insects.

Lateral branch and leaf growth



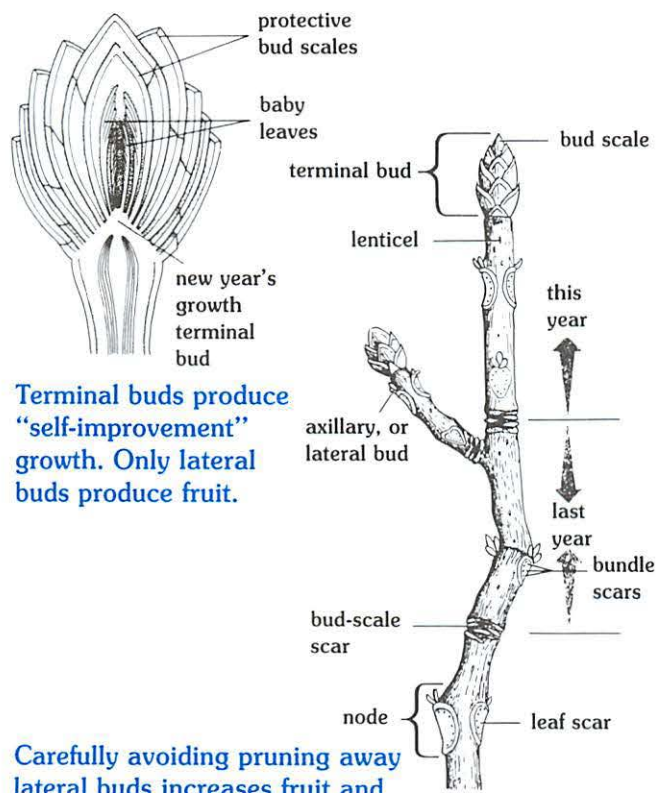
Branches may grow thicker and longer, but they never change their position on the trunk of a tree. A new limb which sprouts from the trunk one foot above the crown (the head of foliage) will remain at the same height until it is pruned away. Sprouts which emerge next to each other may eventually crowd out each other as they increase in diameter.

Pruning small branches while they are just sprouts causes little damage to a tree. However, removing large branches endangers the health of the entire tree and can stimulate an excessive growth of unwanted sprouts and suckers.

How do buds reveal a tree's potential for bearing fruit?

Buds are really "baby" leaves, branches, and flowers surrounded by protective layers of bud scales. *Terminal buds* are located at the tips of branches. They usually add another year's growth to a branch. Gardeners call this kind of growth *vegetative growth*.

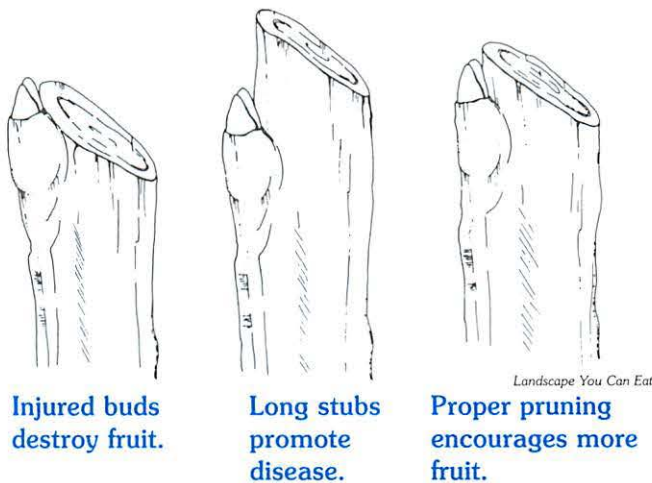
Lateral buds form on the sides of branches and are more likely to produce leaves and flowers. Thus, a tree can use its limited resources in only three ways: vegetative growth, leaf growth, and flowering. However, only flowering buds produce fruit.



Terminal buds produce "self-improvement" growth. Only lateral buds produce fruit.

Carefully avoiding pruning away lateral buds increases fruit and decreases "self-improvement" growth.

Proper pruning minimizes a tree's vegetative and leaf growth and allows the tree to produce the largest quantities of fruit with the least amount of effort. Pruning next to a bud allows new growth to replace the old. Pruning away from a bud leaves a useless stub which will eventually die.



Some buds, called *adventitious*, develop almost anywhere on a tree. They respond to injuries by producing rapid new growths. If rodents damage a tree or a gardener notches a grapevine with a knife, adventitious buds give rise to vigorous new shoots.

Extreme pruning stimulates unwanted adventitious buds which may produce so much new vegetative growth that the tree's fruit production may be diminished for years.

How can the rapid growth of new leaves kill a tree?

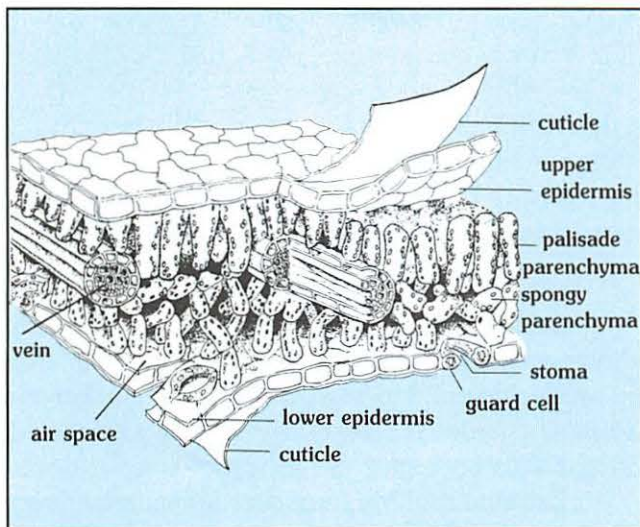
Leaves produce food by mixing carbon dioxide with water to form simple sugars. They then hook the sugars together to build complex molecules of "tree food." *Parenchyma cells* contain the chlorophyll which leaves use to produce food. Trees either store this food or use it to produce new branches, leaves, flowers, or fruit.

Xylem and phloem tissue connect each leaf directly to a tree's root system. This connection supplies a constant flow of raw materials to every leaf, while at the same time it stores every ounce of available food for the following year.

Leaves are covered with tiny holes called *stomata* (singular: *stoma*). Stomata exchange gases such as oxygen, carbon dioxide, and water vapor with the air. This process of evaporation through the leaves puts tremendous pressure on a tree's root system because roots must supply water to replace what is lost, in addition to supplying water for food.

Under normal conditions, the root pressure works to the tree's advantage, since it is the means of forcing up the xylem more water and dissolved minerals from the soil.

The leaf and root systems are especially important to understand when pruning because proper pruning reduces the amount of water loss through leaves and creates less strain on the tree's roots. However, extreme pruning, which stimulates excessive new growth, can kill a tree because younger leaves tend to lose more water than older, more established ones.



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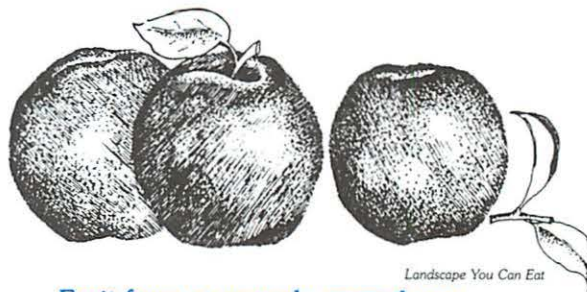
Cross-section of a leaf

How can a little pruning improve the size and taste of every fruit on a tree?

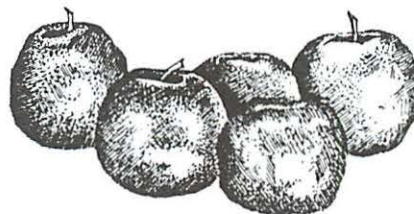
Flowers produce fruit. However, more flowers do not always mean more fruit. Too many flowers produce large amounts of stunted, tasteless fruit. Pruning the number of flowers on a tree reduces the number of individual fruit, but increases the size and quality of each one.

For example, peach trees which are allowed to produce an overabundance of flowers may bear two-inch peaches. A bushel basket can be filled with 380 of these peaches. However, if the peach blossoms are properly pruned, they may result in peaches that are a half-inch bigger and much tastier. It takes only 190 of these superior-quality peaches to fill the same bushel.

Less pruning is needed when trees are producing heavier fruit. By bending branches downward, heavy fruits strengthen the *crotches* which connect branches to the main trunk. These stronger crotches protect against storm damage and winter breakage.



Fruit from a properly pruned tree



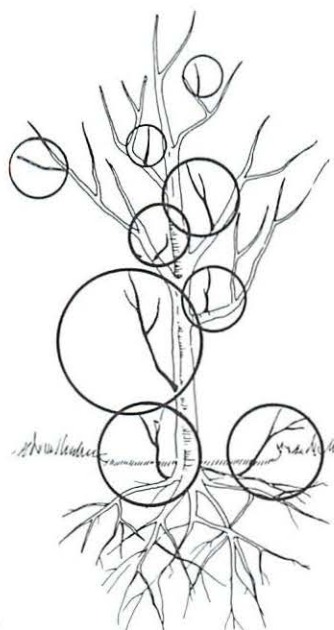
Fruit from an unpruned tree

Three apples picked from a properly pruned tree are larger and tastier than five apples taken from an unpruned tree.

How can nonessential sprouts and suckers hinder the development of fruit?

Horticulturists, who study the science of growing fruits and vegetables, make a distinction between suckers and sprouts. *Suckers* spring up from the crown or root system of a tree.

Sprouts, on the other hand, grow from adventitious buds on tree trunks and branches. Both suckers and sprouts grow very quickly because they have the advantage of a complete root and leaf system for their own private use.



Suckers and sprouts convert valuable energy into useless branches and limbs.

Each of these suckers and sprouts needs to be pruned before it injures the health of the tree.

Landscape You Can Eat

Unfortunately for an orchard owner, suckers and sprouts put all their energy into vegetative growth rather than flowering and fruiting. This growth saps the tree's resources but produces no fruit.

If a gardener fails to prune suckers and sprouts, they grow so rapidly that they often crowd one another to death within a few years. This process endangers the health of the rest of the tree by opening the door to insects and disease.

2 EACH CUT MUST BE CAREFULLY EVALUATED BEFORE IT IS MADE.

Proper pruning requires a gardener to study the tree carefully before he ever makes the first cut. He must be extremely careful to recognize every sprout or limb which must be pruned. Yet, it is especially difficult to envision a slender switch of wood as the trunk of a big tree. It may be even harder to understand how attractive limbs can ever be a threat to a tree's life and productivity.

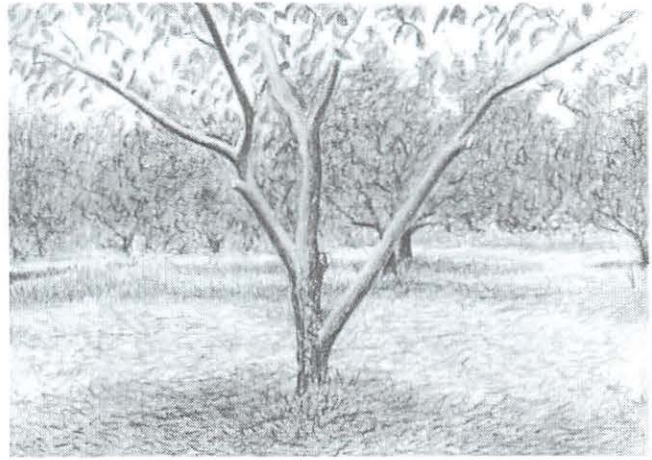
Limbs left unchecked for whatever reason remain as a reminder of the lack of pruning during a tree's early years. A tree may suffer all its long life because of the mistaken kindness of sparing a pruning knife in its early days.



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Failure to prune away unproductive branches leads to unnecessary breakage and disease.

On the other hand, a gardener can seriously endanger a tree by pruning away too much. Once a limb is removed and cast away, it can never be restored. Excessive pruning limits a tree's nutritional intake and may stunt the tree's growth permanently.



Excessive pruning starves a tree (and its owner).



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Proper pruning maintains a balance between a tree's food supply and its responsibility to bear fruit.

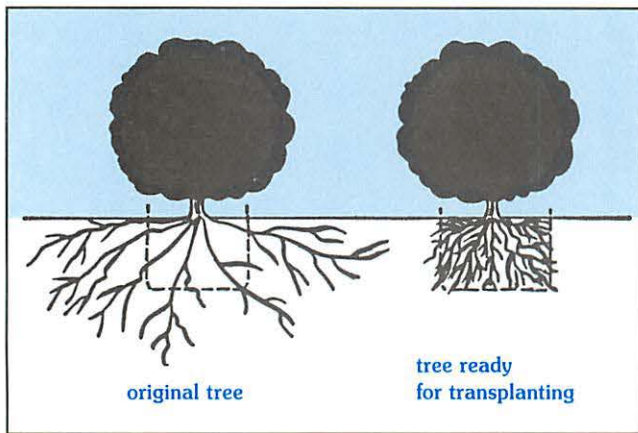
Gardeners may train young sprouts to replace pruning mistakes, but the sprouts will never have the same strength or productivity of the original discarded limb.

3 PRUNING IS A NEVER-ENDING PROCESS. IT MUST CONTINUE THROUGHOUT THE LIFE OF A TREE.

Horticulturists normally transplant fruit trees after they are one or two years old. These young trees are only slender whips with very few branches. Some have no branches at all. Yet, they must be pruned if they are to become healthy, productive fruit trees.

As a gardener prepares to transplant a tree he usually *balls* it. Since all the young roots will not fit into the ball, they must be cut off. This pruning can destroy up to 75 percent of the whip's root system.

To avoid this devastation, roots should be pruned to half their original size a year or more before they are transplanted.



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Gardeners prune roots severely to stimulate new root growth and to make a tree easier to carry to a new home.

How does pruning balance a young tree's demand with its limited supply of food?

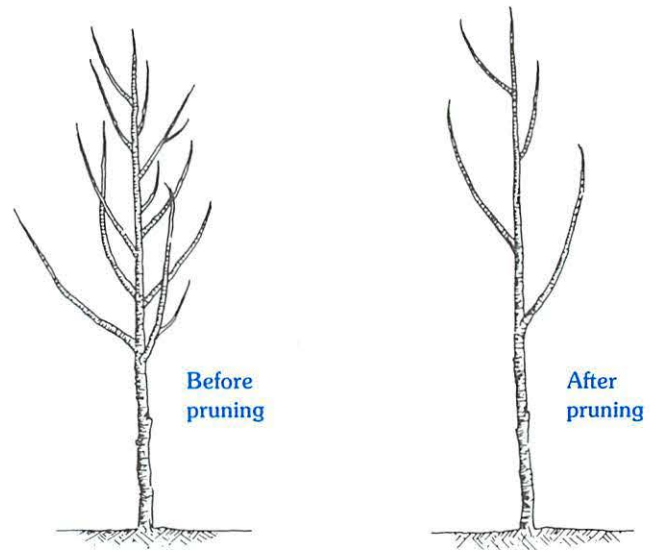
Unless the branches of a freshly transplanted tree are pruned, its meager roots cannot supply enough water and nutrients to meet the needs of the rest of the tree.

Pruning back about one-third of each year's growth helps to balance a young tree's supply and

demand. Pruning ensures the ability of a tree's roots to anchor and feed the entire tree before its branches become too large.

A good gardener removes all a tree's branches that are lower than three feet during the first year the tree is in its permanent home.

These low branches get in the way of managing the tree and drain the tree's strength without producing fruit. The low branches may grow rapidly during the first few years and show great promise, but by the time the tree begins to bear fruit, they wither under the shadow of higher limbs.



Landscape You Can Eat

Pruning a cherry tree

Productive trees need only five or six branches throughout their entire lives. These branches are called *scaffold branches*. They should be spaced eight to twelve inches apart and should point in different directions like the steps of a spiral staircase.

If a pruner fails to remove a branch growing directly above another, the higher branch will shade the lower and prevent the lower branch from bearing fruit.

Even the scaffold branches must be cut back during the early life of a tree. Pruning the scaffold branches stimulates new growth along the branch, increasing the tree's ability to bear fruit.

How does pruning extend the productive life of a tree?

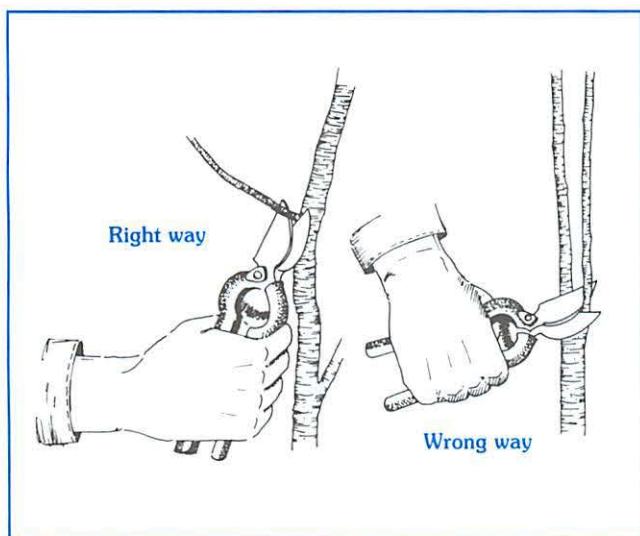
A tree which has been pruned properly in its early years rarely needs radical surgery later. Continued pruning also extends the productive life of a tree by stimulating new growth on "old" trees,

thus keeping them young and productive long beyond the time of their natural ability to bear fruit.

Peach trees, for example, bear fruit only on first-year growths. Yet many thirty-year-old peach trees are still bearing fruit because constant pruning stimulates new growth as the old limbs are gently cut away. The key to a successful peach tree is to keep pruning it just a little each year.

4 CLEAN, SMOOTH CUTS WITH SHARP TOOLS MUST BE MADE IN ORDER TO ENCOURAGE HEALING.

Proper pruning wounds a tree in much the same way as a surgeon's knife wounds a patient. If the incision is smooth, clean, and closed properly, it heals quickly. If a wound is ragged, dirty, and left open, it may allow infection to enter and will form large scars.



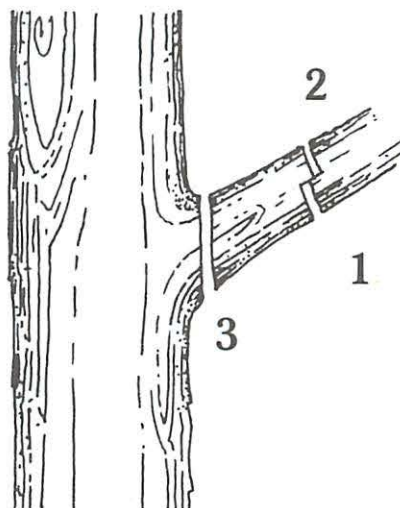
Landscape You Can Eat

Pruning shears should cut from side to side, never top to bottom.

Proper pruning requires only small cuts. However, if a gardener fails to prune early, he may need a power saw to remove the large limbs.

There are three steps to remove a large limb properly. The first step is to cut upward from the bottom side of a branch about six to ten inches away from the supporting crotch. This cut prevents the bark from tearing when the branch falls.

The second step is to cut all the way through the limb. This cut is made from the top side of the branch just above the first cut.



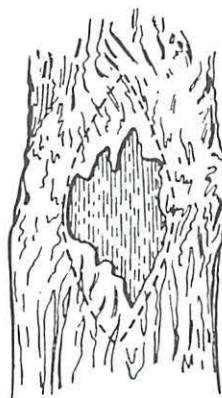
Landscape You Can Eat

The right way to remove oversized tree limbs

The third cut simply removes the remaining stub flush with the trunk. The short stub will not tear the bark or split the wood when it falls.

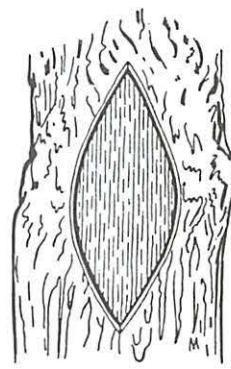
How does proper care after pruning accelerate the healing process?

Gardeners have found that cutting back the bark around large pruning wounds helps to speed recovery and prevent complication. They use sharp knives to cut a smooth, elliptical outline around the wound. This shape allows water to drain from the bottom of the wound, keeping the entire area much drier. Any jagged or horizontal edge collects water, which breeds disease and allows a soft spot to enter the tree.



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A rough wound

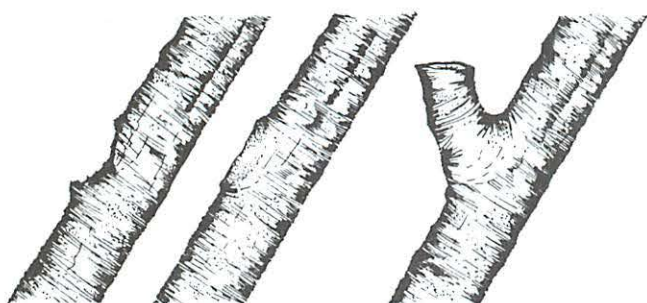


A smooth, shaped wound

Smoothing the edges of an open wound speeds recovery and prevents disease.

Many tree surgeons like to paint the raw wood that has been exposed by a pruning wound. This should always be done with a light sealant paint because heavy, thick tar traps water and promotes rot and disease.

Pruning cuts must never be too shallow or too deep. Shallow cuts promote disease, and deep cuts block the flow of fluids up and down a tree's trunk.



Pruned too deeply

Pruned just right

Pruned too far from main branch

Landscape You Can Eat

If, because of a shallow cut, the pruner leaves a stub, the stub will die and begin to decay before new wood can seal over it. This decaying process may allow disease to enter the main trunk and weaken the entire tree.

Pruning cuts made too deeply may injure the cambium growth layer. This condition destroys both the phloem and xylem layers which the cambium produces. Because phloem cells carry food to a tree's roots for storage and xylem cells feed the leaves, damage to either layer may cause roots to starve and leaves to turn yellow.

5 POTENTIAL WEAK POINTS MUST BE PRUNED BEFORE THEY GROW.

The weakest point of a tree is the intersection of a branch and the trunk. If the angle between the two is much less than 45°, the crotch will grow weaker each year. On the other hand, the branches which leave the main trunk at about a 90° angle grow stronger each year.

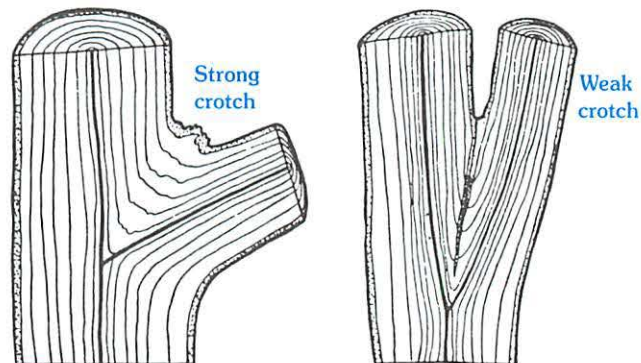


Can you spot the weaknesses in this tree?

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Weakness results from bark which is trapped between a trunk and limb as they grow larger. Bark acts as a barrier between the two, preventing the cambium layer from adding strong wood.

Where a branch leaves the trunk at an angle of 90°, the bark is not trapped. Rather, strong layers of wood overlap one another, making the union even stronger.



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How do gardeners detect weaknesses before they cause serious damage?

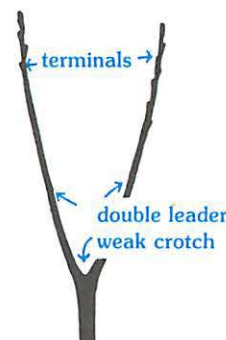
Gardeners detect weak crotches by their characteristic "Y" shape. A strong crotch looks more like an "L."

By pruning away sprouts and Y-shaped crotches in trees, a gardener removes potential weak spots before they can sap a tree's energy and cause it to break under stress. Keeping only the strongest branches helps to ensure that the energy put into future growth and fruiting will not be wasted.

6 MULTIPLE "LEADERS" MUST BE ELIMINATED BY PRUNING.

Leader is a gardening term which describes a tree's central trunk. Because leaders support the main branches of a tree, any weakness in a leader puts the whole tree in jeopardy.

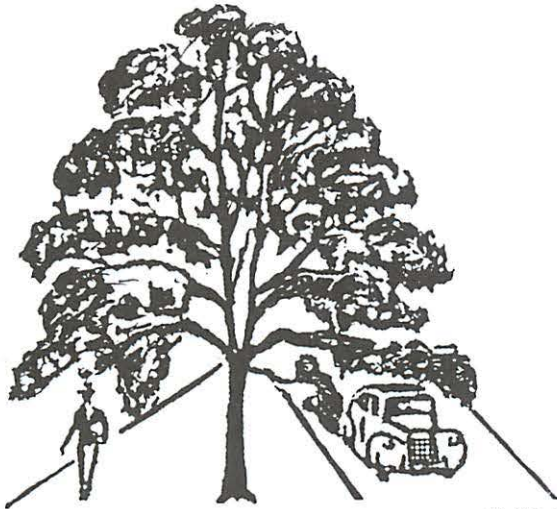
A tree with two leaders usually has a "Y" crotch separating them. Because "Y" crotches are very weak, only one of the leaders will ultimately survive.



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How does a tree replace a broken leader?

Almost any injury which opens up the center of a tree will stimulate competition among existing branches to become new leaders. Light from above causes horizontal branches to bend upward abruptly, quickly filling in the space vacated by an injured leader. However, only one of the new leaders will ever be productive. All the others must be removed in order to eliminate unnecessary competition.



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The weakness of a double-leader tree along a busy street creates a danger for pedestrians and cars. If the weak "Y" crotch breaks, branches may fall either way.

7 PRUNING MUST BEGIN THE FIRST DAY AFTER TRANSPLANTATION.

Young fruit trees produce only leaves and branches for the first few years. Horticulturists call this *vegetative* growth. Vegetative growth is important, but when it is excessive, it hinders a tree's flower and fruit production.

Some apple trees, such as the Northern Spy, do not flower until they are eighteen to twenty years old. However, proper pruning can reduce a Northern Spy's vegetative growth and accelerate its firstfruits by as much as ten years.

How does delayed pruning suppress fruit production?

Gradual pruning, beginning the day a fruit tree is transplanted, minimizes the tree's vegetative

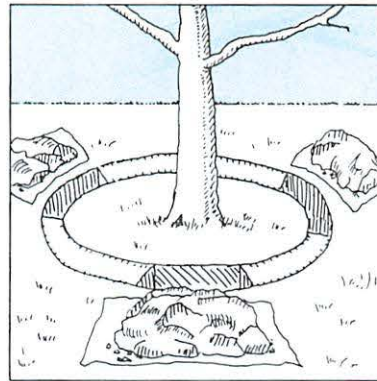
growth and increases the energy the tree puts into bearing fruit.

If a gardener neglects a tree and then heavily prunes it, the sudden pruning promotes vigorous vegetative growth and may suppress fruiting for many years.

How does trimming a tree's roots encourage fruit production?

Another way to stimulate earlier fruiting is to prune a tree's roots. A slow-growing root system results in slow vegetative growth because roots store food over the winter and release it for vegetative growth each spring. As a result, small trees require less energy to maintain themselves and can put more energy into bearing fruit.

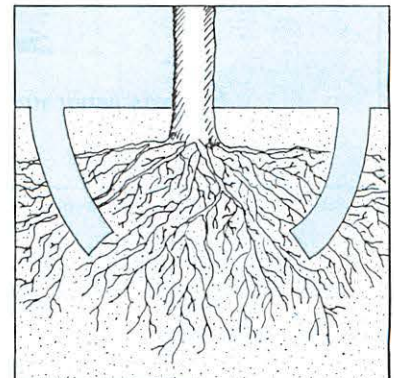
To prune roots, mark a circle around the base of a tree about two feet from its trunk. Dig a dotted line-type trench around the base of the tree to cut away some of the large, thick roots. To avoid destroying too much of a tree's food and water gathering system, not more than one-third of the roots should be pruned in one year's time.



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Pruning back one-third of the tree's roots eliminates much of the next year's vegetative growth.

Root pruning allows a tree to concentrate its energies on producing flowers and fruit.



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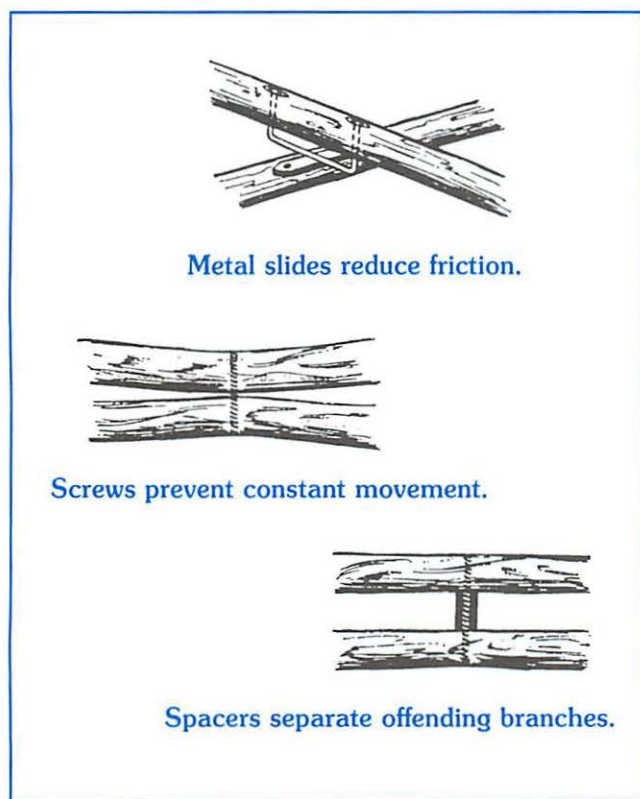
8 LIMBS THAT RUB EACH OTHER AND CAUSE FRICTION MUST BE KEPT APART AND PRUNED.

When limbs are allowed to grow in any direction, they often crisscross. This overlapping promotes self-injury as the branches rub against each other. Friction between the limbs rubs the bark away and may even destroy the phloem, cambium, and xylem layers of a branch.

This friction effectively strangles a limb by blocking the flow of nutrients and water between leaves and roots. If a gardener allows the condition to continue, one or both of the limbs will die.

Crisscrossing branches may actually grow into each other like a self-made "graft." However, the constant rubbing motion prevents the graft from healing, and the wound remains open both to insects and disease.

How does failing to prune crisscrossing limbs while they are small require extraordinary measures later on?



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Only properly spaced branches allow freedom of movement and prevent self-injury.

If proper spacing is ensured by early pruning (during the first or second year), the need for major pruning later will be eliminated. Major pruning leaves large scars, and large wounds require much

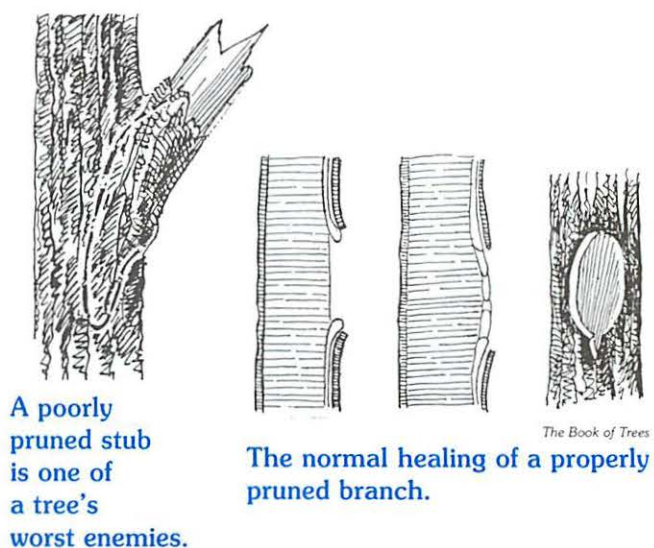
more time to heal. This drastic cutting also stimulates so many new sprouts growing in every direction that the problem of crisscrossing branches is actually compounded.

9 DISEASED LIMBS MUST BE PRUNED TO PROTECT THE LIFE OF THE TREE.

Disease and insects attack trees at their weakest points. *Black rot disease* in apple trees, for example, attacks both living and dead tissues, but it is particularly attracted to dead wood. Storm-damaged limbs and winter-killed branches provide an entry point for the infection. Therefore, orchard keepers must remove any damaged limbs each spring before the disease has a chance to spread to healthy members.

Poorly pruned stubs are another source of dead wood which promotes the growth of black rot. Stubs resulting from improper pruning may incubate a disease which can grow to epidemic proportions within a single season.

The disease may then spread to healthy limbs, where it produces cankers around the limb and strangles the flow of nutrients to and from the leaves.



How do pruning failures promote disease?

Dutch elm disease also favors weak or dying limbs. The bark beetle, which causes this disease, cannot attack healthy, vigorous limbs. Instead, the insect multiplies in weak, growing branches until the population is sufficient to stage a major assault on healthy limbs. Pruning, which eliminates weak elm branches, is the first step in defending Dutch elm trees against the beetle.

How is pruning equipment sterilized?

Pruning equipment itself can carry disease-causing organisms: therefore, it must be carefully sterilized in a solution of household bleach and soapy water or cleansed in 70 percent ethyl alcohol to prevent the spread of disease.

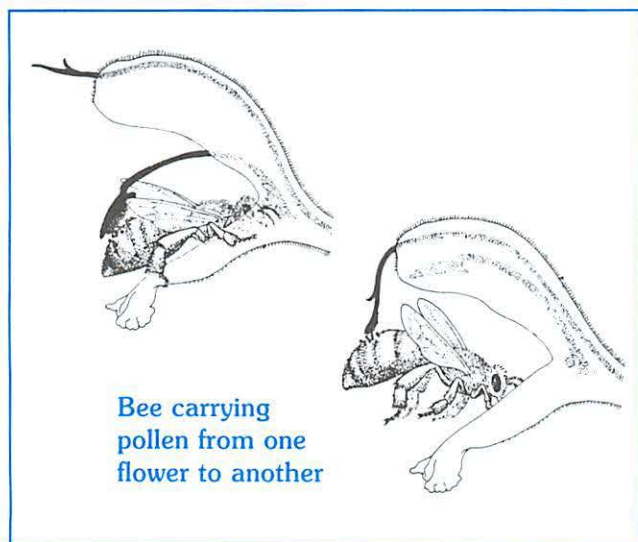
10 BRANCHES WHICH HINDER THE TREE FROM AIR, LIGHT, AND POLLINATION MUST BE PRUNED.

Proper pruning eliminates crowded branches in the center of a tree. One technique is to prune away all branches which grow inward, leaving only those which grow outward. This procedure opens up the center of a tree so that all the branches receive more light and ventilation.

Because light provides the energy for all plant growth, branches which have to compete for limited light never produce abundant fruit. Opening up the center of a fruit tree makes light available and prevents one limb from shadowing another.

Air circulation resulting from proper pruning keeps a tree's bark dry, eliminating a major breeding ground for both fungus and bacterial infections.

Proper pruning also makes flowers more attractive and more accessible to the insects which distribute pollen from one flower to the next.



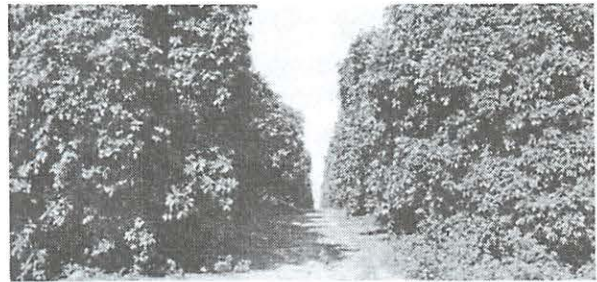
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Trees cannot produce fruit unless an insect carries pollen from one flower to the next. Because unpruned trees hide many flowers, insects are prevented from pollinating them. Without pollination, the flowers wither and never bear fruit.

11 TREETOPS MUST BE PREVENTED FROM GROWING TOO TALL FOR PRUNING.

Pruning has a dwarfing effect on trees. It keeps them small and manageable. Gardeners cut back most apple trees to less than twenty-five feet in height and width. These shorter trees make harvesting much easier since harvesters can reach even the uppermost fruit, using manageable ladders.

If left unattended, a standard apple tree may grow to thirty or forty feet in height. It becomes so gangly and twisted that it is almost impossible to pick the choice fruit which grows at the top or in the center of the tree.



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Narrower trees allow room for tractors and trucks to pass between the rows without injuring limbs. In an orchard which has not been pruned for several years, the rows between trees may be completely blocked so that it is inaccessible to any large equipment.



Sprays never reach the tops of unpruned trees.

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Proper pruning also increases the efficiency of an orchard's spraying program. Unpruned trees have so many hidden branches that the spray is not able to reach the inner leaves which are the most susceptible to disease and insects. Open-center trees, on the other hand, ensure that every leaf, flower, and fruit is reachable with spray.

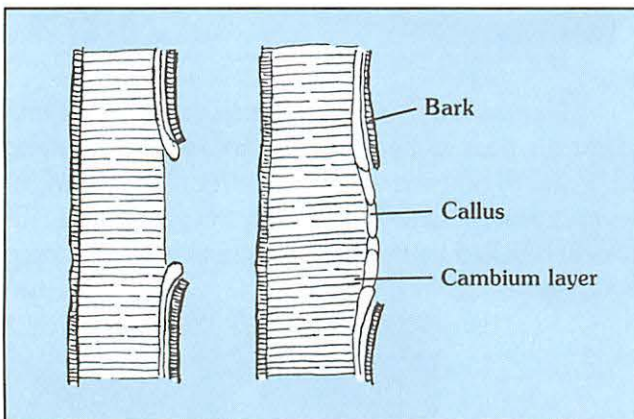
12 PRUNING MUST BE DONE WHILE A TREE IS DORMANT.

The old saying, “prune any time the knife is sharp,” seems wise, but it is not.

Pruning during the late spring while stored sap is rising from the roots results in excessive bleeding. Sap pours out of the pruning wounds, attracting insects and promoting disease. Pruning during the summer does not allow a tree enough time to heal its wounds before winter.

The best time to prune is between February 15 and May 15, during a tree’s dormant period before it begins to leaf out in the spring. Pruning at this time of year eliminates excessive bleeding and gives a tree the entire summer to heal its wounds.

Research demonstrates that trees form a protective *callus* around pruning wounds. The callus forms most quickly in early spring while a tree is not burdened with the activity of growing new leaves or bearing fruit.



The Book of Trees

Callus forming over a fresh pruning wound

Early spring pruning also removes diseased twigs and branches before warm spring and summer temperatures stimulate renewed growth of fungus or bacteria which cause disease.

Winter pruning has the distinct disadvantage of stimulating the growth of many suckers and water sprouts. Summer pruning has the opposite effect. It stops growth and produces dwarfed trees which bear less fruit in the fall.

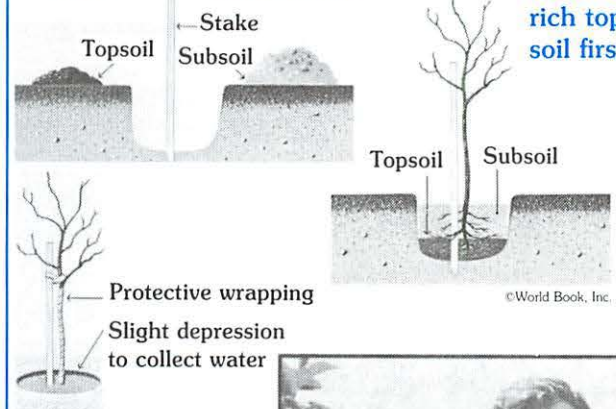
Just as there is a time to rest in all of God’s creation, there is also a time to rest from pruning. According to Leviticus 25:3–5, grapevines need to rest a full year every seven years. Vinedressers allowed their grapes to grow wild without pruning every Sabbath year. This rest helps to heal old pruning wounds and restores new vegetative growth to the vines.

Select several fruit trees appropriate for your climate, and plant them where they can grow for many years. Water, feed, and prune them as a reminder of how God tenderly waters, feeds, and prunes His children so that they might bring forth abundant fruit. Start a “Life Notebook” photo album of each major event in the lives of your trees.

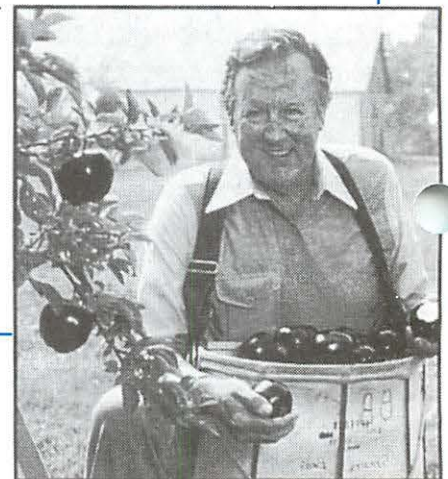
HOW TO PLANT A TREE

Dig a hole twice the size of the tree’s roots.

Refill the rich top-soil first.



Prune your trees regularly but gently to produce the best fruit.



Courtesy of Stark Brothers Nursery

PROJECT

Consider this resource in the light of the following two verses:

“... Let us lay aside every weight, and the sin which doth so easily beset us...” (Hebrews 12:1).

“I am the true vine, and my Father is the husbandman. Every branch in me that beareth not fruit he taketh away: and every branch that beareth fruit, he purgeth it, that it may bring forth more fruit” (John 15:1–2).

Can you draw analogies between each of the twelve points in this resource and the need to prune from our lives anything which hinders fruitfulness? These items would include:

- ☐ Unproductive activities which sap our strength
- ☐ Conversations which rob us of time
- ☐ Thoughts which distract us from productivity

Date completed _____ Evaluation _____



HOW DO "SIGNIFICANT NUMBERS" CONFIRM THE NEED TO CAST OUT THAT WHICH PRODUCES ERROR?



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The work of a surveyor demands accuracy in measurement and calculation, as well as proper equipment which is functioning well.

When measuring and calculating, mathematicians, chemists, physicists, and surveyors must be careful to be as accurate as possible in order to obtain useful and productive results. It is important that they recognize their own limitations as human beings as well as the limitations of their equipment. They must be willing to cast out the insignificant—or that which produces error.

In the same way, we must evaluate our own lives, being careful to recognize our limitations, to see ourselves as God sees us and to discard any hindrances to His working in us.

Job, when replying to his adversaries, defended himself by saying, "Let me be weighed in an even [accurate] balance, that God may know mine integrity" (Job 31:6).

Yet later, in the light of God's presence, he confessed, "I know that thou canst do every thing, and that no thought can be withholden from thee. Who is he that hideth counsel without knowledge? therefore have I uttered that I understood not; things too wonderful for me, which I knew not. . . . I have

heard of thee by the hearing of the ear: but now mine eye seeth thee. Wherefore I abhor myself, and repent in dust and ashes" (Job 42:2–3, 5–6).

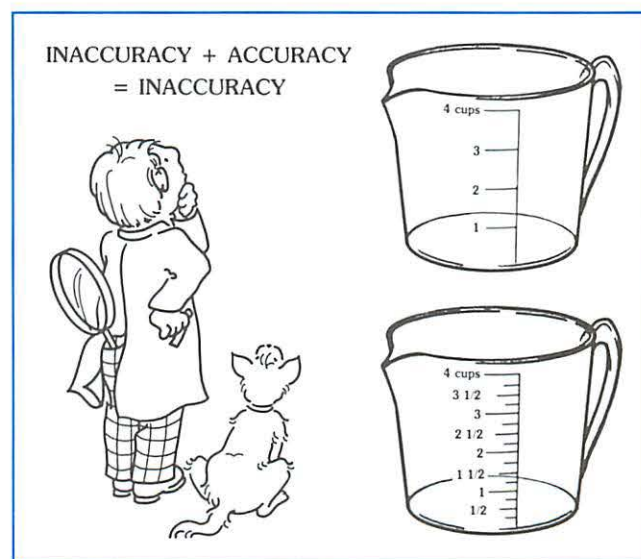
It was at this point, after seeing clearly his insignificance before Almighty God, that ". . . the Lord blessed the latter end of Job more than his beginning . . ." (Job 42:12).

What can we learn from insignificant figures to help us respond correctly to our own limitations, to think accurate thoughts about ourselves and God, and to receive His limitless blessings?

1 EACH PART MUST BE ACCURATE IF THE WHOLE IS TO BE ACCURATE AND USEFUL.

In the study of math, chemistry, physics, and surveying, it is often necessary to make several measurements and then add, subtract, multiply, or divide these measurements in order to solve a problem. The accuracy of the solution is only as accurate as each individual measurement in the process, and each individual measurement is only as accurate as the instrument which was used to obtain it.

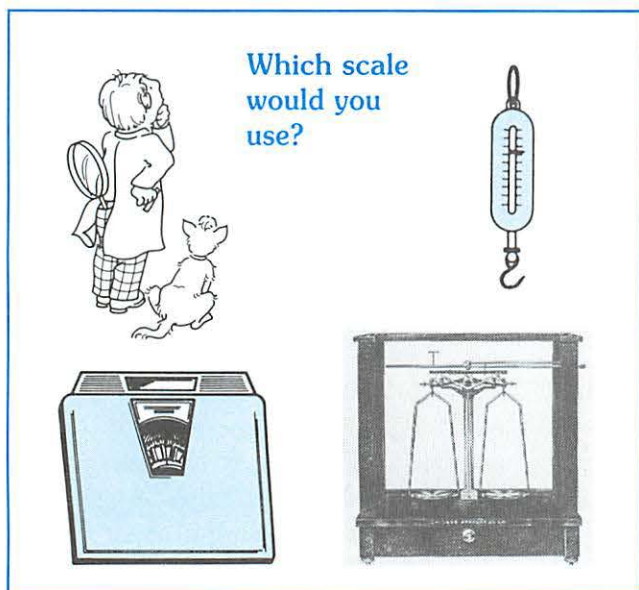
Suppose, for example, that you are making pudding. The recipe calls for $2\frac{1}{2}$ cups of milk. You have your choice of two measuring cups. One is marked in increments of 1, 2, 3, and 4 cups. The other is marked in increments of $\frac{1}{2}$, 1, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3, $3\frac{1}{2}$, and 4 cups. Which one would be better to use?



With the first cup, you would have to guess how much milk is $2\frac{1}{2}$ cups by guessing where $2\frac{1}{2}$ is on the measuring cup. With the second one, you would not have to guess. You would know exactly where $2\frac{1}{2}$ cups is.

Your accuracy in measuring the milk depends on the accuracy of your measuring cup. The quality of your result, the pudding, depends on how accurately you measure the milk and each of the other ingredients.

If a chemist needed to measure exactly 2.850 grams of a chemical for an important experiment, what measuring device would he use: a metric bathroom scale, a kitchen scale, or a laboratory balance which measures accurately to $\frac{1}{1000}$ of a gram?



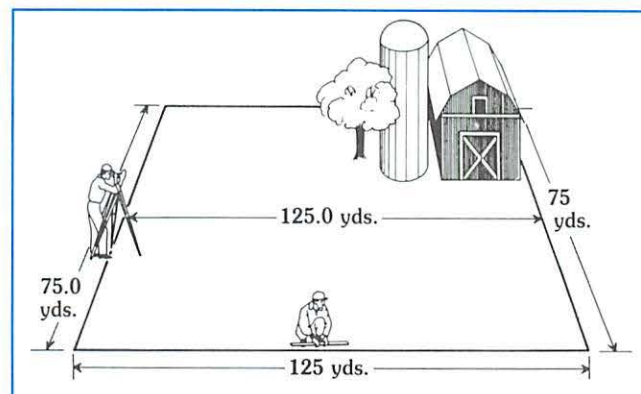
The chemist needs a scale which measures accurately to $\frac{1}{1000}$ of a gram, so he would use the balance, which measures accurately to the same degree required by the experiment. The bathroom scale would weigh accurately only to about the nearest kilogram—anything more precise than that would have to be guessed. A kitchen scale might weigh accurately to $\frac{1}{2}$ of an ounce (approximately 14 grams); thus, some guessing would still be required.

2 FINDING THE INACCURATE MEMBER REQUIRES DISCERNMENT.

It is important to remember that every measurement has some degree of uncertainty which varies according to the precision of the measuring device used.

**Significant figures:
telling the truth with numbers**

When a measurement is used in a mathematical formula with other measurements, the result is only as certain as the least certain measurement. For this reason it is always important that chemists, physicists, and surveyors indicate the amount of uncertainty in any measurement. This is done by writing down all the digits about which they are certain plus the first digit about which they are not certain. These numbers are called the **significant figures** of the measurement.



EXAMPLE: Two men go out to survey a field. One man uses a yardstick and finds that the field is 125 yards long and 75 yards wide. The second man uses surveying instruments and finds the field to be 125.0 yards long and 75.0 yards wide. What is the difference between the two measurements?

SOLUTION: The first man found that the field was “pretty close to” 125 yards long and 75 yards wide. He was sure of only the first two digits in his measurement of the length, the 1 and the 2. The digit that he guessed was the last one, the 5. His answer could be off by as much as 1 in either direction. That is, the actual length of the field could be as much as 126 yards or as little as 124 yards.

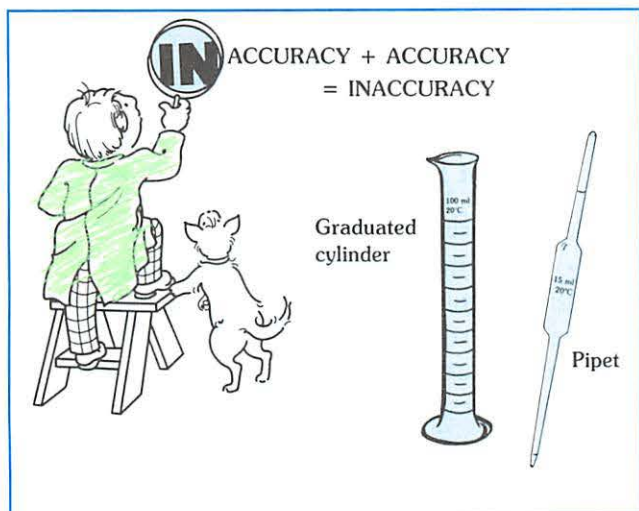
Since he was sure of the first two digits and unsure of the third, there were three significant figures in his measurement of the length of the field.

The second man found that the field was “pretty close to” 125.0 yards long and 75.0 yards wide. He was sure of the first three digits in the length, the 1, 2, and 5. The digit of which he was unsure was the 0. His answer also could be off by as much as 1 in either direction, but this time the uncertainty would be in the *tenths* position. According to his measuring, the actual length of the field could be as much as 125.1 yards or as little as 124.9 yards.

Since the second man was sure of the first three digits and unsure of the fourth, there were four significant figures in his measurement of the length of the field.

According to the first man's measurements, the actual width of the field could be anywhere between 74 and 76 yards (two significant figures). According to the second man's measurements, the width of the field could be anywhere between 74.9 and 75.1 yards (three significant figures).

EXAMPLE: For an experiment, a chemist measures 15.00 ml of water with a pipet. Later in the experiment he measures 15 ml of water with a graduated cylinder. What is the difference between the 15.00 ml he measured with the pipet and the 15 ml he measured with the graduated cylinder?



What is a ml?

Milliliter (MILL-ih-leet-er): a metric unit of measure equivalent to one-thousandth of a liter; abbreviated ml.

Liter (LEET-er): a metric unit of measure approximately equal to a quart; abbreviated l.

SOLUTION: The amount of 15.00 ml measured with the pipet means that the chemist was sure of the first three digits in his measurement (15.0) and was guessing at the fourth digit, the last zero. His measurement has four significant figures and means that the actual amount of water is somewhere between 14.99 and 15.01 ml.

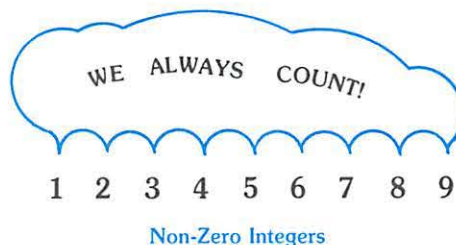
The amount of 15 ml measured with the graduated cylinder means that the chemist was sure of only the first digit in his measurement, the 1, and was guessing at the second digit, the 5. His

measurement has only two significant figures, meaning that the actual amount of water could be as low as 14 ml or as high as 16 ml.

People who work with measurements have rules for determining which digits count as significant figures and which do not.

Rules for counting significant figures

1. Non-zero integers always count as significant figures. Non-zero integers are the counting numbers—1, 2, 3, 4, 5, 6, 7, 8, and 9.



2. Zeros:
 - a. Leading zeros are zeros that come in front of all the counting numbers. They do not count as significant figures. In the number 0.0032, the 3 and the 2 count since they are both counting numbers. The zeros do not count because they are leading zeros.



- b. Captive zeros are zeros "caught" between 2 counting numbers and always count as significant figures. The number 2.004 has 4 significant figures, since the two zeros are "caught" between the two counting numbers.



- c. Trailing zeros are zeros that come after the counting numbers. They are significant only if the number contains a decimal point. The number 100 has only 1 significant figure, since the two zeros come after the counting number and there

is no decimal point. The number 100.0 has four significant figures. The three trailing zeros count this time because the number has a decimal point.



.4 ☺☺

Trailing Zeros



4 ☹☹

Trailing Zeros

3. Exact numbers:

Sometimes there is need for a number that is obtained not by measuring but by counting: 3 apples, 2 experiments, 10 children. These numbers are called *exact numbers* and have an infinite number of significant figures.

• Do Practice Problems—Section A

3 THAT WHICH IS UNCERTAIN MUST BE CAST OUT IN ORDER TO ACHIEVE A PRECISE RESULT.

There are also rules for determining the amount of uncertainty in the results of a problem when more than one measurement has been used.

When two or more measurements are multiplied or divided, the answer can have no more significant figures than the least precise measurement used.

EXAMPLE:

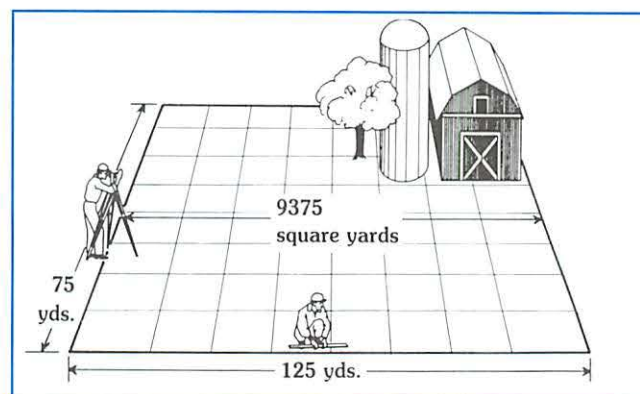
$$\begin{array}{r} 1.04 \text{ — 3 significant figures} \\ \times 3.2 \text{ — 2 significant figures} \\ \hline 3.3 \quad 28 \end{array}$$



INACCURACY × INACCURACY
= A MESS

The answer can have
only 2 significant figures.

The first man who went out to measure the field got the results 125 yards long and 75 yards wide. When the two numbers are multiplied together to find the area of the field, how accurate is the result?



125 has 3 significant figures

75 has 2 significant figures

$$\begin{array}{r} 125 \\ \times 75 \\ \hline 9,375 \end{array} \text{ square yards,}$$

but how many significant figures?

According to the above rule, the answer can have only as many significant figures as the least number of significant figures used in the measurement. In this case, 75 has the least number of significant figures—two. Therefore the answer can have only two significant figures. The answer 9,375 must be “cut off” and “rounded off” to a number with just two significant figures. That number is 9,400.

When the second man measured the field, he got the results 125.0 yards and 75.0 yards.

125.0 has 4 significant figures

75.0 has 3 significant figures

$$\begin{array}{r} 125.0 \text{ yards} \\ \times 75.0 \text{ yards} \\ \hline 9,375.00 \end{array} \text{ square yards,}$$

but how many significant figures?

Again, the answer can have only as many significant figures as the least number of significant figures used in the measurement. In this case, 75.0 has the least number of significant figures—three. Therefore the answer must have three significant figures. The number 9,375.00 must be “cut off” and “rounded off” to a number with three significant figures, 9,380.



INACCURACY × ACCURACY

= A MESS

Which figure more accurately gives the area of the field, 9,400 square yards or 9,380 square yards?

The same rule of significant figures holds true for division. If a field is known to have an area of 2,600 square yards, and the length is known to be 40 yards, what would the width be?

To find the width, divide the area by the length:

2,600 square yards — 2 significant figures
40 yards — 1 significant figure
2,600 square yards ÷ 40 yards = 65 yards

However, since the measurement 40 has only 1 significant figure, the answer can have only 1 significant figure. The answer, 65 yards, must be “cut off” and “rounded off” to only 1 significant figure, 60 yards.

When adding and subtracting significant figures, the result has the same number of decimal places as the least precise measurement used in the addition or subtraction.

EXAMPLE: INACCURACY + ACCURACY
= INACCURACY

11.6 grams — 1 decimal place
7.31 grams — 2 decimal places
+ 9.0 grams — 1 decimal place
27.9 1 grams
The answer can have only 1 decimal place.

Three liquids were weighed separately and then combined. What is the total weight of the three liquids?

13.40 ounces — 2 decimal places
8.7 ounces — 1 decimal place
+ 1.57 ounces — 2 decimal places
23.67 ounces — ? decimal places?

The answer found by addition can have only as many decimal places as the least number of decimal places used in the addition. In this case, since 8.7 has only 1 decimal place, the answer can have only 1 decimal place. 23.67 ounces must be “cut off” and “rounded off” to 23.7 ounces.

If 7.42 meters of tape is cut from a roll that was 38.6 meters long, how much is left?

38.6 meters — 1 decimal place
– 7.42 meters — 2 decimal places
31.18 meters — ? decimal places?

Since the answer can have no more decimal places than the least number of decimal places used in the subtraction (38.6 has only 1 decimal place), the answer must be “cut off” and “rounded off” to 1 decimal place—31.2.

What is rounding off?

There are times when it is not necessary or even accurate to write a number exactly. If you were asked how many people are in your family, you could answer with an exact number. If you were asked how many people live in your town, you would probably have to answer with a “rounded off,” or approximate, answer, because population figures vary. Within a given week or month, births and deaths in a community usually fluctuate; therefore, identification signs generally list estimates. Estimates are always given in “rounded off” figures.



Money is often rounded off to the nearest dollar for purposes of reporting research in graphs or tables or completing annual income tax return forms. If you have \$5.75, that sum, rounded to the nearest dollar, would be \$6.00, since \$5.75 is closer to \$6.00 than it is to \$5.00.

Population counts are usually rounded off to the nearest hundred, thousand, ten thousand, or hundred thousand, depending on the size of the population being counted.

For example, in a small town of 386 people, the population would be rounded off to the nearest hundred—400. A larger town of 7,892 would be rounded off to the nearest thousand—8,000. The population of the city of New York, 7,071,030

(according to the 1983 *World Book Encyclopedia*), would be rounded off to the nearest million—7,000,000.

World Population and Yearly Growth

Major Area	Population (1983 estimate)	Yearly Growth (1980-1985)
World	4,666,000,000	1.7%
Africa	514,000,000	3.0%
Asia	2,810,000,000	1.8%
Australia	15,000,000	1.2%
Europe	674,000,000	0.3%
North America	387,000,000	1.6%
Pacific Islands (including New Zealand)	11,000,000	1.7%
South America	255,000,000	2.4%

Source: UN Statistical Office

In rounding off, you first decide to what place value to “round off.” The digits to the right of that place determine if the number will be rounded off higher or lower. Then these digits are “cut off.”

RULES FOR ROUNDING OFF

If the digit to be cut off:

- is less than 5, the preceding digit stays the same. For example, 1.32 rounds off to 1.3. The 2 was cut off.
- is greater than 5, the preceding digit increases by 1. For example, 1.36 rounds off to 1.4. The 6 was cut off.
- is equal to 5, the preceding digit is not changed if it is even, but is increased by 1 if it is odd. For example, 1.35 rounds to 1.4, but 1.25 rounds to 1.2. In each case, the 5 was cut off.

EXAMPLE: Round off 473 to the nearest ten.

4 **7** 3 ← the digit to be “cut off”
 ↑
 the tens place, the number to be “rounded”

SOLUTION: The digit in the tens place is the 7. The digit to be cut off is the 3. Since 3 is less than 5, the 7 digit stays the same. The number 473 rounded off to the nearest ten is 470.

EXAMPLE: Round off 684 to the nearest hundred.

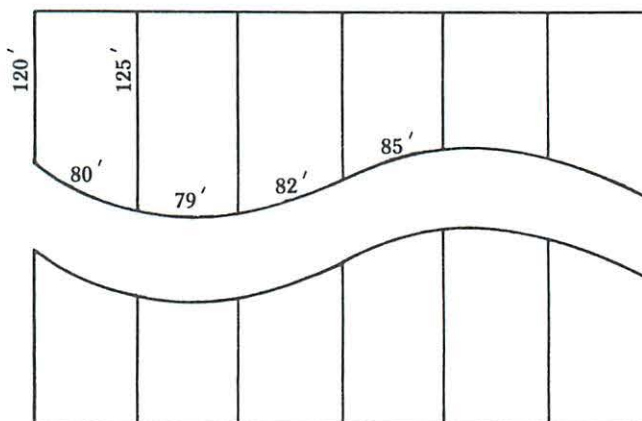
SOLUTION: The digit in the hundreds place is the 6. There are two digits to be cut off this time, the 8 and the 4. Since the 8 is larger than 5, the 6 digit increases by 1. The number 684 rounded off to the nearest hundred is 700.

• Do Practice Problems—Section B

4 TO OBTAIN A MORE ACCURATE RESULT, A PERSON MUST DESIRE A MORE ACCURATE WAY.

Divide 9.8 by 9.3 on a calculator. The answer you get, depending on the calculator you use, is 1.0537634. That looks very impressive, but knowing what you do about significant figures, how much of that answer is really accurate? Since both 9.8 and 9.3 have only 2 significant figures, the answer can have only 2 significant figures. So the “537634” portion of the answer must be cut off, and the “1.0” must be rounded off to 2 significant figures. The accurate answer is 1.0. The only way to improve the accuracy of the answer is to improve the accuracy of the 9.8 and the 9.3.

If the numbers 9.8 and 9.3 are measurements, one way to improve their accuracy is to improve the accuracy of the measuring device that was used.



A plat map showing the results of a survey done on lots in one city block

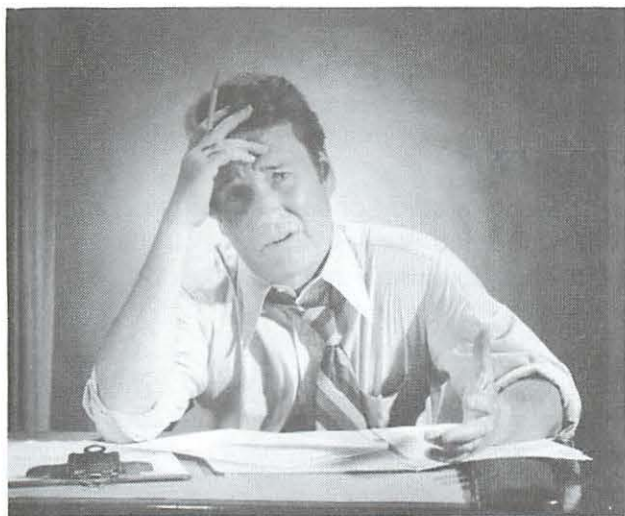
When the two men went out to measure the length and width of the field, the first used a yardstick. The second used surveying instruments. The results of the second man’s measurements were more accurate than those of the first man’s because of the accuracy of the instruments used.

Suppose that a man goes out to survey all the yards on one side of the street in your block. First he very carefully measures the width of every yard, and he writes down his measurements clearly in a notebook.



Ewing Galloway

Then he looks at his watch and discovers that unless he hurries, he will not be able to finish his assignment by 5 p.m. Rather than measuring the length of each yard as carefully as he measured each width, he rushes his work. His measuring is not as accurate, and his writing is sloppy.



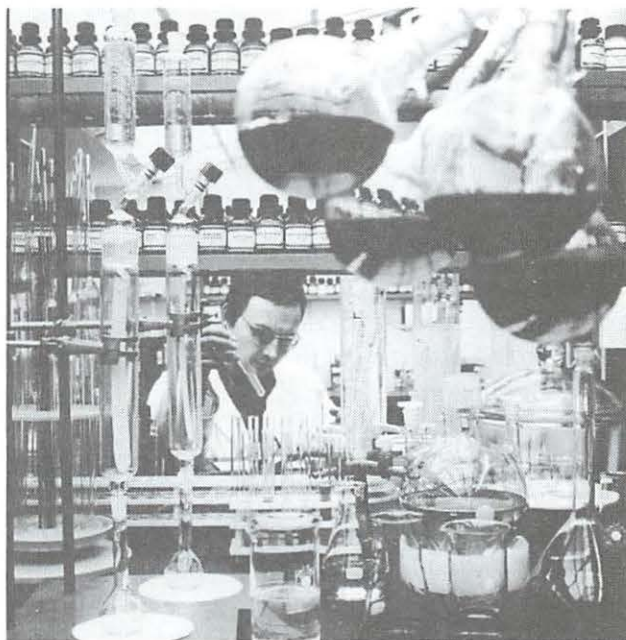
Ewing Galloway

When he returns to his office the next day, he starts mapping his figures onto paper and computes the area of each yard. How accurate are his results? Was it "good enough" to have taken just one of the two measurements carefully?

His desire to finish by 5 p.m. was greater than his desire to do all his work to the same degree of accuracy. As a result, the precision of his entire project is uncertain.

Chemists often measure temperature, volume, weight, and pressure in laboratory situations. These values are then used in mathematical formulas. If the

chemist has been very precise in all of his measurements and calculations, his answer will be precise. If he has been precise in all but one area, the result of his calculations will be imprecise.



H. Armstrong Roberts

For example, suppose a chemist measures the pressure (P), volume (V), and temperature (T) of an amount of gas and obtains the following values: $P = 2.560$ psi (pounds per square inch), $V = 8.8$ cc (cubic centimeters), and $T = 275.15^{\circ}\text{C}$. He then substitutes these values in a mathematical formula:

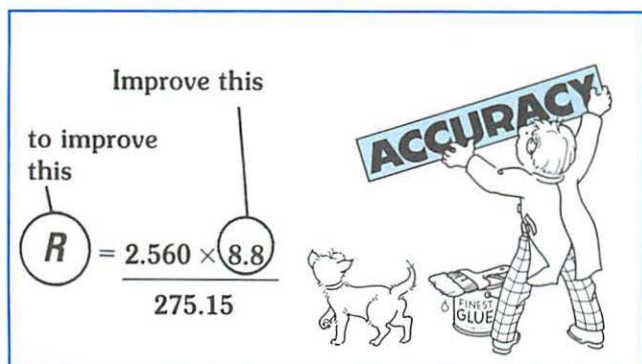
$$R = PV/T$$

$$R = (2.560) (8.8) / 275.15$$

The answer is 0.0818753. However, the accuracy of the result is limited because the value 8.8 has only two significant figures, causing the answer to be cut off and rounded off to two significant figures, 0.082.

What should the chemist do? First, he must recognize that his answer is not as accurate as the one he needs. Second, he must discern what is causing his lack of accuracy. This he can do through his understanding of significant figures.

Third, as soon as the chemist discerns what is limiting his accuracy, he can decide what can be done to improve it. In this case, he can improve the accuracy of the volume either by using his original measuring device more accurately or by using a different, more precise measuring device.

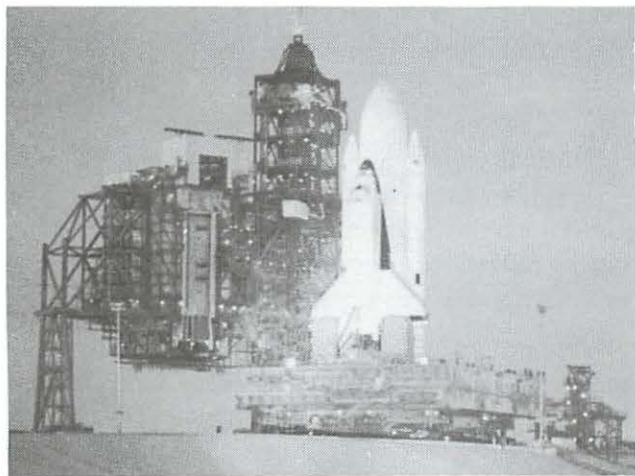


It would not be profitable for the chemist to improve the accuracy of his values for pressure and temperature, since the results would always be limited by the accuracy of the volume. All the values must be equally precise.

5 AN UNCERTAINTY MULTIPLIED BY AN UNCERTAINTY YIELDS A COMPOUNDED WEAKNESS.

At first, significant figures seem to take something easy and make it very hard. It is easy enough to take two numbers and add, subtract, multiply, or divide them, and get the right answer. Why is it necessary to check for significant figures, and then take what looks like a precise answer and make it seemingly less precise?

For most mathematics, significant figures are *not* necessary. When you measure ingredients for a recipe, you do not need to measure as accurately as a chemist or physicist does in a laboratory. When you use money, you are counting (rule #3 for significant figures), not working with a measurement. When you calculate the distance between two towns on a map, it is adequate to know approximately how many miles apart the two towns are.



Measurements involving the operation of a space shuttle require tremendous precision.

However, what if you had to figure out exactly how to combine the chemicals which make up the liquid fuel for a space shuttle? How “close” is “close enough”? If your calculations are in error, the shuttle either will not get off the ground or will blow up. How much error can you have?

When the man measured the field with a yardstick, the most accurate result he could get for the area of the field was 9,400 square yards. The use of significant figures told him that his measurement was not very accurate.

When the second man measured the field, the use of significant figures told him that his measurement was more precise than the other man’s measurement!

The use of significant figures in calculating the precise combination of chemicals for the fuel of the space shuttle tells you how “close” you are to being accurate.

Significant figures are critical for situations in which the margin of error is very, very small. If inaccuracy in one measurement results in an uncertain conclusion, consider what would happen if there were inaccuracy in more than one of the measurements. Significant figures point out which measurements should be cast out in order to produce more accurate results.

PROJECT

Relate a study of James 4 to our limitations before God and our responsibilities in dealing with them. How do these instructions exemplify Matthew 5:29–30?

“Submit yourselves therefore to God. Resist the devil, and he will flee from you. Draw nigh to God, and he will draw nigh to you. Cleanse your hands, ye sinners; and purify your hearts, ye double-minded.”

“Be afflicted, and mourn, and weep: let your laughter be turned to mourning, and your joy to heaviness. Humble yourselves in the sight of the Lord, and he shall lift you up.”

“Speak not evil one of another, brethren. He that speaketh evil of his brother, and judgeth his brother, speaketh evil of the law, and judgeth the law: but if thou judge the law, thou art not a doer of the law, but a judge. There is one lawgiver, who is able to save and to destroy: who art thou that judgest another?”

“... Therefore to him that knoweth to do good, and doeth it not, to him it is sin” (James 4:7–12, 17).

Date completed _____ Evaluation _____



WHAT ANIMALS SACRIFICE A FOOT OR A TAIL IN ORDER TO SAVE THEIR LIVES?



© Dick Randall

A bobcat caught in a trap will remain helpless until the trapper returns and kills it. Other animals free themselves at great personal cost by sacrificing a foot or a tail.

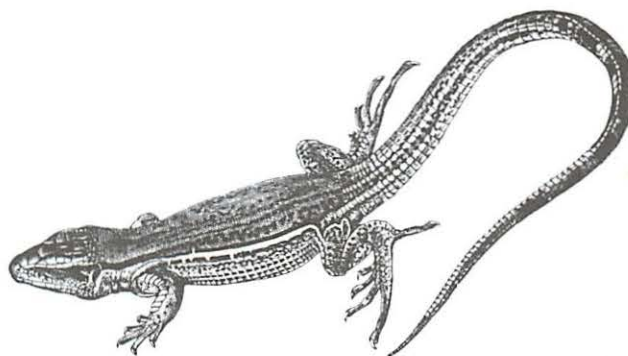
Wild animals depend on their freedom to find food, to hide from their enemies, and to flee from danger. For many animals the bondage of a trap is the worst thing that could ever happen to them. The loss of their freedom is even worse than the loss of a foot or a tail.

It is not uncommon to find wild animals with missing tails and feet. The ugly stubs serve as reminders of their sacrifice for freedom. They willingly endure the handicap of a missing member in order to enjoy the benefits of remaining free.

Other animals, however, are not as willing to pay the price of freedom. They favor a possession, a foot, or a tail more than their own lives, and they refuse to acknowledge the profit of sacrificing a bodily member in order to prevent their entire bodies from perishing.

1 A skink caught snoozing will sacrifice a tail for its freedom.

A skink is a small, lizard-like reptile which can be any of a variety of colors and stripes. It loves to bask in the sun during long, mid-afternoon siestas. This habit, however, makes it easy prey for prowling birds, snakes, and small mammals such as foxes and coyotes.

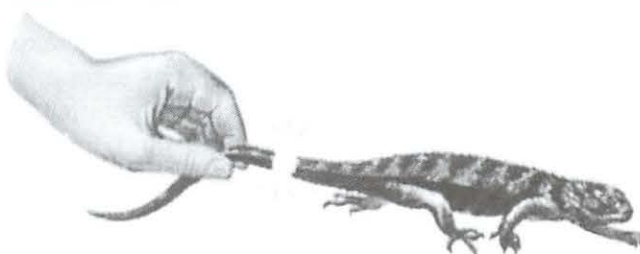


Dover

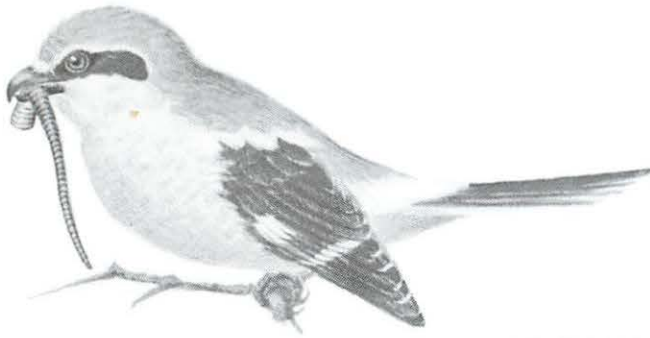
A five-lined skink

Although skinks are very fast, they are fairly easy to surprise during their "naps." Once startled, a skink scurries away at breakneck speed and does not stop to look back until it disappears into a brush pile or other hiding place.

If a predator fails to time its approach perfectly, it may only be able to grasp a skink by its long, skinny tail. Fortunately for the skink, the tail usually comes off in its enemy's grip, and the skink is able to keep running away.



From *Reptiles and Amphibians* illustrated by James Gordon Irving © 1953, 1956 Western Publishing Co., Inc. Used by permission.



All the World's Animals

This shrike was left holding the tail which a skink surrendered in exchange for its life.

Another lizard, called a “glass snake” or “joint lizard,” has no legs. It moves about from place to place by wriggling side to side like a snake. Unlike a snake, however, the glass lizard has a disposable tail which breaks off at the glass snake’s command. This tail protects the glass snake from its predators.



From Reptiles and Amphibians illustrated by James Gordon Irving ©1953,1956 Western Publishing Co., Inc. Used by permission.

The glass snake is a lizard without legs.

The glass snake’s wiggling tail distracts such predators as the king snake while the glass snake sneaks away. Within a few days after its escape, a new tail begins to grow. However, the new tail is somewhat shorter than the original, and after a number of narrow escapes, the tail may be only a stub.

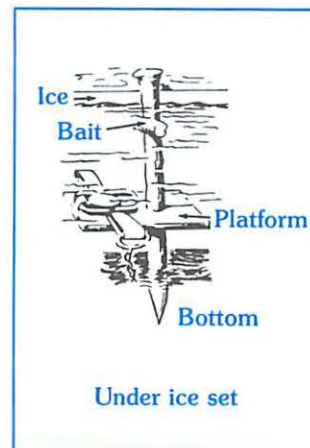
Some glass snakes may grow to be as long as three feet. After reaching adult size, however, they

shrink as first one tail and then another is broken off by hungry enemies.

2 A beaver will twist off its foot rather than remain in the bondage of a trap.



A beaver works from dusk until dawn.



©World Book, Inc.

A beaver trap

Trappers usually set drowning traps for beavers because they know that if they allow a beaver to struggle for very long, it will wring off its trapped foot and escape, if on land.

When trapped, beavers twist and spin in frantic circles. The twisting motion quickly winds the trap around and around until the chain which holds it cannot twist any more.

When the trap stops turning, the force of the beaver’s spinning momentum often snaps the bones of its ensnared foot. Once the bones are broken, the muscles and ligaments above the jaws of the trap wring off easily as the beaver continues to spin.

The beaver's front feet are smaller than its hind feet and wring off much more easily. Thus, trappers try to avoid front foot sets and seek only the more secure hind foot sets. Many traps are also attached to swivels so they are able to twist freely as the beaver twists.



Furbearing Animals of North America (Picture altered)

The beaver pictured above has a missing right front foot. All that remains is a callused stub, a reminder of the price which the beaver had to pay for its freedom from death in a trap.

A beaver that wrings off a front foot is handicapped for life. Even though the wound heals in a few weeks and a foot-like callus pad forms over the stub, the beaver will have difficulty grasping branches, walking, and swimming. Adjusting to the handicap, however, is far less of a problem than adjusting to the consequences which the trapper had in mind!

3 A raccoon will amputate its toes or paws rather than lose its freedom in a trap.



The curiosity of a raccoon makes it especially susceptible to traps. Bright, shiny objects lure the raccoon into them.



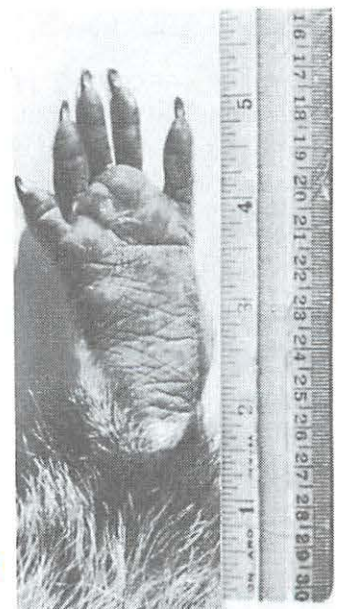
A raccoon feels its way into danger.

The pads of a raccoon's feet are covered with thousands of sensitive nerve endings which it uses to locate food. Raccoons constantly "feel" their way along riverbanks in search of crawfish and mussel shells. This hunting habit makes them particularly vulnerable to traps set along the water's edge.

As a raccoon searches for food with its front feet, it is apt to spring any hidden traps set in its way. Consequently, trappers often catch raccoons in traps set for other, much smaller animals. Many times the trap springs shut on only a toe or just the top of the raccoon's front paw.



Right forepaw of raccoon



The World of the Raccoon

Left hind paw of raccoon



Furbearing Animals of North America

Raccoons do their hunting at night and are very clever at using their eyes and paws to gain entrance to food sources. Their ingenuity often causes consternation to residents whose garbage cans have been raided.

More raccoons are trapped each year than any other fur-bearing animal. During the 1976-77 trapping season, for example, more than 3,832,802 raccoons were taken in traps. That is a greater number of raccoons than the number of people living in the entire state of Alabama.

On the other hand, more raccoons are lost from traps than any other animal. Because its fore-foot is tapered and small, the raccoon pulls itself free of many smaller traps.

The raccoon's lightning-fast reflexes are occasionally able to snatch back a foot before the jaws of a trap slam shut. This ability results in many "toe catches," in which only the tip of a paw or a toe is caught.

If a foot or toe will not pull free, raccoons are noted for chewing off the trapped member.

At first, this action sounds horrible, and it is. Chewing off a foot maims a raccoon for life. It must hobble about on a mere stub without the sense of touch it needs to find food.

The actual amputation, however, is not as painful to the raccoon as might be expected. After a foot or toe has been caught in a trap for several hours, the trap cuts off all circulation beyond its

powerful jaws. This numbs the foot, just as an arm or leg "goes to sleep" after being in an awkward position.

It is estimated that as many as one in four trapped raccoons escapes before a trapper makes his rounds. The loss of toes and feet teach permanent lessons which often prevent further injury. Raccoons become "trap wise" very quickly and rarely require more than one amputation to learn their lesson.



Furbearing Animals of North America (picture altered)

A young raccoon (second from bottom) bears the mark of an early mistake. Usually it takes only one such experience to make a raccoon "trap wise" for the rest of its life.

4 *A red squirrel will allow its tail to be damaged by using it as a shield against an attacker.*



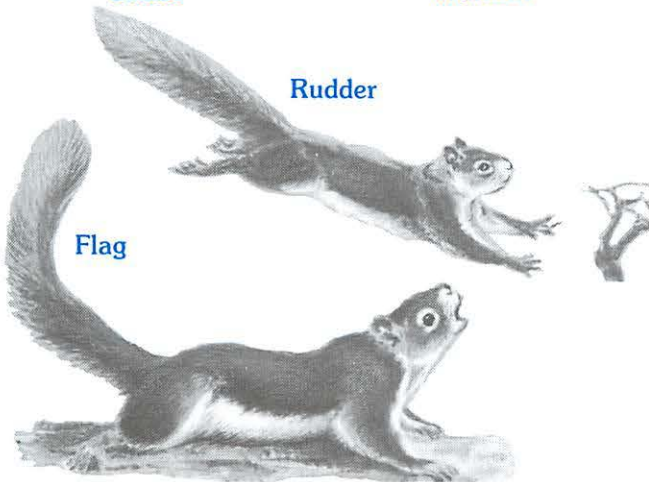
Red squirrels are guardians of the forest. Their activities, alarms, and signals make them vulnerable to predators.



Shade



Warmth



Rudder

Flag

A red squirrel's long, bushy tail is a versatile instrument. It can become an umbrella to shade its

body from both the hot sun and the cold rain. It is also a warning flag, a balance pole, a parachute, and a rudder. In the winter a squirrel curls up in its tail, using it like a warm blanket.

The greatest advantage of the red squirrel's bushy tail, however, may be its use as a life-saving shield against owls, hawks, and martens.

Since a squirrel's tail is almost as big as its body, a diving bird of prey often grabs the bushy tail instead of the squirrel. As the predator struggles, the tail strips off the bone as a popsicle slips off a popsicle stick.



Defense



A squirrel holds up its tail for protection against an approaching hawk.

Within a few days the bony stub dries out and dies. Squirrels are unable to regenerate their tails like skinks and glass snakes. Thus, they are left without an umbrella, flag, blanket, or rudder. Yet a tail is a small price to pay in order to avoid being a meal for a hungry hawk.

WHAT ANIMALS SAVE THEIR FEET WHEN TRAPPED AND, THUS, FORFEIT THEIR LIVES?

In contrast to those animals which willingly cut off an "offending" foot or tail to prevent their whole bodies from perishing, there are other animals which perish while clinging tenaciously to a possession, their foot, or their tail.

1 A bobcat may hiss, snarl, or struggle when trapped, but it never sacrifices a limb to be free.



A trapped bobcat becomes the victim of both paralyzing fear and the jaws of the trap.



Bobcat by Hope Ryden, G. P. Putnam's Sons. Used by permission.

A bobcat may struggle frantically when trapped, but it remains helpless to free itself.

A bobcat's greatest threat is not a trap but rather the freedom which a trap denies. Many bobcats die from shock within forty-eight hours of

being trapped. The terror of not being able to hide, to flee, or to defend themselves causes their blood pressure to drop to the point at which they literally die of fear.

When trapped, a bobcat struggles only against the trap, never against its ensnared leg or foot. A bobcat may attempt to pry open a trap with its free paw or may break its teeth biting at a trap, but it rarely pulls against a trap or shakes it because of the excruciating pain.

After several hours in a trap, a paw may be completely numb from the lack of circulation, yet a bobcat has never been known to free itself by cutting off the "offending" limb. Eventually, as its endurance wanes, a bobcat will die from shock. Unless a trapper checks his traps daily, he is likely to find his prize emaciated and dead, held tightly by a trap grasping only one toe.

2 A fox will avoid a trap with cunning and craftiness, but once caught, it rarely breaks free.



The cleverness of a fox seems to end when trapped.

Most people consider foxes to be crafty and wise. The stories of foxes ridding themselves of fleas, tripping set traps with sticks or rocks, and "outfoxing" packs of hounds are all true. Yet, once a trap springs shut on a fox's foot, the fox's wisdom seems to vanish.

Like other canines, such as coyotes and wolves, foxes become quite docile when caught in a trap, and their personalities change dramatically. Instead of “wisely” figuring out a way to escape, a fox will typically surrender to the jaws of the trap with almost no resistance.

While foxes have tremendous endurance, their tendency to “give up” makes them easy targets for a trapper’s final deadly shot.

3 *Most skunks refuse to use their defensive odor if it means contaminating their own tails.*



The raised tail of a skunk signals danger to any approaching predator.

A skunk has such an offensive spray that few animals ever bother to attack it. Yet, man has learned to take advantage of a skunk’s characteristic refusal to spray when it cannot raise its tail.

To trap a skunk without its spraying, trappers use a small, hollow tube large enough for the skunk to crawl into, but not large enough for it to turn

around or to raise its tail. Once a skunk enters and the trap door closes, a trapper can approach the trap without fear of being sprayed.

A skunk’s unwillingness to spray when it is confined makes it an easy catch for a trapper who knows its habits. In the end, a skunk may lose its life while protecting its tail from its own scent.



Only one of these skunks will spray an enemy.

4 *A pack rat will allow itself to be burned to death rather than leave its storehouse of treasures.*



A pack rat spends its life collecting things it will never use.

In times of drought a pack rat's nest becomes so dry it can ignite from the slightest flicker of fire. Even the concentrated sunlight from a broken piece of glass can set its nest ablaze.



Once the nest of a pack rat catches on fire, the rat has only a few moments to decide if it will save its life or remain with its treasures. It often chooses the treasures.

Pack rats rarely go out during the day. Instead, they prefer to spend most of the day inside their "air-conditioned" nests resting on the piles of treasures they have gathered from the wilds around their homes.

Because fires are most likely to break out during the day, they often start while a pack rat is at "home." When this happens, the pack rat must either abandon its burning treasures or be burned alive itself.

As often as not, a pack rat will choose to remain in its nest rather than forsake its treasury and set out to make a fresh beginning.

PROJECT

WHAT INSIGHTS DO THESE ANIMALS TEACH US ON DEALING WITH AN OFFENDING EYE OR HAND?

Each of the animals in this resource has at least one characteristic which has direct application to our own eyes and hands. Can you name each animal and find one verse for each characteristic?



Name: skink
Characteristic: It naps in the sun, thus exposing itself to predators.
Verse: Pro. 6:6-11



Name: beaver
Characteristic: It works with its hands to provide for its food.
Verse: Eph. 4:28



Name: raccoon
Characteristic: Its curiosity in searching out new things makes it vulnerable to traps.
Verse: Col. 2:8



Name: red squirrel
Characteristic: It warns of danger in season and out of season.
Verse: 2 Tim. 4:2



Name: bobcat
Characteristic: It becomes paralyzed with fear.
Verse: 2 Tim. 2:6-8



Name: fox
Characteristic: It gives up when it is trapped.
Verse: P. 50:15



Name: skunk
Characteristic: It may fail to use its only weapon to save its life.
Verse: Eph. 6:17



Name: pack rats
Characteristic: It heaps up treasures that others will gather.

Verse: 1 Th. 5:39-40 and Matt. 6:19-21

Date completed _____ Evaluation _____



HOW DOES GANGRENE ILLUSTRATE THE DANGER OF ONE MEMBER'S CAUSING THE WHOLE BODY TO DIE?



"A Very Gallant Gentleman" by J.C. Dallman, The Cavalry and Guards Club

Antarctic explorer Robert Scott (1868–1912) tried valiantly to reach the South Pole. Blizzards and bitter cold took their toll as he wrote in his diary, "All our feet are getting bad . . . my right foot worse, left all right . . . amputation is the best I can hope for now."

Gangrene necessitated the amputation to which Robert Scott referred. Many other Antarctic explorers also fell victim to this dread condition. They then had the awesome choice of amputating the infected member or losing their lives.

Gangrene's characteristics are very similar to those of rust. When these characteristics are allowed to develop, they will infect our members and eventually destroy our souls.

1 GANGRENE "GNAWS" AWAY AT HEALTHY TISSUE.

When a person exposes his body to the cold for too long a period of time, the water inside the cells of his hands and feet freezes. As this freezing

water expands, it rips apart cell walls, cutting off circulation and promoting the spread of gangrene.

The word *gangrene* comes from the Greek word *gangrania*, which means "an eating sore." *Gangrania* comes from another Greek root word, *grao*, meaning "to gnaw." Gangrene is a disease which literally "gnaws" away at healthy tissue until it consumes an entire limb or even a whole body.

Before the discovery of antibiotics and antiseptic surgery, a penetrating wound or a frozen limb meant certain death. As the injured tissue died, it gave off a foul-smelling gas along with toxins which killed nearby healthy tissue. Slowly but surely, the disease moved up an arm or a leg until the entire body perished.

Today only about 50 percent of the cases of gangrene follow a traumatic injury; 40 percent of the gangrene cases follow surgery, and the remaining 10 percent are a result of minor injuries, frostbite, or poor circulation. The most frequent operations resulting in gangrene are elective colon resection and gallbladder surgery. In most of these procedures the surgical site becomes infected with gangrenous germs which are already present in the patient's body. Doctors call this process *autoinoculation*.



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Surgery accounts for about 40 percent of all of today's cases of gangrene.

Gangrene may result from any condition which blocks the flow of blood to a part of the body. Without constant nourishment from fresh blood, a limb or extremity grows cold and quickly succumbs to the pressures of opportunistic germs which cause gangrene.

Opportunistic germs are bacteria which are normally present in the body and do not cause any problems. However, when a person's immune system is not as strong as it should be as a result of poor nutrition, surgery, or some other type of illness, these

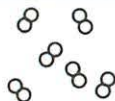









bacteria will begin to multiply and invade areas where they do not belong, causing problems such as gangrene.

Learn what causes gangrene, how it spreads from one part of the body to another, and how doctors prevent it from causing the whole body to perish.

2 GANGRENE IS CAUSED BY OPPORTUNISTIC GERMS WHICH ARE ALWAYS PRESENT IN THE BODY.

There are six basic types of gangrene. Each has its own medical name, associated symptoms, and bacterial causes. Some forms are peculiar to burns, diabetes, abdominal surgery in which wire sutures are used, or gunshot wounds. Other cases are the result of bacteria which are already present in the body. All cases, however, are the result of opportunistic germs which may be dormant for years until sudden changes promote their growth.

The primary bacteria which cause gangrene are all from the genus *Clostridium*: *Clostridium perfringens*, *Clostridium ramosum*, *Clostridium bifermentans*, *Clostridium histolyticum*, and *Clostridium novyi*. All belong to the same family of spindle-shaped bacteria. In fact, *Clostridium* comes from the Greek word *kloster*, meaning "a spindle."

"FAMILIES" OF BACTERIA	
 diplococci	 fusiform bacilli
 streptococci	 filamentous bacillary forms
 staphylococci	 vibrios
 bacilli	 spirilla
 coccobacilli	 sarcinae

After New Family Medical Guide

Other "families" of bacteria also have their own characteristic shapes. Medical technologists use microscopes and visual examination of colonies to identify bacteria taken from an infected site.

SPECIES OF *CLOSTRIDIUM* WHICH CAUSE GANGRENE

- *C. perfringens* causes appendicitis as well as gangrene. It is commonly found in soil, mild dust, and our own intestinal tracts.
- *C. ramosum* is commonly found in all of our body cavities including our mouths, intestines, and bladders.
- *C. bifermentans* makes meat putrid. Regardless of when you last cleaned your refrigerator, there is without question some *C. bifermentans* lurking in the meat drawer. The gas it produces causes the bad odor of rotten meat.
- *C. histolyticum* is often associated with war wounds, but surprisingly the bacteria can be eaten without harm. It is only when this bacteria enters muscle tissue that it produces harmful poisons which destroy healthy tissue.
- *C. novyi* has three distinct forms. Only one attacks humans; the other two attack only sheep and water buffalo. *C. novyi* is common in black dirt which is rich in decayed organic material.

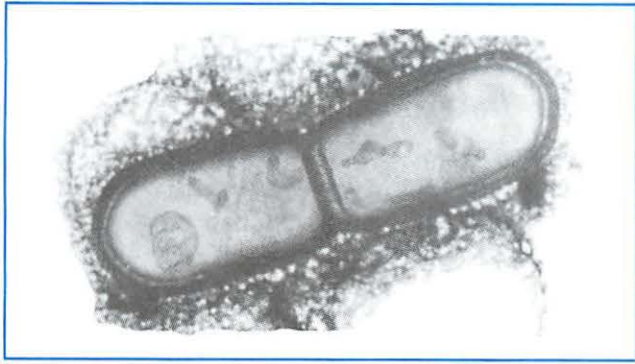
These bacteria do not usually occur alone. They are so common that just about any dirt, dust, or garbage abounds with them.

3 GANGRENE REQUIRES ONLY A SHORT INCUBATION PERIOD BEFORE IT BEGINS TO SPREAD.

The usual incubation period for gangrene is one to four days, but the range has been as short as three hours and as long as six weeks. During the incubation period there is virtually no indication that gangrene is present. A wound appears to be normal until the symptoms suddenly appear.

Bacteria reproduce rapidly by simply splitting in two. Biologists call this form of reproduction *binary fission*. When a bacterium divides, it copies its own genetic information so that each new half has a whole set. After the fission process, two complete bacteria exist where before there was only one. This means that the number of bacteria doubles with each generation.

Under favorable conditions, one generation may require only fifteen to twenty minutes to produce a new generation. At that rate, one bacterium may have as many as 8,421,376 offspring in just eight hours.



NASA

Binary fission of a single bacterium

When favorable conditions are not present, bacteria form *endospores*. An endospore is a skeleton copy of a bacterium's genetic information sealed in a tough protective coat. When a bacterium dies, the endospore inside it continues to live like a well-protected seed. It can survive just about everything, including drought, radiation, heat, and even disinfectants.



Biophoto Associates

Endospores are the light, round balls inside these *Clostridium* bacteria which have been magnified five hundred times.

When favorable conditions exist again, the spores develop into complete bacterial cells which multiply rapidly during gangrene's incubation period.

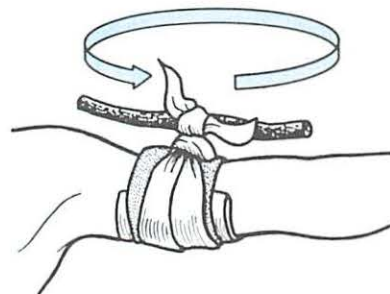
4 GANGRENE DEVELOPS WHEN CIRCULATION IS CUT OFF.

Poor circulation is the root cause of gangrene. Without oxygen-rich blood, healthy tissues fail to

receive proper nourishment. Toes, fingers, feet, and hands grow cold and numb. If as much as 70 percent of the flow is blocked, the tissues may die.

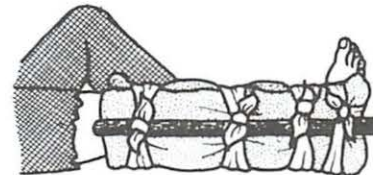
The lack of oxygen also promotes the growth of gangrenous bacteria. Most of these bacteria are *anaerobes*. Anaerobes grow best in an absence of oxygen. The word comes from three Greek parts: *an*, meaning "not," *aer*, meaning "air," and *bios*, meaning "life." Together the three parts, *an-aer-obs*, mean "life without air." Prompt restoration of circulation kills anaerobes as they come into contact with the oxygen in the blood.

Many things may cut off circulation to a member. These include injuries which sever major arteries, atherosclerosis, tourniquets, plaster casts which have been applied too tightly, and blood clots which have lodged in blood vessels.



Tourniquet

Splint for a broken ankle



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A tourniquet is a dangerous instrument. In cases of severe bleeding, direct pressure to the wound should always be attempted first, then indirect pressure. The longer a tourniquet cuts off the flow of blood to a limb, the greater the risk of gangrene; therefore, tourniquets should be used for only thirty to forty-five minutes, and then only if direct pressure and indirect pressure do not stop the bleeding.

Any bandage, splint, or cast which is applied too tightly may also cut off circulation and promote gangrene.

In some cases gangrene "sets in" because a localized area gets cut off from its blood supply. A fragment of metal or even a "tight" stitch may strangle a tiny section and allow opportunistic gangrenous bacteria to multiply so rapidly that they invade healthy tissue surrounding the infected pocket.

Gangrene spreads until it reaches a point at which there is sufficient blood circulation to kill its anaerobic bacteria. This interface forms a distinct line of demarcation between the healthy tissue and necrotic tissue. The word *necrotic* comes from the Greek word *nekrosis*, which means "death." The root *nekroo* means "to make dead."

How do doctors distinguish between "wet" and "dry" gangrene?

Dry gangrene is a condition which results only from the loss of circulation, and tissues die from the lack of blood rather than infection. Dry gangrene spreads only to the point where there is proper circulation; then it stops.

In many instances, a dry gangrenous area may simply fall off of its own accord. The remaining stub usually heals quickly as long as there is proper circulation. This process is called *self-amputation*.

Wet gangrene is a complication of bacterial infection. Wet gangrene is called "wet" because the bacteria kill thousands of white blood cells (leucocytes) and form the runny discharge called *pus*, making the sores look wet.

Wet gangrene is very dangerous because it spreads rapidly. The bacteria multiply at a fantastic rate and can overpower even the healthiest tissues.

Dry gangrene may become "wet" if it becomes infected before the isolated member amputates itself and the stub heals over.

Gangrene has gnawed this toe.



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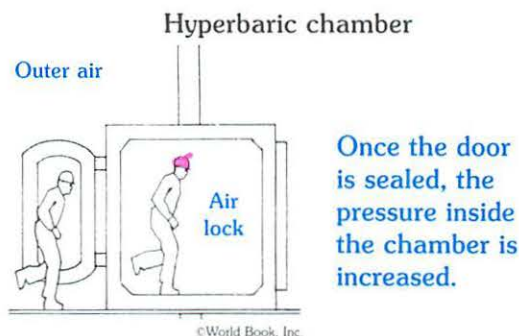
The lack of circulation caused by diabetes was responsible for the first signs of "dry" gangrene in the toe pictured above. However, it was not long before bacteria infected the dead cells and produced "wet" gangrene.

How do doctors attempt to combat gangrene with high-pressure oxygen treatments?

Since the root cause of gangrene is lack of oxygen, some doctors have proposed concentrated treatments of high-pressure oxygen, a process called *hyperbaric oxygenation*. *Hyperbaric* comes from two Greek roots: *hyper*, meaning "above" or "over," and *baros*, meaning "weight." *Hyperbaric* literally means "overweight." When related to gases, it means pressures which are greater than normal.

The treatment places a patient in a pressure chamber where oxygen is forced into the skin under pressure. This infusion oxygenates the affected area, kills the anaerobic bacteria, and helps to halt the spread of gangrene.

After a hyperbaric oxygenation treatment, there is usually a clear line of demarcation between infected and healthy tissue which helps doctors identify what parts should be amputated and what healthy parts may remain.



A hyperbaric pressure chamber is much like an air lock. Technicians must place the patient inside the chamber and seal the door airtight before increasing the pressure. When the treatment is over, the technicians must lower the pressure slowly before opening the door. If the pressure drops too quickly, nitrogen gas dissolved in the tissues will form bubbles in the blood—a very painful condition called "the bends." This condition also occurs when deep-sea divers come back to the surface too quickly.

Unfortunately, high-pressure oxygen has several harmful side effects and requires a long period of decompression.

5 GANGRENE THRIVES IN INJURIES WHICH ARE NOT PROPERLY CLEANSED.

Adequate surgical debridement and exposure of infected areas is essential in preventing gangrene.

The medical term *debridement* comes from the English word *debris*. Debridement refers to the removal of debris from a wound. Doctors cut away all dead tissue and remove any debris when they *debride* a wound.

Gangrene-causing bacteria are found in almost 70 percent of all wounds. Yet, the disease “sets in” in less than 1 percent of these injuries. Failure to cleanse a wound of bits of clothing, metal fragments, dirt, or dead tissue provides an environment where the bacteria can incubate and multiply. Once multiplication begins, toxins are concentrated enough to invade healthy tissue.

Proper *debridement* helps to prevent gangrene in two ways. First, it removes dead tissue, which is a source of food for gangrenous bacteria. Second, it removes dirt and soiled fragments which may carry living bacteria or their spores.

If there is a serious chance that a wound may develop gangrene, doctors leave it open. By not sewing a wound closed, oxygen from the air is able to kill much of the gangrenous bacteria.

6 GANGRENE EXHIBITS UNMISTAKABLE WARNING SIGNS.

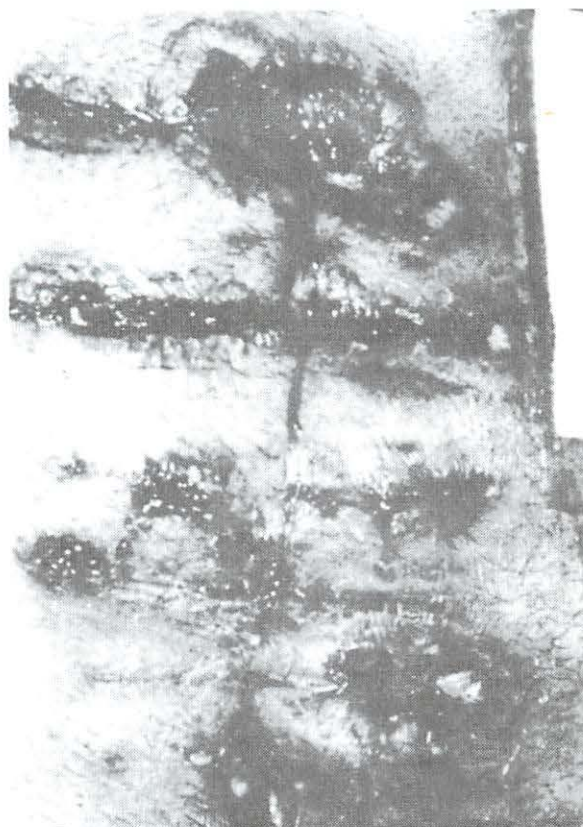
The symptoms of gangrene include sudden pain, a fall in blood pressure, a rise in temperature, and *tachycardia*. *Tachycardia* is a combination of two Greek words: *tachy* is Greek for “quick” or “rapid.” *Cardia* comes from the Greek word *kardia*, which means “heart.” *Tachycardia* simply means a “rapid heartbeat.”

In a matter of hours, an infected wound often begins to swell from fluid and gas which collect under the skin. The resulting pressure cuts off the flow of blood, turning the skin a pale white. As the disease spreads, the surrounding pale areas turn deep red, then almost black.

Swelling is followed by the discharge of a thin, brown, foul-smelling fluid. Mixed with the fluid are thousands of gas bubbles which produce crackling sounds as the tiny bubbles “pop” inside muscle tissue. Doctors refer to this as *crepitation*. *Crepitation* comes from the Latin word *crepitatio*, meaning literally “to crackle.”

The gas also has a characteristic offensive odor, much like rotten meat. In fact, the same

bacteria which cause meat to putrefy are often present in a gangrenous wound.



Principles of Practice of Infectious Diseases, © 1985, Williams & Wilkins Company, Baltimore

These symptoms of progressive gangrene show the wire sutures which doctors used to close the incision after abdominal surgery.

How do doctors diagnose gangrene with 100 percent accuracy?

Bacterial cultures are helpful in diagnosing gangrene. However, because the same bacteria which cause gangrene are present everywhere, it is very easy to contaminate a culture, and thus, indicate that gangrene is present when it is not.

The most reliable diagnosis of gangrene is by surgical incision. When a healthy muscle is exposed, it appears red and bleeds easily. Gangrenous muscles, however, are pale and swollen. They do not move when stimulated and do not bleed when cut. In advanced stages, infected tissue looks dark brown or even black.

With proper diagnosis and treatment, the mortality rates from gangrene have dropped considerably. At one time, this disease killed everyone it infected. However, by the later 1800s the figure had dropped to 25 percent. During World War I the rate was down to 10 percent, and

by World War II it was only 1 percent. At the end of the Vietnam War, the mortality rate from gangrene was less than 0.01 percent.

Doctors made this decrease possible by prompt and thorough debridement and careful preservation of the blood circulation in a wounded member. Those who gave first aid treatment avoided tourniquets which cut off circulation, and doctors applied casts which allowed proper circulation.

How did a young father lose his foot because he failed to recognize the symptoms of gangrene?



The story is told of a young father who broke his ankle in an automobile accident. Doctors set the broken bones and applied a protective cast. However, the cast was too tight and cut off circulation to the injured area.

Within a couple of days the foot began to smell, but the young father ignored the warning signal, thinking it was only the result of not washing his foot. After awhile, however, the smell became so strong that the whole house reeked.

Because the young father felt no pain, he dismissed the smell as simply a necessary part of being in a cast.

Suddenly on the third day, the young father felt a terrible pain in his leg, but dismissed this second warning sign as simply something which had to be endured. In fact, he felt too proud to admit that his leg hurt.

Eventually the young father wrapped his aching and foul-smelling foot in a plastic bag to

contain the stench and returned to his doctor. As the doctor removed the cast, he found that gangrene had completely consumed the young man's foot. In less than an hour surgeons removed the infected leg just below the knee in order to prevent the disease from spreading to the rest of the young father's body.

7 GANGRENE PRODUCES POISONOUS TOXINS WHICH DESTROY THE FLESH.

Gangrene-causing bacteria do not usually destroy cells directly. They merely consume the contents of cells which are already dead. However, they produce over twenty poisonous toxins, including seven which are deadly.

These poisons destroy cell membranes, prevent the blood flow through the capillaries, and destroy platelets which prevent excess bleeding.

The most potent poison produced by gangrenous bacteria is called *alpha toxin*. It causes both *hemolysis* and *myonecrosis*. *Hemo* refers to "blood," and *lysis* is a Greek word meaning "destruction." *Hemolysis*, then, means "the destruction of blood." Alpha toxin destroys red blood cells, thereby decreasing the amount of oxygen present. Without oxygen, living cells die quickly. To make matters worse, the lack of oxygen promotes the growth of the anaerobes as well.

Myonecrosis also has two Greek parts: *myo*, meaning "muscle," and *necrosis*, meaning "death." *Myonecrosis* refers to "dying muscle cells." Although bacteria do not kill healthy cells, bacterial toxins do. If left untreated, the poisonous toxins seep into healthy tissue and poison them. Bacteria then invade the destroyed cells and produce more toxin.

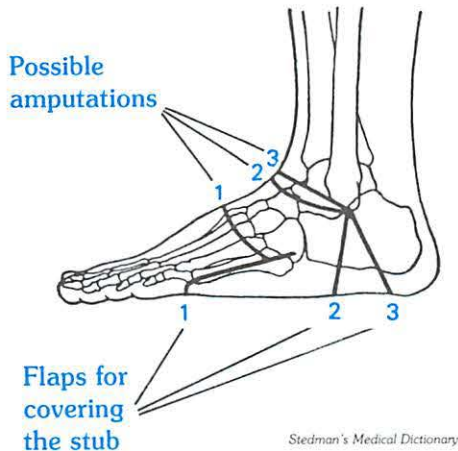
In many respects gangrene is like an invading army which bombards its enemy with heavy artillery before its main forces advance.

8 GANGRENE REQUIRES THE COMPLETE AMPUTATION OF AN INFECTED MEMBER BEFORE A WOUND CAN HEAL.

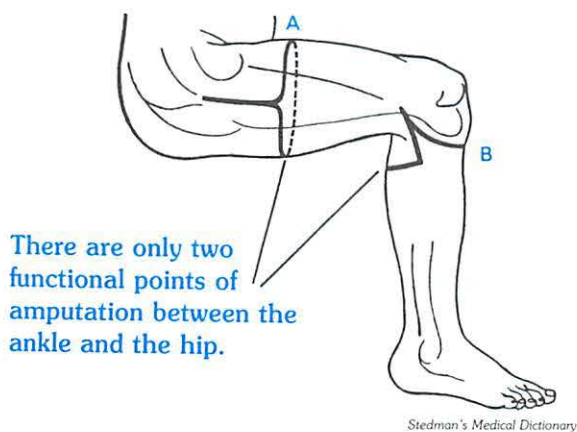
In many cases the only way to encourage healing is to remove a gangrenous member completely. If surgeons leave even a small portion of infected tissue, it may reinfect surrounding healthy tissue.

Doctors usually remove a gangrenous toe at its base even if only the tip is infected. By cutting away the healthy skin, they ensure that the amputation can be closed without trapping infected tissue.

If gangrene spreads beyond a toe, doctors may amputate the foot at one of three locations. On the diagram, the upper lines show the different points of the amputation. The lower lines mark the flaps which surgeons use to cover the stub.



Where a foot suffers from gangrene, it is usually amputated just below the knee, not at the ankle. Doctors remove most of the lower leg even if it is healthy, because the knee makes a much more useful point to attach a *prosthesis* than does the ankle.



The word *prosthesis* has two Greek parts. *Proso* is a prefix meaning "forward"; *thesis* means "a position" or "a placing." A prosthesis is "a placing forward" or "a forward position." When used in connection with artificial limbs, it is something which is "placed forward" of an amputation.



A modern prosthesis is much more than a "wooden leg." It allows its wearer to walk and run without a limp, but it can never duplicate the movement of an original limb.

If gangrene is so widespread that the surgeon cannot remove all the infected tissue without seriously injuring the patient, he may not stitch up the amputated end. The open area allows the wound to be cleansed frequently, permits pus to drain out of the wound rather than being trapped inside, and exposes the anaerobic bacteria to oxygen. These measures prevent the spread of gangrene, but require a much longer healing time than if the wound were sutured.

While penicillin is useful in fighting the spread of gangrene, it does nothing to reclaim tissue which gangrene has already destroyed. Amputation of the infected area is always necessary.

PROJECT

How does gangrene illustrate the development and destruction of lust?

Diseases of the body usually have their counterpart in diseases of the soul. There is, in fact, an intimate relationship between the health of the soul and the health of the body.

By understanding the workings of a disease in one realm we can often gain significant insight to a corresponding disease in the other realm.

Review this resource to discover as many transferable relationships as you can between gangrene and lust.

1 Gangrene (lust) gnaws away at healthy tissue (a Godly soul).

- ☐ How does lust destroy the soul as gangrene destroys the body?

"Flee fornication. Every sin that a man doeth is without the body; but he that committeth fornication sinneth against his own body" (I Corinthians 6:18).

2 Gangrene (lust) is caused by opportunistic germs (the laws of sin) which are always present in the body.

- ☐ What are the similarities between the laws of sin and opportunistic germs?

"But I see another law in my members, warring against the law of my mind, and bringing me into captivity to the law of sin which is in my members" (Romans 7:23).

Compare to Romans 8:1-3.

3 Gangrene (lust) requires only a short incubation period (imagination) before it spreads.

- ☐ How does lust spread from the eye or the hand to the mind and then to the heart?

"Then when lust hath conceived, it bringeth forth sin: and sin, when it is finished, bringeth forth death" (James 1:15).

4 Gangrene (lust) develops when circulation (spiritual nourishment) is cut off.

- ☐ What are the means of spiritual nourishment God has designed for the Christian?

"But strong meat belongeth to them that are of full age, even those who by reason of use have their senses exercised to discern both good and evil" (Hebrews 5:14).

5 Gangrene (lust) thrives on injuries (evil thoughts).

- ☐ How must we deal with lustful thoughts?

"(For the weapons of our warfare are not carnal, but mighty through God to the pulling down of strong holds;) Casting down imaginations, and every high thing that exalteth itself against the knowledge of God, and bringing into captivity every thought to the obedience of Christ" (II Corinthians 10:4-5).

6 Gangrene (lust) exhibits unmistakable warning signs.

- ☐ How does lust reveal itself?

"For he that soweth to his flesh shall of the flesh

reap corruption; but he that soweth to the Spirit shall of the Spirit reap life everlasting" (Galatians 6:8).

7 Gangrene (lust) produces poisonous toxins (sensual actions).

- ☐ What works of the flesh does lust produce?

"Now the works of the flesh are manifest, which are these; Adultery, fornication, uncleanness, lasciviousness" (Galatians 5:19).

8 Gangrene (lust) requires complete amputation (separation) of an infected member (source of evil) before a wound can heal.

- ☐ What actions must we take once lust is established?

"But put ye on the Lord Jesus Christ, and make not provision for the flesh, to fulfil the lusts thereof" (Romans 13:14).

Based on these analogies, how can putting on the whole armor of God and praying protect us from the destruction of lust? (See Ephesians 6:10-18.)



Norwegian Information Service

Roald Amundson (1872-1928), considered the most outstanding polar explorer of his time, was the first to reach the South Pole. He overcame the problems of survival in bitter cold by applying lessons of dress which he had learned from the Arctic Eskimos.

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