

MIGHTY FEATHERS!

Student Notebook of Birds, Feathers & Flight!!
First Timers



You are about to learn more about birds, feathers and flight than you imagined possible!
You'll never look at birds the same!
You'll see birds for what they are;
Unfathomably complex marvels engineered by the Creator of all things
As a wonderful gift of His great love to you.

CROSSWIRED **Science**

Profoundly showing the glory of God through the things He has made.

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This free printable works in conjunction with the course "Mighty Feathers" by Crosswired Science.

Sci-Goodie Free Sign up

<https://crosswiredscience.com/courses/mighty-feathers-goodie/>

Crosswired ScienceWebsite

<https://crosswiredscience.com>

Note: We don't cover everything in these printable pages from Mighty Feathers.

Be sure to add all the rest in.

More links, the articles, the purchased videos and new experiments can be added for more weeks of study.

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Written by Don Miller.

crosswiredscience.com



*Combined with Mighty Feathers, the best STEM deal on the planet!
Deep Science showing the glory of God through what He has profoundly made!*

CrossWired Science

Mighty Feathers Mini-Experiment Pak

\$59.95

A collection of experiment supplies and feathers all for the intriguing Mighty Feathers experiments! Great for all ages!
(Not necessary; BUT a super-blessing!
Order now for Christmas. Our capacity is limited.)

[More Info](#)

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Click these in the Mighty Feathers Unit

1. Watch and Write/Draw: 2 slices (15 m)

DAY 1,2

p.1

Watch the 2 slices for today two times. After the second time, write 2 interesting things about each slice. It's ok if you don't make a full sentence. You may draw a picture for each concept, if your teacher or Mom or Dad OK's it, instead.

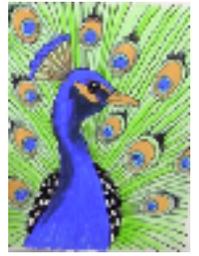
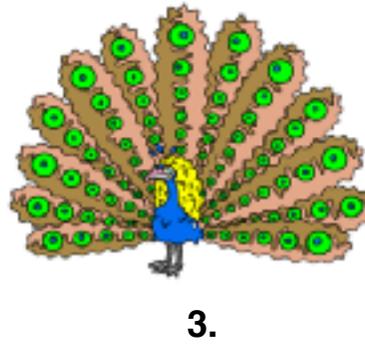
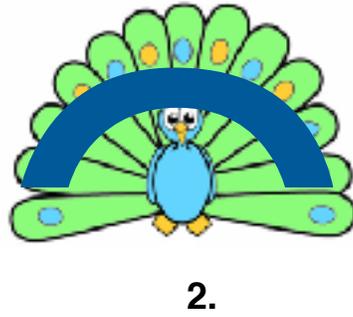
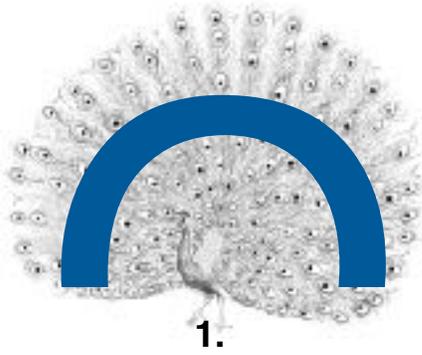
Mighty Feathers Part 1 2.5m

Penguin Micro-Bubbles 2m



2. Concept Drawing: DNA Feather Spacing (15 min)

DAY 1,2 p.2

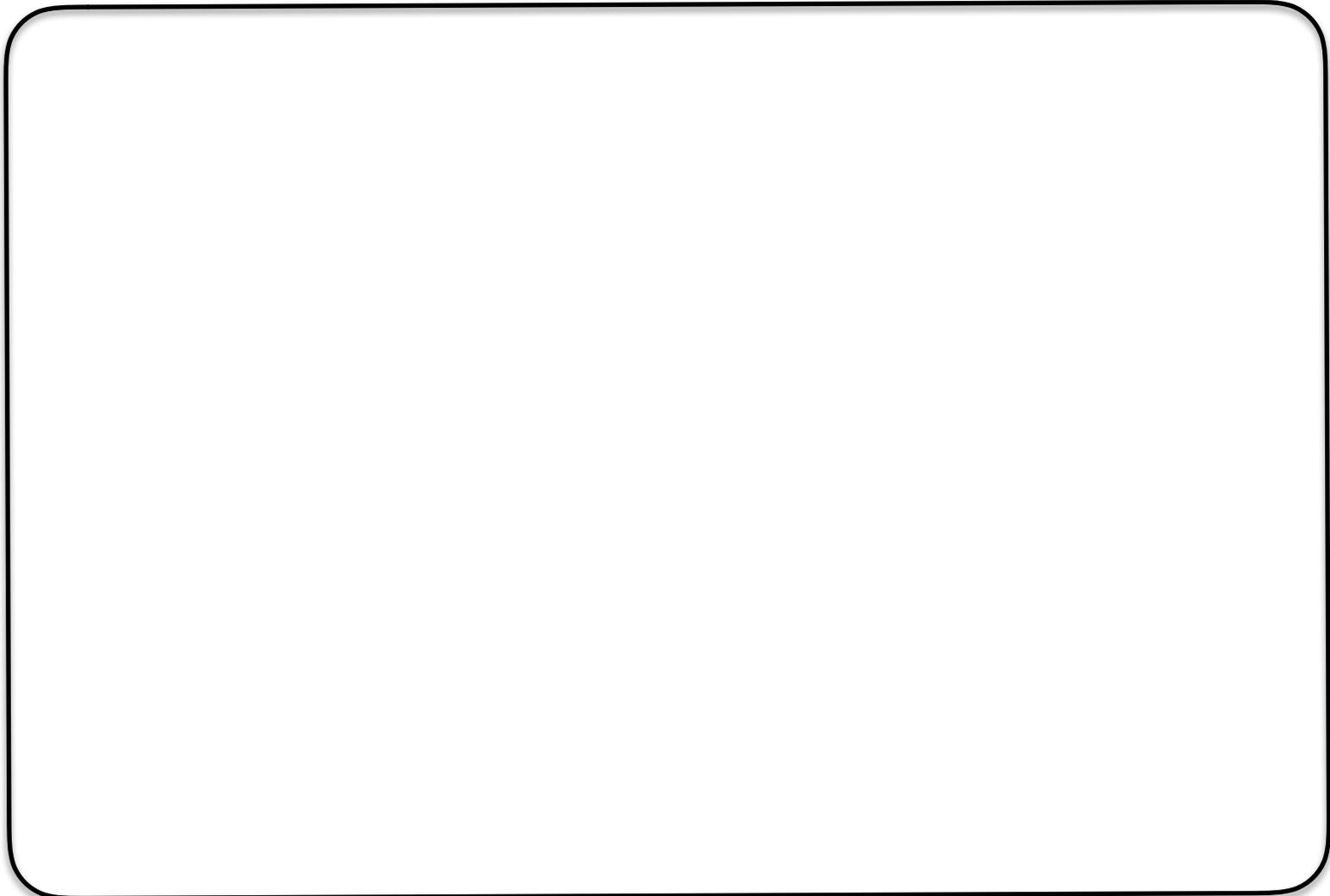


Draw a Peacock:

You may draw a peacock using the directions below for one to the 4 drawings above. Or you may draw a photo of a peacock from the Experiment Journal pages “3-D Feathers and Complex Aeronautics”.

Note the amazing spacing of the peacock eyes. God created a masterpiece!

1. <https://design.tutsplus.com/tutorials/how-to-draw-a-peacock--cms-32004>.
2. <http://www.how-to-draw-cartoons-online.com/cartoon-peacock.html>
3. <https://www.drawinghowtodraw.com/stepbystepdrawinglessons/2011/03/how-to-draw-cartoon-peacocks-step-by-step-drawing-tutorial/>
4. <https://www.youtube.com/watch?v=EphQqnqsJfw&list=PLnoO3k54vcBSFjpDY04fB4F6RebuDKnen&index=2>



3. Concept Coloring (15 min)

Color this picture from the video “Mighty Feathers 1.

A feather has a main shaft called the rachis. The hair-like parts that come off it that you can zip are called barbs. Weird. We would have called them feather strings, not barbs...but we are stuck with barbs.

There are tiny parts that make it so you can zip feathers together. These are called barbules. They are on the barbs. These are too small to see.

The whole feather is made of the protein keratin, which also makes up your fingernails and cat claws. Color the picture below like the picture in the little colored box below. Draw in the Feathers.



4. Write: & Answer (10 min)

Write the words below

keratin

Write above 2 places where keratin can be found other than your fingernails and cat claws. (It is in the slice "Mighty Feathers 1").

barbule

Write above something about barbules. (It's in the slice "Mighty Feathers 1").



"Great is our Lord and abundant in strength; His understanding is infinite."

Psalms 147:5

God made *all* His animals perfectly, including all the birds. It was not difficult for Him. As you try to please the Lord each day, don't forget that God, who is your heavenly Father, is powerful and that He can do wonderful things. That is what this verse means when it says God has "abundant strength".

When this verse says "God's understanding is infinite", it means that God understands everything perfectly including your needs and others' needs.

God wants you to pray for more beautiful things than you can do on your own. He understands what needs to be done and can do it...but He wants you to care and to pray.

"Pray without ceasing." 1 Thessalonians 5:17

5. Watch and Draw: 2 Links (20 m)

DAY 1,2

p.5

Watch the 2 links below. Make a simple mind map about each. You may also just write two facts if you prefer or draw a picture.

Google "Science mind maps" for examples. You do not need pictures like this example unless you want.

<https://www.mindmapart.com/chemistry-mind-map-jane-genovese/>

LINKS 1. L:2,3. 3a. [How Does An Owl Fly So Silently?](#)

BBC 4m



***"Every good
and perfect gift is from above."
James 1:17***

*Everything good is from God.
Trust the God of all beauty
With every detail of your life and bring
everything to Him in prayer.*

LINK 1. L:1-3. 1b. [Teeny Tiny Owl!' Brave Wilderness](#) (8min)

"The earth is full of the lovingkindness of the Lord."

Psalms 33:5

The beauty of birds is quite a proof of how great God's love is for you.

Know that and be encouraged and be courageous

to do creative things today for others!

"Have I not commanded you? Be strong and courageous!

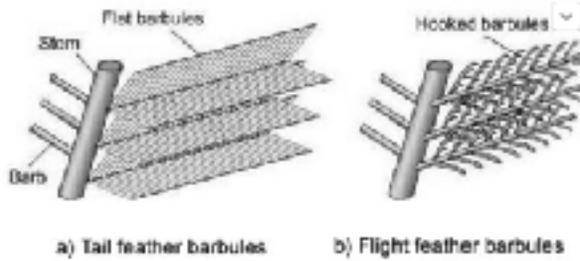
Do not tremble or be dismayed,

for the LORD your God is with you wherever you go."

Joshua 1:9

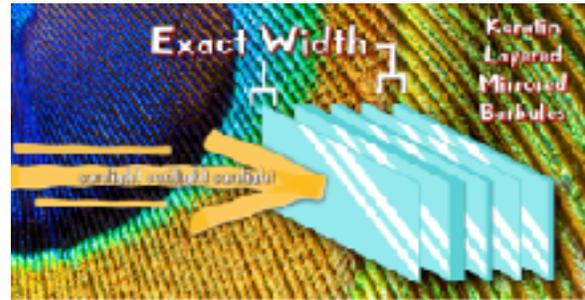
7. Enrichment (20m) BONUS

Write something from each caption below in your own words on the back of this page or on another page. Get some help if you need it! This is hard!



7a. 1,000,000.

There are zipping barbules that cause the feather to zip together. The peacock feather also has flat barbules (top left). The peacocks only color is brown. **These flat barbules amazingly create the colors of the peacock feather! One peacock feather has 1 million barbules! This is SHOCKING!**



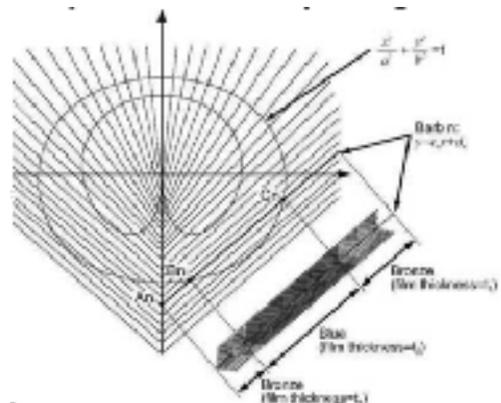
7b. Tiny Feathers!

(Below.) The emperor penguin has incredibly tiny feathers that hold incredibly tiny air bubbles. **They are so small that they are only two times wider than a red blood cell! Imagine two RBC's across the tiny feathers. This is how thin they are!**

The penguin squeezes tiny feather muscles on feathers and creates tiny bubbles from the tiny feathers that are small enough to cling to the body of the penguin. **They create a "bubble tunnel" that makes it so penguins can swim 3 times faster!** Wouldn't it be fun if you could do this!

7c. Mirrors

The flat barbules of the peacock feather are made of **mirrors of different thicknesses**. These cause the different colors of the peacock feathers. This is hard to explain. Just believe us on this one, for now.



4D. Algorithms This is a fact for your mom and dad.

The DNA of the peacock contains math that tells where each barb of the peacock needs to change color and the angle it is to grow..

1. Watch and Write/Draw: 2 slices (15 m)

DAY 3,4

p.1

Watch the 2 slices for today two times. After the second time, write 2 interesting things about each slice. It's ok if you don't make a full sentence. You may draw a picture for each concept, if your teacher OK's this, instead.

Mighty Feathers Part 2 2.5m

Hummingbird Mating Dive 1.5m



“For since the creation of the world God's invisible qualities--His eternal power and divine nature--have been clearly seen, being understood from what has been made...”

Romans 1:20

God shows His power through things He has made like the sun and the moon. **THEY ARE HUGE!**
He shows qualities like His creativity and love through His amazing animals.

2. Concept Drawing: Acoustic Feathers (15 m)

DAY 3,4

p.2

Draw: Barn Owl's Acoustic Face Feathers

Draw the diagram of the barn owl to the right. See the website below for a larger picture.

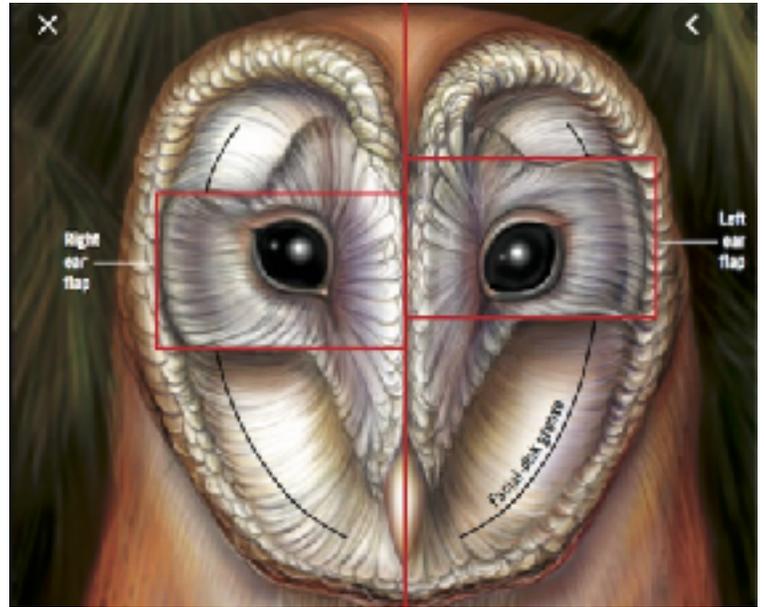
Let me try to explain to you what this picture is showing.

The barn owl has fluffy feathers all over his face. (See the picture of the barn owl in Day 1,2.) Underneath the fluff are the wild feathers you can see in this diagram.

These "acoustic feathers" aim sound to their ears the same way our hands do when we put hands to our ear to hear better. You are looking at two layers in this picture; the one with the eyes and the one that makes a trough where it says "facial-disc groove".

<https://www.birdwatchingdaily.com/news/science/owl-behavior-hunting/>

roenkelly@sbcglobal.net



***This is a tough drawing . Take the challenge!
(Notice that the right ear is slightly higher
than the left. How can this help the owl?)***

3. Concept Coloring (15 min)

DAY 3,4

p.3

Color this picture from the video “Mighty Feathers 2”.



4. Write: & Answer (10 min)

DAY 3,4

p.4

Write the words below and answer the questions.

Acoustic feathers

Write something about “acoustic feathers”. (The info is in the slice the section above called “**Draw: Barn Owl’s Acoustic Face Feathers**”).

Primary Feathers



Write something about “primary feathers”. (It’s in the slice “Mighty Feathers 2”).

"But ask the animals, and they will teach you, or the birds in the sky, and they will tell you...Who among all these does not know That the hand of the LORD has done this, The life of every living thing is in His hand, as well as the breath of all mankind...."

Job 12:9

The magnificence of birds points to a Creator of infinite intelligence who has made them by a code He ingeniously designed.

The same type of code builds our bodies with all their astonishing wonders.

5. Watch and Draw: 2 Links (20m)

DAY 3,4

p.5

Watch the 2 links below. Make a mind map about each .

Google "Science mind maps" for examples. You do not need pictures like this example unless
<https://www.mindmapart.com/chemistry-mind-map-jane-genovese/>

LINK 1. L:1-3. 2a. [Who Knew? Amazing Owl Facts!](#) (4m)



"Praise the LORD! Oh give thanks to the LORD, for He is good; For His lovingkindness is everlasting.."
Psalms 106:1

There are many times God wants us to praise Him even when things are hard. Why? Because we can see from His creation of birds and other wonderful things that He is good. God WILL come through with His goodness. Praise Him now for He is good!

LINK 1. L:2,3. 2a. [Macaws Slow Motion in the Rainforest](#) 8m

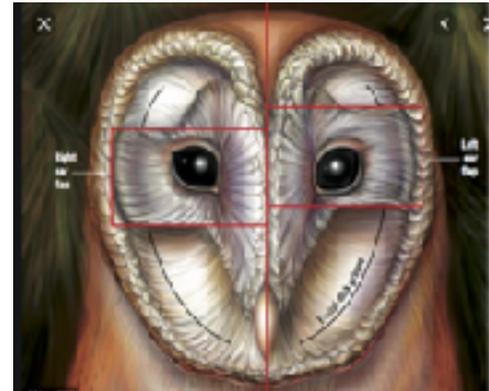
A large, empty rounded rectangular box with a black border, intended for drawing a mind map about the video content.

7. Enrichment (20m) BONUS

DAY 3,4

p.7

Write each caption below in your words on the back of this page.



7a. Barbs and Barbules

The barbs at the end of the little feather parts above are conveniently NOT called barbs. :(

Rather they are called barbules.

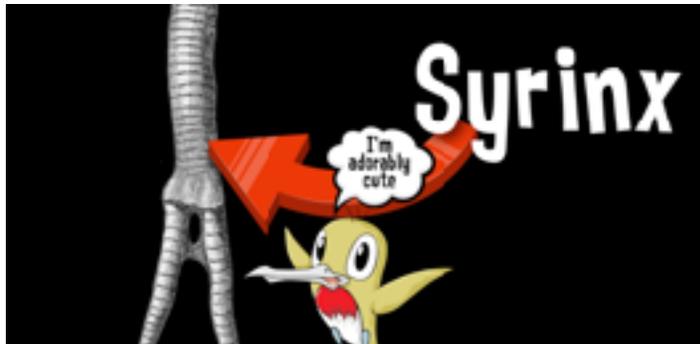
Barbules are too small to see. Remember that ONE peacock feather has one million flat barbules making the colors you see. YOU CANNOT SEE ONE OF THEM!

7b. Acoustic Feathers (For Mom and Dad)

“All owls have circular facial discs covered with loose, fluffy, acoustically transparent feathers. Beneath them are several layers of densely packed, stiff, acoustically reflective feathers called the “ruff”. Each of the ruff’s feathers has a wide shaft and short barbs and bends forward near the tip. The ruff funnels sound waves to the ear openings. (We accomplish the same thing when we cup a hand around an ear to hear better.)

In addition, two prominent grooves in the ruff run from either side of the beak up past the owl’s ear openings. **The ruff’s feathers and grooves are designed to filter and direct high-frequency sounds typical of rodent vocalizations.” (WOW. Frequency specific!)**

www.birdwatchingdaily.com/news/science/owl-behavior-hunting/



7c. The Syrinx vs. Feathers

The syrinx is deep in the chest of birds. It’s at the place where the two bronchi air pipes coming from the lungs join. It has two “sound-making” parts. The 2 sides fo the syrinx can make different super-speed sounds with as many notes as are on a piano keyboard in one second!

The two sounds the syrinx can make are often coordinated duets which the birds emit as single-blended sounds. DNA-coded duets. WOW!



1. Watch and Write: 2 slices (15 m)

DAY 5,6

p.1

Watch the 2 slices for today two times. After the second time, write two interesting things about each slice. It's ok if you don't make a full sentence. You may draw a picture for each concept, if your teacher or Mom or Dad OK's this, instead.

Alula Feathers 3m

UV Birds 1m



“For since the creation of the world God's invisible qualities--his eternal power and divine nature--have been clearly seen, being understood from what has been made...”

Romans 1:20

God shows His power through things He has made like the sun and the moon.
He shows qualities like His creativity and love through His amazing animals.

2. Drawing: Toucan 20m

Draw a Toucan: Bonus

You may draw a simpler toucan using the directions below or draw one from the web. Here are some directions:

[YOUTUBE TUTORIAL](#)

[DRAW ANIMALS HERE](#)



Bonus

DAY 5,6

p.2



A video: [CLICK ME](#)

***“Praise Him for His mighty deeds; Praise Him according to His excellent greatness.”
Psalms 150:2***

When God exerts His power, He doesn't just exert power.

He exerts His power in excellent ways that bring wonderfully excellent results.

There are a million ways we'll need God to help us bring His gentleness, power, words, and joy to others.

All will need His help, creativity and wisdom...

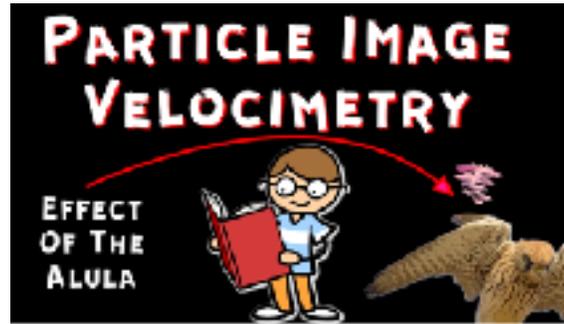
Read: *A Million Little Ways* by Emily Freeman

3. Concept Coloring (15 min)

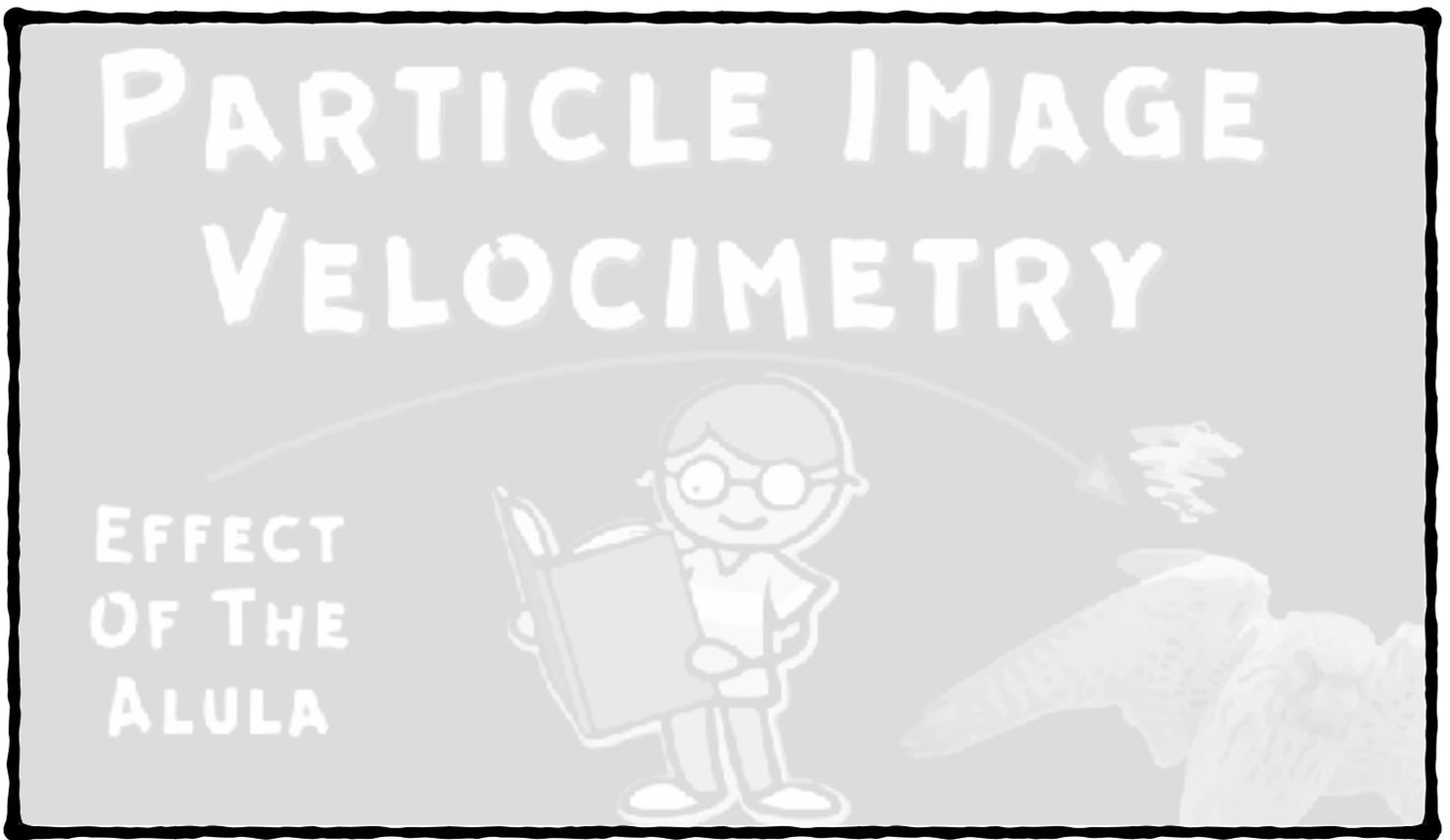
DAY 5,6

p.3

Color this picture from the video “Mighty Feathers 2”.



Particle image velocimetry is when small things like bubbles are put in air or water and computers study their movements with lasers and computers to see how things like wings of birds or fins of fish move the air or water. This helps scientists learn how bird



***“Praise Him for His mighty deeds; Praise Him according to His excellent greatness.”
Psalms 150:2***

When God exerts His power, He doesn't just exert power.

He exerts His power in excellent ways that bring wonderfully excellent results.

There are a million ways we'll need God to help us bring His gentleness, power, words, and joy to others.

All will need His help, creativity and wisdom...

Read: *A Million Little Ways* by Emily Freeman

4. Write: & Answer (10 min)

Write the words below and answer the questions.

Handwriting practice area with three horizontal lines (top solid, middle dashed, bottom solid) inside a rounded rectangular border.

Alula feathers

Write something about “alula feathers”. (It’s in the slice “Alula”.)

Handwriting practice area with three horizontal lines (top solid, middle dashed, bottom solid) inside a rounded rectangular border.

Velocimetry



Write something about “velocimetry”. (It’s in the slice “Alula” and it is described on the last page before this. It’s actually called “Particle Image Velocimetry”, but we shorten it here to “Velocimetry”.)

5. Watch and Draw: 2 Links (20m)

DAY 5,6

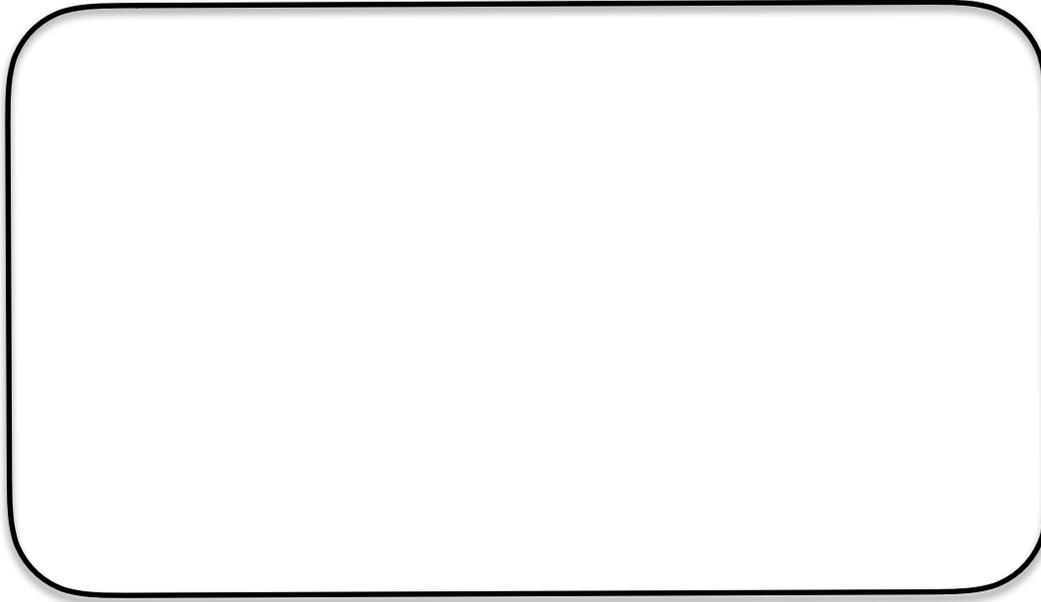
p.5

Watch the 2 links below. Make a mind map about each .

Google "Science mind maps" for examples. You do not need pictures like this example unless you want.

<https://www.mindmapart.com/chemistry-mind-map-jane-genovese/>

[LINKS 1. L:2,3. 7a. Hummingbird Aerodynamics.](#) (5m)



"Walk in love" today.
–Ephesians 5:2

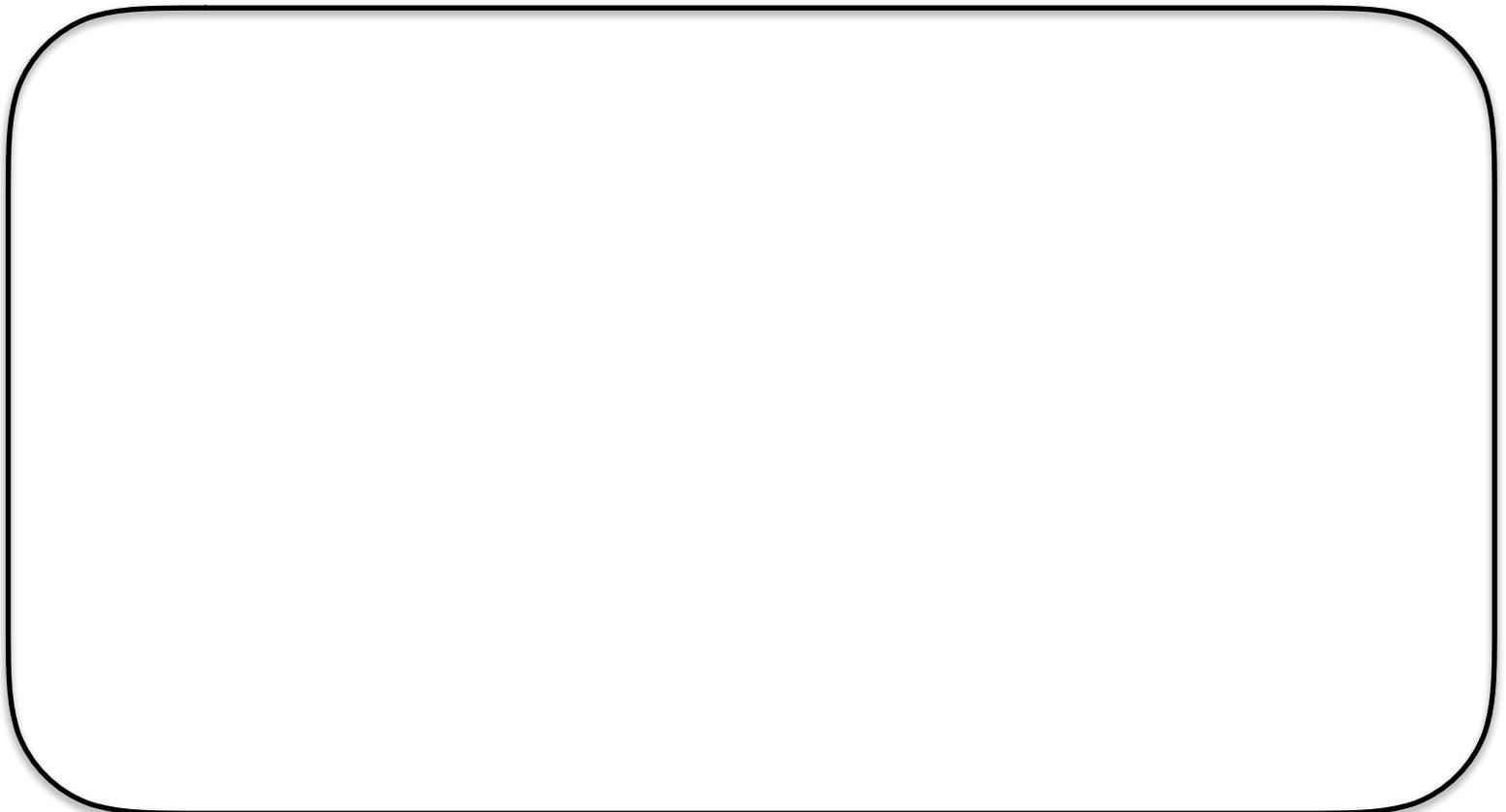
God shows the wonder of His love through the beauty of birds like the toucan or the hummingbird.

He also shows His love through you as you pray about and bring thoughtful blessings to others. Your words are part. As you encourage Mom and Dad and brothers and sisters...God uses you to bring his blessings to them.

To "walk in love" also means if someone is being selfish or crabby...do your best to forgive and love. God understands. He will take care of you. It blesses Him when you do this...even when others completely don't deserve it.

[LINKS 1. L:1-3 2b. Top 10 Most Stunningly Beautiful Birds In The World \(8min\)](#)

[LINKS 1. L:2-3. 1b. BONUS! Slow Motion Raptor Strikes \(6min\)](#)



6a.. Devotion: 10m

Read this devotion in MF in Devotion #1. This may be difficult to understand. If so, ask your mom or dad or bigger brother or sister to explain it. Write a way it applies to you. If your teacher or parent wants you to read from Louie Giglio's book "Indescribable" . Write your response here, too.

Feathers from Red Blood



6b. Drawing: Hawk Toes or Falcon (20m)

Draw and color the toes of a hawk. Draw the whole foot if you want. Google a picture... Or draw a whole falcon [WATCH ME HERE](#)

Write each caption below in your words on this sheet's back.



7a. Primary Flight Feathers' Zipping

Do you see the parts of the feathers here that aren't zipped together? All the flying birds of the world can re-zip their feathers.

Unlike planes, birds are constantly having their feathers damaged by flight through trees and other things. Being able to re-zip their feathers is critical for birds to be able to keep flying. Being able to re-zip feathers is one of God's very clever inventions. And it's quite amazing when you see how it works under a microscope!

7c. Eye Feathers (Orbital Feathers) (below)

Look carefully at the owl eye below.

Do you see the direction of each tiny eye feather here? Each one is angled at a slightly different angle to keep the feathers out of the owl's eye and create the round part around the owl's eye. This round part is called the "orbital disc".

What would happen to the owl if the feathers grew crooked and covered its eye?

The feathers grow the right direction, don't they? How do they know what direction to grow?



7b. Turkey Bronze Feather (Try hard to understand this!)

This is a wild turkey "bronze feather". It is an amazingly beautiful feather. It makes its shimmering gold color by mirrors that stick out from the barbs. (Barbs, remember are the "feather strings" growing out from the main clear shaft (the rachis).

Imagine if you shined a flashlight on a mirror a friend is holding in a dark room. Wouldn't it be a bit freaky if the light shining off the mirror hit the wall on the other side of the room was gold colored?

THIS IS ACTUALLY EXACTLY WHAT IS HAPPENING WITH THIS TURKEY FEATHER.

White light is not actually white, believe it or not. There is actually not one speck of white in the universe. All white is actually rainbow colored and your brain makes up the color white.

When the rainbow colors of your flashlight's white beam hit the tiny 100,000 mirrors in the turkey feather, these precisely built mirrors destroy red and blue light and other light and create the color of gold. Isn't that astonishing? It's called "thin-film interference." Wild!

God knew exactly how to create this blessing in this amazing feather that He wanted to give us. In the same way, He knows exactly how to create the blessings of words, gifts, songs and actions He wants you to give to others. You were never intended to live this incredible adventure alone. He alone makes us adequate every new moment. 2 Cor.2:5) The ENTIRE secret is to stay close to Him...to abide In Him, and let Him bring to pass what He intends as you walk with Him.

"For we are his workmanship, created in Christ Jesus for good works, which God prepared beforehand, that we should walk in them." Ephesians 2:10



This is one of the amazing feathers in the "Mighty Feathers Experiment Pak"

To Pak

SUPPLIES

- BINOCULARS (optional)
- RECORDER (optional)



PROCEDURE

Today begins your bird hunt. Your goal is to find 24 birds and watch them. You do not have to know the names; a description is fine. But it's easy enough to find a list of local birds and a picture of each on-line. Here are a few details.

1. BIRD CALL

You do not need to record them. This is for bonus credit. But you need to try and hear each one and try to describe their calls (quick) and songs (longer melodies).

2. FLIGHT PATTERN

Some birds, like ducks, "power flap". They start flapping and keep steady on as they climb. Some like jays, flap/flap swoop. Others burst...flap really fast then stop, like finches. Pelicans "motionlessly glide" over updrafts. Swifts "Quick cut" as they glide. Try to describe the flight patterns you see.

3. HABITAT

There are different ecological zones your birds will be found in. It's great if you know the names of these; but a little description will be fine. For example, you could list 4 plants in one: Sycamores, reeds, oaks, poison oak.

4. BEHAVIOR

It's great fun to notice unusual behaviors your birds have. This takes time. You won't do this in a day. But it's a great activity to stretch throughout the year!

NAME./ DATE/ PLACE	CALL or SONG	HABITAT	FLIGHT PATTERN	BEHAVIOR
1.				



Go out into your neighborhood and into the wilds and identify and record 24 birds. Write their names here. Make an abbreviation for each different location. list one behavior that you see..or flight pattern..anything unique. Date each.

NAME./ DATE/ PLACE	CALL or SONG	HABITAT	FLIGHT PATTERN	BEHAVIOR
1.				
2.				
3.				
4.				
5.				
6.				



As a reminder. For Bird calls and songs, you do not need to record them. This is for bonus credit. But you need to try and hear each one and try to describe it.

NAME./ DATE/ PLACE	CALL or SONG	HABITAT	FLIGHT PATTERN	BEHAVIOR
7.				
8.				
9.				
10.				
11.				
12.				



For Flight Motions: Some birds, like ducks, “power flap”. Some like jays, flap/flap swoop. Others burst...flap really fast then stop, like try finches. Pelicans motionlessly glide over updrafts. Swifts “Quick cut” as they glide. Try to describe the flight patterns you see.

NAME./ DATE/ PLACE	CALL or SONG	HABITAT	FLIGHT PATTERN	BEHAVIOR
13.				
14.				
15.				
16.				
17.				
18.				



For Habitats: There are different ecological zones your birds will be found in. It's great if you know the names; but a little description will be fine. For example, you could list 4 plants in one: Sycamores, reeds, oaks, poison oak.

NAME./ DATE/ PLACE	CALL or SONG	HABITAT	FLIGHT PATTERN	BEHAVIOR
19.				
20.				
21.				
22.				
23.				
24.				

SUPPLIES

- Scissors
- Glue
- Tape
- Creative Stuff

We're watching you. No messing around!



PROCEDURE

An Overview

Today's activity is to build what we call a 3-d Flat Model. It is the "experiment" in Mighty Feathers with the Wings Icon that is titled "3-d Feathers". We summarize it here, but greater details are on the journal pages you go to if you click the icon. There you will also see many examples. You need to look at these. You must make yours good-nuff to show your grandkids some day. :)

You may build your 3-d flat model on the next 4 pages in this printable, or you may get heavier weight paper and build one page or many pages with this paper type.

The montage should be gathered from your photos, magazines you cut out, or screen shots you gather and print from the web—or all three.

This montage can take between 1 and 10 hours. You can make it 1 page or many, depending on the size of the images you chose to use. Very small images might use 1 page.

1. Getting Your Base.)Your "base" is the 4 pages following or different weights of paper or?

You'll possibly be putting your creation into a sheet protector and putting it into your Sci-notebook. Your "base"—whether it be paper, heavy card stock paper, plastic, a thin sheet of wood, piece of metal, or plastic—has to fit into a sheet protector. You can keep your "base" rectangular (8"x11") or cut it into shapes that you tape into place in a sheet protector.

If you want larger images, you can have two or more 8"x11"bases and put them in sheet protectors back-to-back. (All this is if you opt to not use the following pages in this printable.)

2.Spiffing up Key Images

In this 3-d model, you will have many KEY images on the "base" that you will "spiff up."

3. Adding Picture Details

Make your images of anything or all things about birds. You can copy these, print these or freehand sketch, paint or draw these. You can even add additional pics you get from the web. For resizing an image, do this. (Command shift 4 on a Mac gives you a cutting screen-shot tool on the Mac. Pasting a screen shot on a "Pages" or "Google Docs" page gives you the ability to shrink/expand it. If your screen shot image has a strange "bar" attached to the bottom when you drag it into a Pages document on your computer, drag it from your desktop **onto the white border around your paper** (in Pages). **DON'T DROP IT IN THE MIDDLE OF THE PAGE.**



PROCEDURE

4. Snazzing It Up

Once you get all your desired images and they are the size you want and are printed and cut out, THE NEXT GOAL IS TO PASTE OR TAPE THEM INTO PLACE AND DECORATE AND SNAZZY UP YOUR CREATION AND MAKE EACH PART “3-d”. Do this by having many of the parts rising 1/16”-3/32” off the paper.

NOTE: If you chose to make a collage over the next 4 pages we provide in this printable, making it 3-d can be skipped. Unless you can put the “3-d” images into a sheet protector, it’ll be tough to keep them from being damaged.

If you chose to not make it 3-d, then still add many creative touches, like using varieties of paper, materials etc. You may also add drawn pictures that you make. Or glitter or a 1000 things

5. Snazzying Up The Details

You could make some “fun parts” of your 3-d Flat out of home-made shrink-dinks, others out of torn tissue paper or aluminum foil. Anything goes. You can use spaghetti pieces, thin wire, yarn, pipe cleaners or ribbon for lines and other decor.

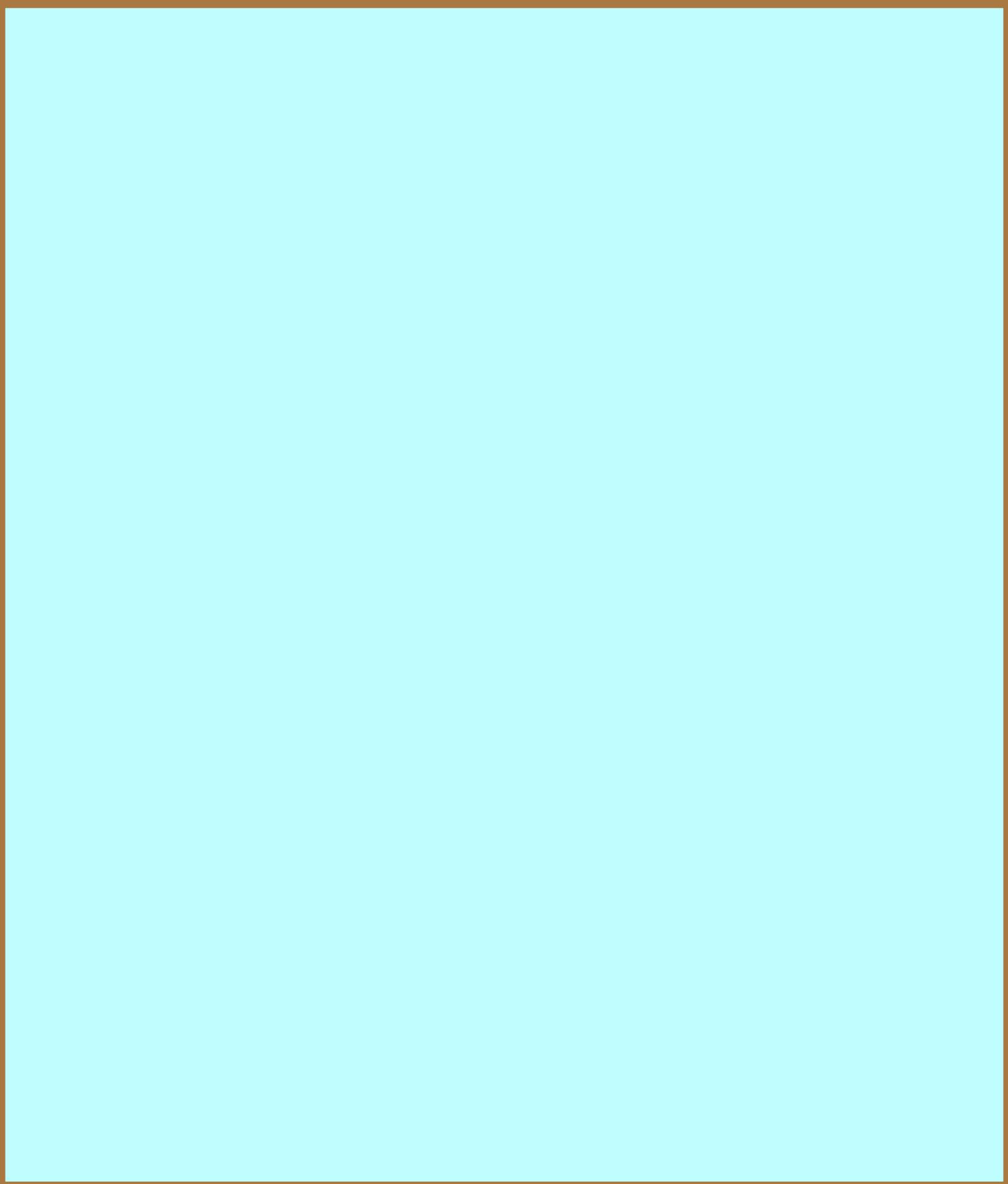
Candy sprinkles, colored sugar, m&m’s, colored sand, cooked-cut-dried pasta can add fun if you glue them on... You can also add string, cut pen parts, hardened beads of hot glue, pipe cleaner pieces, puff balls, glitter paint, UV paint made from markers (see UV Experiment), etc.

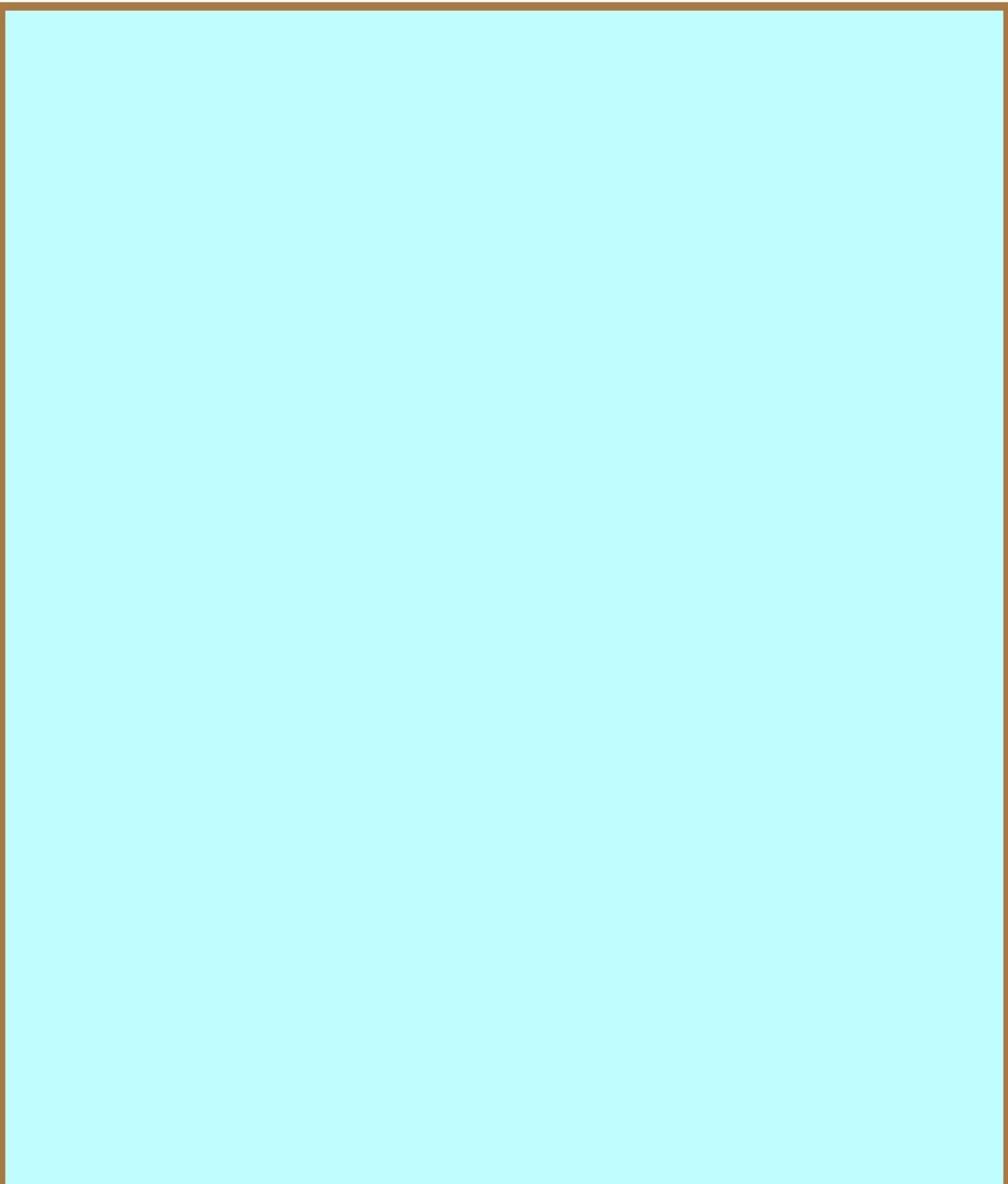
6. Cleverly Raiaing the Images

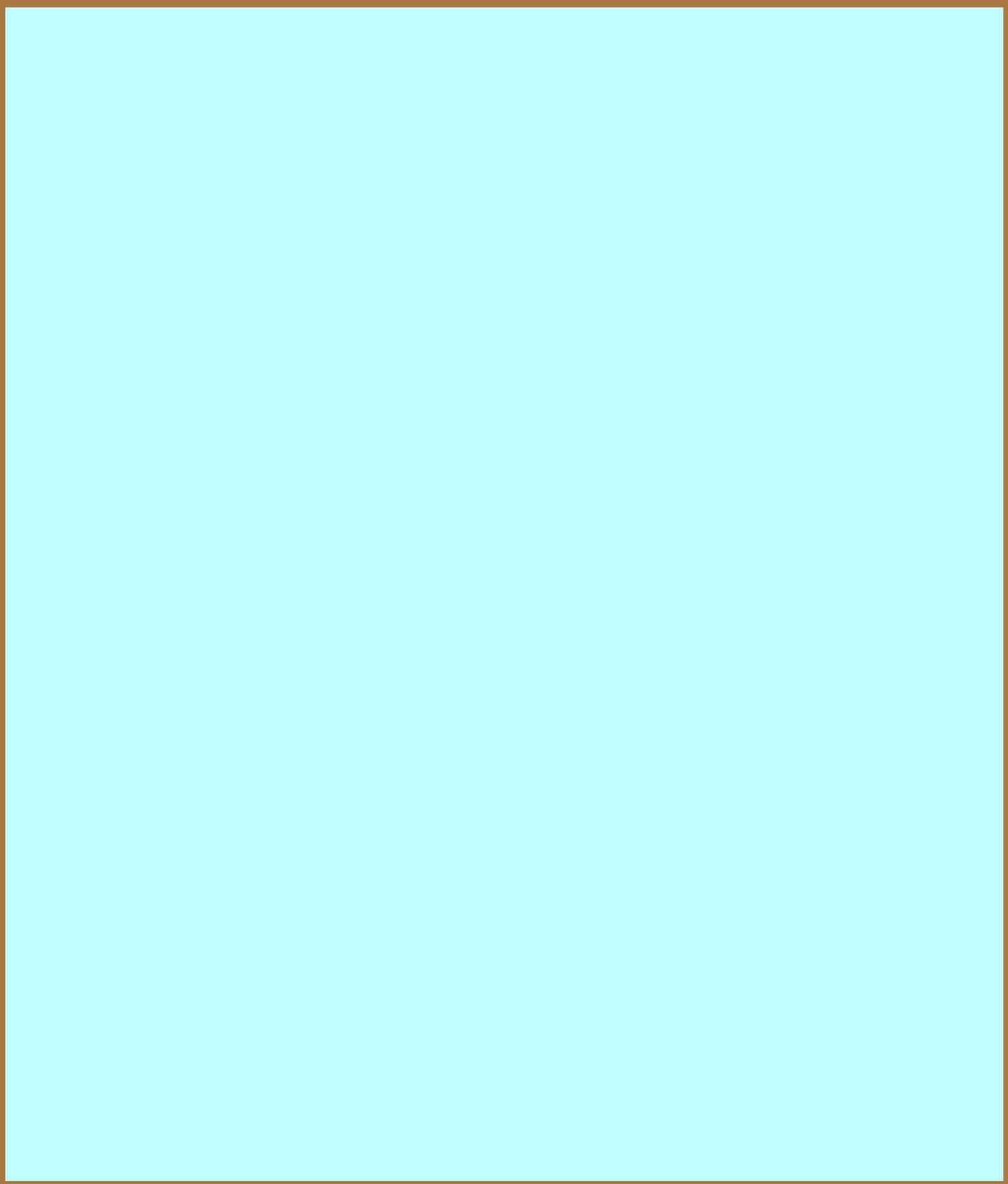
Lift some of your pics by putting a small piece of styrofoam from a hamburger carton from a fast food place behind it. You can use foam you can buy from a craft store.. You could cut 10 pieces of aluminum foil to raise it 1/8 inch or fold paper to make springy parts. You can add widows like an Advent calendar. You can make borders for images out of pipe cleaners, or cut aluminum foil etc.

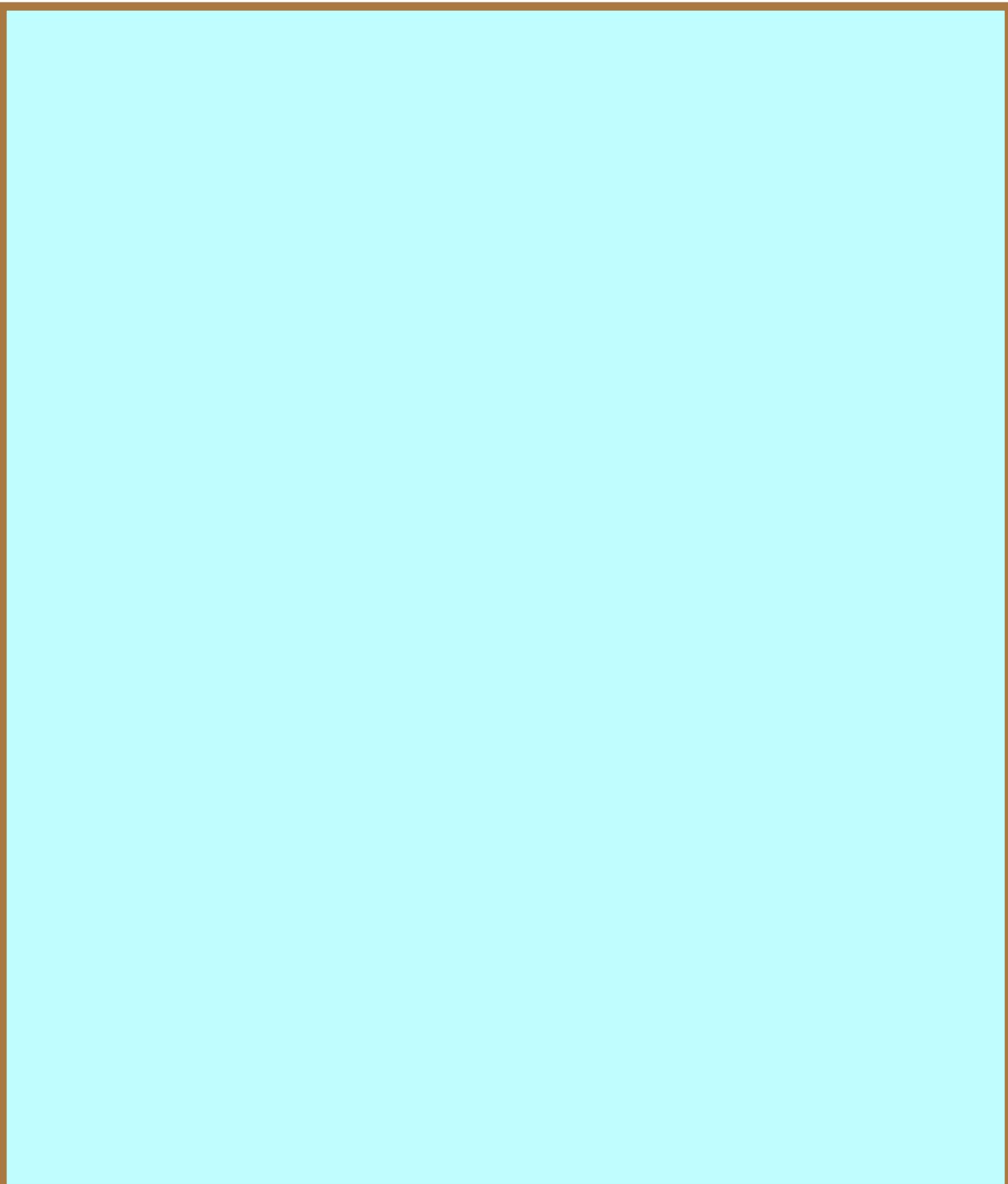


Be brave! Tell your group or family what your creation is all about!









SUPPLIES

See the UV Experiment pages



PROCEDURE

INTRODUCTION:

This is an exceptionally fun group of experiments. You need a decently powerful UV light to do them. We have one that comes in the Mighty Feathers Experiment Pak. If you really enjoy birds and love fascinating experiments, we'd encourage you to get a Pak. It's very affordable and you get LOTS of things. *We think it's the most value for cost experiment Pak on the planet!*

These pages here do not give the directions for the experiments. These pages are just to record your results for a few of the UV experiments and fun activities.

PROCEDURE #1:

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

GENERAL QUESTIONS ABOUT UV LIGHT: (Use Wikipedia or ?)

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?)

SUPPLIES

See the UV Experiment pages

Your results from your investigating with things mentioned in the box on the right.



What Does & Doesn't Fluoresce w/ UV Light

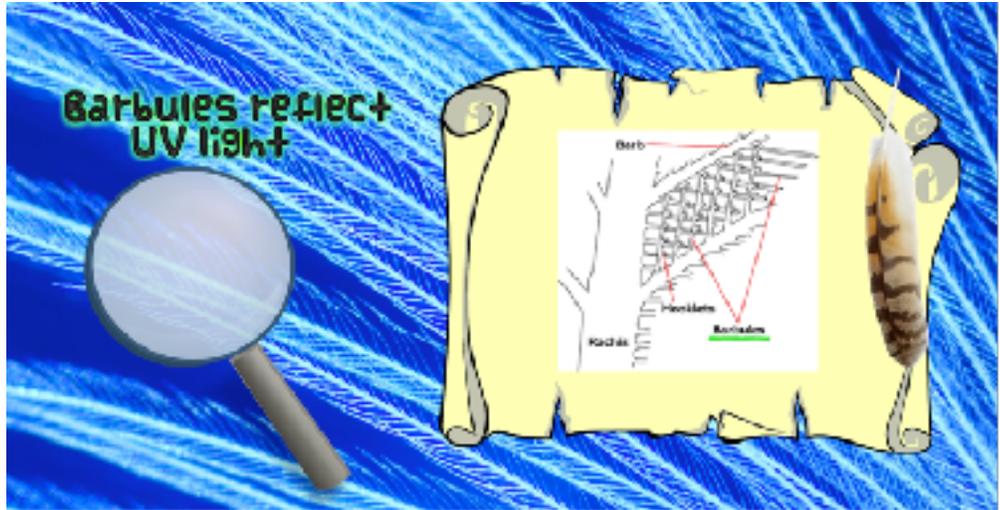
Does

Doesn't

PROCEDURE #2:

1. Find 20 objects that re-emit photons we can see when a UV light shines on them: (This is fluorescence.) Ideas include:

- 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.



ANSWERS FOR UV POLY SPHERES. Pg.5
(Spheres are in the Pak.)



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?



ANSWERS FOR UV EGG. Pg.3



QUESTIONS

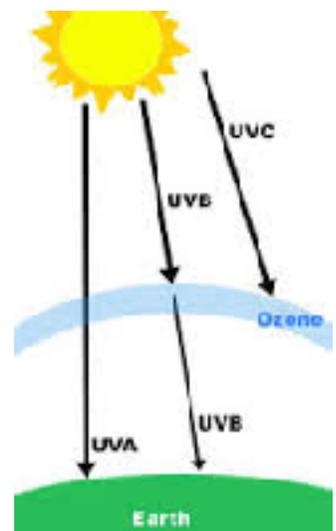
1. For the egg to glow, what had to be true about the size of the glow molecules and the size of the openings (the “gateways”) in the membrane into the interior of the egg?
2. Did the UV dye stay in the passages of the main membrane that you dried or did it only coat it? Did the marker dye make it into the yoke?
3. What might be true about the size of the membrane “gates” in the membrane surrounding the whole egg versus the membrane surrounding the yoke? **Think**

ANSWERS FOR UV TESTING. Pg.7

QUESTIONS:

Classify each item as Great/ OK/Poor in its ability to block UV.

1. Glass 1:
2. Glass 2:
3. Glass 3:
4. Glass 4:
5. Glass 5:
6. Sun Block SPF ___:
7. Sun Block SPF ___:
8. Plastic 1 Wrap around something you buy
9. Plastic 2 Saran Wrap:
10. Plastic 3 U Chose (thicker)
11. What kind of UV does glass block? (UV-A or UV-B?)



1. Feather Collection

See this activity in the Experiment Section of Mighty Feathers.



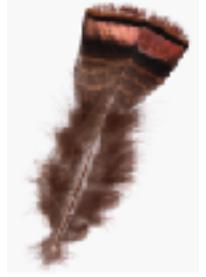
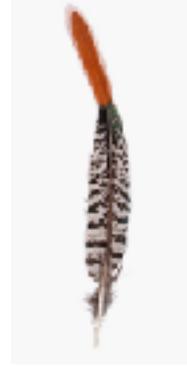
To Pak

a. Get a can with sand in it or vase to show your feathers on your dresser or window sill. Acquire 30 or more different feathers including the feathers below. Checkoff your specialty feathers here.

- 1 parrot feather with feathered edges and one with dots & 1 black and white one
- 1 with a strength ridge in the quill & 1 wild pheasant feather & 1 blue feather
- 1 long 2' or longer feather & 1 red-tipped lady amherst feather
- 1 with 1 design on 1 side of the quill and another on the other side.
- 1 with barbs with at least 4 different colors
- 1 seabird feather
- 1 wing or feather pelt
- 1 total down feather
- 1 very strange feathery
- 5 3+ colored mini-feathers

1. Feather Collection (cont.)

b. Draw a simple picture of 5 of your best feathers that aren't in the Mighty Feathers Experiment Pak.

A large, empty rectangular box with a thick black border, intended for drawing.

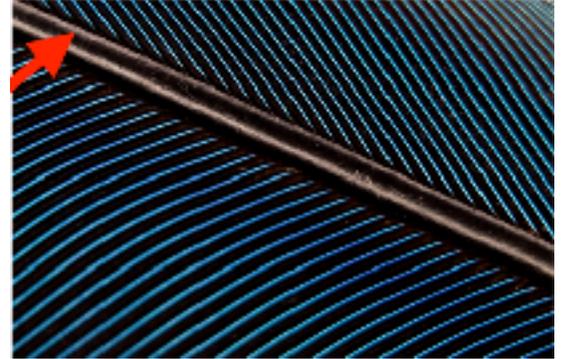
2. Dollar Cup

Day 13,14 p.3

a. Do this Dollar Cup experiment as described in the Experiment section of Mighty Feathers.

b. Draw a picture of the Rachis Groove (also called the “ventral groove”) of a primary flight feather. (See the picture and the red arrow below.)

Label the rachis, the barbs, and the vanes.



A large, empty rectangular box with a thick black border, intended for drawing and labeling the feather structure.

3. Peacock Feather

a. Do the Peacock experiment as described in the Experiment section of Mighty Feathers.

b. Draw a picture of the Peacock Sword Feather. You can look it up online or see it in the Mighty Feathers Experiment "More info" page. It is the green feather. A good bonus activity is to do a report on Isaac Newton.



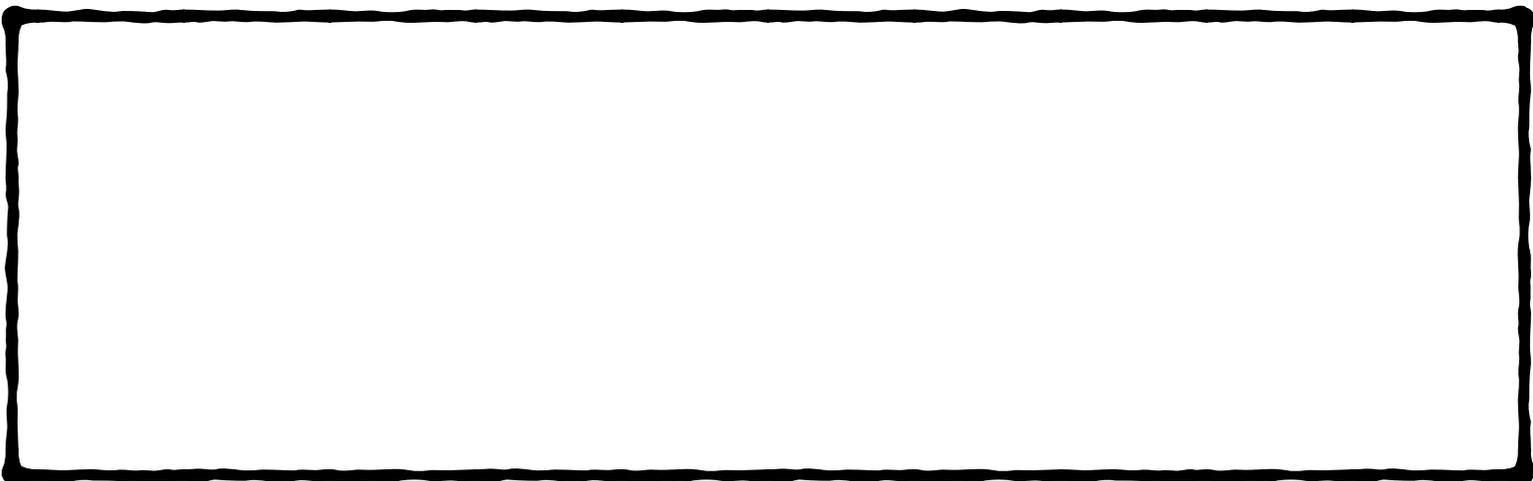
The Peacock Sword Feather



4. Bird Engineering & Rachis Designs

a. Do this experiment as described in the Experiment section of Mighty Feathers. You will need help from Mom or Dad.

b. Draw a picture of your unique rachis design of your feather here.

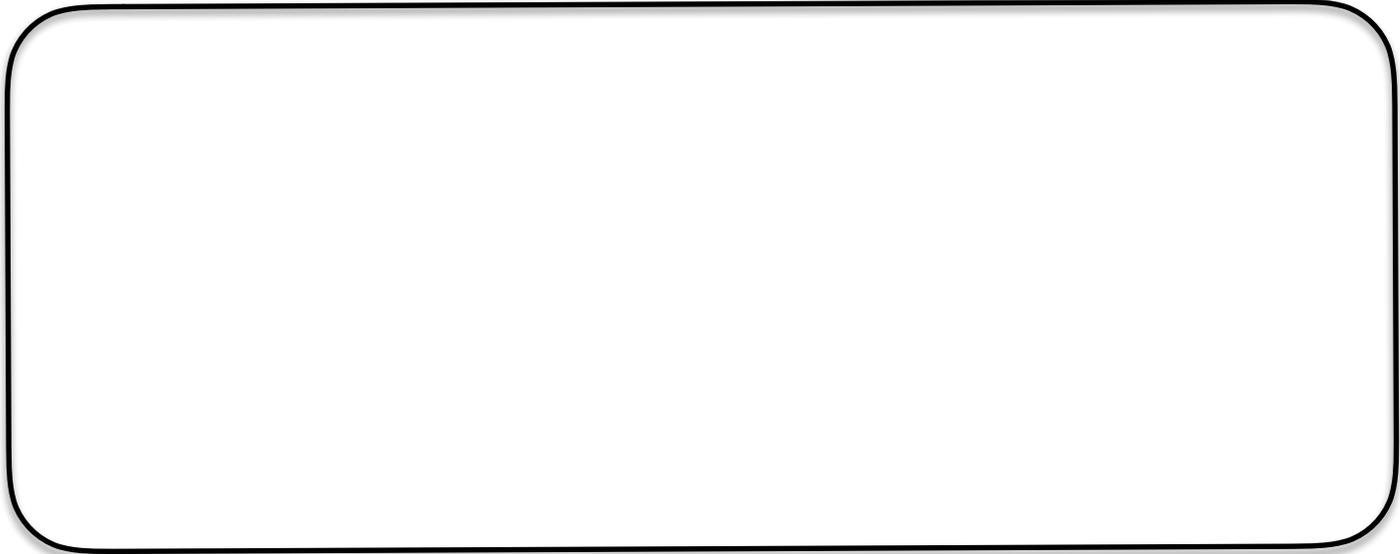


1. Watch and Write: 2 slices (20 m)

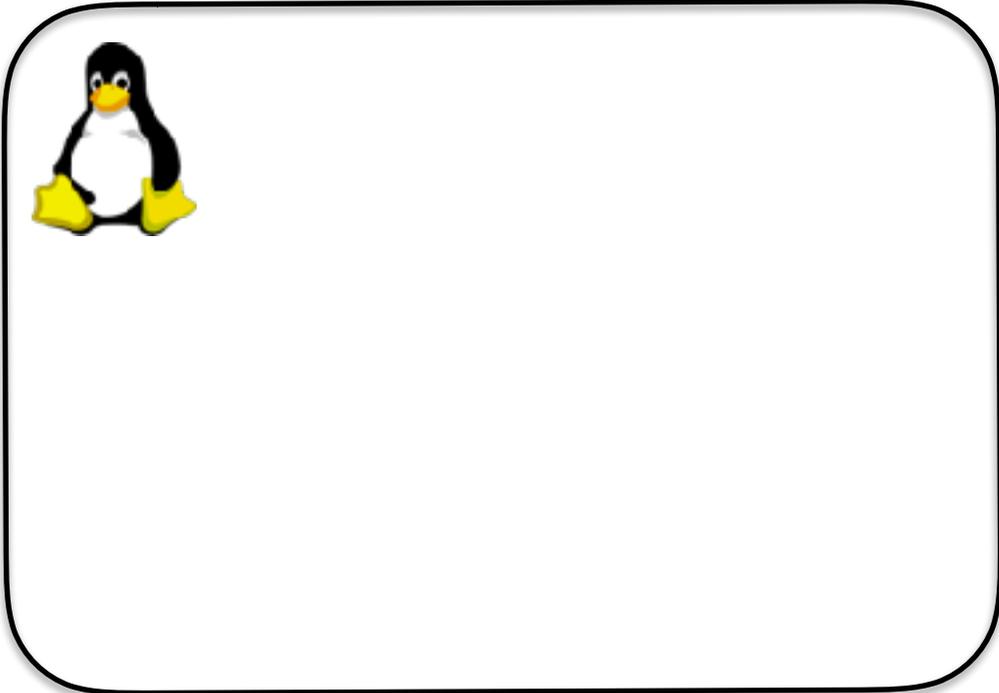
Watch the 2 slices for today two times. These are a review from before. We want you to know these well!

After the second time watching, **TAKE THE QUIZ** about each slice that comes after the slice. Try to do it by memory. Next: Draw one concept picture from each slice. These tell something interesting.

Mighty Feathers Part 1 2.5m



Penguin Micro-Bubbles 3 m



“Finally, brethren, whatever is true, whatever is honorable, whatever is right, whatever is pure, whatever is lovely, whatever is of good repute, if there is any excellence and if anything worthy of praise, dwell on these things.”

Philippians 4:8

God’s instruction for us is to think upon the true, honorable and right things– the things of beauty which are worthy of praise. This has its roots in God’s power. God is saying, “I’m bigger than everything; Think of Me and the things I have made like beautiful birds. Also think on the things I am doing. I can triumph over *anything*; *I can win any battle.*”

2. Drawing: Budgie or ? 20m

Take Your Pick!

1. Draw a Budgie Parakeet

<https://how2drawanimals.com/8-animals/115-how-to-draw-a-budgie-parakeet.html?start=3>



2. Draw a Penguin

<https://lifestyle.howstuffworks.com/crafts/drawing/how-to-draw-a-penguin.htm>



3. Draw a Pelican Cartoon

<https://www.drawinghowtodraw.com/stepbystepdrawinglessons/2011/01/how-to-draw-cartoon-pelicans-step-by-step-drawing-tutorial/>

Day 15,16

p.2



4. Draw a Parakeet

http://www.hellokids.com/c_27383/drawing-for-kids/drawing-tutorials-step-by-step/animals/how-to-draw-a-parakeet-for-kids

"I have been crucified with Christ; and it is no longer I who live, but Christ lives in me; and the life which I now live in the flesh I live by faith in the Son of God, who loved me and gave Himself up for me." Galatians 2:20

Wild results!

When we trust the God of the Universe who gave His only son Jesus on the cross for us, we are trusting the most powerful Being in the Universe. There is NOTHING and NO ONE wiser to trust in!

3. Watch and Draw: 2 Links (30m)

Day 15,16

p.3

Watch the links below. Make a simple mind map about each. You may also just write two facts if you prefer or draw a picture.

Google "Science mind maps" for examples. You do not need pictures like this example unless you want. <https://www.mindmapart.com/chemistry-mind-map-jane-genovese/>



LINKS 1. 2a. [MACAWS In SlowMotion! Rainforest Research!](#) (8min)

LINKS 1. 6b. [BONUS! Bird Feathers "Sing" | National Geographic](#) (1.5min)

4a. Devotion: (20 m)

Read this devotion in MF in Devotion #1. This may be difficult to understand. If so, ask your mom or dad or bigger brother or sister to explain it. Write a way it applies to you. If your teacher or parent wants you to read from Louie Giglio's book "Indescribable", write your response here, too.

Eagle Landings and their Inventor



4b. Drawing: 4 Feathers. Pt. 1. 30 m)

Draw and color the four feathers above-right with as much detail as you can. Be sure to add some faint lines indicating the direction of the barbs.

5. Bird Fun: Origami (30 m)

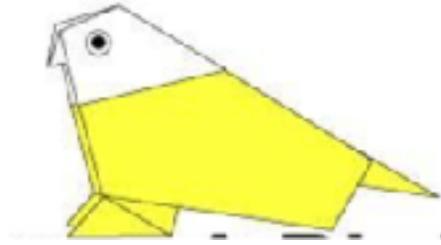
Have some fun making some origami birds!

Day 15,16 p.5



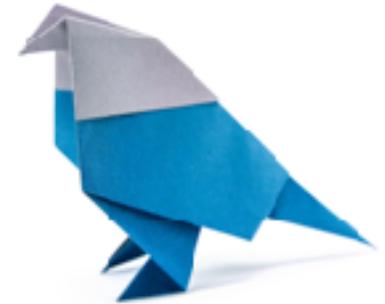
Peacock with Spreading Feathers

<http://www.origami-make.org/origami-peacock-spreading-feathers.php>



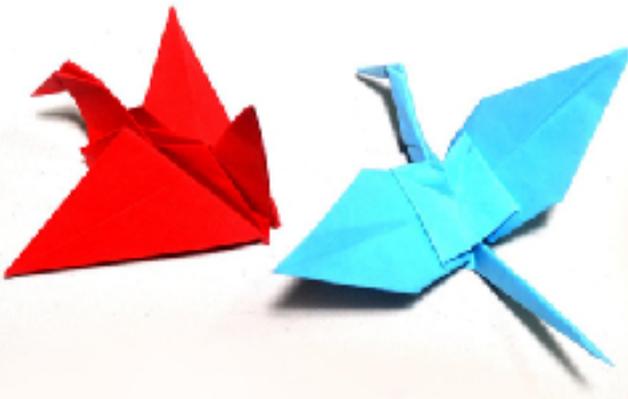
Parakeet

<https://i.pinimg.com/originals/93/fa/f2/93faf2cb4ad679f384c14057e67eeeca.jpg>



Blue Jay

<https://origami.guide/origami-animals/origami-birds/origami-bird/>



Flying Crane

<https://www.wikihow.com/Make-Origami-Birds>

<http://www.origami-instructions.com/origami-crane.html>



Owl

<https://www.wikihow.com/Make-an-Origami-Owl>



Hummingbird

<https://www.youtube.com/watch?v=gn2iLmwvZPk>

<https://www.youtube.com/watch?v=648edMxpPDc>

6. Bird Fun: Crossword Puzzle (10 m)

Day 15,16

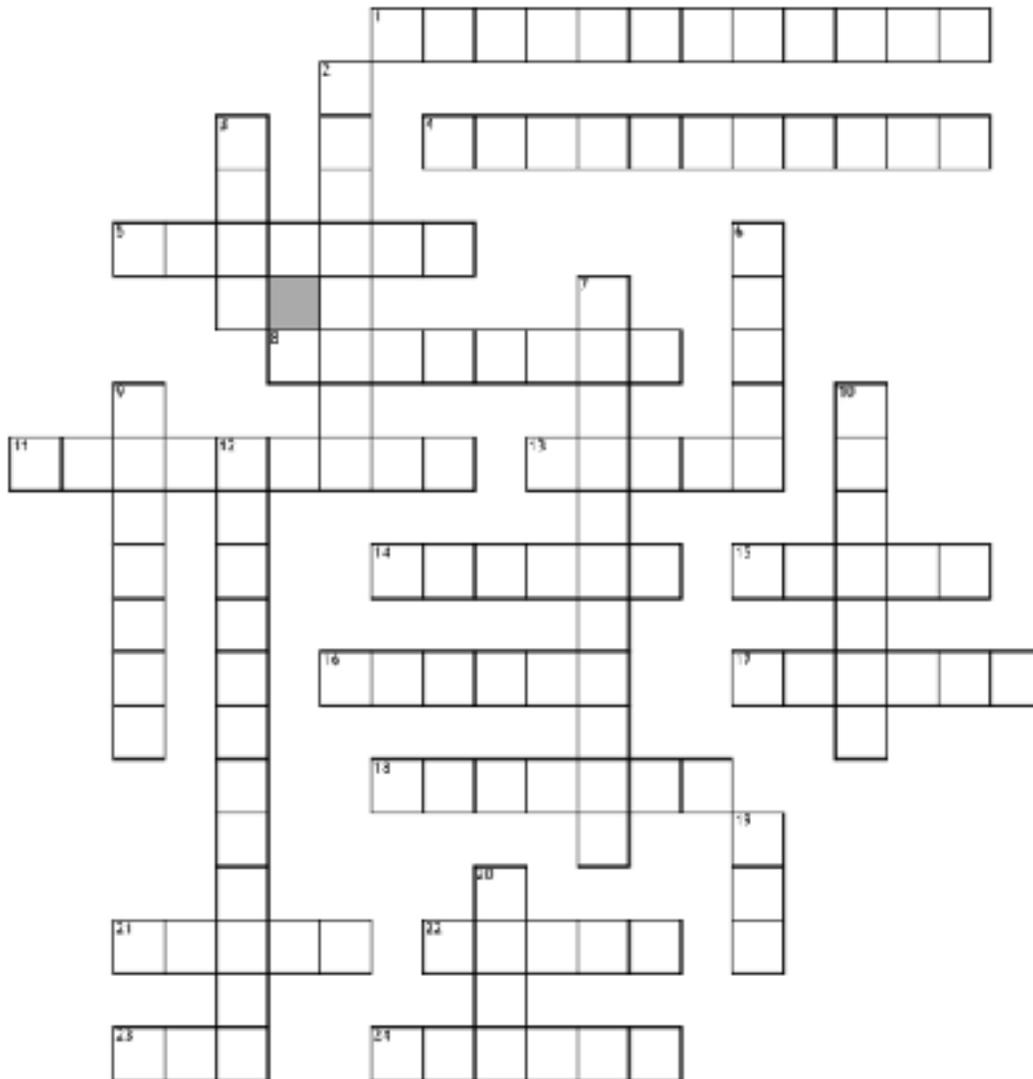
p.6

Give this Crossword Puzzle a try.

(For the answers, they are in the CrosswiredScience.com "Parent Section".

The only way you can access these pages is if you subscribe to the science website. Sorry, this is the only way we can secure the answers.)

Birds First Timers



“Trust in the LORD with all your heart And do not lean on your own understanding.”

Proverbs 3:5

God wants us to trust Him without stopping. This brings excitement...Why? Because we became connected with the things God does. And there is no telling what the Creator of the flying bird wonders will do next!

Across

1. Penguins make these to create a bubble tunnel to swim faster through. m_____
4. Many birds can see this color of light that we cannot see. u_____
5. The chief feather for flight which are found at the end of wings. p_____
8. These are tiny parts of the feather that can zip together. b_____
11. The alula feathers help birds to land e_____.
13. The manakin bird can move its wings faster than the speed of s_____.
14. This part of feathers is the main shaft. r_____
15. These are the feather strings that come off the feather shaft. b_____
16. The turkey feather that glimmers with a gold color are the turkey b____ feathers.
17. The part of the bird where bird songs and calls come from. s_____.
18. Some feathers d_____ light to make colors.
21. This animal's horn is made of the same protein that feathers are made of. r_____
22. Two to six feathers on the front edge of bird wings that help them to land better and climb at steeper angles. a_____
23. Tiny shafts where feathers are formed are p____ feathers.
24. Egrets and herons make cleaner powder with the tips of their d_____ feathers.

Down

2. This type of bird has the world's longest feathers. p_____
3. The hummingbird's "swooping sound" comes from feathers located on its t_____.
6. Feathers that have blood in them that give the feather food to grow as the feather is being built are b_____ feathers
7. Particles are shot into the air or bubbles in the water and a laser scans them and computers study how they move in Particle Image V_____.
9. All feathers are made of this protein. k_____
10. Peacocks' feather color comes from tiny m_____ on the feathers.
12. 10 g's is the a_____ of humming bird as they dive.
19. The world's longest feathers are s_____ feet long.
20. This part of a cat is made of the same substance as a feather is. .c_____

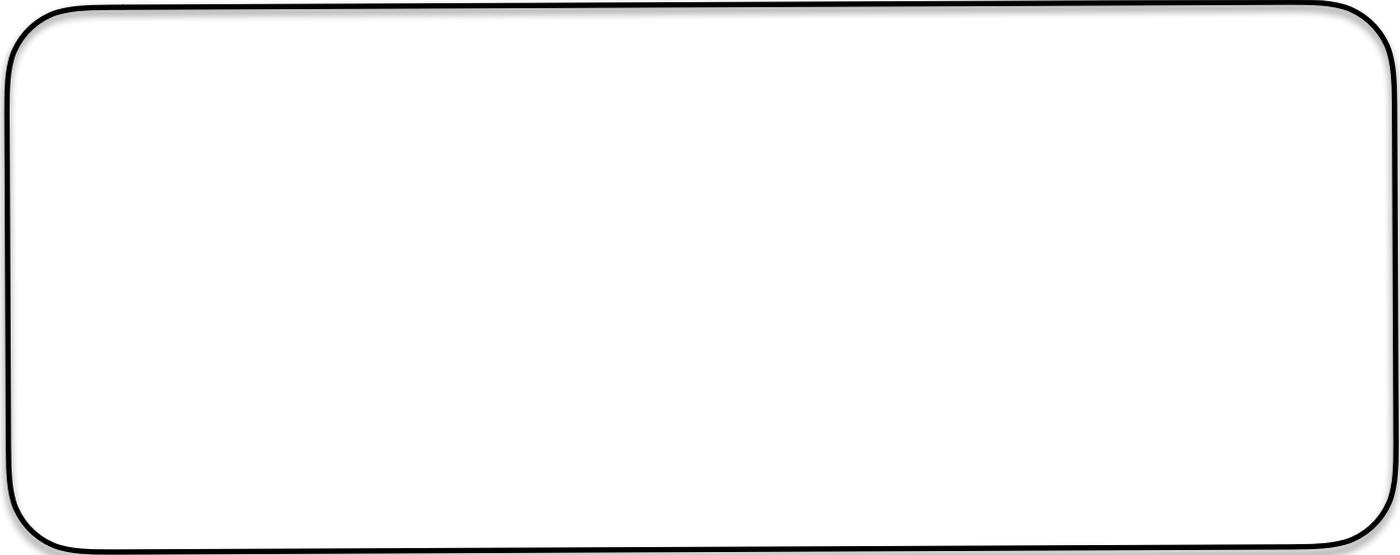
1. Watch and Write: 2 slices (20 m)

DAY 17,18 p.1

Watch the 2 slices for today two times. These are a review from before. We want you to know these well!

After the second time watching, **TAKE THE QUIZ** about each slice that comes after the slice. Try to do it by memory. Next: Draw one concept picture from each slice. Concept pictures tell something interesting.

Mighty Feathers Part 2 2.5m



Hummingbird Mating Dive 1.5m



"Worthy are You, our Lord and our God, to receive glory and honor and power; for You created all things, and because of Your will they existed, and were created."

Revelations 4:11

God not only created hummingbirds and feathers,
He created the atoms that make everything up.

Get your directions for the day from Him...and also get the plans for your months and years to come.

2. Drawing: Hawk 30m

DAY 17,18 p.2



1. Draw a realistic hawk:

<https://design.tutsplus.com/tutorials/how-to-draw-a-hawk--cms-31764>

2. Draw an easier one.

<https://www.youtube.com/watch?v=g8yxCGzNcI8>

3. Draw a fun one.

<https://www.youtube.com/watch?v=g8yxCGzNcI8>

“Rejoice in the Lord, always, again I will say rejoice.”

Philippians 4:4

When nothing goes as planned in a day, it's good to remember to rejoice the Lord. Why? Because God created visible signs of His love like the birds you see each day.

He dealt with all their issues in keeping them going...He knows your struggles too.

And He knows how to deal with frustrating situations...and how to make up lost time and opportunities.

“Rejoice ALWAYS.” 1 Thessalonians 5:16

3. Watch and Draw: 2 Links (30m)

Watch the links below. Make a simple mind map about each. You may also just write two facts if you prefer or draw a picture. Use this sheet's back side if necessary.

Google "Science mind maps" for examples. You do not need pictures like this example unless you want. <https://www.mindmapart.com/chemistry-mind-map-jane-genovese/>

LINKS 2. L:1-3. [1a. Bird Molting](#) (4min)

LINKS 2. L:2,3. [6b. How To Clip A Parrot's Wings: Easy Steps!](#) (4min)



LINKS 2. L:1-3. [2a. Cute Parrots Videos Compilation #1](#) (10min)

4a. Devotion: (20 m)

Read this devotion in MF in Devotion #1. This may be difficult to understand. If so, ask your mom or dad or bigger brother or sister to explain it. Write a way it applies to you. If your teacher or parent wants you to read from Louie Giglio's book "Indescribable", write your response here, too.

Feather Algorithms



4b. Drawing: 4 Feathers Pt. 2 (20 m)

Draw and color the four feathers to the right with as much detail as you can. Be sure to add some faint lines indicating the direction of the barbs.



5. Feather Acrostic

DAY 17,18

p.5



The Rules:

You've learned a great deal about birds, their feathers and their flight. There still is a pile more to learn if you exhaust all that's on the Mighty Feathers Sci-goodie. But now's your chance to test your mastery of the six slices.

Go to this web page. <https://www.poetry4kids.com/lessons/how-to-write-an-acrostic-poem/> Go down to the ice cream acrostic.

Do you see how for the "I" the writer put "I love ice cream"? This is an "easy", used when something couldn't be found. Try to be a master and list powerful "interestables" (interesting info) for each letter.

M

I

G

H

T

Y

F

E

A

T

H

E

R

S



1. Watch and Quiz: 2 slices (15 m)

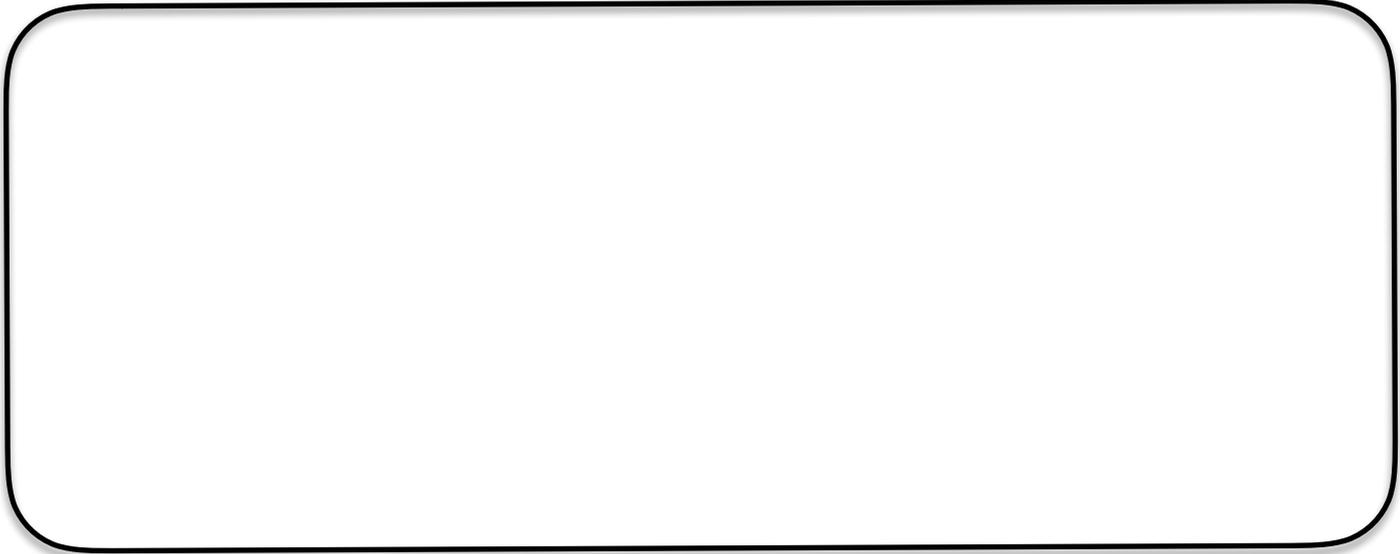
DAY 19, 20

p.1

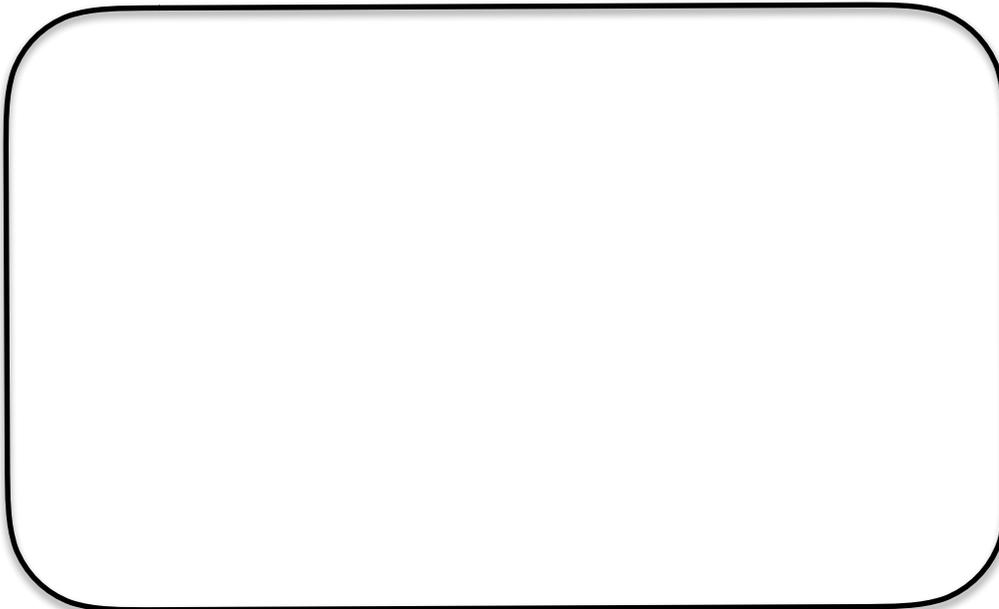
Watch the 2 slices for today. Twice. These are a review from before. We want you to master the material in these.

After the second time, **TAKE THE QUIZ** about each slice. Try to do it by memory. Draw one concept picture from each Slice. (a concept picture tells something interesting.)

Alula Feathers 3m



UV Birds 1m



***“You are precious in My sight. You are honored and I love you.
Do not fear; I will help you.”***

Isaiah 43:3,5

You are worth more to God than the entire universe.

It is so important that you understand your true worth,

And love others from the full assurance of your deep worth to the Creator of all things.

God created the hummingbirds as a gift to you.

If you were the only person on earth...He would have made them just for you!

2. Drawing: Macaw

Bonus

DAY 19, 20

p.2

Draw a Blue or Red Macaw: Bonus

You may draw a simpler macaw using the directions below or draw one from the web. Here are some directions:

Red

<https://how2drawanimals.com/8-animals/365-scarlet-macaw-portrait.html>

Blue

<https://how2drawanimals.com/8-animals/253-draw-blue-yellow-macaw.html>



“Thus says the LORD, "Heaven is My throne and the earth is My footstool. Where then is a house you could build for Me? And where is a place that I may rest? For My hand made all these things, Thus all these things came into being," declares the LORD. "But to this one I will look, To him who is humble and contrite of spirit, and who trembles at My word.”

Isaiah 66:1,2

The parrot with its fascinating face, agile flight and so fun antics and vocalizations is a gift of God to you. Let it and God's other clever birds remind you of His cleverness. It is an incredible joy to have God work clever wonders on our behalf. Be one who secretly treasures His words...so He can show Himself strong for you.

3. Watch and Write: 2 Links (20 m)

Watch the 2 links below. Make a mind map about each .
Google "Science mind maps" for examples. You do not need pictures like this example unless you want.
<https://www.mindmapart.com/chemistry-mind-map-jane-genovese/>
<https://how2drawanimals.com/8-animals/253-draw-blue-yellow-macaw.html>

LINKS 2. Two videos! Use the back side of this sheet for 1 mind map if necessary

L1-3. 1b. [Try Not To Laugh Challenge - Funny Birds 2017](#) (8min)

L2-3. 1a. [What Makes Owls So Quiet](#)



Q: What do you give a sick bird?

A: Tweetment.

LINKS 2. Two videos! Use the back side of this sheet for 1 mind map if necessary

L2-3. 1b. [Silence Of Owls](#) (2min)

L2-3. 2a. [Knocking E With A Feather](#) (2min)

4a. Devotion (10 m)

Read this devotion in MF in Devotion #3. Write several personal applications.

Lil' Bee Hummingbird And A Shakeup



Great Horned Owl

<https://design.tutsplus.com/tutorials/how-to-draw-an-owl-with-ink-liners--cms-28656>

4b. Drawing: Great Horned owl

Draw and color the owl detail as you can.

<https://design.tutsplus.com/tutorials/how-to-draw-an-owl-with-ink-liners--cms-28656>

AN IMPORTANT STORY ABOUT PUPPETS

Puppets and Ted Talks

Everyone needs to learn how to use puppets. They can be so fun and prepare you for ministry to children and even help you to really cut loose for public speaking, teaching or preaching sermons.

One of the CWS staffers was recently asked to do a Ted Talk. Five years before, he found a Frog puppet (shown here). It had an easy-to-move mouth.

He had some little guy classes of 4-6 year olds and others of 6-12 year olds. He was too intimidated to use the puppet for the older kids. But to his surprise, he discovered that the little ones loved the puppet if he just sat in a chair and held it and spoke...even though he couldn't move the mouth right.

More & More

He began using the puppet more and more for, at first, 1 minute shots... then 4-6 minutes shots. Then he had other helpers sit in chairs beside him. They began really clowning around. He eventually learned accents and caught on to all sorts of ways to be funny and to teach science ..as did his helpers.(The classes taught science to kids.)

He got so good at it that he could throw any puppet on his right hand and keep a group of 40 6-10 year olds completely fascinated for a few minutes at a time. And he never used stages like you generally see puppets used in. It was puppet-on while sitting in a chair with kids on the floor one foot away and in a tight group. Then go kinda wild..and then puppet off. He got good enough at it that he could draw two eyes and a smile face on a coke cup from McDonalds and keep a troop's attention.



He's called "Toad" But clearly he's a frog. :)

Folkmania Puppets

<https://www.folkmanis.com/146/home.htm>



So cute!!

You might find it easier, though, to have a puppet with an easy to use mouth to start with.



AN IMPORTANT STORY ABOUT PUPPETS (cont.)

One Day...

One day a gal with a master's degree from Oxford approached him. Her kids were in his class. She told him that they LOVED the class. She asked him if he could do a Ted Talk. He said no. Three years later, he finally felt the Lord saying it was time to take the challenge.

It was tough—37 drafts and 200 hours of hard work for the 18-minute-no-notes talk.

Early on the day he gave the talk, he prayed as never before..."Lord, use this talk to open doors for us to show kids around the world Your glory through the things you have made." Before he went on stage, he again poured out his heart behind the back curtain on the darkened stage asking God to move as never before with him.

He gave the talk. It went astonishingly well..thanks to the Lord's help...and partly, too, because he considered it important to be faithful to the Lord in his little puppeteering. As he spoke at the Ted Talk, the force he spoke with puppeteering came out..and the humor. The leaders of the event said it was the best talk of the best conference they ever had.

Now the world's opening up...all because of little days with puppets with precious kids.

Now You!

NOW IT'S YOUR CHANCE.

Make a 5-minute puppet show for kids. Use a stuffed animal if you don't have a puppet..Just have fun. Start with littles if you need to. In your journey, always remember that the children you reach out to are incredibly important to the Lord. Their whole families can be affected and greatly touched by Him. And don't think of it as the "day of small things." It's truly a day of wonderful things...Enjoy the journey profusely! Some of the beloved littles will become older beloveds whom you love deeply!



<https://www.folkmanis.com/146/home.htm>

1. BUILD A SMASHBOOK! 2 hours+

DAY21,22

p.1

Your goal for two days is to build a Smashbook on birds, feathers and bird flight. Just title it “Birds” or “Mighty Feathers”. The link below gives the official description of a Smash Book, but here’s our take on it.

The Rebel Scrapbook

A Smashbook is a scrapbook on steroids. You can basically do whatever you want and smash it altogether.

You can add parts of cut-out newspaper articles, magazines etc. Then add every kind of yarn, pipe cleaners, stars, toothpicks and glitter—basically anything that you’d use in a scrapbook. But there are several big differences.

1. YOU CAN ADD ANYTHING YOU WANT. IT JUST HAS TO SMASH TOGETHER.

You could add feathers, claws, owl pellet bones, etc. You could even add a nest if you wanted! But you’d have to do quite a job squeezing it! (Elephant step on it?) Probably, realistically, you’d want to add some of the straw and small sticks of a nest in it...making it more smashable. Smash-inees is key!

2. YOU CAN LET THINGS HANG OUT OF THE PAGES

Tidiness isn’t a rule with smashbooks. Things can go outside the pages. Things can hang out. Papers can shoot past the book edges.

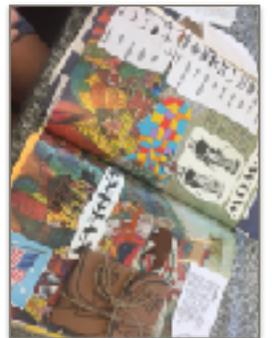
3. YOU CAN USE ANY BOOK YOU WANT TO.

You can get an old snazzy book, photo album, composition book or encyclopedia and begin popping all kinds of things on the pages. You can rip out all the pages but 20 and go crazy decorating and adding cool info onto these.

4. SUBJECTS CAN GO ANY ORDER YOU WANT AND THEY CAN BE TOTALLY MIXED TOGETHER.

Tight organization is NOT necessary. You can throw in 2 pages on nests then 10 on bird bills, then come back to 3 on nests and then off to birds wings. You can even come back to nests 10 more times as you explore new things.

The fun of this is that you can concentrate on making everything rich and fun and creative...and not spend all your time carefully organizing and reorganizing things.



Visit this website for ideas!

<https://www.muminthemadhouse.com/how-to-make-a-smash-book-scrapbook-for-kids-a-step-by-step-guide/>

Have fun!

“Bird Races” are meant to be fun and challenging. These can be done individually or as teams of two or more. You can have unlimited time or be racing against the clock. Your teacher will give you a topic or topics and make each a race to 10 or 20.

If you are doing this as classwork and not as a contest, we’ve assigned three topics for you. You’ll know which three by the apple 🍏. (See below also)

Look over the list of “Races” and then read the next gray box and we’ll explain how to do this.

The Bird Races!

1. Weird Eggs
2. Great Bird Dances 🍏
3. Strange Bird Behaviors and why they do what they do
4. Wild Nests
5. Very Different Flight Patterns
6. Very Different Terrestrial Birds (more time on land than air)
7. Different Owl Pellet Bones (do with owl pellets or online)
8. Exotic Birds 🍏
9. Crazy Feathers not seen on Mighty Feathers
10. Elephant Bird Facts
11. Different Eagles, Hawks, Penguins or Hummingbirds
12. Wildly Different Feet
13. Bird Lung Interestables (fascinating facts) 🍏
14. Bird Eyes Interestables (fascinating facts)



How Ya Do It

On the pages following you will see a couple sheets to use.////// Self-paced students see note below.

Your teacher will assign you a topic (s). You will then begin a mad scramble with your team to complete 10 or 20 of what your teacher assigns.

PICTURES AND WRITTEN:

Most of the Races involve pasting screen shots into the sheets below or ones of your own making. There is also some writing, either the name of something or its function or some details about it.

WRITTEN ONLY:

No topics need writing only. Even technical topics like “Bird Eye Interestables” ought to have some great screen shots as well as info.

When you are done, print your sheets and put them into your Crosswired Science notebook..

YOU NEED:

You need at least one computer per team. You need to make a sheet of your own on a document like Pages for Macs or whatever you like to use for PC's if you want to type onto it. The document you chose must have the ability to shrink and expand images. (the ones below cannot be typed onto.)

PRINT THEM OUT. KEEP THE FUN FOREVER.

You may opt to crowd all your color screen shots on a paper and print them on one sheet. Then you can cut them out and tape them onto a Mighty Feathers Sheet. You could then put your paper into a sheet protector and put them in a CWS notebook for an inexpensive keep-forever alternative.

SCREEN SHOTS

Hold COMMAND SHIFT 4 to give screen shots on a Mac.

GENERAL USE SHEET

We included a blank sheet at the end of this activity in case you want to vary the size of your images.

IMPORTANT TEACHER NOTE:

By increasing the search number to 20 items it is easier to get to deeper critical thinking and real hunting. Ten “finds” is easy; but 20 greats of any one topic make diligent searching necessary.

Self-Paced Students

If you are not part of a class but are on your own, you must do 3 hunts, the “Appled” ones on the first page. You must do this many of each...complete with screen shots.

2. Great Bird Dances 10 🍏

8. Exotic Birds 20 🍏

13. Bird Lung Interestables (fascinating facts) 10. 🍏

Bird Races Topic



Name:

Date:

Screen shots or drawings

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

Bird Races Topic



Name:

Date:

A large dashed-line rectangular frame occupying the majority of the page, intended for a student to write their response to the topic.

1. Polarizing Filters

1-2 hr

DAY25, 26

p.1

This activity will need help for younger children.

Polarizing filters filter out certain angles of light waves. This is why polarized sunglasses take away glare when you look at shiny surfaces. They are cutting out some of the light.

If you look at water like a lake that has a glare on it, you can't see into the water. But if you look through polarized sunglasses, the glare is no longer there and you can see the plants and fish underwater. This is why fishermen usually own a pair of polarized sunglasses!

Many birds can see polarized light and use it to accomplish incredible feats.



Write Ten Concepts about Polarized Light

From The Mighty Feathers Experiment Pages or Other Sources Below
(20 Concepts for Extra Credit)

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Polarization of Light UCLA

2 min. Dull. But informative.

<https://www.youtube.com/watch?v=E9qpbt0v5Hw>

Polarized Light

14 min.. Dull but good.

<https://www.youtube.com/watch?v=gP751qpm4n4&t=208s>

Polarized Light Articles Fascinating!

<https://www.polarization.com/viking/viking.html>

Do the polarizing light experiments listed in the Mighty Feathers Experiment section. Record your results here.

(NOTE: The answers to these questions are in the Parent/Teacher Section of the crosswiredscience.com website. The only way you can access these is by being a member. We are sorry. This is the only way we can secure the answers.)



Look at One Filter Through Another filter at a Computer Monitor

1. As described In the experiment pages on Polarization of Light, take one filter and look at another and look at a white compute monitor. Twist the one back and forth that is closest to your eyes like you are turning the adjustments on a pair off binoculars. What happens?

Look at Objects Through One filter at a Computer Monitor

2. As described In the experiment pages on Polarization of Light, take one filter and look at objects like the mica and the plastic fork, knife and spoon while they are maybe 6" from the monitor. What do they look like? What happens as you twist the plastic utensils slightly?

Build a "Tape Stack" and Look at It Through One Filter at a Computer Monitor

3. As described In the experiment pages on Polarization of Light, make a cut-tape stack. Take one filter and look at the cut-tape stack 6" from the monitor. What does it look like? What happens as you twist it slightly?

1. Wind Bag and Bernoulli's Principle 2+ hours

DAY27,28

p.1

This activity will need help for younger children.

This set of experiments is packed. Some are simple, others are much more involved.

The windbag is a fun one that you need to purchase. It's in the Mighty Feathers Experiment Pak, if you have it.



Daniel Bernoulli Info

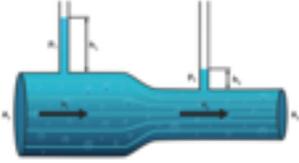
List 10 interesting facts about the life of Daniel Bernoulli from the Experiment Journal pages or from other sources.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Visit these websites for ideas!

<https://www.famousscientists.org/daniel-bernoulli/>

<https://www.thefamouspeople.com/profiles/daniel-bernoulli-4716.php>



Bernoulli's principle is one of those science laws that has a surprising amount of application in our lives. We'll look some of these applications here.

Bernoulli's Principle Concepts and Applications

List 10 interesting facts about the Bernoulli's Principle and its applications from the Experiment Journal pages or from other sources such as the videos mentioned in the Journal pages.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Visit this website from NASA for ideas!

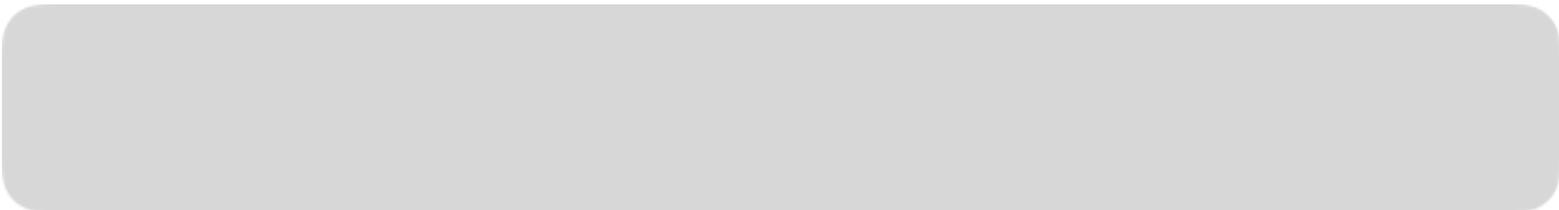
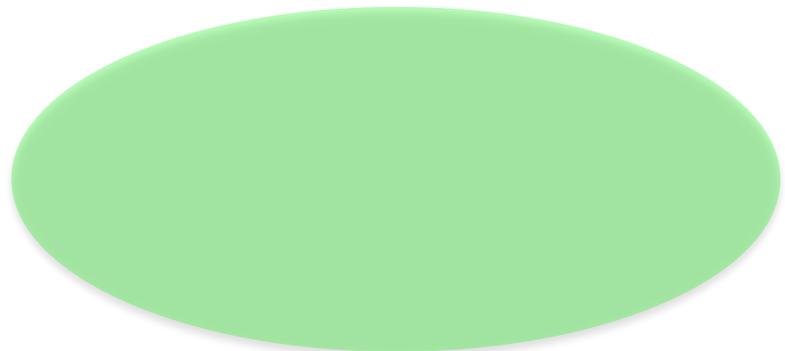
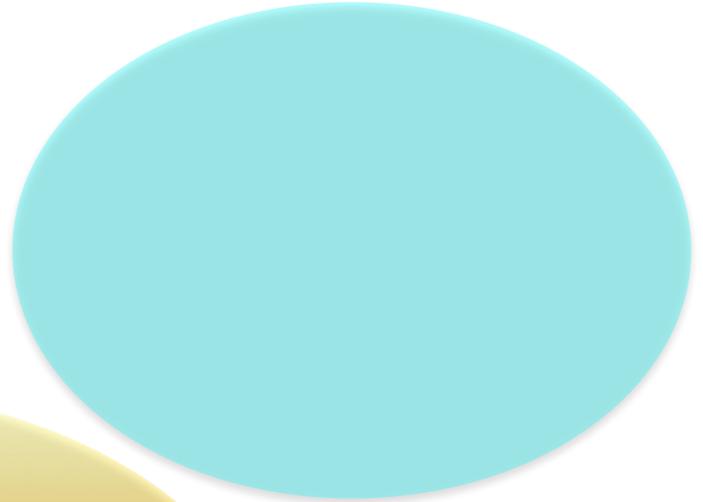
https://www.nasa.gov/sites/default/files/atoms/files/bernoulli_principle_5_8.pdf

Wind Bag and Bernoulli's Principle

DAY27,28

p.3

List your favorite Bernoulli's Principle's Experiments that you did from the dozens listed on the Journal pages. Describe them and tell your results. Use the back of this page if you need to.



There are a pile of other experiments...many of which have supplies in the Mighty Feather's Experiment Pak and many have ordinary supplies at home. These are your two days to go wild with them!

1. Here's a list of the Remaining Experiments

Check off the ones you do and state what you learn.

1. Talking Strings



2. Feather Rocket

BTW: In Fluid Dynamics in the Crosswiredscience.com website, we have a paper rocket. It's the highest flying paper plane/rocket in the world. It's stunning! And you build it from a piece of paper!

3. Spectroscope

4. Bubbles and Thin Film

This is the most comprehensive index for Bubble Making on the planet—in 8 pages!

***Visit this website for incredible science!
Crosswiredscience.com***

Here are a number more of MF experiments and activities!

Here's more of the Remaining Experiments

Check off the ones you did and write what you learned.

5. Water bird Whistle

6. Balance bird

7. Tornado Tube

8. Microscope Bird



*Visit this website for incredible experiments!
Crosswiredscience.com*

You know what 2 do!!!

Here's a list of still more of the Remaining Experiments

Check off the ones you did and state what you learned.

9. Orbees and Gravigoo



10. Jelly Crystals

11. Diffraction gratings

12. Rattlesnake Eggs

We love, love love pulling practical jokes on kids and adults in our Science Classes and Camps. It's a special thrill to get them to jump, dive for cover, or scream. This tiny little "experiment" does just that.

Visit this website for incredible ideas!
crosswiredscience.com

