# SUPPLEMENTAL ACTIVITIES

PLEASE NOTE: You can choose which of these activities are suitable for your situation. Skip any activities that are not appropriate for your student(s).

## CHAPTER 1

### ACTIVITY IDEA 1A: Observe cork cells and plant cells (like Robert Hooke and Robert Brown did)

This activity requires a microscope. If you don't have one, just skip this activity. If you have a microscope but don't know how to use it, search for a tutorial video on YouTube or another video streaming service.

**You will need:**

- a compound microscope and a glass slide
- a piece of cork (NOTE: Cutting cork can be tricky. If it is too difficult, just use the onion skin.)
- a piece of onion skin
- a razor blade (or sharp craft knife like X-Acto)
- pencil and paper if you want the students to draw what they see

*TIP: A good place to order science supplies is www.homesciencetools.com*

**What to do:**

An adult should do the cutting of the cork. Use the razor blade or craft knife to make very thin wedge-shaped slices. The tapered edge (as it tapers off to nothing) will be the best place to look for cells. Put the wedge onto a glass slide. View under the lowest power (shortest objective lens) first. After you get it in focus, you can then move up to the next highest power. You will have to refocus, but only slightly. You will only need to use the 4x, 10x or 40x objectives (giving you 40x, 100x and 400x, respectively). If you want your student(s) to draw the cells, provide paper and pencils.

To view the onion skin cells, slowly peel off the papery layers one by one. Try to find the very thin, almost transparent "membrane" layer that surrounds the bulb. Lay a piece of this moist, transparent layer onto the slide. If you want to do a traditional "wet mount" you can place one or two drops of water onto the onion, and the place a cover slip on top. (If you need instructions on how to place cover slips, use key words "how to make a wet mount" in YouTube or your favorite video streaming service.) However, I have done this lab without cover slips and it has worked just fine. The onion will dry up eventually, but will remain moist long enough to complete the lab.

Again, use your lowest power first and get it in focus, then move up to the next power. You should be able to see a dark dot in many of the long, box-like cells. This dot is the nucleus. You might also see some other lighter dots that could be other organelles, but usually you can't see other organelles without special stains.

### ACTIVITY IDEA 1B: HOW BIG IS A CELL?

This interactive activity lets students zoom in and out on a series of microscopic things, starting with a coffee bean and a grain of rice and ending with a carbon atom. Cells and cell parts are shown along they way, along with bacteria and viruses. (This link was active as of November 2021. If you find that this link doesn't work for you, try using an Internet search engine with key words: "cells scale how small microscopic"

**https://learn.genetics.utah.edu/content/cells/scale/**

# CHAPTER 2

## ACTIVITY IDEA 2A: DEMONSTRATION of FLUID MOSAIC MODEL

This activity helps students to understand the fluid nature of the membrane. The text mentioned that the phospholipid molecules can move around, sort of like ping pong balls floating in a bathtub. This demonstration is a fun way to help them understand this concept. (If time is limited, you might want to choose between this activity and idea 2B.)

**You will need:**

- a large, shallow metal or plastic tray of some kind (a 9x13 cake pan would be adequate)
- a pitcher of water
- a bag of "miniature" marshmallows (these will represent the heads of the phospholipid molecules)
- Chunks of apple that are slightly larger than the mini-marshmallows (You could also use chunks of Styrofoam® or anything else that is waterproof and will float.) Cut some of the chunks into thick discs you can use to represent lipid rafts. Cut some oddly shaped chunks that you can use to represent surface proteins.
- a few toothpicks

**What to tell the students:**

*This will be a demonstration to show what it means when scientists say that a phospholipid membrane is a "fluid mosaic." The word "mosaic" means a pattern made from small pieces. "Fluid" means "flowing." In this demonstration, we will imagine that we are looking down on the outer membrane of a cell. We will only be able to see the heads of the phospholipid molecules. The marshmallows will represent these phospholipid heads. We will see how lipid rafts and membrane-bound proteins can move around, going in and among the phospholipids.*

**What to do:**

Pour at least an inch of water into the tray. Dump in marshmallows until they cover most of the surface of the water. Add your representations of lipid rafts and membrane-bound proteins. You might want to use a few toothpicks to create proteins that are sticking up above the surface. Fill in any remaining gaps with marshmallows.

Allow the students to gently push the rafts and the proteins around. (You could even provide very small chunks of "protein" that they could set on top of the lipid rafts.) Notice how the marshmallows won't allow an empty patch of water. They immediately fill any gaps you try to create. The surface of the water remains covered at all times even though the positions of the rafts and proteins are constantly changing.

**Extra tips:**

You might want to put a bath towel under your pan to absorb any slop-over accidents, and have plenty of paper towels on hand. (Also, just in case you have any thought of up-sizing this and using a small plastic pool, I tried this and found the results disappointing in several ways. Definitely not worth the time and money.)

## ACTIVITY IDEA 2B: MAKE AN EDIBLE FLUID MOSAIC MODEL

This is a delicious way to review the amazingly complicated surface of the membrane. This activity is somewhat similar to idea 2A, so if time is limited you may want to chose one or the other.

**You will need:**

- a selection of healthy edibles such as grapes (excellent for representing phospholipid heads), strawberries, blueberries, carrots, cucumbers, celery, broccoli, pieces of melon, etc.
- a large paper plate for each student, or a large tray for a small group of students

- safe knives for students to use
- toothpicks
- paper towels

**What to tell the students:**

*In this activity you will make an edible model of a membrane as seen from above. Imagine looking down on a membrane, so all you see are the heads of the phospholipid molecules, plus the various rafts or proteins floating among them. You don't need to worry about accurately portraying any particular structures, just the general idea that the surface of a cell is a very crowded place, with many strange-looking structures sticking out of it.*

**What to do:**

Provide the students with the raw materials, safe tools to work with, and a plate or large tray on which to arrange their edible "sculpture." Photograph the final results, especially if the students are keeping a portfolio that documents their educational activities during the year.

## <u>ACTIVITY IDEA 2C</u>: A HUMAN MODEL OF A MEMBRANE (20 or more students)

**You will need:**
- a fairly large space (but an average-sized classroom will do, if you move the tables and chairs)
- a few small balls (ping pong or tennis balls) and at least one large ball (basketball, beach ball)
- a long stick to be a "flag" (cell identification marker) You might even want to tape a piece of paper to the end, that says something like, "I belong" or "I am part of the body" or even the name of one of the students.

**What to tell the students:**

*In this activity, each of you will represent a phospholipid molecule. You will imagine that your head is the water-loving head of the phospholipid, and you will stretch our your arms to be the water-hating tails. You'll have to ignore your feet for a while! Just like in a real membrane, your water-hating tails will face each other and your water-loving heads will be on the outside. After you have lined up and created your membrane, we will do some demonstrations that show how the membrane works.*

**What to do:**

Line up the students in two rows, facing each other, but not too close. Tell them that their heads will represent phosphate heads. Then have them put their arms out straight in front of them to represent the two lipid tails. Their hands should come close but not touch. If one of the students asks what their feet represent, tell them to ignore their feet and pretend they just have heads and arms. Weird, yes, but we have to deal with the constraints of gravity and human anatomy. Human are not phospholipids.

With the students lined up and modeling a piece of membrane, show the students a few small balls and tell them the balls represent very small molecules such as water or oxygen or carbon dioxide. Then gently toss or roll the small balls between the students. Emphasize that this is to show that very small molecules can pass right through the membrane. Then show them the large ball. Say that this represents a very large molecule, such as a food molecule or a piece of protein. Demonstrate that the molecule will not be able to slip through. (The students should be standing close enough together that the large ball can't get through the space between their legs or bodies.) Then ask if anyone remembers how cells regulate the entry and exit of large molecules. (Answer: portal proteins) Volunteer one pair of students in the middle to be a portal protein. Have them turn to the side and put their arms out to their sides. Designate one side to be "outside" the cell and give the ball to the portal protein who is on that side. Have the outer protein pass the ball to the inner protein. The inner protein can then just let go of the ball or give it a gentle toss into the "inside of the cell." If time permits, you can let other students take turns being portals.

*One student is playing the role of a portal protein. The ball is a molecule.*

Volunteer a student on the outer side of the membrane to pull their hands in and pretend to be a protein instead of a phospholipid. Then give him/her a long stick to hold up. This will represent an identifying "flag" that will tell all other cells that come into contact with it that it's part of the body and not a foreign invader.

Something else you can do that was not mentioned in this chapter, is the flipping of phospholipids from the inside to the outside, or vice versa. (Special proteins called "flippase" and "floppase" help with this process. Assign a number to each pair of students and let them switch places when you call out their number.

## <u>ACTIVITY IDEA 2D</u>: MAKE A PHOSPHOLIPID ORNAMENT

OPTION A: Use a clear plastic ornament
OPTION B: Use just paper and chenille stems

**You will need:**
FOR OPTION A:
- a clear plastic ornament for each student (The kind that has two halves that snap together is best, but you can make other hollow spheres work if you are able to cut a slit in the bottom. If clear plastic ornaments are not "in season" when you do this unit, they can still be ordered online through various websites. Search for "clear fillable ornaments.")

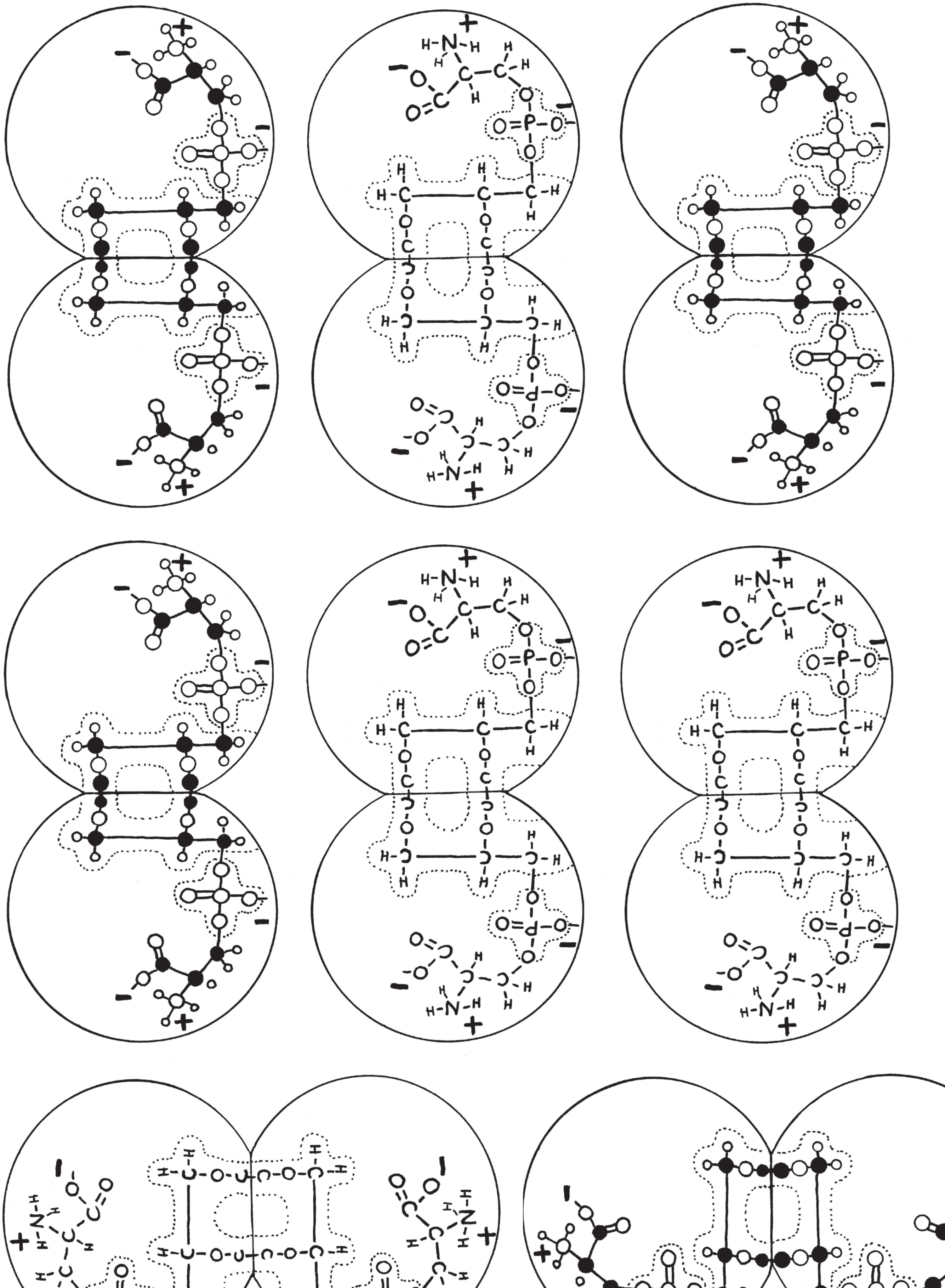
FOR BOTH OPTIONS:
- a copy of one of the following pattern pages

(If you need to resize the circles to fit into your ornaments, you can shrink or enlarge the patterns slightly using a copier or scanner, or tell your printer to print at a percent less than 100.)

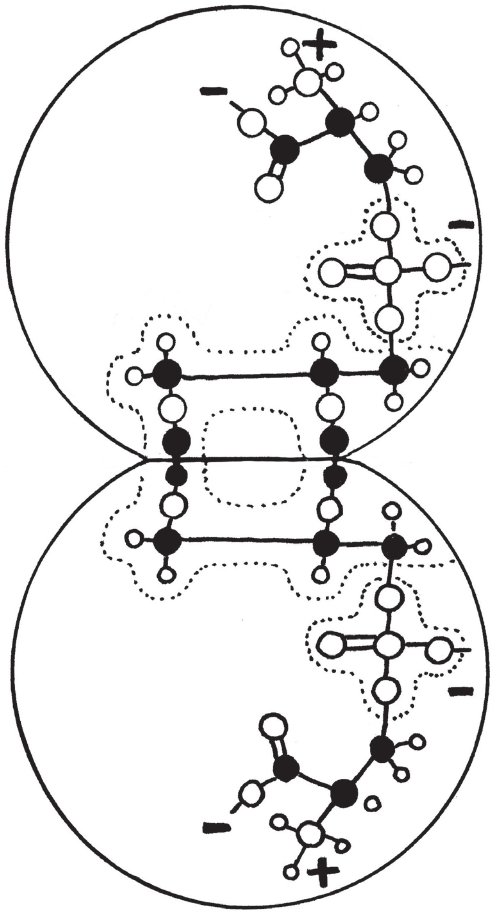
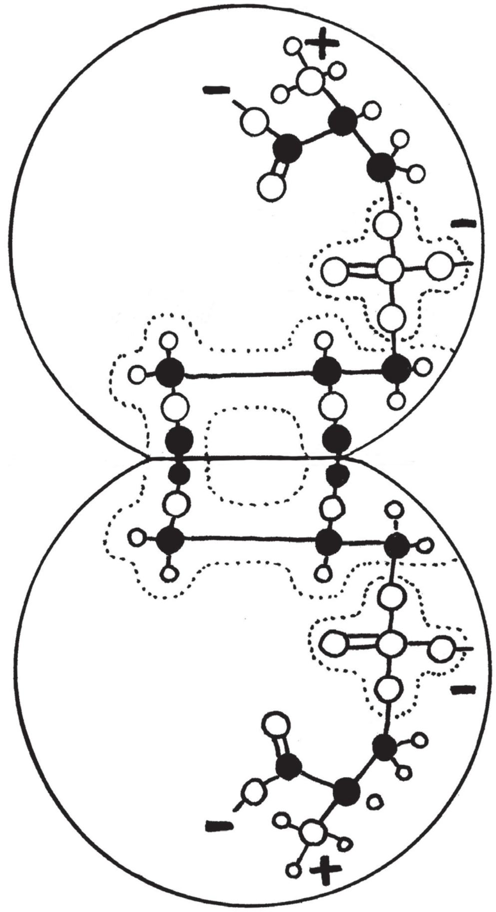
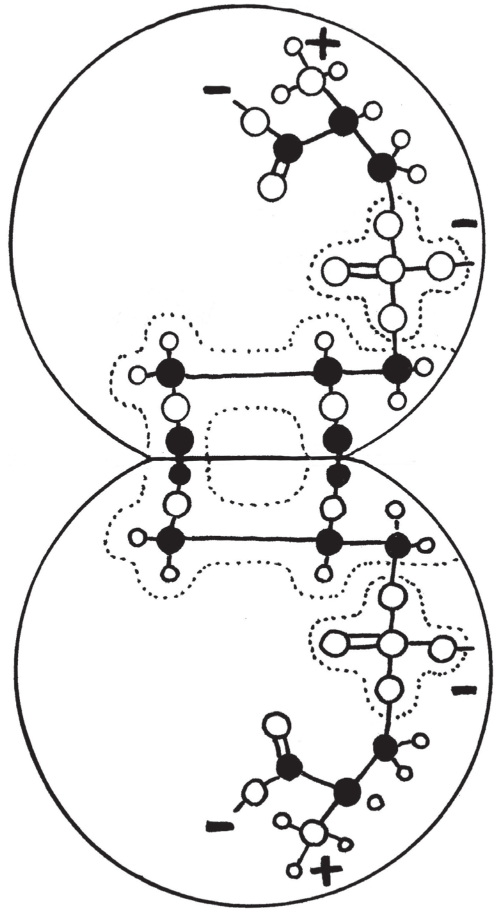
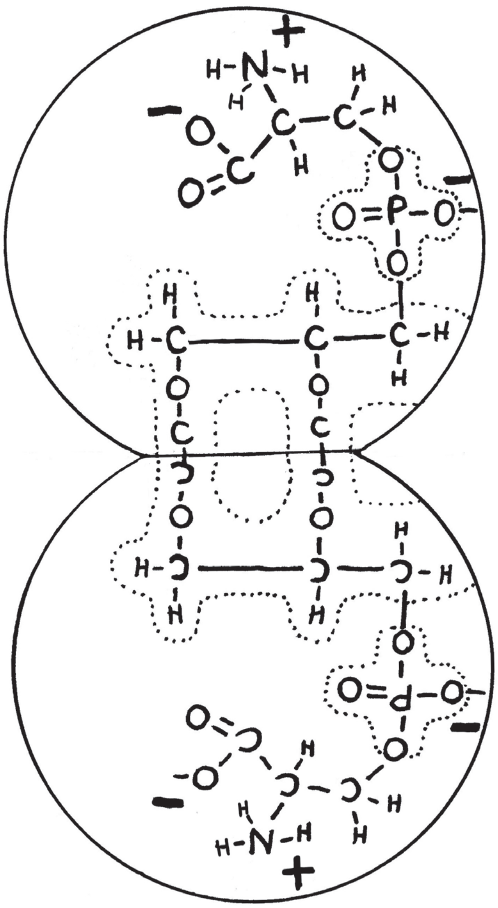
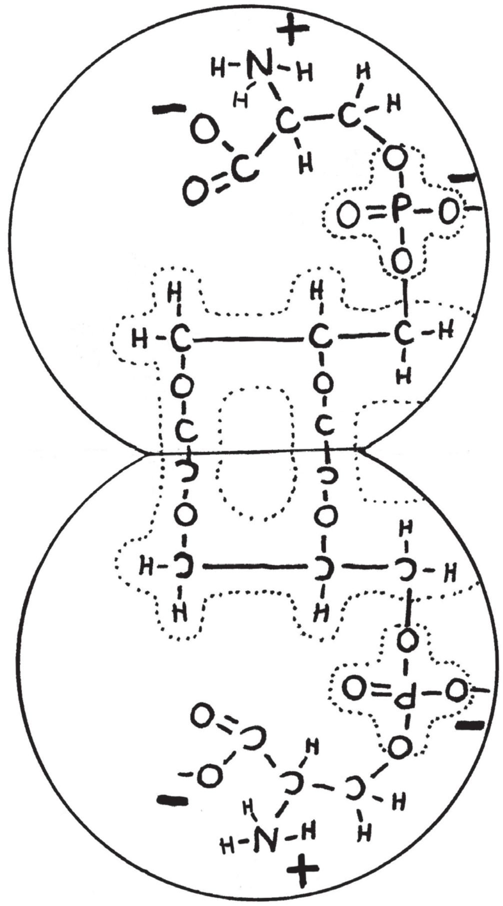
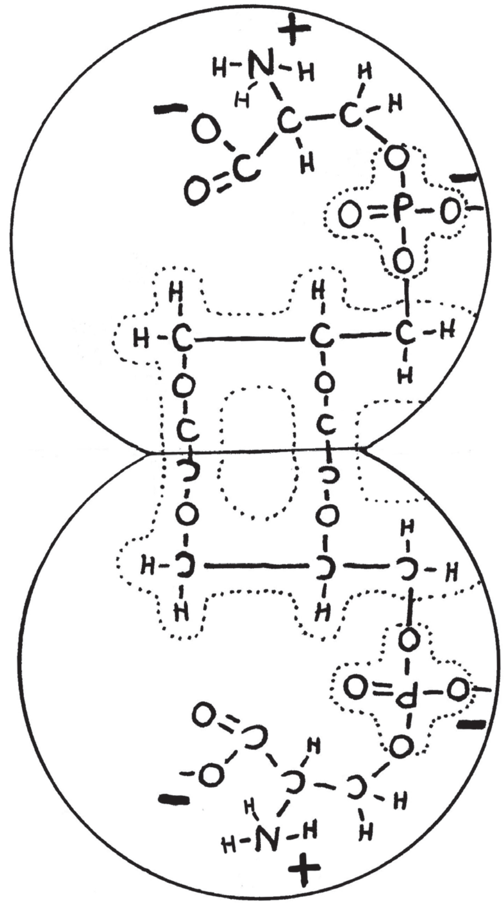
The blue tails have tiny beads for C atoms.

- colorful chenille stems
- colorful string or yarn to hang the ornament
- FOR THE PATTERN WITH DOTS: colored pencils or markers for oxygen, nitrogen and phosphorus atoms **(Suggested colors: red for oxygen, green for nitrogen, blue for phosphorus)**
- scissors and glue (NOTE about glue: Don't use glue sticks or white school glue. Buy either PVA glue (outside of USA) or try Elmer's Craft Bond glue, or Aleen's Tacky Glue.)
- OPTIONAL: small beads that will slide onto the chenille stem (to represent carbon atoms)

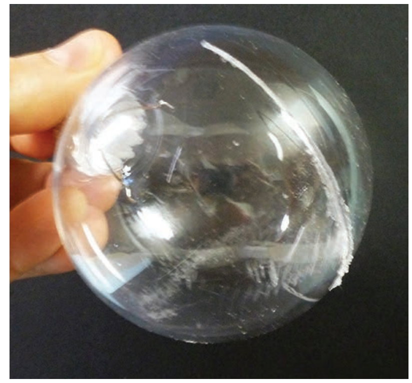
SMALL 2" dia.



# MEDIUM 2.5” dia.

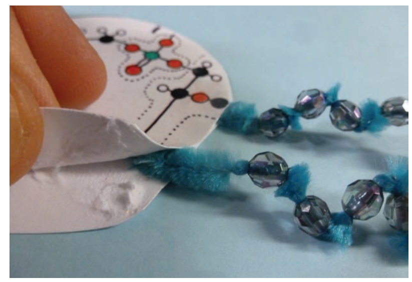
**What to do:**

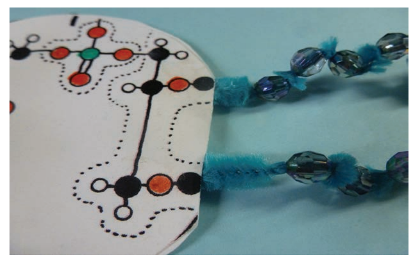


The slit has to be just long enough so that you can maneuver the C-shaped molecule up through it.

FOR OPTION A:

1) If your ornaments have two halves that snap together you are ready to go. If your ornaments are one piece, you will need to make a slit in the bottom. I have tried various methods and found the easiest and most effective is to use a hack saw. Hack saw blades have very small teeth and will cut the slit in less than 30 seconds. If this option is not possible, you can try using a sharp craft knife (e.g. X-Acto) or a serrated bread knife, and be very careful to keep your fingers out of the way. (I set my balls in the top of a vice that was opened just enough to let the ball nestle down halfway.) Keep your fingers well out of the way and/or wear a rubber glove that will provide some protection while not being too slipper.





2) Cut out the two halves of your paper molecule. If you want do any coloring, do it now, before you glue the halves together. NOTE: You can mix and match halves, if you want to have the letters on one side and the dots on the other. Just be careful to get the appropriate images matched correctly so that you will be able to cut around the molecule on both sides.

3) Choose one chenille stem and cut it in half. If you happen to have small beads that fit onto the stem you can string on 8-12 beads to represent carbon atoms. You can leave the stems straight or bend them in a zigzag shape to simulate the shape of a real carbon chain.

4) Apply glue to one side of the paper molecule. Use enough, but not too much. Apply a few drops and then spread them out. You should not have glue oozing out when you press the papers together.

5) Make sure the ends of the chenille stems are tucked between the papers, right where the bottom carbon atoms are. You can cut along this bottom line, or you can make two tiny ships for the stems.

6) Press sides together, making sure that the stems will be glued into place when it dries. Let this dry for a few minutes.

7) If you are using an ornament with two halves, simply put the paper into the ornament and snap shut. If you are using one that has a slit cut in the bottom, first cut carefully around the molecule, cutting away as much extra paper as you can without cutting off any atoms. The result will be kind of C-shaped (as shown in the examples on the previous page). You will be able to maneuver this shape up through the silt bit by bit until it is inside. Just be patient.

8) Add a decorative string, yarn, or ribbon so you can hang it up.

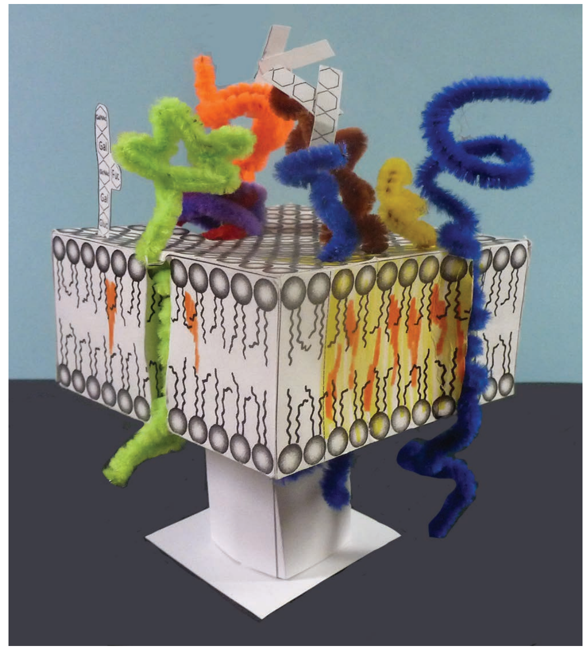
FOR OPTION B:

1) Choose your paper molecules and do any coloring you'd like to do.

2) Follow steps 3-6 above. You will not need to do any additional cutting. Leave the molecule as a circle.

3) Punch a small hole in the top of the paper so you can add a string or ribbon hanger.

**<u>ACTIVITY IDEA 2E</u>: A PAPER MEMBRANE MODEL**
**Note: This activity can be used after chapter 3 if you are out of activity time for chapter 2.**



**You will need:**
- the following pattern page printed onto card stock
- scissors
- really good white glue (I order PVC glue from Amazon.co.uk. You might also try a white craft glue, such as Elmer's Craft Bond (not regular Elmer's white glue), or Alene's Tacky Glue.)
- a tool for cutting the chenille stems (Scissors will cut them, but be aware that they will dull scissor blades.)
- a sharp craft knife (such as an X-Acto knife)
- a pencil
- colored pencils or markers, especially in yellow or orange (for cholesterol molecules)
- a ruler or straight edge
- a pointed object for scoring fold lines (compass point, nail, very large needle, etc.)

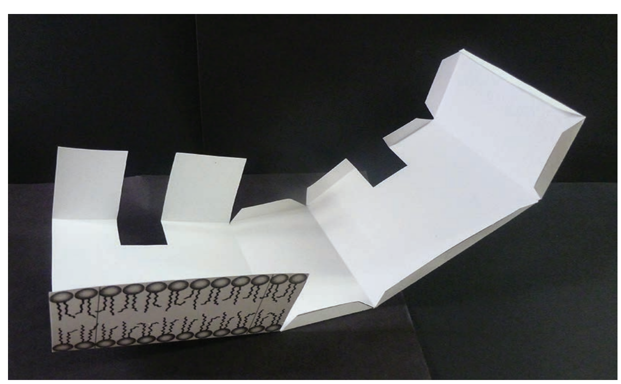
**What to tell the students:**

*In this activity, you will make a paper module showing a tiny piece of a phospholipid membrane. You will add some protein structures to the membrane, both peripheral proteins and transmembrane proteins. One of these will be a real protein called MHC 1. It is the little flag that identifies the cell as part of the body. The other proteins will be examples of general types of proteins but won't be identifiable as any particular protein. For example, you will be putting in a channel that controls the flow of some type of molecule in or out of the cell but it won't be modeled after any particular channel. Also, you will add a number of receptors and "switches" but you can create your own squiggly patterns with the chenille stems. There so many protein shapes in a membrane, that whatever you create will probably look similar to one of them. There are still membrane proteins that scientists have not yet discovered!*

**What to do:**

1) Before cutting out the pattern, score along fold lines. This step always seems like an extra bother, but it will make all the difference when you do the folds. The folds will be crisp and straight and the model will almost snap into place automatically. Use a ruler and something that will lightly scratch the paper without cutting it, such as the point of a compass, a nail, a large needle, or even a "dead" ballpoint pen. Scissors might be used successfully by an adult (I have done this) but can be tricky for many students. **If you are working with a younger group, you might want to consider doing this step ahead of time and give the students a pre-scored pattern page to cut out.**

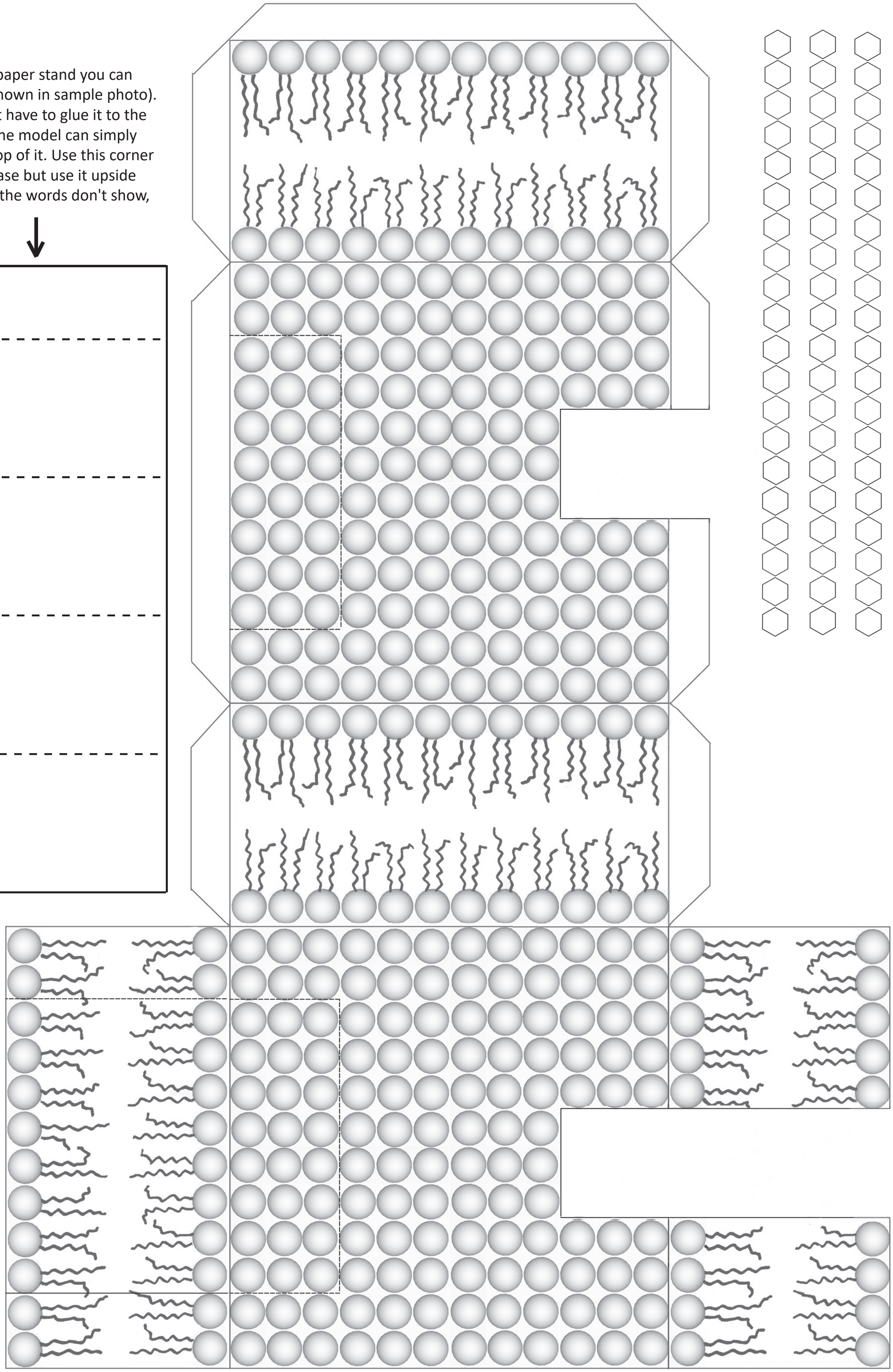
2) Locate the lipid raft section (indicated by thin dotted lines). Add cholesterol molecules between the phospholipid tails in the lipid raft region. You can also add one or two cholesterols on other sections, if you find those few places that have more straight tails. Student might also want to add some light yellow to the phospholipid heads that belong to the lipid raft region, to make it more visible.



3) Cut around the edges of the paper pattern. Work carefully. Slopping cutting will make the assembly process much harder.

4) Fold on all the fold lines. After this step your project should similar to the one shown here.

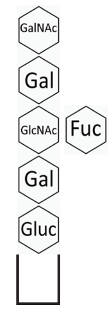
This is a paper stand you can use (as shown in sample photo). You don't have to glue it to the model. The model can simply rest on top of it. Use this corner for the base but use it upside down so the words don't show,



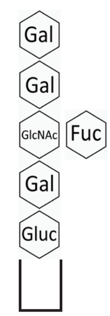
Optional:

ABO Blood antigens (made of sugars)

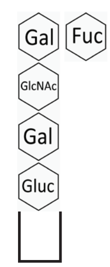
Type A




Type B



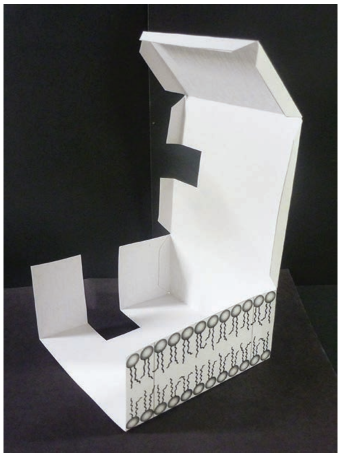

Type O

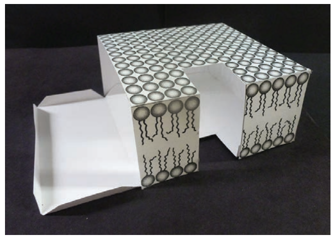



For type AB, use both A and B.

5) Begin gluing the glue tabs, perhaps in this order:

1





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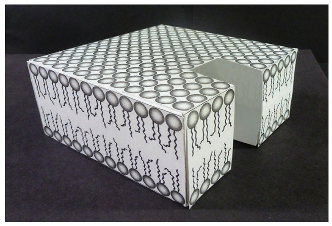

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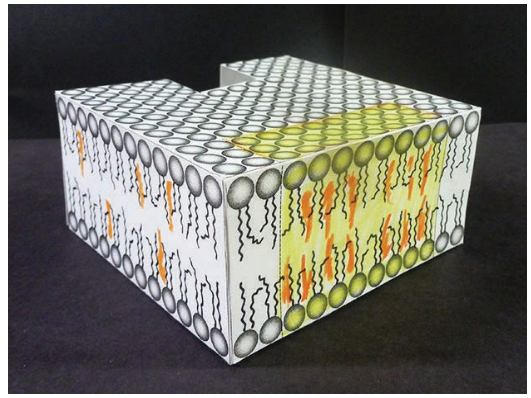
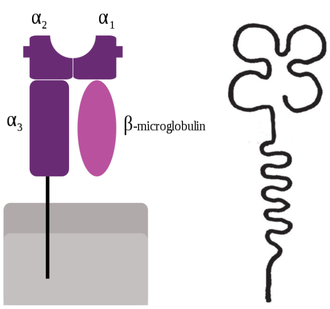
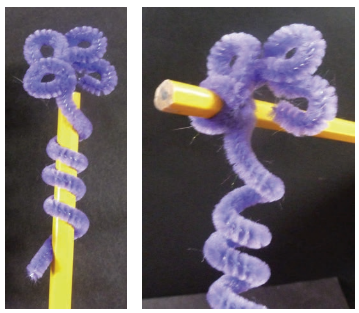


If you have colored the lipid raft area, your model will look something like this.

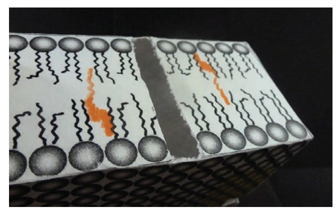
6) Use a chenille stem to make an "MHC 1" shape. (the ID flag)
You can use a pencil to create the round shapes.



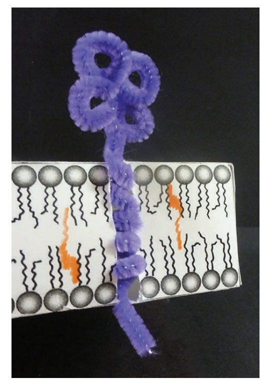

*MHC 1 is shown many ways. Here are two typical diagrams. We'll imitate the one on the right.*



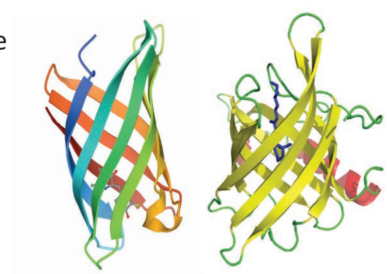
*Your MHC 1 can be any color. My students found it helpful to use a pencil to make the curls.*



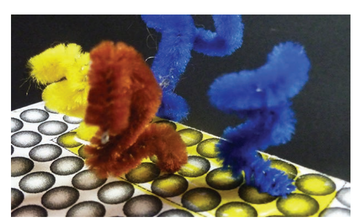
*To insert MHC 1 (or any transmembrane protein) use a craft knife to cut out one phospholipid. Tuck in curled chenille. Add a tiny bit of glue to keep it in place.*



7) The large opening is for a beta barrel. Beta barrels are made of folded proteins called beta sheets. Beta barrel diagrams often look like a braided structure. We are going to just use two or more chenille stems and curl them in opposite directions around a finger. Try to make your barrel large enough to fit into the space in your membrane. Some barrels have extra curls on the top or bottom.

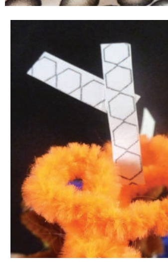


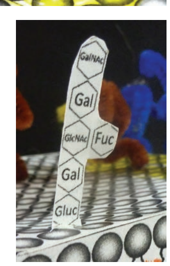
8) Add some peripheral proteins and some transmembrane proteins. They can be any shape. For the peripheral proteins, you can make a tiny hole, put a small blob of glue on the end of the chenille and stick it in (and let it dry). For the transmembrane protein you will need to cut a slot in the side of the model. Make sure you put several proteins in the lipid raft area.



9) Add some glycan sugar strings to your model.

You have a number of options. You can add one of the famous "ABO" blood type markers, provided on the side of your pattern page. Only red blood cells will have these proteins on their surface, but we are not concerned with making this sample membrane accurate to any particular cell, so you can add these gylcans or leave them off, either way is fine. If you happen to know your blood type you can make your membrane match your own cells.





## CHAPTER 3

**ACTIVITY IDEA 3A: CRAFT: MOTOR PROTEIN PENS**

Even "craft-shy" students will probably like this craft because it is so bizarre. The students will be making a model of a motor protein that is also a functional pen they can write with.
NOTE: This craft has a lot of flexibility in how it is assembled. You can adapt the materials and/or construction to suit your situation. If you can find a better way to make it, please do so!

**You will need the following for each student:**

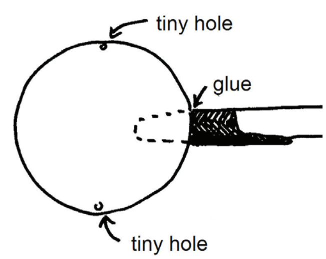
- a ballpoint pen (the kind with the cap that comes off)
- a handful of assorted colored beads for each student (miscellaneous sizes, shapes and colors)
- chenille stems (4 per student)
- tape: ideally, colored masking tape (available in craft stores) Regular masking tape or floral tape will also work. Avoid clear or duct tape.
- some kind of hollow ball (I used inexpensive plastic Christmas tree ornaments. You could also use a Styrofoam™ ball, or any lightweight plastic ball. If you can't find any suitable plastic balls, you can make one out of heavy card stock paper using the following dodecahedron pattern.
- hot glue gun (or fast-drying glue that sticks to plastic)
- drill to make small holes in side of ball

**What to tell the students:**

*You will be making a model of a kinesin motor protein. It won't be a highly accurate model of a particular kinesin, as we have limitations due to the craft suppliew we will be working with, but it will definitelyl be recognizable as a motor protein. The ball on the top will represent a vesicle that is being carried. At the bottom of the motor protein we will make the heads that walk along the microtubules. You will use plastic beads to represent amino acids that make the structural proteins. The nice thing about this model is that it is also useful as a pen you can write with. You can have a lot of fun making people guess what it is, then telling them what your learned about motor proteins.*

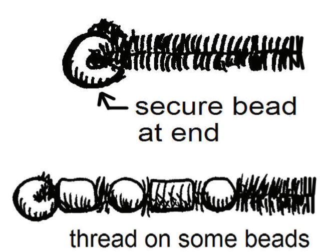
**How to assemble: (This is what I did, you can adapt where needed.)**

**1)** Take the cap off the pen. Use some hot blue to stick the cap firmly to the top. If using other glue, do this step ahead of time and let it dry. If no glue is available, just press the cap on as firmly as you can.



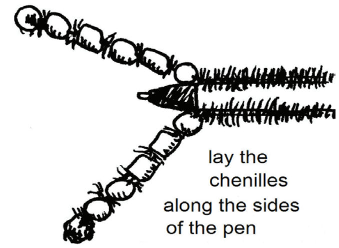

**2)** Drill or punch a hole in the bottom of the ball, if you are using a plastic ball. The hole must be just the right size so that it fits onto the cap at the halfway point. (see drawing at right) Use hot glue to make the ball stick firmly to the pen cap. (If using another type of glue, do this step ahead and let it dry.)

**3)** Drill or punch two tiny holes in the ball; the holes should be just large enough to accommodate the end of a chenille stem. Refer to photograph above; you can see where the chenille stem will go in. If you can't drill holes but you have a hot glue gun you can also glue them place.

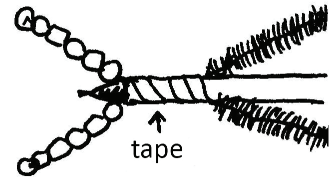


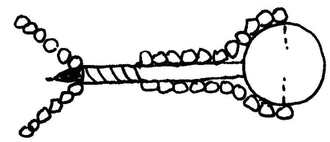

**4)** Take two of the chenille stems and secure a bead to one end of each stem. Just loop the chenille stem around, give it a twist and tuck the end back into the bead. Make sure there isn't a sharp metal end sticking out. Then thread some beads onto them until you've covered about 5 cm (2 inches) of the chenille stem. The measurement does not have to be exact.

**5)** Lay the chenille stems alongside the pen so that the yet-to-beaded part is flush with the pen tip. (see drawing for clarification) Wrap some floral tape around at the tip, to secure them, then wind the tape up the pen about 4 cm (1.5 inches). The measurement does not have to be exact. Tear off the tape and continue wrapping until the end of the tape is sealed on. Press firmly. Floral tape won't seem very sticky so you may think it won't hold, but surprisingly, it will adhere very well and will stay in place even while the pen is being used to write with. The floral tape won't stick to fingers, just to itself. (For further clarification, look at the color pictures in the appendix.)



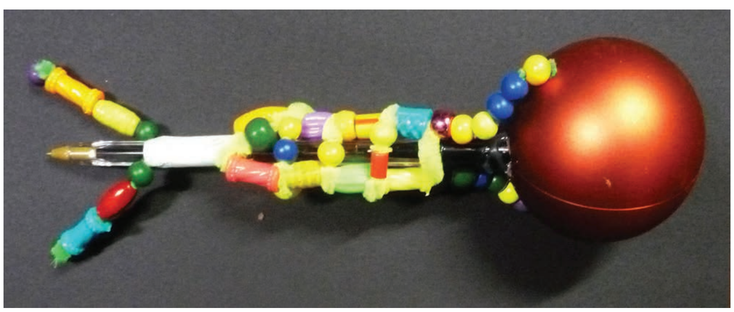

**6)** Thread some more beads along those two chenille stems until you reach about 2 cm (3/4 inch) from the end. Those two ends will fit into the small holes you drilled or punched in the ball. (Refer to photograph on previous page.) You may want to glue the ends of the stems into these holes. (Ours stayed secure even without glue.) You may need to make adjustments for your particular situation, depending on what you are using as a ball and how large your beads are.

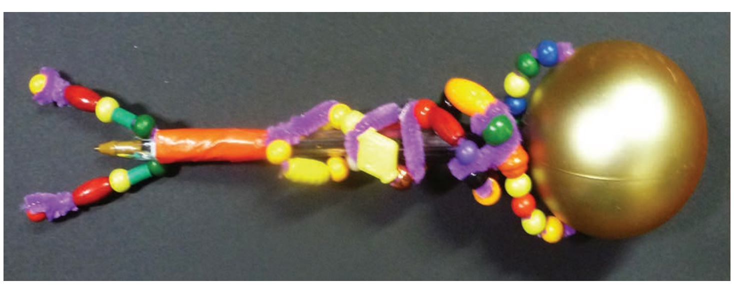


**8)** Secure a third chenille stem to one of the side stems right at the top of the taped area. Begin a pattern in which you alternate winding with threading a few beads on. Wind tightly.

**9)** After you have wound to the top, right under the ball, secure the chenille stem to one of the beads. You may also add a second beaded chenille if you'd like to have more beads on the model, and/or you can use an unbeaded chenille to wind around the middle, securing the others more tightly.



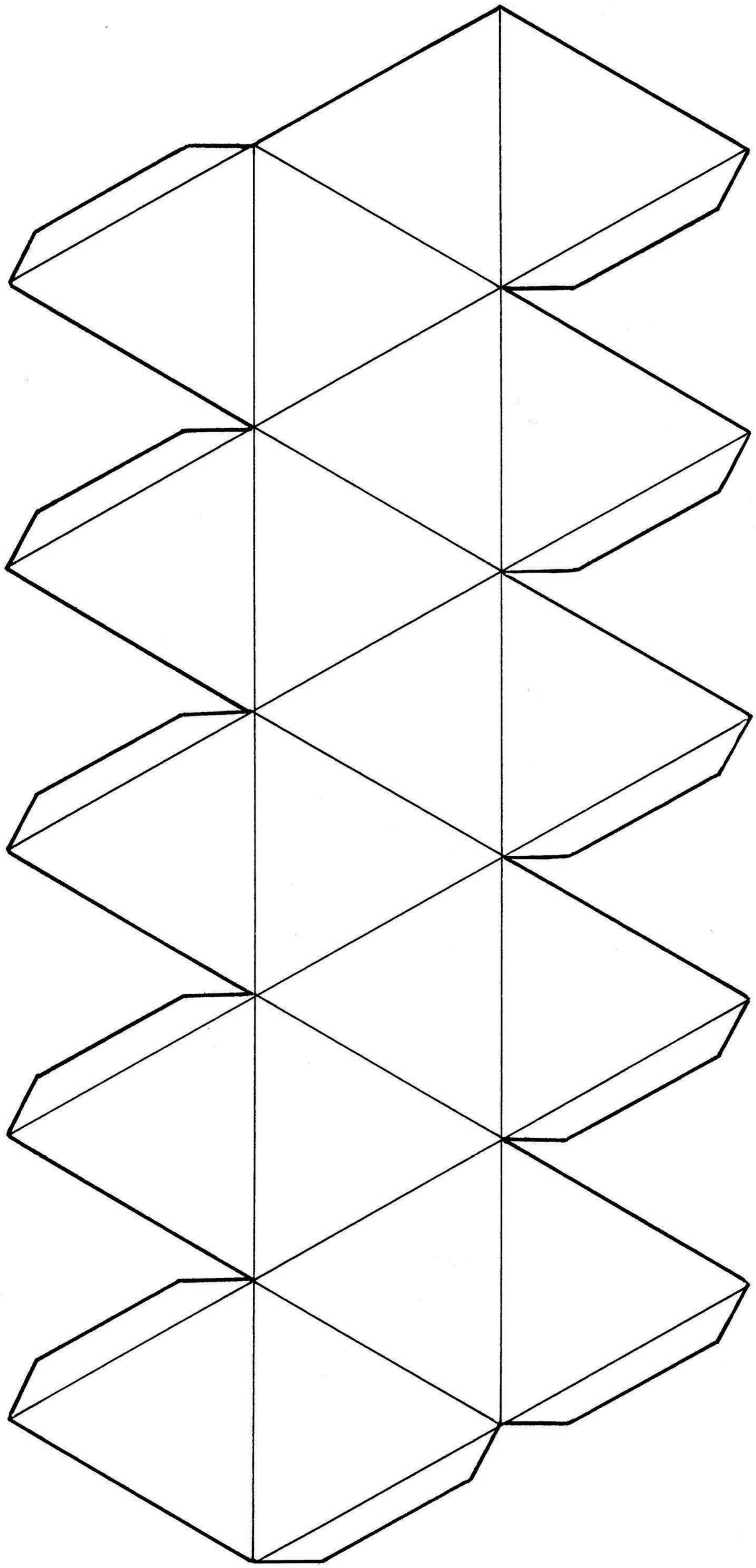


To use the pen, just bend the heads (which look like feet) up and out of the way. (Be careful not to bend them over and over again, as it is possible to "wear out" the metal in the chenille stems so that they break.)

## <u>ACTIVITY IDEA 3B</u>: MOTOR PROTEIN CARTOON CHALLENGE

**You will need:**
- paper and pencils

Ask your students to look again at the kinesins on page 19 (and possibly supplement with some Internet images of both kinesins and dyneins?) and then make cartoon drawings of motor proteins. (Also, make sure they have seen the video "A Day in the Life of a Motor Protein" which feature animated cartoon motor proteins.) Post the drawings so they can be shared with the group. This activity will encourage artistic students whose abilities are not usually appreciated in science classes.



PATTERN for making a paper vesicle for motor protein craft if a hollow plastic ball is not available.

**PRINT ONTO CARD STOCK**

## <u>ACTIVITY IDEA 3C</u>: MOTOR PROTEIN RELAY RACE

**You will need:**

- a fairly large space (long and narrow is fine, like a hallway)
- two very large, but lightweight, objects such as beach balls (or other large inflatables) or the "balance balls" used for exercise programs
- something to be your microtubules; I have used toilet paper and paper strips, but found blue painter's tape or masking tape to give best results. If you use paper of some kind, you'll need some tape to secure it to the floor at various points.
- two pieces of wide elastic, tied at the ends to make loops that will fit tightly but comfortably around the knees (notice elastic in bottom photo)

**What to tell the students:**

*In this relay race, you will play the role of a kinesin or a dynein walking down a microtubule, carrying a vesicle. Walk carefully so you don't tear the microtubule! If you tear it, someone on your team will have to come and repair it before you continue. Cells often have to repair parts of their cytoskeleton and they can do it very quickly and efficiently.*

**How to set up for the race:**

Prepare your microtubule "roads." If you are using paper, secure it in several places and make sure you have some extra left over (and some tape) for repairs. If you are using tape for the full length of the road, you probably won't need to worry so much about repairs.

Have a loop of elastic for each team at the starting line. Also, have the balls ready at the starting line.

**How to run the relay race:**

Divide the group into two teams. If you have an odd number of players, assign one player to go twice. Then divide those teams in half and put one half at each end of their road. Those on one side will be kinesins, and those at the other end will be dyneins. This will help to reinforce the idea that motor proteins only go one way. It won't matter which side goes first.

The first players stick their feet into the elastic loop and pull it up to just above their knees. They are only allowed to move the lower part of their legs, below the elastic. This will make them move more like a real motor protein. It will also add a humorous twist to the relay race and make it more fun. Then the players pick up their ball and hold it over their head. Now they are ready to start down the microtubule road. They must walk along the strip without tearing it. If it tears, one of the team members must take a piece of tape and fix the tear. The mending job doesn't have to be great. The minimum is that the two ends of the paper must be touching. (If using a tape road this step may might not apply, depending on how sturdy your tape is.)

When the runners reach the end, they put down the ball, take the elastic off their knees and hand it to the first player on that other side. This next player puts on the elastic, picks up the ball, and hobbles down the road to deliver the ball back to the side where it started. They hand both elastic and ball to the next player. Play continues like this until all the team members have been down the road. The first team to have all their members finish their run is the winner of that round. Since the race only takes a few minutes, several rounds can be played.

NOTE: I found that it takes a bit of adult supervision to make sure players are adhering to the rules and not "cutting corners" like putting the elastic too high or stepping off the road. It is up to you to determine how to handle things like this if and when they occur. (The main point is that they are having fun and learning!)