



# The Nucleus

*Official Quarterly Newsletter of the  
Texas Association of Biology Teachers*

**Volume 22, Issues 2-3**

**Spring-Summer, 2008**

## President's Message:

Greetings,

I hope that you had an enjoyable and restful summer. Hopefully, you are now recharged for the start of a new school year.

Several TABT members visited Costa Rica on our annual TABT sponsored international trip. You've already seen the eBook Alton Biggs sent, and more details are contained on pages 5 and 6 of this newsletter. Stay tuned for details, regarding next year's trip, and consider traveling with TABT! Traveling is a great opportunity to add to your arsenal of stories, and examples to use in your biology classrooms.

Summer is the season for excellent professional development opportunities. I highly recommend attending an AP Summer Institute next year if you didn't get around to it this year. It is a great opportunity to learn from some of the best classroom teachers around. If the budget does not allow for a major professional development opportunity, then try something a little less formal than traditional professional development. Take the time to beef up on your knowledge of local wildlife, and environmental concerns, by visiting local parks, and nature centers. Go to your local bookstore and sift through the plethora of popular books, and field guides, that have been written for Texas wildlife, or even volunteer with a hospital or research facility. Also, there are many new biology related books that warrant a second look – far too many to review, or make recommendations on. I read Kenneth Miller's latest book *Only a Theory: Evolution and the Battle for America's Soul*, and *Guns, Germs, and Steel* by Jared Diamond this summer. I'd recommend them if you haven't yet had a chance to read them.

Finally, before you get too far into this new school year, take some time to reflect on the past year. Think about what worked, what flopped, and try to work in a few new labs or activities. If you do not have a well written syllabus for your course, I encourage you to take the time to write one. Syllabus writing is a great way to reflect on your course, and to help you plan for the upcoming year. Plan your course proactively rather than reactively. Time spent planning is much more productive now than in a couple of months when students, grades, and parent conferences are all piling up.

I hope you had a great summer, but more importantly, I hope you have a great school year in 2008-2009!

***Benjy Wood,  
TABT President***

### *In this issue ...*

20 Questions: An Introduction to Dichotomous Keys by Michelle Barnet . . . . .	2, 6
Cheap Inspiration by Jill Wallace . . . . .	3 - 4
Thank You to Our Sponsors . . . . .	4
TABT's International Expedition to Costa Rica by Alton L. Biggs . . . . .	5 - 6
NABT Application . . . . .	7
TABT Application . . . . .	8

## 20 Questions: An Introduction to Dichotomous Keys

by Michelle Barnet, Bandera High School, Bandera, Texas



Image used with permission from 20Q. 20Q™ electronic game by Radica Games, Inc.

As most biology teachers know, a dichotomous key is used by taxonomists to identify organisms. It is a set of paired statements, one of which is chosen by the observer that best describes the organism. At the end of the statement, one is directed to another set of statements until the organism is finally identified. Biology objective 8A of the Texas Essential Knowledge and Skills (TEKS) is directly related to the teaching of dichotomous keys—“collect and classify organisms at several taxonomic levels such as species, phylum, and kingdom using dichotomous keys.”

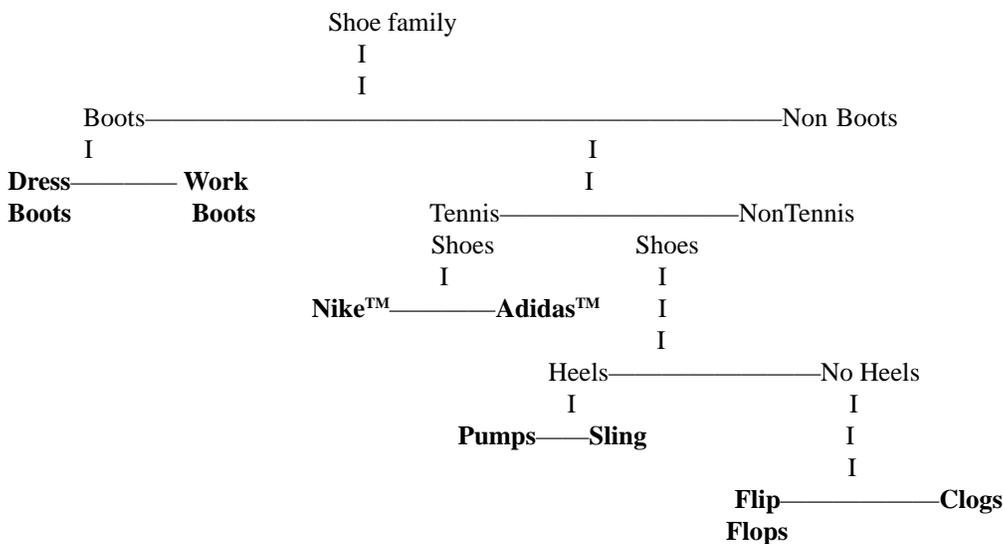
One of the newest toys in recent years has been the “20Q” or 20 Questions electronic game by Radica Games™. This game amazes players by “guessing” the object (animal, vegetable, or mineral) that one is thinking of. It is very accurate, and my students who had not seen it before were amazed by its abilities when I brought one to class. I used this game as an introduction to dichotomous keys, because the basic workings of 20Q are similar. I explained to students that the electronic game has a database of objects and their descriptions, and as it asks the player questions (like the old 20 question game), it is *eliminating* possibilities and then choosing the next question—similar to how a dichotomous key is designed to identify organisms.

The workings of this electronic game were developed by Robin Burgener in 1988, when he developed the game for himself and friends. There is an on-line version of this game at [www.20q.net](http://www.20q.net), and this on-line version is a form of artificial intelligence that functions similarly to a neural-network.<sup>1</sup> Of course, this “game” is much more sophisticated than a simple dichotomous key, but it works well to introduce the concept to students. Some interesting discussions can also be held regarding potential applications for the 20Q program, as the inventor Burgener hopes that its artificial intelligence could be used in the medical field.

I use the 20Q game to emphasize to students how dichotomous keys have been developed to identify living organisms by using characteristics that are apparent to the observer. As a class, we think of several everyday objects and test the 20Q electronic game to see if it will guess correctly. I point out to the class that each time we start a new game, the toy is not using the *same* questions each time—it is choosing the next question based upon the last answer we gave it. At this point I show my students that when using a dichotomous key, the path taken through the key is different each time a new organism is being identified, and it is dependent on the choice made at each dichotomy. I give them examples of different types of simple and complex keys used to identify trees, insects, etc. Some students immediately point out that these dichotomous keys could be put into a computer instead of on paper similar to the 20Q game.

Once they understand how a dichotomous key functions in identification, we build one for ourselves in the classroom by classifying shoes. Many teachers have used this quick and easy activity. For those who have not done this, the teacher begins by asking each student to remove one shoe and placing it in a pile in the center of the room, or on top of a desk. The teacher then asks, “What **one** characteristic could be used to separate these shoes into **two** major groups?” The shoes are then separated into the two main groups, and the teacher draws on the board a representation of the key as it is developed. Each pile of shoes is then subdivided by a new characteristic, until there is only one shoe left in each category. This is a good opportunity to introduce binomial nomenclature and emphasize that each individual shoe could be a “species” and thus be named.

Here is a hypothetical shoe tree” and its dichotomous key. Emphasize to students that a different dichotomous key could have been developed for these same shoes, and in biology, dichotomous keys and taxonomy changes every day as more evidence in the form of DNA sequences are discovered. Invariably, a visitor appears at my classroom door to deliver a message during this lesson. Examination of the visitor’s shoes allows the class to “test” the dichotomous key to see if it needs to be changed!



(Continued on page 6)

## **Cheap Inspiration**

by Jill Wallace, science department co-chair at Flower Mound, Texas

I am a biology teacher, which means I save everything! And I don't save just my junk. No, I'm a world class saver. My mother-in-law saves dead spiders and plastic containers for me and my sister-in-law saves craft supplies and old magazines she thinks I may be able to use – and I *do*! The beauty of teaching Biology is that I can find a use for anything and everything. I get great ideas for labs and activities from 'prizes' I get from friends and families.

Another source of inspiration for new labs or activities comes from one of my favorite places to spend an hour or so: The Dollar Store! In Texas, there are lots of them to choose from and I have found lots of materials on their shelves to develop labs and activities around. At \$1.00 per item, you can get a big bang for your buck. In this day of budget crunches and rising prices, The Dollar Store may just be a science teacher's best friend.

On shelves of my local dollar stores, I have found all kinds of basic lab essentials. For example, I keep a supply of baby bottle brushes on hand which make the best beaker scrubbers (the large brush end) as well as super test tube cleaners (the small brush end). At a \$1.00 each, you can throw them away when they get dirty without feeling guilty. Traditional lab beaker and test tube brushes are expensive when purchased from a scientific supply company and mine work just as well.

Other items I buy for general lab use include: cheesecloth for DNA extraction; clear plastic cups as beaker replacement; assorted craft/art supplies; calculators for a cheap classroom set; cleaning supplies; tools (hammers, wire strippers), rope, string; electrical supplies; and kitchen tools (knives, can opener). Occasionally, I go to the local discount or toy store and just walk through the aisles looking for something that I may be able to use as material to demonstrate or model something for my students. Following are a few of my favorite ideas.

### ***Word Walls***

I used 6 shower curtain liners and 3 packages of computer paper with decorative borders to make my Word Wall. I laminated the computer paper and sprayed the liners with temporary adhesive (the only thing not bought at The Dollar Store). Students used the laminated paper with dry erase markers over and over and I could hang the liners anywhere on my walls or even from the frames that hold up my suspended ceiling – by using ribbon, string, or shower rod hooks. The versatility makes it handy in my classroom, lab, or even in the hallway.

### ***Ravenous Balloonies***

Do you remember 'Balloonies' from your childhood? You may not recall the name but I bet you'll remember the small, silver toothpaste-like tubes that contain a polymer you placed in the shape of a ball on the end of a small straw you blew into to make a large bubble. I loved those things and my students do too! And best of all, they make the perfect model for endo- and exocytosis. Here's how I use them in my class.

Each card of 'Balloonies' comes with 6-8 tubes of polymer and 5 straws. I have found that if you pair your students, one tube will provide enough material for up to 3 pairs. Students reuse the straws by wiping them with alcohol swabs after use. Plastic coffee stirrers cut into thirds work well also. Do not use regular size straws.

Model the blowing of a 'balloonie' using the directions on the back of the package. As soon as you blow up the bubble, remove it quickly from the straw by pinching the polymer together to seal the area where it was attached to the straw. Next, challenge each team to have their new single-celled organism 'eat'. Do not tell them how to do it – let them experiment. M&Ms and Skittles make good 'food' for the cells. Use food of different sizes to illustrate the concepts of molecular size and phagocytotic limitations. Once students' cells have successfully engulfed their food, the food will be encased in a 'vacuole' composed of the polymer which represents the cell membrane. Next, once one or two of the students' cells have managed to successfully 'eat,' challenge your student to have their cells undergo exocytosis. It can be done successfully, but requires patience and usually more than one try.

Here are a few pointers to make this activity more successful.

First, *do not* do this in a closed classroom. The polymer fumes will give you and your students a headache. I do this in the main hallway which brings “oohs” and “aahs” from adults and students alike. Inquiring minds that pass by during this lab give my students a chance to explain the process of endo- and exocytosis which gives me a chance to evaluate their understanding of the concept.

The ‘cell’ needs to start as large as possible. The ‘cell’ will be able to ‘eat’ a little easier if the balloon is not completely full of air. When the ‘cell’ undergoes exocytosis, it is easier to do if the food is dropped to the bottom of the ‘cell’ and is removed from there.

Again, not everyone will be successful but most will. I always wrap up the activity by having a volunteer who was successful to demonstrate for everyone both processes followed by a class discussion about how this occurs in real cells and what are some of the problems they must overcome. Regardless of how well their ‘cell’ managed to accomplish this process, they will understand the concept.

### ***Classification Games***

Classification can be demonstrated in a variety of ways using inexpensive materials. One of my students’ favorite activities dealing with classification is using plastic animals I have purchased at dollar, toy and discount stores and placing them in groups based on different criteria.

Another classification activity uses sticky-backed fun foam shapes. The fun foam pieces can be used over and over again if they are affixed to plastic wrap or wax paper. If you are using the shapes to produce cladograms, the students may use permanent markers to construct the outline on the wax paper or plastic wrap.

So, the next time you have an opportunity to spend a few minutes (or an hour) in a discount, dollar, or toy store – smile and try to think of some creative uses for those affordable treasures you find on their shelves in your class or lab room. Your students will be glad you did.

---

## **Thanks To Our Sponsors**

### **Underwriter Members**

Carolina Biological Supply

Glencoe/McGraw-Hill

Holt, Rinehart, and Winston

Prentice Hall School Division

### **Corporate Members**

Flinn Scientific

George Seidel & Associates

Sargent-Welch Scientific

Science Kit/Boreal Laboratories

Ward’s Natural Science Establishment

### **Sustaining Members**

NASCO

*Consider our sponsors for all of your science equipment and supplies needs this year,  
and thank them for their support.*

## *TABT's International Expedition to Costa Rica*



On the morning of departure Jennifer Jordan-Kaszuba and Alton Biggs used flowers to identify the trip.



From coatis to resplendent quetzals, the group was able to study firsthand both cloud forests and lowland rainforests.



One of the indigenous groups explained their customs and traditions during a walk through the forest. Some TABT members purchased handmade tribal masks and other goods made by this tribe.



On a visit through a working coffee plantation, they learned about how coffee is planted, nurtured, and the beans are roasted.



A two-toed sloth crossing an electrical wire from one post to another provided a reason to make a photo stop. Such unexpected sightings were a regular part of this trip.



All members of the TABT group took the optional visit to a butterfly farm and bat display, which provided the details of myriad ways that these two diverse groups function in ecosystems. The group had seen many butterflies in the wild, but they were much easier to photograph in the exhibit.



From tree ferns to mosses, liverworts, and mushrooms the forest floor was covered with plants.



Three members (and the spouses of two) attended this year's TABT International Expedition to Costa Rica. They were (from left) Alton and Louise Biggs, Jennifer Jordan-Kaszuba, and Karen and Steve Judd.

Consider joining a TABT-sponsored trip or workshop this year. You'll enjoy it, but you'll get to make friends with other TABT members even more than you might imagine!



Nothing is better than the children we meet on our trips!

(Continued from page 2)

### Dichotomous Shoe Key:

- 1 Shoe has tall sides and closed toe (boot).....Go to 2  
Shoe is not a boot.....Go to 3
- 2 Boot has a low heel for working.....*Work Boot*  
Boot has a higher heel for dressy appearance.....*Dress Boot*
- 3 Shoe has appearance of a tennis shoe.....Go to 4  
Shoe is not a tennis shoe.....Go to 5
- 4 Tennis shoe is a Nike brand.....*Nike*  
Tennis shoe is an Adidas brand.....*Adidas*
- 5 Shoe has at least a 1" heel or higher..Go to 6  
Shoe does not have a heel.....Go to 7
- 6 Shoe has a closed toe.....*Pump*  
Shoe has an open toe.....*Sling*
- 7 Shoe has a closed toe but open back...*Clog*  
Shoe has an open toe and back.....*Flip Flop*

The 20Q electronic game is available at many department stores, including Wal-Mart™ and on-line, and retails for about \$9.99.

<sup>1</sup><http://scienceline.org/2006/07/28/tech-schrock-20q/> "Twenty Questions, Ten Million Synapses", by Karen Schrock

<sup>2</sup>[http://abclocal.go.com/wpvi/story?section=special\\_coverage&id=3907755](http://abclocal.go.com/wpvi/story?section=special_coverage&id=3907755) "Matt Plays the Hot Game "20Q"

# 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 \_\_\_\_\_

\_\_\_\_\_

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](http://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



**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**