The Nucleus

Official Quarterly Newsletter of the Texas Association of Biology Teachers

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President's Message:

Greetings,

I hope that everyone has had a great start to the new school year. At the beginning of this school year I experienced something I have not experienced in several years – nervousness. I am in a new school district, and I am experiencing new teacher stresses that I had long forgotten. I tell you this to encourage you to find the new biology teachers in your building and help him or her out in any way you can.

This is an exciting year for many reasons, but one in particular is the ongoing Science TEKS revision process. By the time that this letter reaches you, it will be the perfect time to write your local State Board of Education (SBOE) Member. It is crucial that our State Board of Education members are encouraged, by as many science teachers as possible, to follow the recommendations of the experts that are working on the TEKS revision. The link for SBOE member contact information is ***http://www.tea.state.tx.us/sboe/members.html***.

We are looking forward to an exciting CAST, in Fort Worth this year. If you are planning to attend, I encourage you to join us for our TABT short courses and workshops, and to stop by and visit at the TABT booth. Don't forget to buy your ticket for the TABT luncheon that will be held on Saturday November 8 at the conclusion of CAST. I hope to see you there!

I want to thank Joe Stanaland for taking on the task of being the editor of *The Nucleus*. This is often a thankless job, but Joe has done a fine job for us. Now Joe has decided that it is time for him to move on to other opportunities. We wish him the best.

Now it is time for you to step up to the plate. Every position in TABT is a volunteer position. Won't you try at being our new Editor. Just contact Alton Biggs at ***altonb@ix.netcom.com*** and he'll help you from there. There are also committee openings for many positions. Again, Alton will be our contact point for getting names to Joy Killough our new president in 2009. Additionally, every year we need people to run for office. Consider this your invititation. Remember that TABT is your organization. If we can ever be of help to you, please don't hesitate to ask one of us. We may know know the answer to your question, but we'll do our best to find the correct answer for you.

Benjy Woods,
TABT President

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Onion Cell Osmosis

by **Joy Killough (*joy.killough@kisd.net*)**
Kerrville ISD

Cells of all types are affected by osmosis, the movement of water across a selectively permeable membrane. In the red onion you can see dramatic effects quickly when the onion cells are placed in a hypertonic solution (one with more solute in comparison to another solution) Changes in these cells membranes can be measured using *Image J*, a free computer program available on the internet.

To be most successful at this activity, these two things are needed.

1. Thin tissue
2. Pigmented cells

The red onion is an excellent choice of organism for this activity because pigmented, one-cell thick tissue is easily obtained in the following manner:

Caution: Scalpels and razor blades are sharp. Use these precautions.

- Cut away from your body.
- Put away as soon as cut is complete.
- Never use a rusty blade (dispose of properly).

You will need:

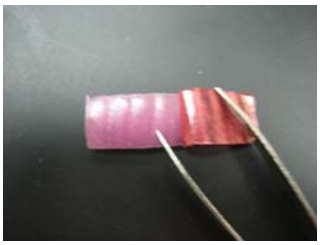
glass slide	pipette	camera to share at your lab table
cover slip	small beaker of water	microscope
forceps	15% Salt solution	laptop

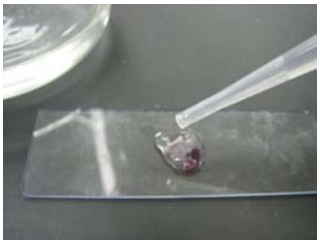
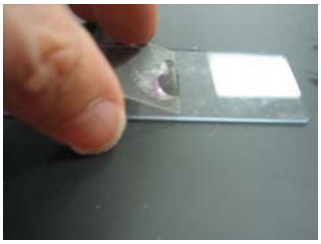
Make a Wet Mount of the red onion tissue:

1. Cut a rectangle (approximately 1 cm by 2 cm) in the red onion.

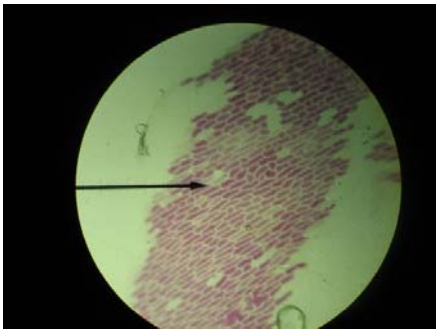


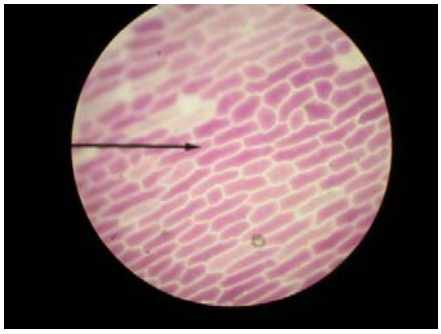
2. Do not use papery outer layer.
3. Remove a cut onion layer. Onion may be shared with others in your class.
4. Using forceps, remove a single layer of tissue on the pigmented side of the onion slice. Immediately place on slide and add drop of water on top of onion tissue. Delay may cause the onion tissue to curl up requiring you to begin again.



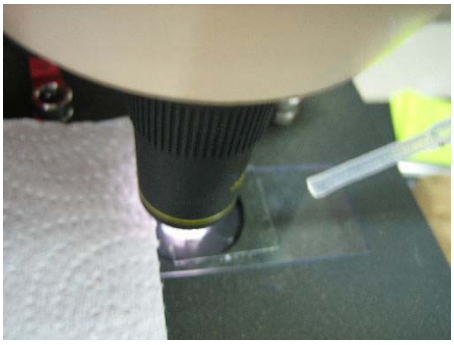
5. Find the onion cells under scanning power (40x) as shown below.


Red Onion 40x


Red Onion 100X

6. Center the sample and switch to the 10x objective (100x) as shown above. You may now use 100x or switch to the 40x objective (400x).

7. Tear a small piece of paper towel with a straight edge. Place on one side of the cover slide. Add several drops of 15% NaCl (salt) solution to the other side of the cover slip. The fresh water added as the wet mount was made will be wicked away to the paper towel and replaced by the salt water. The salt water is hypertonic to the cell. It has more solutes than are present inside the cell. Water will leave the cell since water moves from a hypotonic to a hypertonic solution.



8. The changes are fast. Watch your onion undergo plasmolysis. When you think your onion has stopped “shrinking” take a picture and download it to your computer. Be sure to pay attention to where it is saved.

Analyzing Change in Red Onion Osmosis Using Image J

From the start menu, open **Image J**. **Image J** is a free program available on the Internet. Open your picture and use it to set the scale. The easiest way to set the scale is to use the known values for the diameter of your

microscopic field of view. If your measurements are in micrometers, convert to millimeters (mm). Your sample field of view in mm. Microscope will vary, but may be: 40X = 4.5 mm; 100X = 1.8 mm; 400X =0.45 mm. Use the straight line selection tool (fifth from left) to make a line across your entire field of view.

In Image J:

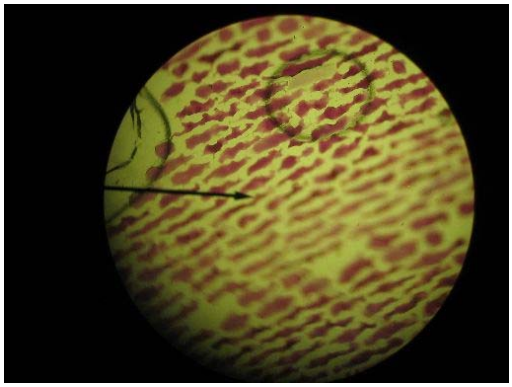
Go to analyze - "set scale."
The distance of your line will show in the pixel box.
Enter the known distance for your field of view.
Leave pixel ratio at 1.0
Change unit of length to mm
Choose "Global"
(Be sure to check scale after opening a new picture)
Choose OK.

You are now ready to work with your onion cell picture and measure the area of the cell. Go to analyze - "set measurements" and then click "area" and "perimeter" boxes. Set for 4 decimal places.

To compare area before and after, use the freehand selection tool (4th tool from left). Trace the cytoplasm within one cell with the tool. Select "analyze" to "measure." This will open a results box. This is your final value. Repeat with the same cell. This time trace the inside of the cell wall. This is the initial value.

Using the area values calculate the percent change in area as follows.

$$\frac{\text{Final area-Initial area}}{\text{Initial area}} \times 100$$



These cells are plasmolyzed. The cytoplasm and cell membrane are pulled away from the cell wall.

What do you turn in?

Make a data chart in your journal with your final (after salt) and initial cytoplasm areas and perimeters (in mm) for at least 3 cells.

Calculate percent change in area and percent change in perimeter.

Discuss data using the terms hypotonic, hypertonic, and plasmolysis. Discuss the difference between percentage change in area and the percent change in perimeter.

Answer the following questions:

1. Why can you use the same cell for the final and initial area and perimeter?

2. What makes the red onion a good choice for this experiment?

3. Which value changes more, area or perimeter? How do you account for that?

The Egg as an Adaptation to Life on Land

by Alton L. Biggs

Amphibians were the first vertebrates to invade the land. However, their success was limited by their dependence on water for reproduction. Only a few amphibians havebeen able to reproduce without water. The exceptions are minor and all are threatened or endangered in their natural habitats.

Reptiles successfully adapted to life on land by producing amniotic eggs. Unlike fish and amphibian eggs, ***amniotic eggs*** contain membranes that protect the embryo from the external environment. Amniotic eggs are like a self-contained pond with all of the materials needed stored inside the egg.

The ***amnion*** is the innermost membrane of the egg. As in humans, the amnion is filled with the fluid in which the developing embryo floats.

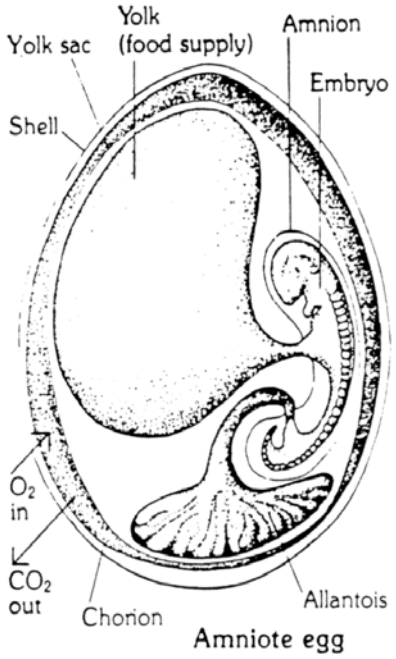
The ***yolk sac*** is the membrane that encloses the stored food. Egg yolk is rich in proteins, carbohydrates, and lipids. The food reaches the embryo through blood vessels that develop between the yolk and the embryo as it grows.

In reptiles, the ***allantois*** is a membrane that grows from the gut of the embryo. The allantois collects the wastes and is left when the egg hatches.

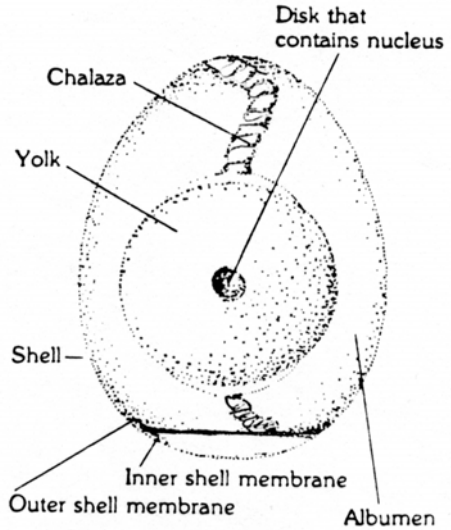
The outermost membrane, ***the chorion***, serves as a gas exchange surface for the embryo. Without the chorion, oxygen would be unable to reach the embryo and it would die. Gas exchange occurs through diffusion, a process that does not require the expenditure of energy.

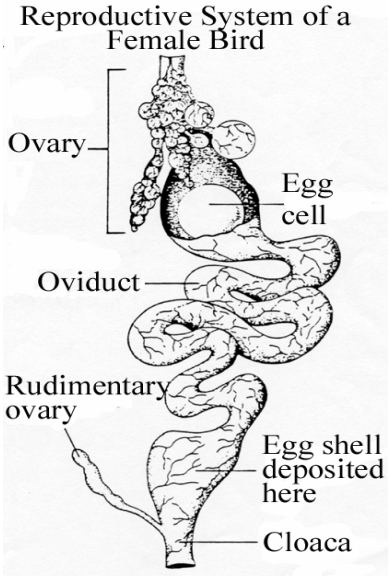
The ***chalaza*** is a membrane found in bird eggs that keeps the embryo from settling to one side of the egg. This membrane is found between the mem-brane covering the albumen and the yolk.

Reptile and bird eggs differ most markedly in their external covering. In reptiles the shell is pliable and soft. Bird eggs have a hardened shell made up of deposits of calcium carbonate. Much of the shell's calcium is absorbed by the embryo just prior to hatching. The reduction of calcium content makes the egg crack open more easily as the chick emerges.



Amniote egg





Notice in the figure on the previous page that the reproductive system of a female bird usually consists of a single functioning ovary. The left ovary of female birds is usually only a rudimentary structure. Most birds produce eggs only in the spring. The barnyard chicken has been bred to produce eggs throughout the year. However, even the eggs of chickens are produced in greatest abundance in the spring.

DIRECTIONS

Empty the contents of a chicken egg into a Petri dish. Examine the egg to locate the structures shown on the previous page. Compare the egg with the structures shown in the reptile amniote egg. Notice the similarities and differences.

REPORT

1. Draw and label to parts of a chicken egg as found in your Petri dish.
2. In most instances the eggs purchased from stores are not fertilized. What does this mean?
3. Describe the differences between the shell of a chicken egg with the shell of a snake or turtle egg.
5. Assume that a particular species of bird evolved to live its life in water. What adaptations might be expected in the eggs produced by the new species?
6. Make a table to list similarities and differences between reptile and chicken eggs.

Join NABT! National Association of Biology Teachers

MEMBERSHIP APPLICATION

❑ **Yes,** I want to join the National Association of Biology Teachers (NABT) and receive all member benefits, including:

- ❑ 9 issues of *The American Biology Teacher*
- ❑ *ABT* Online supplements
- ❑ weekly electronic issues of *News & Views*
- ❑ conference and publication discounts
- ❑ and more!

Dr./M _____

School/Org. _____

Mailing Address _____

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City _____

State _____ Zip _____

Province _____ County _____

This is my ❑ home ❑ business address.

E-mail Address _____

Fax _____

Type of Membership

❑ **FULL MEMBER** $70/yr

❑ **FOREIGN MEMBER*** $119/yr (U.S. check or international money order only)

❑ **STUDENT MEMBER** $39/yr (open to regularly matriculated students not in full-time employment)

Signature of faculty member required below:

_____

❑ **SPOUSE MEMBER** $33/yr

(when accompanied by an active membership)

❑ **SUSTAINING MEMBER** ($750/yr)

❑ **ORGANIZATIONAL MEMBER** ($149/yr)

❑ **LIFE MEMBER** (one payment): Ages 21-29: $1250; 30-39: $1000; 40-49: $850; 50-59: $600; 60+: $400

**U.S. rates apply to citizens of Canada and Mexico.*

NOTE: $48 of membership dues goes toward a subscription to *The American Biology Teacher,* for each year joined, except spouse members, in which case only the sponsoring active member receives a subscription to be shared by the two persons.

Professional Information

Please complete the following to help NABT better serve your needs:

1. Professional Class
- ❑ Biology Teacher
- ❑ Department Head
- ❑ Supervisor/Administrator
- ❑ Teacher Educator
- ❑ Student
- ❑ Other _____

2. Teaching Level
- ❑ Elementary
- ❑ Middle/Junior High
- ❑ High School
- ❑ Two-Year College
- ❑ Four-Year College/University
- ❑ Other

3. Interest in NABT Sections
- ❑ Elementary/Middle School Section
- ❑ High School Section
- ❑ Two-Year College Section
- ❑ Four-Year College Section
- ❑ AP Biology Section
- ❑ Role & Status of Women in Biology Education
- ❑ Multicultural Affairs Section
- ❑ Retired Section

4. Do not provide my name & address to other companies ❑

Payment Method

NABT accepts checks drawn on U.S. banks and international money orders (payable to NABT), MasterCard, VISA, and Purchase Orders or join online at www.nabt.org.

❑ Check ❑ Purchase Order # _____ *(please attach)*

❑ MasterCard ❑ VISA

If paying by credit card, please complete the information below:

Acct. # _____

Expiration date _____

Card holder _____

Signature _____

RECRUITED BY: TABT, Alton L. Biggs

Complete and return to:

National Association of Biology Teachers
P.O. Box 791048, Baltimore, MD 21279-1048
FAX (703)264-7778

Texas Association of Biology Teachers
c/o Alton Biggs, Computer Records Clerk
2006 Creekview Drive
Commerce, Texas 75428-3947

Texas Association of Biology Teachers

Membership Application (Please Print All Information)

Name:_____ Telephone: (_____)_____

Home Street Address, City, State, Zip:_____

E-mail address (***very important***): _____

Type of membership: _____Active ($10) _____Student ($5) _____Retired ($5) _____Life ($250)

Please complete the following to assure balanced representation in planning TABT activities

1. Professional Class (**Check one only**)

_____Biology Teacher _____Department Chairman _____ Curator/Interpreter
_____Supervisor/Administrator _____Teacher Training _____Student
_____Other_____

2. _____Male _____Female (**OPTIONAL**)

3. Have you ever received the OBTA? ___ No ___ Yes If yes, what year? _____

4. Number of years teaching?_____

5. Organizational Class (**Check one only**)

_____Elementary _____Middle/Junior High _____Secondary _____College/University _____Zoo/Aquarium
_____Business/Institution _____Other_____

6. Special Interests (**Check no more than 2**)

___Cellular/Molecular ___Botany/Plant Science ___Laboratory Science ___Reproduction/Evolution ___Zoology
___Computer Instruction ___Environmental Biology ___Teaching Materials ___Other_____

7. I am also a member of (**Check all that apply**): ___National Association of Biology Teachers (NABT)

___National Science Teachers Association (NSTA) ___Science Teacher Association of Texas (STAT)

Please send membership application and dues to: Alton L. Biggs, TABT Records Clerk
2006 Creekview Drive, Commerce,TX 75428-3947

Make all checks payable to: Texas Association of Biology Teachers