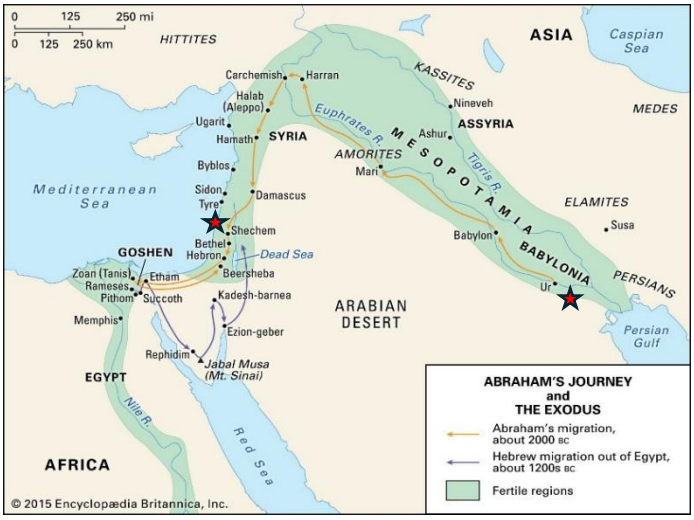
GO THE DISTANCE

INTRODUCTION:

Hebrews 11:8 [8] *By faith Abraham, when called to go to a place he would later receive as his inheritance, obeyed and went, even though he did not know where he was going.*

What if…
You had to leave your home and trek on foot over 1000 miles to a region filled with relatives of Nimrod, Ham's descendants (through his grandson Canaan), to live among a pagan culture. What would your strategy be?



Less than 500 years after Babel, Abram was called to leave his home in Ur and go to Canaan. God changed his name to Abraham which means exalted father of many nations. Abram was not seeking to make a name for himself, like Nimrod, but his name would become great. The difference between Nimrod and Abram was faith. One trusted in his own thinking and capabilities (like most scientists); the other trusted in God and obeyed Him (standing firm in his faith).

Abram and Sarai traveled far from their original home in Ur, first to Harran with his family, then to the region of Shechem (see the map). Travel was difficult, but they followed the rivers whenever possible – a smart survival plan. Cities were days apart. These early cities, including Ur, have been identified from ruins in Mesopotamia, in Israel, in Egypt/Goshen, and Babylonia/Sumer. When Abram encountered famine in the land of promise, Canaan, he journeyed further into the land of Egypt – not part of God's plan – and found trouble.

DEVOTIONS: GENESIS 12:1-9

GENESIS 12:6-7 *Abram traveled through the land as far as the site of the great tree of Moreh at Shechem. At that time the Canaanites were in the land. And the Lord appeared unto Abram, and said, Unto thy seed will I give this land: and there he built an altar unto the Lord, who appeared unto him.*

The Moreh (meaning teacher) Trees at Shechem were north of where Jerusalem is today, in the region of Hebron in the West Bank. When Abram stopped there, God promised him, 'I will give this land to your offspring." (Genesis 12:7 ESV) God's intent for Abram and his descendants was to know and trust the Him, to teach others about Him, and for the

Hebrew people to be a blessing to all other nations. The "teacher" tree symbolizes the role the Hebrews would have as the keepers of the faith and as blessings to all nations.

GENESIS 12:2-3 *I will make you into a great nation, and I will bless you; I will make your name great, and you will be a blessing. I will bless those who bless you, and whoever curses you I will curse; and all peoples on earth will be blessed through you*.

Israel, the promised land, was at the crossroads of all the ancient civilizations. Its location was strategic to God. Here, the Israelites could interact with travelers from every direction as they journeyed for trade and commerce. Remember, God's plans for our world will come to fruition, even when famine, wars, or terrorists try to overturn His plans. Any nation that stands against Israel is also taking a stand against God's ultimate plans for His people.

From Father Abraham to Jesus, God used the Israelites to build a heritage based on the Bible, God's Word, and God's promises of redemption. We call that heritage the Judeo-Christian foundation of our faith. Abraham "went the distance," overshot it, and returned. He kept the faith by trusting God to the point of not sparing his son, Isaac, when God asked him to go ***all in***. We're called to "run the race with perseverance" and to "fix our eyes on Jesus," rather than "doing our own thing." It's rarely easy, but it is profitable in every way.

HEBREWS 12:1-2 *Therefore, since we are surrounded by such a great cloud of witnesses, let us throw off everything that hinders and the sin that so easily entangles. And let us run with perseverance the race marked out for us, [2] fixing our eyes on Jesus, the pioneer and perfecter of faith. For the joy set before him he endured the cross, scorning its shame, and sat down at the right hand of the throne of God*.

DEFINE:

ENERGY – the capacity or ability to do work. Energy resources allow potential or kinetic **WORK** to be done. A joule equals ~1/4th or .24 calories; 4.184 Joules = 1 calorie. A Joule (1 kgm^2/s^2) the capacity of 1 **Newton** (force) **for 1 meter distance** (**Nm)**.

CALORIE: The quantity of energy needed to raise the temperature of 1 cc or mL of water 1 degree Celsius = one calorie.

WORK – Work = Force (F) x (d) Distance (kinetic displacement)
W = Fd given as kgm^2/s^2 or joules (J), Newton meters (Nm). Just remember, F = ma, so mass in kg and acceleration in m/s^2 x distance (m) covered (kgm^2/s^2).

RODS: SPINDLES (rods or pins)**, SHAFTS** (a rotating axis), **AXLES** (can be rods or shafts)
FIXED rods or axles are attached to a frame with free spinning wheels; **FREE** shafts or axles rotate with the wheels, sometimes inside a sleeve or bearing. (Shafts are rotating rods.)

AWD – all wheel drive means the axles (free) are rotating with the wheel
2WD – one axle is free (engaged and turning) and one axle is fixed (not rotating)
Locking Hubs – 2WD until the hubs are locked to the axle becoming 4WD

FIXED WHEELS – wheels are fixed to a shaft so both rotate; **FREE WHEELS** spin on a stationary rod/pin. Gears are often free; whereas, waterwheels and windmills need to be fixed to their rods/shafts to do work.

RPM – Revolutions per minute, **rev/min**, and **rps** is revolutions per second, a frequency or rate not a speed.

BELT DRIVE – transmits rotational motion by belts/bands connected to wheels/pulleys, shafts, or gears.

MAIN TYPES OF ENERGY:

KINETIC – energy in motion, a form of energy possessed by an object due to its motion. Examples: windmills/waterwheels are forms of energy dependent on motion.

POTENTIAL – stored energy with the capacity to do work due to its position, properties, or forces acting upon it. Think of potential energy like food or calories to "run" your body. If you stopped eating, eventually your energy or your ability to work would be "0" and, subsequently, death. Gasoline for your car is another example of "potential" energy whereas a car in motion is an example of "kinetic" energy in use. Another form of energy is radiant energy or thermal energy which exhibit both kinetic and potential energy properties.

SUB-CATAGORIES OF KINETIC ENERGY: Radiant and thermal energy are molecular or atomic-level energy, commonly invisible forms of energy in motion measured by an increase in temperature.

THEME: GO THE DISTANCE

1 Corinthians 9:24 *24 Do you not know that in a race all the runners run, but only one receives the prize? So run that you may obtain it.*

Running is WORK! It uses calories (potential energy) converted to kinetic energy to move a mass (our bodies) over a distance, W = Fd. Water running into and through a waterwheel, or air flowing through a windmill, is mass moving the distance needed to do the work. Waterwheels, windmills, and turbines create rotational motion delivering a number of revolutions per minute (RPM) that can also do work. Gravity has potential energy to do work (such as water at a higher elevation falling into waterwheels or turbines) because it naturally causes mass to accelerate downward. This gravitational potential energy is often converted to rotational motion to grind grain or to generate electricity.

Any invention that takes the burden of hard work off "us" and puts it onto a mechanical device is considered progress. Since water is heavy and difficult to transport, early cities

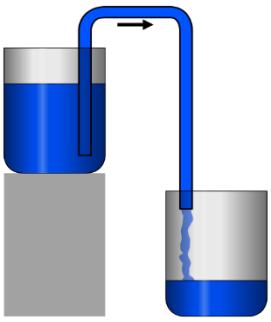
were commonly located near water sources making it easier to harness rivers and streams for mechanical energy. Later, wells, aqueducts, or canals made it possible to inhabit regions further away from water sources. A clay tablet dating back to 2300 BC from Mesopotamia depicts a **well with a pulley system** used for irrigation purposes. This finding provides concrete evidence of the early use of pulleys/wheels in this region.

TIMELINE/Introduction (History): After the Flood

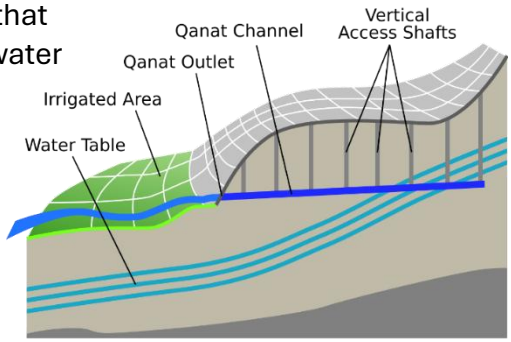
2000-1000 BC Egyptian Siphons, Sundial, (Gravity) Waterwheels BC Water towers (Tower of Babel/Pyramids and Ziggurats to Abraham)

Near the end of the Bronze Age, people recognized the power of gravity, water, and wind to do work. It was apparent that water flows downward, but they also observed that it could flow upward under pressure. Pressure systems in siphons, qanats, and aqueducts ushered in an new era of settlements at greater distance from rivers. Later, wheels were utilized to elevate water or to rotate shafts. Even though they couldn't mathematically describe it, this captured energy enabled them to invent new uses for these simple tools.

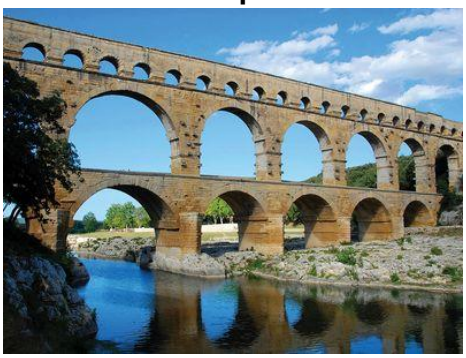
EARLY INVENTIONS:



Aqueducts – water channels/canals above ground
Qanat – pipes underground connecting with gravity-driven water
Siphons – a tube used to bring fluids upward, by removing constraints (priming or removing air), draining downward to a lower level
Waterwheels – a water device that taps into the energy of moving water by means of paddles or temporary containers.



Roman Aqueducts



Persian Qanats

Around 2000 BC, God sent Abram out to a distant land. This land, also known as the promised land, would be the home of the Hebrew nation – the actual first nation in history (based on tribes and regions working together). Western civilization owes its foundations, laws, and understanding of right and wrong to the Hebrew nation called out by God to be a BLESSING to the world.

GENESIS 12:2-3 *I will make you into a great nation, and I will bless you; I will make your name great, and you will be a blessing. I will bless those who bless you, and whoever curses you I will curse; and all peoples on earth will be blessed through you.*

In Genesis 1:28, God commands humanity to "fill the earth and subdue it," to be good stewards of His creation, and to "GO" to be a blessing to others. This mandate encourages us to use our ingenuity, and energy resources like wind, water, oil, light, and magnetism that were created by God, to master our environment. With this understanding, civilizations have advanced and become better able to survive and thrive.

EQUIPPED/Science Principle:

Harnessing resources takes ingenuity.

For example, this image contains: a) an oxen team turning a long shaft; b) rotating a connecting rod attached to a wheel, c) dipping containers in and out of a stream to lift water; d) dumping the water into an aqueduct or irrigation canal. **WORK DONE!** From this elevated position, the water will flow downward to reach its destination. Because the wheel lifts the water, the water has gained gravitational potential energy. This water can do work.

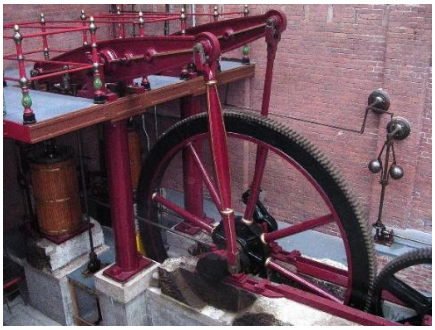
WORK – the transfer of energy to or from an object via application of force,

Work = Force (F) x (d) Distance (aka s → for displacement). W = Fd

Work is force applied over a distance implying motion. If you think about it, a world with no motion is like a still image photograph. That would be a very boring existence. Thankfully, this is not the world in which God placed us to live. Motion is key.

The force of accelerated water provides the energy to do the work needed to pump water uphill, to grind grain, or to generate electricity. In most instances, water gains its ability to do work by moving from a higher position to a lower position. Streams and river naturally flow from higher to lower elevations; therefore, they are an amazing natural resource. Gravity is the natural force acting on and with water at higher elevations to supply potential energy (such as a dam holding back a reservoir/lake). Once the water is put in motion (kinetic energy) by gravity, it becomes a force of accelerated water capable of doing the work needed to pump water uphill, to grind grain, or to generate electricity. A waterwheel takes advantage of a flowing river in order to turn the rod or shaft.

GEAR-UP/Practical Illustration:



Energy and work are measured with the same units. However, the amount of energy needed to do the work is generally greater than the amount of work done. We call that difference the efficiency of the system. Energy is often lost due to friction, resistance, transfer, or waste.

The Work-energy theorem states that the net work done on an object is equal to the change in its kinetic energy. Thus, **ENERGY** is required to do the work, whereas work indicates the actual movement/displacement done. Energy and work are both measured in Joules or Nm (Newton meters). 1 Joule (J) is equal to 1 Newton (force) displaced 1 meter. 1 J = .7376 ft-lbs; a joule is equal to about 1/4th or .24 calories which is also a measure of energy. Or, 4.184 Joules = 1 calorie.

EXPERIMENT: Kinetic and Potential Energy conversion to Work

Naturally moving water is the result of elevation change or pressure differences. This experiment demonstrates water's ability to do work (by transferring gravitational potential energy to water). Calories are the original source of energy to "lift" the water/slough.

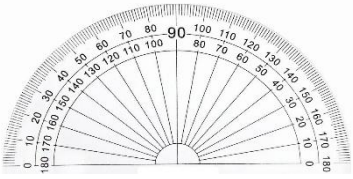
SUPPLIES: water, measuring cup, wrapping paper tube, cellophane (tape if desired), bottle cap, towel, and oyster crackers.

Determine the distance 10 to 50 mL of flowing water can move an oyster cracker. Start with 10, then continue adding more water as needed to travel the full distance.

STEP ONE: Create a trough (using a cardboard tube from wrapping paper). Cut in half lengthwise.
STEP TWO: Mark a start position for an oyster cracker a 5 centimeters in from the start. Mark out 1 decimeter increments from start to the end of the tube.
STEP THREE: Line the tube with cellophane. Place the tube on a towel with a bottle cap to elevate it. (Measure angle if possible.)
STEP FOUR: Set the oyster cracker on the start position.
STEP FIVE: Pour the water into the tube in the first 5 centimeters location.
STEP SIX: Measure the distance between the start and the finishing location.

Potential Energy (Gravitational) due to Elevating Water equals greater WORK. Try this experiment at different angles to see **ACCELERATION DUE TO GRAVITY.**

With a vertical or 90 degree drop, force and potential energy/work can easily be measured. Work would be equal to the Force x Height (aka distance).



Problem #1: If 100 kilograms of water is released under the acceleration due to gravity (9.8 m/s^2 or use 10 m/s^2) its force after 1 sec would be:

Force = ma		**Force = ma**
F = 100 kg x 9.8 m/s^2	or	100 kg x 10 m/s^2
F = 980 kgm/s^2 aka 980 Newtons	or	F = 1000 kgm/s^2 aka 1000 Newtons
ANSWER: 9.8 x 10^2 N	or	F = 1000 N aka 10^3 N

Problem #2: If we round the answer above to 1000 kgm/s^2 and calculate a 1 meter drop for the falling water's potential to do work, we have:

Work = Fd
F = 1000 kgm/s^2 x 1 m
F = 1000 kgm^2/s^2 or 1000 Newton meters
ANSWER: 10^3 Nm

Harnessing the power of flowing water to do work was a natural step into automation for cultures that understood energy resources, such as gravity and water. Waterwheels converted the energy into a rotational force to do grinding or thrashing work.

GOT-IT/Apologetics:

1 Timothy 4:7 *I have fought the good fight, I have finished the race, I have kept the faith*.

As a student of both faith and science, it's essential to expose modern science's faulty foundations. Three major battle points with science: 1) A bias against Supernatural causes (God); 2) A foundational belief that simplicity evolved into complexity or diversity; 3) A "name it and claim it" paradigm. That is, if science can "name," define or describe "it," science owns it, not God. Rather than crediting God for the complexity of nature, forces, or phenomenon, and for our ingenuity, language, mental capacity, reasoning, and creativity, science advocates solely for human reasoning and its ownership of its discoveries, as if their discovery equals ownership. Science (*scientia*) simply means knowledge or a quest for knowledge. Knowledge apart from God is foolishness; therefore, science without God can become foolishness. Science belongs to people of faith as well as non-believers.

Believers know that substances and energy sources were created in the beginning by God for us. Science agrees that the amount of matter and energy in our world today is equal to the amount of matter and energy in the universe from the very beginning. It's known as the Law of Conservation of Matter and Energy. However, due to bias against supernatural causes, scientists promote purely human-reasoned theories (which are completely untestable) such as another universe or many universes. God put matter and energy into our universe in the beginning, for us to use, to leverage, and subdue for our benefit and for His plans to prosper us and make us into a great nation of believers.

REFLECTION/Devotion:

John 14:6 *Jesus answered, "I am the way and the truth and the life. No one comes to the Father except through me.*

Abraham's trust, like Noah's, made all the difference. Israel, against all odds, is in its homeland today. Western civilization rests on the foundation of the Bible, both the Old and New Testaments. Judeo-Christian values continue to lead the world because of the truth God revealed in His Word, delivered first to the Jews then to Christian believers. Those who saw "TRUTH," manifested in Christ, established our nation and our modern laws.

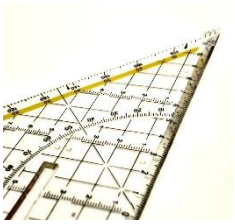
Our lives should mirror the heroes of faith who trusted what God said and obeyed. His Word is foundational to all we understand, believe, or know. His truth is what will save us, what will lead us on the right path, and what our future holds. We may not know what our future holds, but we know who holds the future.

John 8:32 *Then you will know the truth, and the truth will set you free.*

REMEMBER THESE THINGS/Devotion:

"Wheels make the world go round" is a saying that means: there is **something** so important and essential that even ordinary things wouldn't happen without it. Think of all the ways our lives would be different without wheels. Then, consider how important brakes or anchors are! A runaway train, an unanchored ship, or a spinning wheel that breaks free. "Jesus take the wheel," is a song that calls for God to take both our anchor and our forward motion in His hands. There's no better place for Him to be than "at the wheel" of our own life.

John 16:13a *But when he, the Spirit of truth, comes, he will guide you into all the truth.*



Going the distance requires energy, perseverance, running as if to win, staying on course, and trusting the plan God lays out for you. Abraham had to travel to a distant land to be at the crossroads of the world, to be a blessing to all nations. He had no idea "how" he would accomplish God's plan, he only knew he should trust and "GO."

Jeremiah 29:11 *For I know the plans I have for you," declares the Lord, "plans to prosper you and not to harm you, plans to give you hope and a future.*