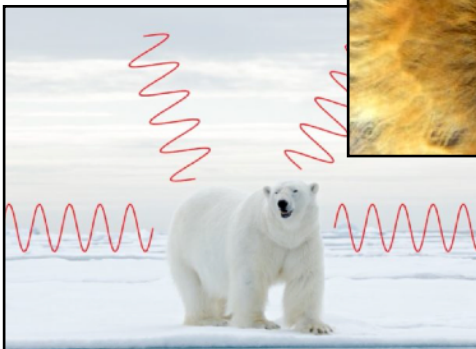
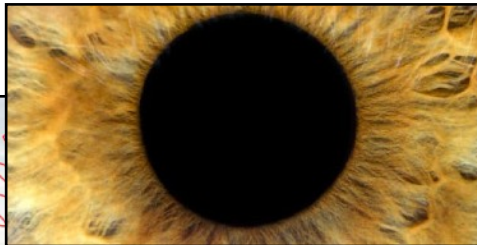


# CrossWired Science



## CWS CORE 2 Student Notebook Semester 1



***An incredible journey into the Life , Physical and Earth Sciences that powerfully shows the beauty, power, intelligence and the love of the God who created all things.***

# Quick Start Info

## CrossWired Science Core 2

### Welcome to CrossWired Science Core Year 2!

We are happy to take you on a thrilling journey to learn about God's handiwork as we study Life, Earth and Physical Science together. Our prayer is that you will come to know the power, love intelligence and beauty of the Lord more than you ever thought possible through the things you learn in this course!

#### PLEASE READ THIS BEFORE BEGINNING.

- 1. Be sure to be logged in when you are using the downloadable Student Notebook Printable Modules.** The printable Student Modules will schedule and navigate every lesson of the year. (The online calendars are for those using CWS as a supplement). These printable Student Modules are the **ONLY** way to effectively access the online lessons and videos. **All blue print is hyperlinked.**
- 2. There are 24 Student Notebook Modules for Year 2.** They may be printed module by module.
  - **CrossWired Science Core Year 2a 12 MODULES Global Topics Eyes/Insulation**
  - **CrossWired Science Core Year 2b 12 MODULES Global Topics Heat & Cold/Bioluminescence**
- 3. Integrating CrossWired Science Core and our High School Program, BCP,** There are 24 "Student Notebook Modules each year for both **Biology/Chemistry/Physics** (High School) & **CrossWired Science Core** (K-9th Grade).
  - **Modules in BCP 201 & 202 correspond to the Module Lessons in the CWS Year 2 Core Curriculum**
  - Some lessons each week overlap for all students, Kindergarten through High School, including: Experiments/Video Links/Core Videos/Specific Videos/Gold Digs/Memory Verses/Devotions/Concept Drawings/ and Scientists (K-8th grade). Each age has its own level of work in each of these content areas..
- 4. There are references to First Year Students and Second Year Students in many Modules.** These refer to existing students and students entering into a group studying CWS materials. If you were a member of a CWS group last year and a friend wants to join it this year, you would be the second year student and he would be the first year student. Your assignments are sometimes slightly different because he does not have the same background you have. We did this so new students can join an existing group.
- 5. You do not need to print the Student Modules.** You can save money and use them electronically and simply use a regular notebook to record your student's work. You can also use an editing tool to type in these electronically. If you print them, we highly recommend the **EPSON ECOTANK COLOR PRINTER 3760 SE** (Costco/Sam's club). Printing costs to print the first 12 modules for CWS in color is about \$5 TOTAL. This printer is a homeschooler's dream come true. The ink lasts forever and refills are VERY inexpensive.
- 6. CWS is organized by Global Topics.** These bring out God's wonders in different subject areas. If you are a student using CWS for a Full Year's curriculum, you will use the **Student Modules** to access ALL lesson components you can download them from any Global Topic. Each Global Topic also has a lesson page that can be used as a supplement any curriculum. The Lesson page for the Global Topic "Fluid Dynamics" looks like this: [LESSON PAGE](#). To access this, go to "My Curriculum" in the top menu. Click **CWS: Core 1** or **CWS: Core 2**. Choose one of the Global Topics. You will see the "Lesson Page". The **BCP Modules** access these lessons and many more. The Student Module provides step-by-step instructions with the blue, hyperlinked text designed to access the lesson content directly.

# Quick Start Info (cont.)

**7. Hyperlinked General Links and Unit Links.** “General Links 1”, “General Links 2” and “Unit Links” are not accessible by clicking (hyperlinked), unless you are in the Parent or Admin Account. (If parents are logged on in their user, you can see General Links and Unit Links when you click on the Parent Tab in the top menu. These General and Unit Links are immediately accessed when an image is clicked. **To get to the links in the student user**, you must copy and paste the Link in the URL bar at the top of every link. We realize this is inconvenient. We do this to add a tiny amount of internet protection.

**8. Interestables and Clipped Sentences.** We will often ask students to find “Interestables”. These are interesting—even fascinating— facts and concepts. We want Note Taking about them to be as easy and pleasant as possible. We encourage using “Clipped Sentences” for note taking, which are shortened notes like those taken in a college class. An example of a clipped sentence for, “The iris is the colored part of the eye. It grows and shrinks to let different amounts of light into your eye.” Clipped: “Iris colored. Grows shrinks. Adjusts light.”

**9. Review is an essential component to a CrossWired approach.** Review is VERY important for detailed long-term memory! *You will see materials brought back to your students at regular intervals.* **The material in Core Videos and some in Gold Digs and Digging Deeper will need to be mastered over the course of six or more years in CWS Core and Biology/Chemistry/Physics.** When you watch a Core Video of each Global Topic the first time, 3-5 notes are taken on it or an easy First Timer Quiz is taken. The third time there is a little more difficult Mastery Quiz. BUT, even after these 3 sessions with every Core Video you are not done with the material.

There is a very novel Mastery System we will be introducing. It will take all the material of all the Core Videos/Gold Digs and Digging Deeper and assess by Computerized Super-Reviews what a child knows and doesn't know. The students will be helped to get 100% in every Review by in-built video-based animated sessions. The more the student masters the material in their three interactions with the material before the Super-Review, the more enjoyable “Super-Mastery” will be. Super Mastery is mastering ALL CWS Core material.

**10. Go at your OWN pace!** We encourage you to choose what sections fit your students' needs and spread out the lessons over as much time as needed. The goal is to create a LOVE for learning about God's handiwork, NOT to create head-smart but heart-ignorant young people!

**11. Stay Connected - Join our [CrossWired Science Community Facebook Group](#)** and join our email list at **contact@crosswiredscience.com** if you do not receive our weekly devotional emails.

## 1. Core Video 1 (20 minutes)

## CWS CORE 2: Module 1

### Fluid Dynamics Video: V1: **Fluid Dynamics and Bernoulli**

**First Year Students:** Do NOT do quiz. Find 3-5 interestables from these Core Videos and star the best one of each. Mark the second best one with the phrase "2nd". Younger students may want to draw a picture from the video. Your teacher will decide which to do.

**Second Year Students Review:** (**Note: You have 4 review Global Topics this year and 4 new ones.**) **You have already interacted with this video twice.** This quick review needs you to find 3 "compound interestables". These interestables will have 3 or more facts tied together into one concept. For instance, in this video you could write: Hydrodynamics is a branch of Fluid Dynamics. Example: The shark's dorsal fin helps its hydrodynamics by its dermal fibers which stiffen it for high-speed swimming."

(See #4 in Quick Start info above to determine if you are a first year or a second year student.)



1.

2.

3.

4.

5.

### Eye Video: V1: **LIVING CORNEA**

**All Students: Do NOT do quiz.** Watch this Video twice. Draw a picture about a fun fact or write down 3-5 interestables. Your teacher will tell you which to do. Use the back if needed.



1.

2.

3.

4.

5.

## 2. Verse Explanation (10 minutes)

Explain what the verses below mean and apply them to your life in some way.

**Ephesians 1:18,19**

### Mom's Corner

## 20 Years Later...

We are starting school today... yes, it's a late start for most homeschoolers. I'm sipping my coffee and reflecting over the past 20 years of homeschooling my eight children as I let my sleepy teenagers wake up a bit slower (minus the alarm clock.)

This journey has definitely been the most easy, most difficult, most thrilling, most depressing, and the most unexpectedly beautiful adventure! What an invitation from God, I'm so glad I accepted it. And all along the journey I have been privileged to have gotten a front-row window seat.

In my early 20's I wasn't on the path to motherhood and homeschooling certainly was the furthest thing from my mind. My "career" was my plan. But then God gave me the "desires of my heart" before I even realized what they were! Homeschooling my children came into focus and became a reality.

We started out with nothing more than a sweet, eager-faced little towhead boy. With his newly sharpened pencil, he eagerly waited for me at a re-purposed, hand-me-down end table with a little stool in our unfinished basement and a handful of books. While we read and played together, I discovered a great and unexpected pleasure in teaching this little person whom I loved most in the whole world. I jumped wholeheartedly into the joy of teaching him and vowed I'd never share that joy with some unknown schoolteacher down the street. (Continued next page)





## 20 Years Later (continued)



As we ventured along this path, our family kept adding a new student every couple of years. One of my first big homeschool purchases was my “school table” – a real, school-quality, blue table with adjustable legs that we could raise and lower. I got quite a workout over the years doing deep squats near that table every day! I vividly remember sitting at that very table with my older three children and thinking, “Someday... all these chairs will be filled with *my* kiddos, and God wants ME to teach all of them!” It was hugely intimidating yet quite exciting, too!

We outgrew the table pretty quickly. I knew I was in over my head and would need divine intervention to complete this monumental task! I asked God to show up and help me do this...since it had been His idea from the beginning! I kept that table for many years, it was always a symbol of God’s provision for me: He called me to this job, and He showed up day after day to help me.

Our journey took us through several family moves to several different states. We participated in co-ops and didn’t participate in co-ops. We played sports, did music lessons and orchestras, joined theater groups, and drove to hundreds of soccer practices and ballet lessons—and didn’t do all that, too. We had seasons with church activities and programs and seasons without.

We prioritized the Word of God. We memorized scripture (thank you - Awana and the Bible Bee!) We read about our heroes with biographies about Christian missionaries from all over the globe. (My second big purchase was every YWAM Bengé *Christian Heroes Then & Now* series ever printed!) We LOVED reading them out loud as a family and listening to them on road trips. They built an incredible shared heritage between the kids and us and gave all of us a passion for the world and godly heroes to look up to. We prayed over countries and Unreached People Groups. We studied worldview and apologetics together and learned about the world God so loves.

We spent endless hours lost in great books and read-alouds together – *The Wingfeather Saga* and the *Mysterious Benedict Society* series were a few favorites. Our family has many hysterical inside jokes that come from the pages of the books we shared together. Almost all my favorite homeschool memories contain references to the books we read.

We explored the wonders of science together. We watched as tadpoles turned into frogs (that lived for 7 YEARS!) We marveled at our caterpillars flying away as butterflies. We collected every type of stick, pinecone, stone and bird nest we could find! We took countless nature center and science museum field trips and practically grew up at the zoo. We did experiments (including my personal favorite...the dissections!) together at the kitchen table and in classes at coop together with our friends.

We learned about the world while we cooked the craziest concoctions, (ever tried Pilgrim Swill?) and eagerly tasted food from all over the world (Vegemite anyone?). Our home was filled with maps and globes. For many years we had maps on the kitchen table under clear tablecloths. Our favorite school time snacks came from





We ventured into high school, eager to prove we had done this homeschooling thing well. We mastered dual credit college courses, and rigorous study, classic literature analysis papers and the ACT. We did all the “Bonus” questions, and extra credit assignments and we had years we didn’t even finish the book!

I discovered I had a passion for teaching— both at home, and in a co-op setting. We learned to manage our time (the kids and me!) by doing schoolwork, having part-time jobs and balancing our commitments and responsibilities. We survived Driver’s Ed (Only a few more to go...) We deepened our faith and understanding by taking the Perspectives of the World Christian Movement course together. We went on mission trips and learned to serve others. And we learned to bravely

step off the fast track and customize their education to the person God created them to be with new and varied learning opportunities.

We experienced health issues and came face-to-face with cancer, twice. We suffered deep tragedy and we wrestled with trusting in the goodness of God. We learned how truly faithful God is. We experienced beauty for ashes and thrilling new beginnings.

We came to the end of the school years for my first born (that seemed would never end) and I had the great joy to hand my son a high school diploma. I was an absolute emotional mess as I graduated Sam, my always eager student, in a full cap & gown ceremony with all the pomp and circumstance (How do we parents ever survive the Senior slide show?)

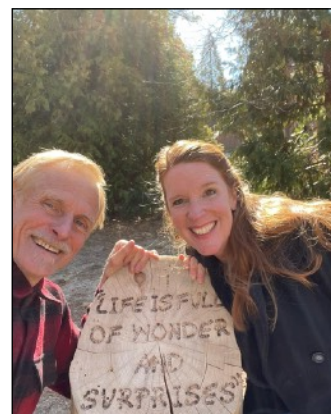
More years passed and more graduations have taken place. I’ve *loved* seeing each of them fly high beyond our homeschool! So much is happening now with all of them and some are launching into adulthood from home which has had some amazing lessons, blessings and opportunities for all of us! My kiddos joke that I get more relaxed with each child... the last one will probably have a diploma thrown out the window at them as I speed off in my much-dreamed-about red convertible... and a laugh...a wild crazy laugh!) Homeschooling will make you lose your mind at times!

These past 20 years have taught me so much more than I ever dreamed. Sometimes I believe God’s direction to homeschool my children may have actually been more about my learning than theirs. There are amazing and abundant blessings that came with this decision! I have learned that I need to be constantly reliant on the Lord for each and every step along this path. Each new season requires His fresh guidance for the twists and turns ahead that only He knows are necessary for the wonders He wants to bring. I need to be truly as dependent on His leading today as I was in that first uncertain day.

This gift of TIME with my children is the most precious gift I’ve ever been given. I had time to get to know them, time experience life with them, time to learn together, time to grow in knowing God together, time to get to know and love on many people together and time to catch a glimpse of the amazing people God designed them to be.

I was given an invitation to participate in this great work to the very end of the journey—their graduation from High School and beyond! I’m so incredibly grateful! I pray that you will accept the invitation too!

Blessings!  
Renita



### 3. Specific Videos (15-30 minutes)

## Lesson 1 Page 3

**Watch the video links below.** Choose older or younger. Write 3 interestables (interesting concepts) or draw two pictures or make a mind map of each one on the back. (Some are review). Google "Science mind maps" for examples or see [MIND MAPS](#). You do not need pictures unless you want.

**Younger:** [PEREGRINE FALCON SPEED](#) BW 4m [WEIRD ANIMAL TEETH](#) SSK 4m

**Older:** CHEMISTRY: AS ["Sky-High Soda"](#) 11 min

**Review:** BIOLOGY : [Backyard Squirrel Maze 2.0](#) MR 19 min MR 21 m.

(Learn how astonishing God has made the abilities of the marble-sized brain squirrel.)

**Mark Rober** is an ex-NASA engineer evolutionist who knows very little about evolution. You can pray for him and Derek and other non-believing engineers and scientists we bring to your attention. No one can bring another person from darkness into fellowship with the living God...but God is able.  
Minute 15 "Squirrels around 30 million years and evolved very little." What Mark means by this is that squirrels have been found in layers that are supposedly 30 million years and they are just like squirrels in your backyard. Nope. This just means that squirrels were squirrels when they were buried by Noah's flood.



**Younger:** [SNAPPING TURTLE: BIGGEST!](#) BW 6m [Check Out the Great Barrier Reef!](#) SSK 7m

**Older:** ARACHNIDS [WHY ARE SCORPIONS FLUORESCENT?](#) Ver 9 min)

**Derek** is an evolutionist. There is a slight reference to evolution @6:33. As to scorpions "coming out of the water", the professor is referring to the completely unsubstantiated myth of the fish of the earth having evolved first and then changing and becoming terrestrial (land) creatures. This requires the addition of complex information on an organism's DNA which has 1. NEVER been observed and 2. Is beyond-belief mathematically impossible.



## 4. Gold Dig 1 Sections A-G (45+ minutes)



## Lesson 1 Page 4

### Gold Dig 1: Bones 1

#### Older students:

- Read First Timers Gold Digs for 7 **sections**.
- Write 3 exciting facts or draw & label 2 pictures of the most interesting concepts found in the 7 letters for this Gold Dig in the boxes below.

*You may take the quiz for the parts you do, but the quiz will erase itself when you close it. You must finish the entire quiz in one sitting.*

#### **DO NOT DO THE ENTIRE TEST YET.**

**NOTE1:** These first assignments in Gold Digs and Digging Deeper are not the same as those assigned to Bio/Chem/Physics students at first. As you go on, they will merge.

**NOTE2:** These are a fast review for the second year students, but are new for first year students.

An alternative to doing Gold Dig lessons is to watch "Absolute Genius" Videos found in Fluid Dynamics [General Links](#). These are only accessed by copy/pasting the given URL

For clickable access Be logged into Parent User and use this link: [General Links 1 Hyperlinks](#).

Title:

Title:

## 1. Core Video (15+minutes)

Fluid Dynamics Video: V2: [Wrights and Foils](#)

**First Year Students:** Do NOT do quiz. Write 3-5 interestables, drawing.(See directions in Lesson 1)

**Second Year students:** Follow “compound interestables” directions in Lesson 1.



1.

2.

3.

4.

5.

## 2. Devotion: (10+ minutes)

Teen Devotion: [A Backpacking Trip](#)

Science Devotion: [Hearing Plants](#)

Bible Devotion: [A Hike To What We Never Want To Have](#)

Read the devotion in Teen Devotions link above. Write the main take home point and 2 personal applications below. Next Pick either the Science or the Bible Bible and do the same . Use the back for more room. For younger children, we suggest using the book “[Indescribable](#)” or “[How Great Thou Art](#)” by Louie Giglio.

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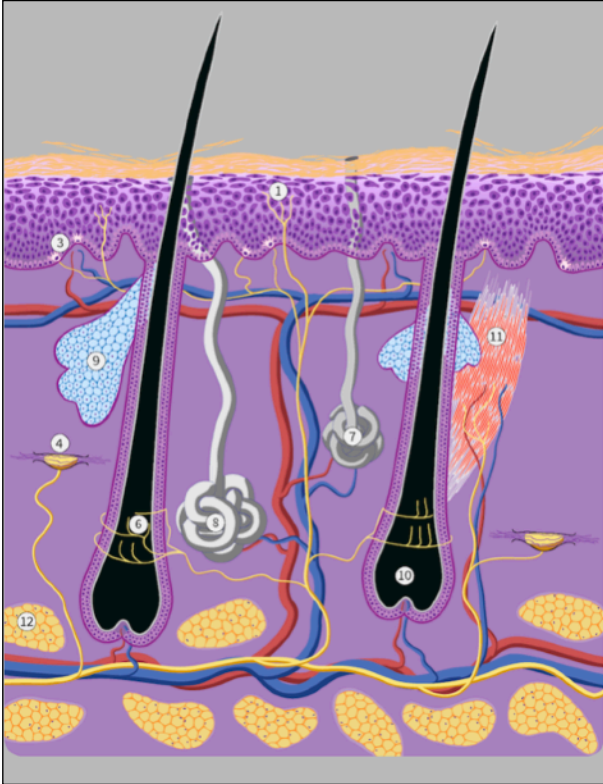
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### 3. Concept Drawing (20 min)

Draw this diagram. Label it.



1. Dead epidermis cells 3. Nerve 4. Heat detectors 6. Hair 7,8 Sweat glands 10. Artery in the hair follicle

**Skin**

Write 5 interesting things about this on the back.

### The Profound Gift of Skin!

As I've grown in my understanding of God in science, skin has become something that often causes my heart to rise in praise to Him.

Skin is not at all simple like it appears. It is saturated with wiring, extremely sophisticated detectors, lubricators, and thousands of miles of piping and millions of bio-electrical wires. Every square inch of it has hundreds of wires streaming information to the brain and is at the same time receiving impulses from the brain to put different mechanisms into active status.

The hair is built from blood parts coming in from piping at its base. The living skin is in the dermis which is under the dead epidermis cells on the outside of our skin. These living cells are constantly being pushed upward after they are made. As they ascend, they multiply the strong protein keratin inside them and eventually die becoming the smooth protective layer that God made our skin to be.

God wanted us to be able to feel warmth and coolness all over our bodies so He put sophisticated bio-devices all through our skin with nerve wires directly to our being to keep us informed. Our brain can tell exactly where the messages are coming from even though there are millions coming every second from hundreds of miles of wiring from our skin.

Fat cells multiply under our skin to provide warmth for us. Without the fat just under our thin layer of skin, we would freeze in the mildest cold weather!

What wonder-filled hi-tech gift from God our skin is! As you are blessed by skin, never stop praising the One who created it for you!

## 4. [FD:General Links 1](#)—Lesson #1 (45–60 minutes)

Lesson 2 Pg.3

Today is a “General Links 1” Lesson where YOU pick what Links to watch.

**Year 1 Students:** Watch 45-60 minutes of Links you chose from this group. Write 2 great facts from 3 of your favorite Links.

**Year 1 Students: Review:** Extra Credit—also do above, recording different interestables than last year. Finish work on the back of this sheet.

**These links are a review of Core 1. Record your rewatched links on the new link page below.**

PARENTS: Watch this **VERY IMPORTANT** video which explains [How To Do Links](#). Click the button “Quick Looks” in the upper right hand corner of the page. **Record your Link Views.** Every link has a number. Record the date viewed in small print in the appropriate box in the Viewing Record sheets below. This is explained in [How To Do Links](#)

**IMPORTANT:** The General Links 1 link above is not to activated links. In the student user, Links can only be accessed by copying the URL. For clickable links you must be logged into the Parent User and access the links from the Parent/Teacher tab. Watch 45-60 minutes of Links you chose from this group.

Link 1:

Link 2,3:

(Put notes on back)

### 5. Scientist (20 minutes)

Optional

Nikola Tesla

**Yr. 1 students:** List some general information about this scientist’s life.

**Yr.2 Students:** What are the 3 great turning points of Tesla’s life (for better or worse)?



### Possible Subject Areas:

Fluid Dynamics  
Wright Brothers

Bernoulli

Foils

Eyes

Cornea of eyes

Lasers

Lizards

Dragonfly

Hummingbird

Fly

Butterfly

Birds

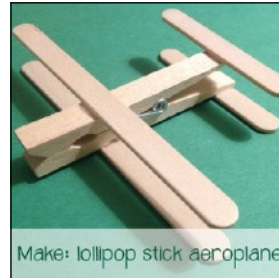
Grasshoppers

Shark

Birds and Insects Flying Patterns

## MODULE 1

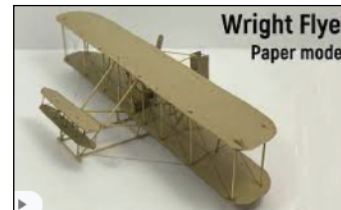
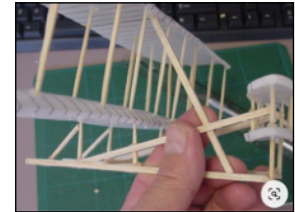
### Build a Wright Brothers' Plane



Make: lollipop stick aeroplane

#### [#1 Plane](#)

#### [#2 Plane](#)



Wright Flyer  
Paper model

#### [#3 Plane](#)

#### [Many More Models](#)

### [5 Hummingbird Feeders](#)



5 EASY Homemade  
Hummingbird Feeders

#### [Recycled Bottle Hummingbird Feeder & Nectar Recipe](#)



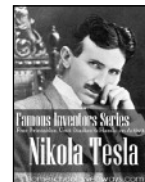
RECYCLED BOTTLE  
HUMMINGBIRD FEEDER

### Color Page: [Iguana](#)



#### [Lizard Color Pages 1](#)

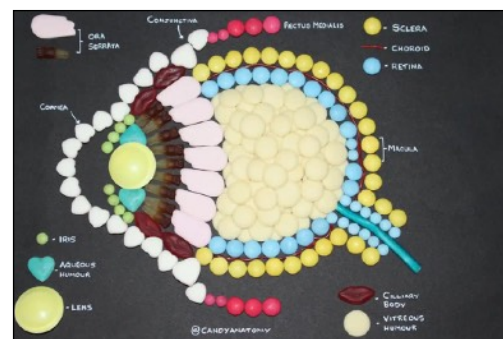
#### [Lizard Color Pages 2](#)



Famous Inventors Series  
Nikola Tesla

### [Nikola Tesla Activities](#)

### [Eye Candy Craft](#)



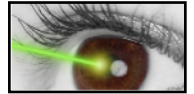
## 1. Core Video (15+minutes)

## Lesson 3 Page1

Eye Video: Eye Video: V2: [LASIK & CORNEA PUMPS](#)

All Students: **Do NOT do quiz.** Watch this Video twice.

Watch this Video twice. Draw a picture about a fun fact or write down 3-5 interestables. Your teacher will tell you which to do. Use the back if needed.



1.

2.

3.

4.

5.

## 2. Verse Memory (15 minutes)

Write or illustrate the verses & memorize.

**Ephesians 1:18,19**

Large empty rounded rectangle for writing or illustrating the verses and memorization.

## 3a. UV Mysteries Experiment Block (3+ Hours over 3 Weeks)

## Mod 1-3

**NOTE: Supplies for this experiment will be available in the new CORE: Wonders Experiment Pak. This experiment is for advanced CORE students. We recommend completing the WONDERS Track and WONDERS PAK before doing this experiment.**

In this Experiment Block you will experiment with UV light.

1. Fun with a marker.
2. Search for UV fluorescing objects.
3. Surprising mystery of Using UV light with clear orbees.
4. Testing for chlorophyll in leaves with UV light.

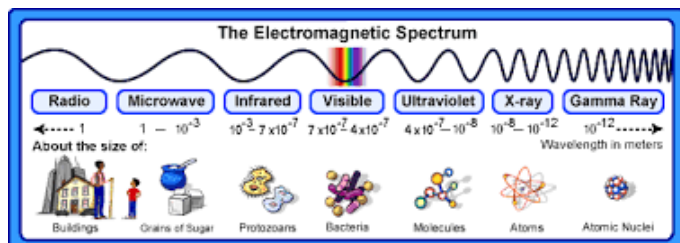
**Take 1-3 Pictures of your experiments & tape them in the boxes below or tape them on the back of this sheet.**

Here are a few more fun [CWS activities with UV Light](#).

### 1. UV EFFECTS

#### SUPPLIES:

- ☐ [UV flashlight](#) (Purchase from Amazon)
- ☐ 3 AAA batteries
- ☐ 2 Yellow + 1 Pink Sharpie highlighter
- ☐ 3 small clear cups
- ☐ [Polymer spheres](#) (Purchase from Amazon)



#### PROCEDURE #1:

Take your yellow highlighter and write on a paper or your fingernails or your hand. Shine the UV light on it. (try other colors of high-lighters too)



#### Research:

1. What is the wavelength range of UV light?
2. What is the weakest wavelength of UV light?
3. What is the strongest wavelength of UV light?
4. What happens when invisible UV light strikes something and a color can be seen that is not normally there in the object? (When the object fluoresces?)

#### PROCEDURE #2:

1. Find 20 objects that re-emit photons we can see when a UV light shines on them: Ideas include: (Circle which ones do this)

- Blond hair, tennis shoes, detergent, scorpions, compare veg oil and olive oil...
- Look for chlorine in someone's lighter-colored hair. It will look green under a UV light. Look at transparent highlighting markers, rocks, labels on bottles...
- Teeth, tonic water (quinine in it), chlorophyll in a leaf (get it out by mashing ie spinach or swiss chard in a small amount of alcohol), your washer and dryer area...
- Vitamin A, vitamin B12 dissolved in vinegar is strong, toothpaste whiteners, anti-freeze, blood, newer \$20 bills and other larger \$ bills, light bulbs, scorpions, mine trailings...
- Other cleaners, banana spots, some toys and plastics, white paper, cosmetics, some corals, fish, mushrooms, jellyfish, vaseline, olive oil, rock salt, turmeric (the spice), canola oil...
- Honey, some postage stamps, catsup, cotton balls, pipe cleaners (chenille craft sticks)
- Fungus that causes Athlete's Foot, Shells (the aragonite of the nacre in them can fluoresce green, red or blue depending on the wavelength of the UV shining on them (try different angles) Abalone works well.

## 2. INVESTIGATION / UV POLY-SPHERES

### UV HIGHLIGHTERS & POLYSPHERES

**NOTE: The Flight Patterns Hunt 3-Month Project from Lesson 3 is due in 3 weeks.**

### SUPPLIES:

- **Polymer spheres** Amazon
- 3 small plastic cups
- 2 **Yellow + Pink Sharpie highlighters** Amazon



### PROCEDURE 3

- Remove the yellow and pink ink cartridges from the markers and squeeze the contents into 2 cups.
- Put 6 spheres in the cup with the yellow dye and 6 in the cup with the pink dye. Add 1/2" of water to each. Let them sit 1 day. Pull them out and shine UV light on them
- Put each color of spheres into their own small plastic cups (clear is best). Do not put in a paper cup!
- Take 1/2 of the yellow spheres and put them into a 3rd cup. Put 1/2 of the pink spheres on top of them. Let sit 2 days Look at the 3 groups of spheres with the UV light after 2 days.

### PROCEDURE 3 (continued):

- Look at your pink and yellow highlighter spheres from in a darkened room from above the spheres. There will be a reflection from the UV light on the spheres. (It looks like the bright spot on a bubble). What color is each? Why?
- With the pink highlighter spheres on the top of yellow ones, after one day, carefully observe the spheres in a darkened room with a UV flashlight from the top and from the bottom. What do you see? Why? Why is there a bright lining around the very edge of the spheres?

### PROCEDURE 4:

- Make a mixture of Spinach leaves chlorophyll as described in #5 below. Put 5 of your orb spheres into the alcohol/chlorophyll solution. Observe in one day with a UV flashlight. Was the chlorophyll absorbed into the spheres?
- Add two tablespoons of water into the alcohol solution. Add another batch of spheres. Let sit one day. Did they absorb the chlorophyll molecules now that more water is there to be absorbed by the spheres? Do the spheres absorb concentrated alcohol?

### Sphere Art For Fun:

- Place 1/2 of each of the 3 cups of spheres neatly on a stack of 3 napkins (or 6 sheets of folded TP (3"x6"). Spread out the spheres about 1/4" from each other.
- Observe after 2-3 days with and without the UV light. Move the spheres 1/4 inch from where they are on the napkin. You should see a spot of color where they were. Let them rest in their new spot a couple days. Move them and you'll have fluorescing "art" on your napkin. Save the napk in a sheet protector in your sci-notebook (tape it to a paper). Compare the size of the spheres on the napkin with those not on it.

### Questions:

1. What do the spheres look like with the UV light on day 1? Are they clear or opaque?
2. What do the mixed spheres (1/2 on top of 1/2) look like after 3 days? Are the mixed ones opaque when viewed from the top? Are the mixed ones opaque when viewed from the side? What's going on?
3. Did the ones on the napkin grow or shrink? Why?

### SOMETHING YOU MIGHT LIKE TO DO: Glow in the dark bones.

To make glow in the dark bones, take the fluorescent dye from a yellow or pink highlighter and mix it with about 1/8 cup of water and drop in a bone and let it sit until it is coated with dye (3 to 7 days) Wipe it off and hit it with a UV light and it glows wildly! Start with vertebrae of chicken from your Bones experiment and then try hunks of beef bone. Why do they coat differently?



## 3. TESTING FOR CHLOROPHYLL—and its buddies

**SUPPLIES:** All the leaves and plant parts are not necessary. Leaves are best.

**NOTE: The Flight Patterns Hunt 3-Month Project from Lesson 3 is due next week.**

- ☐ Leaves: Spinach, juvenile, “black”, Fall leaves. Avocado, Kiwi
- ☐ Green peppers, cucumber, Green beans, lettuce, kale
- ☐ UV light, 70 or 91% Alcohol 3 coffee filters
- ☐ Microwave

### REVIEW:

- UV light is part of the electromagnetic spectrum. It is the photons of light whose wavelength is 400nm-10nm. 10 nm (ten nanometers) is the short, powerful wavelength of UV light.
- UV B is more powerful UV light than UV A. It has greater energy. This causes it to have a higher frequency than UV-A light (the photon moves up and down more often and more quickly than those of UV-A).
- Remember, longer wavelength UV is weaker: it doesn't have as much energy,
- Solar cells used in producing solar panels must have glass on them that is of the right type and thickness to allow the right amount of UV light to pass through.
- Insect eyes have mini-lenses in the ommatidia. The parts of the compound eyes that detect UV light must allow it to enter the eye or the insect eye couldn't detect it.



### Questions:

1. Did you see any other colors than green in the chromatography?
2. What color does the chlorophyll fluoresce under UV light?
3. Why does it look one color under the UV light? Why does it look another color when the light is under the mix and black when from the side.



**UV light fluoresces Chlorophyll molecules. Chlorophyll molecules are inside the donut-shaped chloroplasts inside the pancake-stacked thylakoids. (see right) They are so tiny that you could put more than a billion into a dust particle. But each is very precisely made.**

### PROCEDURES 5-10

#### 5. Break up 3-5 spinach leaves into 1” pieces

(Leave out the stems). Mix with 10 tbs of alcohol (70 or 91%) and mush the leaves down into the alcohol. Let sit 20 minutes or more. Look at under UV. Strain out the roughage by pouring it through a strainer or a coffee filter. Observe again with UV light.

**6. Put 1/2” of the spinach solution** in a small glass. Put a 1”x7” cut-out strip of coffee filter in the mixture with 1” sticking in the water and the other 6” up the glass and out. Let the mixture be absorbed by the filter. Note the chromatography. Do you see orange? If you do, it is carotene, the pigment that makes carrots orange. Look at the strip with UV.

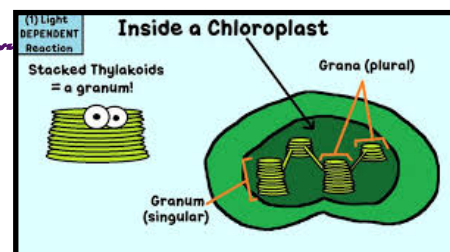
#### 7. Look at the remaining mixture under a UV light.

(In a clear glass) Shine the UV light from the top and from the side and from underneath and from the far side. What does look like in each case? (Record all observations on an experiment sheet.)

**8. Testing** different leaves as you did in #5 above for their chlorophyll content. Crush 5 new leaves in separate alcohol batches of 5 tablespoons of alcohol (see leaf requirements below).. Compare the deepness of the red color of light they fluoresce in UV light to determine if they have chlorophyll, and, if they do, how much each set of leaves have in comparison to each other.

**9. Try also:** light green baby leaves from a plant (juvenile leaves), celery, green pepper, avocado (the inside green part), purple plum leaves (they appear black-get from a nursery), fall leaves from deciduous trees (test ones that are yellow, orange and red), green bean skin, lettuce, kale, kiwi pulp, lime peel.

**10. Lab Report:** Make a Lab Report. The question you'll be investigating is “Do different leaves and plant parts contain chlorophyll?”



**This Hunt was given in Core 1. Find different birds, mammals and insects than you did last year.**

The purpose of this Hunt is to get you thinking more deeply about aerodynamics and to apply your knowledge to living things. You have the next 3 months to find 20 flying creatures with different flying patterns and analyze the aerodynamics involved in each. You may include flying mammals, and insects and birds. The analysis of their flights may be researched or hypothesized. You must see each one personally. We've listed 6. Write in your analysis of these two and do likewise for your remaining flight patterns. (Put the remaining 5 on the back)

## Flight Patterns Hunt

1. **Dragonfly** (See [Dragonfly Flight Design](#))
2. **Hummingbird** (See [Hummingbird flight Design 1](#) and [Design 2](#) and [Robotics](#))
3. **Butterfly** (See [Red Admiral Flight](#), [Designer Wings](#), [Photonic Structures](#) for beauty,)
4. **Birds 1** (See [Swifts](#), [Albatross](#))
5. **Grasshopper** (See [Locusts](#))
6. **Fly** (See [Aces of the Air](#), [How Flies Fly](#), [Fly Development](#))
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.
- 13.
- 14.
- 15.

# 1. **FD UNIT LINKS** Lesson #1 (30+ minutes)

Today is a "Unit Links" Lesson where YOU pick which Links to watch.  
Watch 20-25 minutes of videos you chose from this group.

*Write 2 great facts from the videos you watch.*

**IMPORTANT:** For clickable links you must be logged into the Parent User  
and access the links from the Parent/Teacher tab.

**Link 1:**



**Link 2:**

**Link 3:**

## Level 1



# Fluid Dynamics Unit Links Viewing Record

[Unit Links Hyperlinks](#) Log into Parent user to access these.

1a.	1b.	7a.	7b.	13a.	13b.
2a.	2b.	8a.	8b.	14a.	14b.
3a.	3b.	9a.	9b.	15a.	15b.
4a.	4b.	10a.	10b.	16a.	16b.
5a.	5b.	11a.	11b.	17a.	17b.
6a.	6b.	12a.	12b.	18a.	18b.

## Level 2.3

1a.	1b.	11a.	11b.	21a.	21b.
2a.	2b.	12a.	12b.	22a.	22b.
3a.	3b.	13a.	13b.	23a.	23b.
4a.	4b.	14a.	14b.	24a.	24b.
5a.	5b.	15a.	15b.	25a.	25b.
6a.	6b.	16a.	16b.	26a.	26b.
7a.	7b.	17a.	17b.	27a.	27b.
8a.	8b.	18a.	18b.	28a.	28b.
9a.	9b.	19a.	19b.	29a.	29b.
10a.	10b.	20a.	20b.	30a.	30b.

## Level 3

1a.	1b.	5a.	5b.	9a.	9b.
2a.	2b.	6a.	6b.	10a.	10b.
3a.	3b.	7a.	7b.	11a.	11b.
4a.	4b.	8a.	8b.	12a.	12b.



## 2. Article (Extra credit)

**Younger Students:** Go over this article with Dad and Mom

**Older Students:** Annotate this article; underline what is interesting and star the best info.

Write 5 clipped-sentence interestables on this article on the back.

### Lizard skin inspires lubricant-free slipperiness

by [David Catchpoole](#)

Engineers now frequently copy designs in nature—a field known as biomimetics—resulting in many great gains in our technology.<sup>1</sup> But sometimes even the engineers themselves are surprised at just how dr

A recent example featured in the *Bioinspiration and Biomimetics* journal is the copying of the scaly skin of the sandfish skink lizard (*Scincus scincus*).<sup>2</sup> Engineers already knew that the shape and pattern of its non-overlapping scales make the skin ‘slippery’ when going forwards, but give it high resistance to movement in the opposite direction (thus helping the creature to propel itself forward). And they knew it was achieved without lubrication, as the skinks do not secrete oils or other liquids onto their skin.



So, wanting to see if this feature might be usefully applied in engineering, researchers Christian Greiner and Michael Schäfer of the prestigious Karlsruhe Institute of Technology (Germany) etched similar scale shapes and patterns onto flat steel using laser surface texturing. When they slid the steel across a smooth, dry sapphire surface, they were astonished to discover that the lizard-inspired etched pattern lowered friction by an amazing 40%.

“If we’d managed just a 1% reduction in friction, our engineering colleagues would have been delighted; 40% really is a leap forward and everyone is very excited!” said Greiner.

It’s easy to see why. This discovery could help to reduce friction in machines that cannot be lubricated, e.g. miniature devices in which lubricants tend to hinder and gum up moving parts—in fact, under lubrication, this scaly structure *increased* friction threefold compared to a smooth surface.<sup>2</sup> It could also be used to reduce friction in the sensors used in anti-lock braking systems and computer hard-disk drives, and in the accelerometers used in cell phones. Furthermore, preliminary results suggest that the scaly texture also reduces wear.<sup>2</sup>

With further refinement, the potential applications could include making lizard-inspired robots useful for exploring extremely dusty environments (where oily lubricants are notoriously difficult to manage and keep clean).

Of course, given the *inspiration source* of all these applications, one should always remember that God thought of it first! Unfortunately, the researchers instead wrongly ascribe design in nature to being “the result of a long evolutionary adaption process.”<sup>2</sup> But how does that make any sense, given the many thousands of research hours and top-flight engineering intelligence employed in merely *copying* biological design—does it not rather point to there being a Designer behind it all? No wonder that the Designer inspired the Apostle Paul to write that God’s power can be perceived in the things that have been made, “so that they are without excuse” ([Romans 1:20](#)).

## 1. Read a Book (30-60 minutes)



## Lesson 5 Page 1

Read a Science book or magazine for one hour. Choose a way to record something about your reading. Reading aloud as a family is great!

- Short essay // Key words // Mind map or drawing, etc.
- [ANSWERS](#) magazine is great to use.
- [CREATION](#) magazine is another of our favorites..



**CWS SUGGESTION:** *Heroes of History: Dr. Paul Brand By J. Bengé p.1-35.* NOTE: We offer these five great books at \$10 under Amazon with free shipping from YWAM. See [PURCHASE BOOKS](#). Buy "Science Bundle 2"

Title:

Pages read

### ***"Walk in love"***

*—Ephesians 5:2*

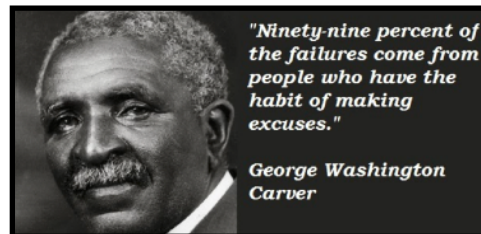
God shows His love through the beauty of birds like the toucan.

**He also shows the beauty of His love through the beauty of His love moving in your heart** to bring specific thoughtful blessings to others. Part of "walking in love" each day involves **kind encouragements and blessings** God wants you to give others.

**To "walk in love" also means if someone is being selfish or crabby**, to do your best to forgive and love. When you do this, God understands your efforts to be a peacemaker.. **He will help you.**

### **Quotes:**(10 minutes)

Write this quote and another quote from this scientist on the back. (A different one than last year. ) Also include 3 great interestables about him or her.



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Written by Don and Renita Miller.

**2a. CWS Devotionals:** Read the devotional. Write what it means and add a couple personal applications in the space below or on the back—either a need you have or an answer God gave you.

## Disneyland Verses The Hummingbird pg.1

God's creatures are built by a code that is too small to see. They are constructed atom by atom and are wildly elegant. It would be impossible for any of our computers or computerized accessories to be assembled without oversight and intensive planning by their manufacturers. I have a friend who spearheaded building one of Apple's computers. The planning needed to pull it off was mind-boggling.

Complexity cannot arise from chance. For complexity to self-assemble is insanely impossible. It takes ten times more information to self-assemble something than it takes to run it.

We were at Disneyland recently. We had just visited one of the new Star Wars rides. In one part of it, a robotic fleet commander talks to your group. One of my sons commented, "Wow, it certainly is lifelike!"

I agreed with a little thought of how pathetic our attempts are to create brainless robots that resemble humans. I remembered how it was recently discovered that our brains process more information per second than the entire worldwide web. We've got a LONG LONG way to go! And besides having zero brainpower, the Star Fleet

Commander has quite a bit of animatronic ability to go to hit what I just saw in the Olympic performance that took the gold in figure skating!

After the ride, we headed to Tom Sawyer's Island, for those of you who know it by its old name. After going through the caves, climbing the rocks, crossing the crazy bridges, and enjoying some of the peaceful nature hidden on it, we sat waiting for the barge to come to get us and return us to the mainland.





**2a. CWS Devotionals:** Read the devotional. Follow the directions below.**Disneyland Verses The Hummingbird** pg.2

A hummingbird just across from us started flitting about feeding from flower to flower while airborne hitting 80 wing flaps per second. As dozens of people filed by us without a person giving our aerodynamic wonder a second of praise, I quipped, "It's amazing to me that so many can be excited about one of the brainless robots here at Disneyland and not see the wonder of one right in front of them that self-assembles and is a million times more complex! What a mission we have to help people see the hidden staggering wonder!"

Yep. What an exciting mission we have!



When you see one of God's creations that self-assembled and you see them do amazing things, realize again and again that their exquisiteness is meant by the Lord to send us a profoundly wonderful hidden message, "I, the Creator of all things think about you constantly. I love you deeply. Don't worry about anything. I am wholly aware and wholly able. NOTHING IS IMPOSSIBLE FOR



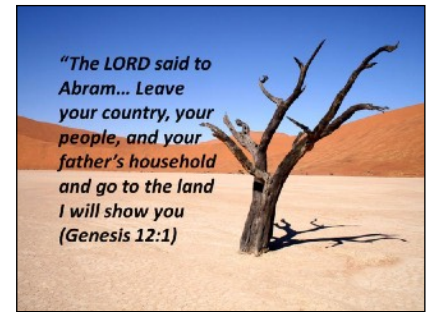
ME. I will do what has never entered your mind. TRUST ME."

**Write what this means in your own words and add a couple personal applications here and on the back—either a need you have or an answer God gave you.**



## God Will Give Much More...and Different! pg.1

It is very much worth the time to spend time with the Lord and bring situations and people to Him. In doing so, when we let His Word seep into our minds and hearts, it lifts us to the greatest reality where God in His love, power and omniscience is present. This heart movement into the presence of the One who made the stars and who placed us here on earth brings His goodness in might upon needs and desires we have for ourselves and others.



Isn't this what we really want and need? We don't desire just the meager results we can bring by our own doing. We desire God's much more. We want the great good that only He can bring—for ourselves, our families and other very beloved ones whom He has placed in our hearts.

### God's Giving To Abraham

Abraham lived a simple life before God. As best as we can tell, he was never hurried. He took time to pray and be with God. During these times God met him. Genesis 15:1 reads, "After these things, the word of the LORD came to Abram in a vision, saying, *"Do not be afraid, Abram. I am your shield, your exceedingly great reward."* In verse 7, God added, *"I am the LORD, who brought you out of Ur of the Chaldeans, to give you this land to inherit it."*

What's so significant is that God said, "I will GIVE you..." What God was wanting to do came about because God was going to give what was needed to accomplish His desire to bless Abraham and also give all that was needed for each of the ways he was intended by God to help and bless others.

In our zeal and hurry, we can neglect the very things that carry the Might we so deeply want to affect everything our life is about. But hurriedness does not help with God's plans, it hinders.

Look at Genesis 18:17-19. It's quite amazing, *"And the LORD said, 'Shall I hide from Abraham what I am about to do?' Abraham will surely become a great and powerful nation, and through him all the nations of the earth will be blessed. For I have chosen him, so that he will direct his children and his household after him to keep the way of the LORD by doing what is right and just, so that the LORD will bring about for Abraham what he has promised him."*

None of this involves hurriedness on the part of Abraham. Abraham was to walk before the Lord and take time to be involved with the relationship with God of his children and others. And, the exceedingness of what God was going to give was off the charts: God was not going to hide from Abraham what He was going to do, and nations were going to be blessed through his life.

This is all about God doing exceeding, abundantly beyond all Abraham could ask or think.

### Walking and She-Shed Building

Abraham's life deeply speaks to me. Even in little things like walking. There are many times when I'd love to go on a walk with the Renita or as a family, but hurry grabs me and I start thinking there is no time. But then I remember how God blessing what we do is what makes the really good things happen in our lives. I remember Abraham walking from place to place and realize again that if I don't have time to take walks, something is really off. When this happens, I take time before the Lord to adjust goals, activities

and schedules so there is again time.



## 2b. CWS Devotionals: Read the devotional. Follow directions at the bottom.

### God Will Give Much More...and Different! pg.2



#### Walking And She Shed Building

Abraham's life deeply speaks to me. Even in little things like walking. There are many times when I'd love to go on a walk with the Renita or as a family, but hurry grabs me and I start thinking there is no time. But then I remember how God blessing what we do is what makes the really good things happen in our lives. I remember Abraham walking from place to place and realize again that if I don't have time to take walks, something is really off. When this happens, I take time before the Lord to adjust goals, activities and schedules so there is again time.

Recently we found ourselves in a situation where, after praying a whole lot, we determined that we needed a little "She shed" for some things that we felt the Lord was leading us to do. We were going to place some money we saved into a better car we needed but decided that it would be better spent

building a she shed.

I was divided. We built our house and guest house. I know well the time it takes to build things. I felt way too busy to build something else. And we decided on a gambrel design which I knew nothing about. But I felt it was needed in many ways and that it would be a tremendous experience for our younger children.

Gritting my teeth, I began.

We had prep work to do and knocked it out. We've been in the wall framing stage for the last week. With six kids on the project, I can hardly believe the amount of blessing the Lord has brought already. It has been one wildly fun and productive and instructive day after another. We've snapped hundreds of pictures. Everyone is excited and exhausted.

What will our she shed do for time and eternity? I have no idea...but we already have a number of friends who want to come and visit and we'll have a place for them to stay. We also have an international ministry. It'll greatly help in giving us a place for some from overseas to stay in also.

All this is part of a quite radical set of decisions we made to move ourselves into position where we would be more available to help others. We, like Abraham had to step into the unknown. I, for one, was afraid. I got "bit" when I took a similar course earlier in my life. But we decided that we only live once and we only have one life to serve the Lord and that we needed to try.

The results have been extraordinary! Getting off the path and being different is bringing some of the most astonishing blessings the Lord has ever brought to Renita and me.

#### Seek For God's More

Can I encourage you?

Seek more for God's more. Try—as one person said—"to ruthlessly eliminate hurry". Take baby steps toward the higher things that Jeremiah 6:16 talks about, *"Stand at the crossroads and look and ask for the ancient paths where the good way is, and walk in it, and you will find rest for your souls."*

## 2b. CWS Devotionals: Read the devotional. Follow directions at the bottom.

### God Will Give Much More...and Different! pg.3

Don't we all want rest for our souls more? Don't we all want God to give more so we can help and bless more? Don't we all want to walk more closely with the Lord every day? Don't we want to stand in the beauty of His presence more? Don't we want to hear more from Him every day and have more of His wonders happening in our lives?

You know we do. I'm sure you do, too. Let's all seek better to spend more time seeking Him and determine to be a little more courageous in doing things differently when God nudges us to. Let's join those who more and more are saying, "We welcome God's different!"

And be sure to take those walks when walkers or otta-be-walking-nudges knock!



***"I have made the earth, the men  
and the beasts which are on the face of the earth  
by My great power and by My outstretched arm,  
and I will give it to the one who is pleasing in My sight."***

**Jeremiah 27:5**

God gives when we live in ways that are pleasing to Him. Abraham in his simplicity never frantically hurried, yet God freely gave him impact over countless multitudes of people over the last 4000 years. Ruth pleased God by loving one person in a hidden place where only the Alpha and the Omega saw what happened. Then she went daily to glean a field to help this person again. God saw it all. When God gave to Ruth, she became the owner of that field!

It's not by might nor by power, but by His Spirit that we receive what He wants to freely give. The doorway is not striving, it is by pleasing the One whose opinion matters *everything*.

***"How blessed is he whose help is the God of Jacob, whose hope is in the Lord his God, who made heaven and earth, the sea and everything that is in them."***

**Psalms 146:6**

**Yes !**

**Write what this devotional means in your own words and add a couple personal applications here and on the back—either a need you have or an answer God gave you.**

### 3. U-Choose & Field Trips (30-60+ minutes)

EXTRA CREDIT



#### This is a Science-Free-For-All Lesson!

The U-Choose lesson contains truckloads of great ideas. Summarize the projects or Field Trips you choose here. Be sure to add a picture or two (or a dozen).

*Go For Whatever U-Want! Field Trips included!*



Title

## 4. WONDERS TRACK *Experiments!*

Record what experiments you did this week from Wonders Track. Write 3 interesting things you learned from each and the best part of the experiment or activity.



**Exp 1:**

**Exp 2:**

**Exp 3:**