Hi! I read all you Mail, the emails in the journal head over to www.nancysciencesclub.com, and download all the free
sciences, activities!!

You can also:
- Share your journal pages with other club members and see
  what they've been working on.
- Apply for a Summer Science Scholarship.
- Read and comment on the latest and new science news.
- Learn more about me! Or, meet other kids who are
  making a difference in our world.
- And much more...

Hope to see you there!

Nancy B.
From the mile-deep Grand Canyon to an ocean so blue you can see the bottom, our world is filled with fascinating wonders that are huge. But there is another world of fascinating wonders all around us that is so small we cannot see it with the naked eye. Let’s explore the miniature world using a microscope.

Micro means “very small” and a scope is used to watch things. So a microscope is designed to watch things that are very small. Throughout history, the microscope has been used to find cures for diseases, solve crimes, and even create super-tiny microchips for computers. Now it’s your turn to explore the microscopic world around you. Maybe you will discover a universe of miniature aliens.

Draw a picture (or paste in a photo) of yourself looking through your microscope. Maybe one day you’ll make a great discovery with a microscope that will lead to a cure for a disease or a fantastic invention!

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**POWER UP AND POWER DOWN**

Here are some tips for viewing objects using the different powers on your microscope.

**TIP #1**
Always start with the lowest magnification (40x). This allows you to easily move the object you’re viewing (specimen) where you need it. The lowest power also gives you the widest possible view.

**TIP #2**
Slowly turn the focus knob to bring the object into focus.

**TIP #3**
When you are ready to view at a higher magnification, move the objective lenses. Note, if you have something large (such as a rock or a petri dish) on the stage (the surface where the slide sits), first move the focus knob so that the lenses move away from the stage. This will keep you from hitting the lens with the stage and damaging the lenses.

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**IMAGINE IT!**
Describe and draw something cool you would like to look at close-up with your microscope.

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NANCY B. SAYS TO TRY THIS!

Let’s practice using your microscope.

THINGS TO DO:
1. Set your magnification to 30x. (The magnification power of the eyepiece is 10 times. The smallest objective lens is 3x. A 3x objective lens x 10x eyepiece = 30x magnification.)
2. Turn on the bottom light (light microscope).
3. Select a prepared slide and put it on the microscope stage, securing it with the stage clips.
4. Look through your microscope. Try moving your slide around as you view it. You will notice that when you move the slide right, the image moves to the left. That’s because everything appears upside down and backward.
5. Move the slide back to the middle so you can easily see the specimen. Draw what you see in the 30x slide on this page.
6. Then, move to the 100x magnification, and finally the 400x magnification, drawing what you see each time.

Did you notice that you see less of the object under the higher magnification? That’s because when you magnify something, you see a smaller portion of it. Think of it this way: at lower magnification it’s like you see an entire forest. But at higher magnification, you see just one tree—but you see that tree really well. (And if the magnification is even higher, you might see a squirrel in the tree!)

Repeat this activity with the other prepared slides. Make those drawings on a separate paper and slide them into your journal.

STUFF YOU’LL NEED:
• Prepared slides
• Crayons (or other drawing supplies)

30x

100x

400x

NANCY B. SAYS TO TRY THIS!

Experiment with the light and dissecting features on your microscope.

THINGS TO DO:
1. Find and circle a spot on the picture that appears to be all one color to the naked eye. Put the picture on the stage, move that spot directly under the lens, and secure the paper with the stage clips.
2. Turn on the light microscope and turn to the lowest power.
3. Take a look at the picture. Adjust the focus.
4. View under the higher magnifications. Do you see colored dots? Yes/No
   Do you see more or fewer dots with the higher magnifications? More Power

Draw what you see at two different magnifications.

STUFF YOU’LL NEED:
• A piece of paper with a color picture printed on it (such as a picture from a newspaper or magazine). Cut or tear off a piece about the size of a microscope slide.
• AIAA: A little token: flower petals, leaf needles, or coin.
• Colored pencils or markers.

NANCY’S FUN FACT

Surprise! The colors in most photographs, printed papers, television screens, and even computer screens are made up of tiny dots called pixels, which your brain blends together into one color. Notice the fine detail effect again: you see fewer dots at higher magnifications.
TWO MICROSCOPES IN ONE! (Continued...)

Paper is translucent—light can pass through it. So you can use the light microscope to view it. Now, try viewing something that is not translucent.

THINGS TO DO

1. Put your textured item on the stage. If it starts to fall off or is not centered under the lens, move the brace stopper forward to keep it in place.
2. Turn on the dissecting microscope and turn to the lowest magnification. View your specimen. Adjust the focus. If the surface has lots of hills and valleys, you will need to focus differently for each depth on the object.
3. Move the specimen around slowly to see the texture all over it.
4. Move the stage down, away from the lenses, and then move to higher magnifications to see how the view changes. Be careful not to crash the high-power lens into your specimen!

Pick the magnification with the most interesting view and draw what you see.

THINGS TO DO

1. Draw four vertical lines on one piece of paper, using a different writing tool for each.
2. Tape your paper to the blank slide.
3. Put the slide on the stage and look at each line. Draw what you see. Label each line with the name of the writing tool.

As you do other activities in this journal, try switching back and forth between your light and dissecting microscopes to see how the view changes. But remember that the light can’t pass through the object, it will appear dark with the light microscope.

Object: __________________________
Magnification: ____________________

NANCY B. SAYS TO TRY THIS!

Take a closer look at your writing and see what’s happening.

THINGS TO DO

1. Draw four vertical lines on one piece of paper, using a different writing tool for each.
2. Tape your paper to the blank slide.
3. Put the slide on the stage and look at each line. Draw what you see. Label each line with the name of the writing tool.

On the lines below, write some notes to describe each line. Record the type of microscope (light or dissecting) and magnification you used to make the drawings.

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

WRITE ON!

Mind Bender: Why does a pencil write easily on paper, but not on glass? (If you’re not sure, try Nancy B’s next activity.)

STUFF YOU’LL NEED
- A piece of paper a little smaller than the blank slide
- Blank slide
- Clear tape
- 4 different writing tools, such as a pencil, crayon, marker, ballpoint pen, colored pencil, highlighter

Try This Tool! On another small piece of paper, use the different writing tools to draw lines, that cross. Look at these lines, compare them to the first line. Do you see the different layers? Detectives use this process to determine if something has been written or something else has happened. Use the process when studying old paintings, too. How can it be that the painting on the wall may have been changed during the process of creating it?
WRITE ON TRACK

NANCY B. SAYS TO TRY THIS!

Now try using the same writing tools on different types of surfaces.

THINGS TO DO

1. Completely cover the small piece of writing paper with pieces of tape. Draw four vertical lines on the tape, in the same order as you did in the last activity. Again, tape the paper to the blank slide.
2. Put the slide on the stage and look at each line. Draw what you see.
3. Label each line with the name of the writing tool.

CIRCLE THE TYPE OF MICROSCOPE AND MAGNIFICATION USED TO MAKE THE DRAWINGS.

Type of Microscope: Light Dissecting Magnification: 30x, 160x, 400x

Did you notice a difference between writing on paper and writing on tape? Yes No

Now repeat the activity by drawing vertical lines on each of the other types of paper. Use your microscope to see if the lines look different on those surfaces. What do you notice about the texture of each type of writing surface?

MIND BENDER SOLUTION

Pencils write well on paper, because the rough texture of the paper breaks off tiny bits of graphite from the pencil as it travels across the paper and leaves a trail of graphite dust. The very smooth texture of glass, like that of tape and dried paper, does not allow a pencil to leave a trail.

CELLS

What’s a cell? A place to keep prisoners? Well, not for this activity. Cells are the building blocks of all living things. A plant is made up of cells and so are you. Cells were discovered with a microscope.

NANCY B. SAYS TO TRY THIS!

Discover cells for yourself. See the cells that make up an onion skin. You may cry from the joy of discovery (or possibly from the onion).

THINGS TO DO

1. Peel an onion.
2. With the help of an adult, cut a piece of the inner skin that is about the size of your smallest fingernail (1cm).
3. Use your tweezers to separate a very thin layer of the onion skin.
4. Use the pipette to place a small drop of water on a blank slide.
5. Use the tweezers to place the thin onion skin on top of the drop of water.
6. Put another drop of water on top of the skin.
7. Using the tweezers, put one edge of a cover slip down next to the drop of water. Then slowly lower the cover slip onto the drop to squeeze out air bubbles.
8. Observe the onion skin at different magnifications with your light microscope so you can see inside the cells.

STUFF YOU’LL NEED

Blank slide + Pipette
Cover slip + Water
Tweezers + Onion
Scalpel

DRAW YOUR OWN ONION CELLS

Use this picture to help you identify the basic parts of a cell. Choose a cell or cells in your drawing and label the cell wall, nucleus, and cytoplasm.

- Cell Wall
- Nucleus
- Cytoplasm

MAGNIFICATION: 400x

By the way, the slide you just made with a blank slide, drop of water, specimen, and cover slip is called a wet mount.
YOUR BODY--CHEEK CELLS

Could this be? Are you breathing? Do you have a pulse? Awesome! That means you’re alive! And if you’re alive that means you’re made of cells. It’s time to take an up-close look at some of the cells that make you unique!

NANCY B. SAYS TO TRY THIS!

Examine your very own cells from inside your cheek.

THINGS TO DO:
1. Use the pipette to put a drop of water on the slide.
2. Use the flat end of the toothpick to gently scrape the inside of your cheek. Don’t make yourself bleed! You can collect cells by gently scraping.
3. Stick the tip of the toothpick in the drop of water. Throw away the toothpick. Do NOT put it back in your mouth.
4. Cover the drop with a cover slip.
5. Put the slide on the stage. Slide it under the stage slits to hold it in place.
6. Observe the slide under the light microscope at different magnifications. Look for oddly shaped cells, like these:
7. Draw your own cheek cell.

My Very Own Cheek Cell

Nucleus
Cytoplasm
Plasma membrane

Your Turn: Use a drop of water and examine your cheek cells. What do you see?

Stuff You’ll Need:
• Blank slide
• Toothpick
• Water
• Pipette
• Cover slip

Try This, Too! Look at the plaque on your teeth. Plaque is the home of bacteria on your teeth.

YOUR BODY--WHAT’S ON YOUR SKIN?

Beware! You’re never really alone. Thousands of microscopic critters live their whole lives in YOUR skin. But most of the time, you don’t even know they exist.

NANCY B. SAYS TO TRY THIS!

Take a look at what’s hiding on your skin and in your pores, the small openings in your skin.

THINGS TO DO:
1. First, see what plain tape looks like. Put a piece of tape, sticky-side up, on a slide. Take two smaller pieces of tape and tape the edges of the face-up tape onto the slide.
2. Take a look at the plain tape with both the light and dissecting microscopes so you can see the texture of the tape.
3. Take another piece of tape, stick it to your face, and pull it off. You’ve just collected some stuff from your pores. Put the tape sticky-side up on the slide, tape the ends down and look at it under the microscope. Find something that looks different from the plain tape you saw in step #2.
4. Take another piece of tape and touch it somewhere else on your skin—maybe in your armpit, between your toes, or on the bottom of your foot. Use a new piece of tape for each spot. Examine under the microscope.

Choose the most interesting thing you saw. Draw it. Circle the type of microscope and magnification you used to make the drawing.

Stuff You’ll Need:
• Blank slide
• Clear tape (not frosted)

Part of the Body: __________________________________________
Type of Microscope: __________________________
Magnification: __________________________
SPICE UP YOUR SKILLS

Let’s get cooking with some spices! Well, we won’t actually cook a meal, but we will explore the colors, shapes, and smells of spices.

THINGS TO DO

1. With a clean spoon, put about a ⅛ teaspoon of each spice into each bowl. Put away the spice containers.
2. Dip the string rod into a bowl to get a small amount of spice on the end. Tap the spice onto a blank slide.
3. Look at the spice under the dissecting microscope. Draw what you see on the next page.
4. On the lines, write clues for identifying the spice, such as the color, the texture, the smell, what it is used for, or what plant it comes from.
5. Thoroughly wash the spoons and bowls with soap and water when finished.

Show your clues and drawings to someone else. Let him/her take a look at each slide through the microscope. See if he/she can identify the spice. If the person is still clueless, let him/her smell the contents of the bowls.

So you don’t forget what they are, write the answers below. But make sure you keep the answers hidden!

Mystery Spice A:
Mystery Spice B:
Mystery Spice C:

NANCY B. SAYS TO TRY THIS!

Most spices are plant parts. The plant parts have been ground up to make the spice. That means spices were a part of living things!

STUFF YOU’LL NEED

- 3 Blank slides
- Staining rod
- 3 Spices (such as cinnamon, paprika, garlic powder)
- 3 Clean spoons
- 3 Small bowls

Using the Microscope

Note: Do NOT touch the microscope materials to the inside of the spice containers because spices are used for eating. Do not put the spoon back in the spice jar once you have touched it to any microscope materials. Use a clean spoon every time. You don’t want to contaminate the spice containers.

Mystery Spice A
Magnification:

Mystery Spice B
Magnification:

Mystery Spice C
Magnification:
LIQUIDS WE LOVE

Scientists get hungry, so go get a snack and a glass of milk! And while you’re at it, look for the word pasteurized on the milk container. In the 1860’s, microbiologist Louis Pasteur used a microscope to discover harmful bacteria in raw milk, which made people sick. He showed that the harmful bacteria could be destroyed by heating milk to a high temperature and then cooling it quickly. In honor of Pasteur’s discovery, this process is now called pasteurization.

NANCY B. SAYS TO TRY THIS!

Look at what liquids leave behind after they evaporate.

THINGS TO DO

1. Pour a tiny bit of a liquid into the specimen vial. Be careful not to touch the drink container to the specimen vial. Don’t drink anything that has touched your microscope materials.

2. Immediately put the liquid away so you do not contaminate your drink with your laboratory supplies.

3. Use the pipette to draw some liquid from the specimen vial. Place one drop of the liquid on a blank slide. Do not add a cover slip.

4. Observe the drop under the dissecting microscope to see what the drop’s shape and texture look like when magnified.

5. Look at the liquid and make some observations.

6. Repeat steps 1-5 with the other two liquids. Choose the most interesting drop and draw it.

STUFF YOU’LL NEED
- 3 Different liquids (for example: milk, juice (including pulpy orange juice), soda, drinks mixed from powder, smoothies, coffee
- Specimen vial
- 3 Blank slides
- 3 Side labels
- Fisette
- Coloring supplies

Save your slides for the activity on the next page. Use the slide labels to label the slides so that you know what they are when you return.

LIQUID CRYSTALS

What do snowflakes, diamonds, and salt all have in common? They are all types of crystals. When some liquids dry up they leave behind a film or yard—a type of crystal. While you probably won’t find diamonds or snowflakes in this activity, you can observe some really cool crystal designs!

NANCY B. SAYS TO TRY THIS!

Look at the hidden beauty that liquids leave behind after they evaporate.

THINGS TO DO

1. Leave your microscope slide with the liquid samples out so they can dry. This will take a few days, so put them in a safe place where they will not be disturbed.

After a few days have passed, place the samples under the microscope. Observe them with both the light and dissecting microscopes at different magnifications. Pick the most interesting view and draw what you see.

Missing:
- Liquid
- Type of Microscope: Light, Dissecting
- Magnification: 30x, 100x, 400x

You are seeing microscopic crystals on the slide! Solid ice in the liquid, such as sugar, crystallized when the water evaporated.

Tip: This tool [You will need to transport a blank slide, you can observe salt crystals. Compare them to the sugar crystals from the sugary drinks]
CAN YOU DO THE MANGO?

Bananas, limes, peaches, and pears might make great desserts, but they are also interesting living things to study under the lens of a microscope.

NANCY B. SAYS TO TRY THIS!

Observe living tissue under a microscope.

THINGS TO DO

1. Use your scalpel to cut a small piece of fruit. Do NOT eat fruit that touched the scalpel or other microscope instruments.
2. Squish the piece of fruit between your fingers.
3. Use the spatula to smear a thin layer of fruit onto a blank slide.
4. Cover the smear with a cover slip.
5. Look at the smear under your microscope. Look for seeds, cells, and different textures.
6. Draw what you observe and fill in the type of microscope and magnification used for the drawing.
7. Repeat steps 1-6 with a different fruit.

STUFF YOU’LL NEED
- Fruits (apple and strawberry are recommended, but try others too)
- Scalpel
- Spatula
- Blank slides
- Cover slips

Fruit One
Type of Microscope: 
Magnification: 50x 100x 400x

Fruit Two
Type of Microscope: 
Magnification: 20x 100x 400x

CHEW GOO

Did you ever see a bowl of macaroni and cheese that someone forgot about for a few days? It was probably hard, orange, and beginning to grow green fuzz! Gross! Food changes when left out at room temperature. But it changes even faster when chewed.

NANCY B. SAYS TO TRY THIS!

Discover how your food changes when chewed!

THINGS TO DO

1. Observe your food with the naked eye. In the box below, draw what the food looks like before chewing. (To avoid contamination, do NOT put food you are about to eat under the microscope.)
2. Chew the food for 30 seconds.
3. Spit out a small bit of the chewed goo onto a clean spoon.
4. Use your spatula to smear a small sample on a blank slide. Then cover it with a cover slip.
5. Take a look under the microscope and draw what you see.

STUFF YOU’LL NEED
- Food (something you don’t mind chewing!)
- Blank slides
- Cover slip
- Spatula
- Clean spoon

NANCY’S FUN FACT

Did you know the digestive process starts the moment you begin chewing your food? Saliva in your mouth breaks down starches into sugars—which is the reason our chewing and bread leaves a sweet aftertaste in your mouth. Sweet!
LIFE IN OPEN WATER
From mud puddles to great oceans, bodies of water are full of amazing forms of life—and it’s much more than mermaids and dolphins!

NANCY B. SAYS TO TRY THIS!
The next time you visit a natural body of water (pond, river, ocean, lake, stream, etc.), collect a sample in a specimen vial. Make sure an adult is with you at the water at all times! This activity won’t work with drinking water from your sink or bathtub (how yucky would that be?!)!

THINGS TO DO
1. Put a drop of water from your specimen bottle onto a blank slide.
2. Cover the drop with a cover slip. Put it on the microscope slide and secure it with the stage clips.
3. Take a look under the microscope at various magnifications.

Shown on the next page are pictures of some common microorganisms. There are hundreds of thousands of forms of microscopic life, so you may see something different in your water sample.

STUFF YOU’LL NEED
• Specimen vial with water sample
• Blank slide
• Cover slip
• Pipette

Sketch a picture of the location where you collected your sample.

<table>
<thead>
<tr>
<th>MICROORGANISM</th>
<th>WHAT IT LOOKS LIKE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PARAMECIUM</td>
<td></td>
</tr>
<tr>
<td>AMEBA</td>
<td></td>
</tr>
<tr>
<td>BACTERIA</td>
<td></td>
</tr>
<tr>
<td>MINERALS</td>
<td></td>
</tr>
<tr>
<td>EUGlena</td>
<td></td>
</tr>
<tr>
<td>COPROE</td>
<td></td>
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<tr>
<td>DINOPEA</td>
<td></td>
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<tr>
<td>ROTIFER</td>
<td></td>
</tr>
<tr>
<td>WORM</td>
<td></td>
</tr>
</tbody>
</table>
Draw what you see under the microscope. As you record your observations, make note of where the sample was found, the type of microscope, and the magnification used for the drawing. Record notes about what you see. Look online or check your local library to try to find out which critters you may have collected.

Plane Collected: __________
Type of Microscope: Light, Dissecting Magnification: 20x, 100x, 400x

Notes: __________

I AM NOT MAKING IT UP

The business of Beauty is a BIG business! People spend billions of dollars every year on cosmetics. So chemists are constantly working on new formulas that will make people feel even more beautiful.

NANCY B. SAYS TO TRY THIS!

Take a look at different types of makeup under your microscope.

THINGS TO DO

1. If the makeup is not yours, be sure to ask permission to use it.
2. Use a clean cotton swab to remove a makeup sample.
   Use a brand new, clean cotton swab each time you touch the makeup so you don’t contaminate the makeup with your microscope supplies!
3. Put the makeup away.
4. Dip the cotton swab onto the slide to transfer the makeup onto the slide.
5. Take a look at the slide under the microscope. Draw what you see.

<table>
<thead>
<tr>
<th>TYPE OF MAKEUP</th>
<th>WHERE IT’S USED</th>
<th>WHAT IT’S SUPPOSED TO DO</th>
<th>DRAWING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

STUFF YOU’LL NEED

- 2 Blank slides
- 2 Cover slips
- Cotton swabs (brand new)
- 2 Different types of makeup (such as lipstick, mascara, eye liner, powdered) You can use nail polish, but be aware it will permanently stay on your slide!
WHAT'S BUGGING YOU?

There are more than 7 billion humans on the planet, but that's nothing compared with the 10 quadrillion insects in the world! Sometimes insects can really bug you, kind of like a brother or sister. But insects are actually fascinating creatures that have important jobs in nature.

NANCY B. SAYS TO TRY THIS!

With the help of an adult, find and collect dead insects. (Check the window sill—especially in the garage or basement.) Use your tweezers to pick up an insect and put it in the petri dish. DO NOT kill or harm insects for this activity. Ask an adult to check that your insect is really dead. You don’t want to get bitten or stung by an irritated one! Do not touch the insect—especially a stinging one—with your hands. Use your tweezers to pick it up. Stay away from wasps' nests, bee hives, etc. Even after spraying, sometimes there are live larvae (babies) still in the hives.

THINGS TO DO

1. Take off the top of the petri dish. Put the dish with the insect on the microscope stage. If necessary, move the brake stopper to hold the petri dish in place so the insect is directly under the lens.

2. Take a look at the insect with your dissecting microscope. (Be careful to move the lenses away from the stage before changing magnifications. Don’t crash the lenses into the petri dish.)

3. Slide the petri dish around to look at different parts of the insect. You can also use your tweezers to turn the insect over.

4. Try to find these interesting insect parts: compound eye, antennae, sensory hairs, patterns on the wings, legs, and stinger (maybe you can figure out why it hurts to get stung!)

5. On the next page, make some drawings of the insect parts. Be sure to note the magnification used.

STUFF YOU’LL NEED

• Tweezers
• Dead insect (e.g., butterfly, moth, fly, bee, mosquito, ant, praying mantis)
• Petri dish

The study of insects is called entomology. Imagine you are an entomologist. What is one reason why insects are good to have around?

Type of insect | Insect Part | Drawing | Magnification | Total # of parts
--- | --- | --- | --- | ---

If you could be an insect for one day, what insect would you be?

Why?

Design a cool-looking or beautiful insect. Give it a name.

From the fear on your head, to the mud on your breast, to the shot in your heel (illustrated below), there are thousands of things to explore under your microscope. Have fun exploring the microscopic world around you! You never know when you might make an awesome discovery. Keep on exploring!

Nancy B.