NEWSLETTER

Kansas Association of Biology Teachers

Volume 41 Number 4 - November—December 2000

Calendar & Activities

Please send meeting dates and other items of interest to biology teachers to: John Wachholz, 2311 Applewood Lane, Salina, Kansas 67401-3707, 913- 825-7742 - E-mail: jwachholz@midkan.net

Date	Event
January 27, 2001	KABT Board Meeting—Emporia State University, Emporia Coffee and Snacks at 9:00 AM—Meeting at 9:30 AM
April 6-7, 2001	KS Academy of Science Annual Meeting, KU, Lawrence
May 4-6, 2001 Tentative	KOS Spring Meeting—Crossed Timbers Area—Chataqua/Elk County
May 4-6, 2001	Kansas Herpetological Society Spring Field Trip East—Marais des Cygnes NWF
May 12, 2001	KABT Spring Field Trip - Northeast KS
June 1-3, 2001	Kansas Herpetological Society—Spring Field Trip West—Hamilton County
September 15, 2001	KSU Manhattan

Plan on attending the Spring KABT Field Trip
Northeast Kansas -- Saturday, May 12th, 2000
(Time & Place in next newsletter)

KABT Web Site - **http://kabt.org**

Made Available by KanCRN - http://kancrn.org

Send comments to: jwachholz@midkan.net

NABT Web Site - http://www.nabt.org

Your membership **expiration date** can be found on your mailing label. All dues are now payable on September 1st of each year. The membership list was last updated on **January 1, 2001**. If you sent dues in after this date they were not recorded before the mailing list was printed.

Publishing Dates For Newsletter

The newsletter is published during the months of September, November, February and April. Manuscripts must reach the editor by the 15th day of the previous month. The KABT Newsletter includes abbreviated minutes of the official meetings, announcements of future activities, brief news notes, and other brief items of interest to biology teachers. Send your contributions to John Wachholz, Editor, 2311 Applewood Lane, Salina, KS 67401 785-825-7742. You may send your information to jwachholz@midkan.net.

Newsletter & Journal Articles

Articles are needed for the newsletter and journal. Send them via e-mail to jwachholz@midkan.net or on a disk. If you send it on a disk, any format is acceptable. Your help is appreciated.

Articles for the Kansas Biology Teacher should be sent to John Richard Schrock, editor KBT, Division of Biological Sciences, Box 50, Emporia State University, Emporia, KS 66801-5087. E-mail: <ksnaturl@esumail.emporia.edu>

Please remember to keep your dues up to date so you will continue to receive KABT publications.

Outstanding Biology Student Certificates

These are available for students who have completed a biology course under you and have shown outstanding achievement. Send your name and address to KABT Student Certificates, 2311 Applewood Lane, Salina, KS 67401-3707.

Please use these certificates as valuable awards for outstanding students.

NABT Contact Information

Address:	12030 Sunrise Valle Drive, Suite 110 Reston, VA 20191-3409
Web Site:	http://www.nabt.org
Phones:	703-264-9696 or 800-406-0775
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E-mail:	NABTer@aol.com

Message From Your President

I can't believe I will actually be the KABT president come January 1. For the last two years, as I have represented KABT, I have been identified as the president-elect. It seems as if I have been in this honorary position. I would speak to a reporter as the president-elect and even a year later, I was still the president-elect. I guess I will have to earn my keep now.

I really think all members of KABT should express their appreciation to Lisa Volland for a job well done. Lisa has done much to keep KABT vital and in the public eye these last two years. She now joins an elite list of KABT past presidents. Each has brought their own special talents to our organization and left it better off because of them.

Lisa has been a great organizer. She has arranged for KABT members to present their favorite labs at the national NABT convention for the past two years. This was well received even in our first year with a packed house. She has arranged some great field trips highlighted for me by seeing that black bear down near Elkhart.

Undoubtedly Lisa will be remembered by everyone who has won one of her door prizes at our meetings. She has secured the donation of a microscope each of the past two years. That is quite a door prize when there are only 30 people in attendance. I am glad Lisa has volunteered to continue in the job of arranging door prizes. I was feeling a lot of pressure to keep up.

I won't attempt to replace Lisa but I promise all KABTers that I will give my best effort to continue the strong traditions of our wonderful organization and add to them.

Many of us have been active both with KABT and with Kansas Citizens for Science fighting for a return to quality science standards in Kansas. We were particularly fortunate this fall to have Wayne Carley, NABT Executive Director, speak at our fall meeting in Wichita.

He spoke eloquently about how we needed to keep up the fight against those who would abridge our standards and the very quality of science education by imposing their personal points of view. He mentioned how creationism isn't really a religious movement but rather a political one.

He suggested we use our vowels to fight these challenges.

A - advocate. Advocate in your community and in the state for quality science education.

E - educate. Educate others about the need for quality science education and about the challenges we face.

I - integrate. Integrate evolution into your classes throughout the year. Don't make a lie out of the idea that evolution is an overarching theme of science.

O - opportunity. Take every opportunity you can to talk about this issue.

U - unite. We don't need to face these challenges alone. Unite and let our strength come from our association.

& Y - you. It's up to you.

Message From Your Outgoing President

What a great way to start the year--KABT had an excellent fall conference at the Great Plains Nature Center in Wichita in September. We were honored to have a special guest speaker, Mr. Wayne Carley, the executive director of NABT. He talked to us about our expectations of ourselves as biology teachers and how that will shape our

teaching in the future. We were given both a talk on Kansas wildlife and an opportunity to tour the trails of the nature center lead by Mr. Bob Gress, the director of the nature center. It will be a nice place to take my students in the spring--check into their field trips! Last week, I was able to attend the NABT conference in Orlando, Florida. It was invigorating as well as informative. It is so nice to attend an NABT conference and see both friends from Kansas as well as friends that I have made at previous NABT conferences. Once again, five (plus one) KABT members presented their favorite labs at an afternoon session on Friday, October 27, 2000. Presenting along with myself and our new president, Harry McDonald, was our OBTA recipient, Ernie Brown; the section chair for the two-year community colleges, Todd Carter, and KABT member Mickie Pemberton (I just used her labs in my class today!!). Brad Williamson, the new NABT president-elect, was able to squeeze in a few minutes at the end to present a nifty idea on writing up lab reports. I hope you can see by all of these accomplishments that our KABT speakers have completed they are on top of things.

I tried to keep track of everyone that was from Kansas at the NABT meeting--besides those mentioned above; Ernie's wife, Pat and his wife from Tonganoxie, Stan R. and his wife from Lawrence, Jeff from Ottawa University, Randy (our new director-at-large) from Olathe North, Elaine and Maria from Washburn Rural, Caroline from Blue Valley, Sondra from Allen CCC, Donda and Lucy from Wichita. If I left someone out, I apologize! I had a migraine most of the time that I was there, so it is hard to remember every detail! It was really nice to see a good deal of representation from Kansas once again, and it was certainly fun to all have dinner together after our presentation. Harry was asked to step in and cover the Region 4 get-together Friday night and just did an outstanding job!!

In order to be a professional in our field, it just makes sense for every biology teacher in Kansas to become a member of both KABT and NABT. All of the ideas, labs, research, etc., are geared towards our use. Plus, there are opportunities to be a part of the summer workshops, research experiences, and field trips. BE A MEMBER OF BOTH YOUR STATE AND NATIONAL ORGANIZATIONS!! If you would like an application to join NABT, send me an e-mail, and I'd be glad to share one with you! One of the biggest benefits of joining NABT is receiving the American Biology Teacher. The updates are valuable and timely and the how-to-do-its are great for high school teachers. NABT also offers a wide variety of other publications as well as corporate discounts for insurance and credit cards.

A special congratulations goes out to Ernie Brown, again, he is our OBTA winner for Kansas, and we are very proud of him! We are also proud of Brad Williamson's win for the NABT president-elect. He will be our sixth Kansas NABT president (according to Stan Roth, our KABT historian!!). What great colleagues we have to teach with and communicate with--don't miss out on your opportunity to be involved with KABT and NABT--the friends you will meet and correspond with are so very valuable to your teaching career!

I also would like to say that it has been both fun and an honor to serve as the KABT president for the last two years. I really respect those people who work really hard at keeping KABT alive--such as John W., Stan R., and Brad W. Without them, Kansas biology teachers wouldn't have any kind of cohesion! Thanks to all of our officers and board members as well as to the members that keep up their memberships. Please plan to attend the spring field trips and fall conferences--keep KABT going strong in the future!

Heading To Quivira or Cheyenne Bottoms

Birders heading to Cheyenne Bottoms need to be aware that highway K-156 is under construction and closed from Great Bend to the Barton—Ellsworth line. Bummer! Best bet if you are coming from a westerly direction is probably to come in from the west past the headquarters. If you are coming from an easterly direction follow the detour on highway K-4 and come in at the Redwing entrance (aka the Prairie Dog Town road). Information from the Kansas Department of Transportation indicates that K-156 is scheduled to be closed until July 2001. If you are headed to Quivira NWR take the detour to Claflin and then take the paved road south from the east edge of Claflin. This will eventually get you back to the road that goes into Ellinwood from the north.

Evolution Lab Activities

The controversy surrounding the Kansas State Science Standards has helped to clarify the need for effective, laboratory-based evolution activities. Traditionally, high school evolution laboratories have tended to be simulations or dry labs. "Natural selection" simulations involving colored paper disks on various backgrounds or dyed toothpicks in the grass come to mind. KABT (thanks to Brad Williamson) has collected a few excellent evolution labs that can be found on the web. Several are actually designed for college undergraduates but they can be rather easily adapted for high school. Here are three of them:

1. A classic activity developed by Joseph Camin while at the University of Kansas is the phylogenic history of Caminalcules. Robert P. Gendron from Indiana University of Pennsylvania has developed a fine web site that features an activity he wrote using Caminalcules. His site has downloadable instructions and caminalcules as well as numerous other valuable evolution resources. He recently published this activity in the American Biology Teacher. This activity works well, unmodified with sophomores and above.

   http://www.iup.edu/~rgendron/camin.htmlx
2. John Bannister-Marx has developed a number of excellent high school evolution labs and has made them available on the web. One that I think is particulary

important for high school students has to do with measuring the age of a particular geologic deposit—the Green River formation from Wyoming and NW Colorado. Students count lake varves (layers of lake sediment layed down in an annual patter) in this activity. The Green River formation is a former freshwater lake and the formation is approximately 240 meters thick. Students count the varves in a small section (1 cm) to get an average number of layers and extrapolate that to the estimate the length of time necessary to deposit the formation—millions of layers = millions of years. John has this and other acitivities at:

http://www.tufts.edu/as/wright_center/fellows/jbm6.html

3. The Biology Workbench is a site rich in potential for student research and exploration. This is a supercomputer site that has a number of professional tools available for student and teacher use for molecular analysis of evolutionary phylogenies. There are a number of tutorials that are set up to introduce you to this tool. Few high school teachers have the background to feel comfortable with this site—at first glance. I'd suggest you try the myoglobin analysis tutorial first before introducing your students to this. I think you'll find that this is the next place that we will be working in the high school classroom. Exploring the incredible gene, protein and genomic databases will be a required part of high school biology in the near future.

   http://workbench.sdsc.edu/

   The tutorials page is at:

   http://glycine.ncsa.uiuc.edu/educwb/tutorials/

4. Many of us "more experienced" teachers started teaching before cladistic analysis became established in most fields of systematics. The University of Kansas Museum of Natural History has the following available that can help you get caught up to date:

   The Compleat Cladist: A Primer of Phylogenetic Procedures by E.O. Wiley, D. Siegel-Causey, D.R. Brooks, and V.A. Funk is out of print. A new edition is expected in 2000, but until it becomes available, the museum has made available free a portable document format version of the first edition. To obtain a copy, go to the download page.

   http://nhm.ukans.edu/cc.html

Books for Biology Teaching

This is a great time to be teaching biology. The public is becoming intensely interested in the new understandings that are developing in biology. Reflecting that interest a number of excellent books have been authored over that past three years that address specific areas of biology. These books are excellent resources for teachers and students. Here is a list of books I'm recommending with descriptions or reviews posted on Amazon.com:

Life Itself : Exploring the Realm of the Living Cell

by Boyce Rensberger

Book Description from Amazon.com.

Hidden in a nondescript red-brick building in Rockville, Maryland, is the most unusual warehouse in the world, a bank of living cells called the American Type Culture Collection. Here, at 321 degrees below zero--a temperature at which life abandons its vital dance and enters limbo, but without dying--are some 30,000 vials holding 60 billion living forms in suspended animation, including mouse kidney cells, turkey blood cells, armadillo spleen cells, and some 40 billion human cells. These cultured cells are essential to modern biological research--in fact, cells today are the most intimately studied life forms in all of science, for both practical and philosophical reasons. For one, all disease--from cancer and the common cold, to arthritis and AIDS--stems from cells gone awry. And cell research not only promises a cure for a wide variety of disease--it also holds the key to the mystery of life itself.

In Life Itself, Boyce Rensberger, science writer for The Washington Post, takes readers to the frontlines of cell research with some of the brightest investigators in molecular, cellular, and developmental biology. Virtually all the hottest topics in biomedical research are covered here, such as how do cells and their minute components move? How do the body's cells heal wounds? What is cancer? Why do cells die? And what is the nature of life? Readers discover that--contrary to what we may have concluded from pictures in our high school textbooks--cells teem with activity and that, inside, they "are more crowded with components than the inside of a computer." We learn that scientists now know of at least ten molecular motors that move things about inside the cell--in most cells, this motion is short because the cell is tiny, but in the single-celled nerve fibers that run from the base of the spinal cord to the toes (measuring three or four feet in an adult human), molecular motors can take several days to make the trip. Rensberger describes the many fascinating kinds of cells found in the body, from "neural crest cells" (early in embryonic development, these cells crawl all over the embryo to the sites where they will pursue their fate--as nerve cells, or cartilage, or skin), to "dust cells" (nomadic cells in the lung that swallow and store indigestible particles, then migrate to the gullet where they themselves are swallowed and digested), to "natural killer cells" (millions of which roam the body looking for cancerous cells). We meet many of the scientists who have pioneered cell research, such as Rita Levi-Montalcini—an Italian who, shut out of her lab during World War II, continued to experiment in her bedroom at home, making the discovery ("nerve growth factor") for which she won the Nobel Prize--and American Leonard Hayflick, who proved that all human cells (except cancer cells) invariably die after about fifty divisions. Rensberger also provides an illuminating discussion of AIDS--revealing exactly why this virus is so difficult to defeat--and of cancer, explaining that before

cancer can start, a whole series of rare events must occur, events so unlikely that it seems a wonder that anyone gets cancer at all.

The solutions to the most pressing challenges facing scientists today--from the efforts to conquer disease to the quest to understand life itself--will be found in the innermost workings of the cell. In Life Itself, Boyce Rensberger paints a colorful and fascinating portrait of modern research in this vital area, an account which will enthrall anyone interested in state-of-the-art science or the incredible workings of the human body.

The Energy of Life : The Science of What Makes Our Minds and Bodies Work

by Guy C. Brown

Book description from Amazon.com.

The enigma of human energy has been cracked. Biologist Guy Brown offers the first popular introduction to the cutting edge science of bioenergetics, one that provides a new understanding of the energy of life. We all know that something is happening to our energy levels on a sugar "rush," or a coffee "high," or following that afternoon nap, but now everyone can understand the smoothly operating human-energy machine, thanks to Brown's lucid overview of how energy courses through us at both the micro level of our cells and the macro level of our behavior.

At the micro level, the fundamental energy of our bodies is the frenetic movement within our cells that is powered by body heat. The nucleus, the mitochondria, and all ten thousand tiny bimolecular machines that fabricate and transport molecules around the cell do not sit still within the cell membrane but move about as if they were bubblegum balls in a vibrating gum machine. This movement puts every element of the cell in contact with every other every few seconds and enables the energy of the cell to flow. The energy comes from mitochondria, those strange, genetically distinct little beasts that heat our bodies and consume all the food we eat and oxygen we breathe. Brown has completed breakthough work on mitochondria and explains how they invaded our cells hundreds of millions of years ago. In the last few years, he and his colleagues have shown how these invaders wield the power of life or death over our every cell, over our very lives.

The carbohydrates, fats, and proteins we eat constitute mitochondria's main fuels, but our brains run only on glucose -- a peculiar and even toxic chemical when there is too much of it in our blood, as any diabetic knows well. This energy source of the mind is in very limited supply in our bodies because we can store so little of it. Brown suggests that we tend to eat too much fat because we are designed to stop being hungry when we've eaten enough of the carbohydrates from which we make glucose. Eating fat doesn't make us feel "full" as quickly or in the same way. For this reason, in the macro world of affluent societies, we must remind ourselves of the importance of a relatively high-carbohydrate, relatively low-fat diet.

Brown explores the energy dynamics of our athletic limits and our excited minds. He shows the strengths of mitochondria-rich brown muscle and the high-speed power of mitochondria-poor white muscle. Sex, which surprisingly begins as electrical energy in the brain's hypothalamus cell nuclei, increases heart rate, blood pressure, respiration rate, and muscle tension, quickly drenching the body in a shower of energy, culminating in orgasm. Ultimately, Brown reveals all the processes of mind and body to be flows either of short-term or long-term energy that are most efficient when we follow the simple plan of a balanced diet and regular exercise.

Built on a foundation of original research, a study of what energy has meant historically, and the up-to-the-minute perspective of the Brown Laboratory in the celebrated halls of biochemistry at Cambridge, this book is a treasure chest of human science for those interested in how our vital force works. Intriguingly, Brown concludes that it is more important to base our lives on the science of long-term and short-term energy levels than on monitoring our calorie intake or even our bank balance. Whether or not we follow this advice, here is an entertaining and scientific owners' manual for the human body that celebrates "the creator and destroyer of all things,"

At the Water's Edge : Fish With Fingers, Whales With Legs, and How Life Came Ashore but Then Went Back to Sea

by Carl Zimmer, Carl Dennis Buell (Illustrator)

Book description from Amazon.com.

Everybody Out of the Pond

At the Water's Edge will change the way you think about your place in the world. The awesome journey of life's transformation from the first microbes 4 billion years ago to Homo sapiens today is an epic that we are only now beginning to grasp. Magnificent and bizarre, it is the story of how we got here, what we left behind, and what we brought with us.

We all know about evolution, but it still seems absurd that our ancestors were fish. Darwin's idea of natural selection was the key to solving generation-to-generation evolution -- microevolution -- but it could only point us toward a complete explanation, still to come, of the engines of macroevolution, the transformation of body shapes across millions of years. Now, drawing on the latest fossil discoveries and breakthrough scientific analysis, Carl Zimmer reveals how macroevolution works. Escorting us along the trail of discovery up to the current dramatic research in paleontology, ecology, genetics, and embryology, Zimmer shows how scientists today are unveiling the secrets of life that biologists struggled with two centuries ago.

In this book, you will find a dazzling, brash literary talent and a rigorous scientific sensibility gracefully brought together. Carl Zimmer provides a comprehensive, lucid, and authoritative answer to the mystery of how nature actually made itself.

Parasite Rex : Inside the Bizarre World of Nature's Most Dangerous Creatures

by Carl Zimmer

Book Description from Amazon.com.

For centuries, parasites have lived in nightmares, horror stories, and in the darkest shadows of science. Now award-winning writer Carl Zimmer takes us on a fantastic voyage into the secret parasite universe we actually live in but haven't recognized. He reveals not only that parasites are the most successful life-forms on Earth, but that they triggered the development of sex, shape ecosystems, and have driven the engine of evolution.

In mapping the parasite universe, Zimmer makes the astonishing observation that most species are parasites, and that almost every animal, including humans, will at one time or another become the home of a parasite. Zimmer shows how highly evolved parasites are and describes the frightening and amazing ingenuity these commando invaders use to devour their hosts from the inside and control their behavior. The sinister Sacculina carcini makes its home in an unlucky crab and proceeds to eat everything but what the crab needs to put food in its mouth, which Sacculina then consumes. When Sacculina finally reproduces, it places its young precisely where the crab would nurture its own progeny, and then has the crab nurture the foster family members. Single-celled Toxoplasma gondi has an even more insidious role, for it can invade the human brain. There it makes men distrustful and less willing to submit to social mores. Women become more outgoing and warm-hearted. Why would a parasite cause these particular personality changes? It seems Toxoplasma wants its host to be less afraid, to be more prone to danger and a violent end -- so that, in the carnage, it will be able to move on to another host.

From the steamy jungles of Costa Rica to the fetid parasite heaven of rebel-held southern Sudan, Zimmer tracks the genius of parasitic life and its impact on humanity. We hosts have developed remarkable defenses against the indomitable parasite: our mighty immune system, our culturally enforced habit of keeping clean, and, perhaps most intriguingly, sex. But this is not merely a book about the evil power of parasitism and how we must defend against it. On the contrary, Zimmer concludes that humankind itself is a new kind of parasite, one that preys on the entire Earth. If we are to achieve the sophistication of the parasites on display here in vivid detail, if we are to promote the flourishing of life in all its diversity as they do, we must learn the ways nature lives with itself, the laws of Parasite Rex.

Genome : The Autobiography of a Species in 23 Chapters

by Matt Ridley

Review is from The New England Journal of Medicine ® 2000 The Massachusetts Medical Society. All rights reserved.

We have come a long way since the public confrontation in 1860 between Bishop Samuel Wilberforce and Thomas Huxley, one of Charles Darwin's chief advocates. When the bishop asked him whether apes were on his grandmother's or grandfather's side, Huxley snapped that he would prefer an ape to a man who "introduces ridicule into a grave scientific discussion" (Adrian Desmond. Huxley. Reading, Mass.: Perseus Books, 1997). In his latest discourse on evolution, Genome, Matt Ridley, a fluent science writer, points out that "we are, to a ninety-eight per cent approximation, chimpanzees, and they are, with ninety-eight per cent confidence limits, human beings." Yet in August 1999, the Kansas Board of Education voted to delete any mention of evolution from the science curriculum of the public schools in its jurisdiction. This act of political flimflam denies Kansas students not only the right to think for themselves but also the ennobling awareness of the fundamental unity of all living creatures. Ridley says it well: "Wherever you go in the world, whatever animal, plant, bug or blob you look at, if it is alive, it will use the same dictionary and know the same code. All life is one." How unfortunate that students in Kansas cannot share Ridley's enthusiasm for life.

Genome is a gambol through the 23 human chromosomes. It is not a catalogue of the 80,000 or so genes that wind around beads of histones to form chromatin, the stuff of chromosomes. Instead, Ridley samples one or two genes from each chromosome, selecting them to form a base from which he can wander freely into realms of biology and medicine that reach from the Prader-Willi and Angelman syndromes (for an essay on genetic imprinting) to why Mediterranean people eat cheese (Ridley will tell you). In Genome you will find essays on, among many topics, alkaptonuria, asthma, Huntington's chorea, the immune system, eugenics, and cancer. The emphasis is not so much on the genome as on evolution and natural selection, especially on how we became the way we are in form, thought, and behavior.

Ridley is a personal guide through the thickets of complex biologic systems. He addresses you directly ("Are you still with me?" punctuates a story about the role of serotonin in anxiety and depression). He is enthusiastic ("Mock my zeal if you wish"), and he challenges ("Once you start thinking in selfish-gene terms, some truly devious ideas pop into your head"). Above all, he speculates -- sometimes soberly, sometimes wildly, but never boringly. Ridley's musings can reach ethereal heights, only to be caught in a downdraft of fact. There is little or no jargon, which is fine, but also none of the equivocation that glues us to reality -- readers will not often encounter "perhaps," "might," and "maybe." A typical pronouncement: "Freudian theory fell the moment lithium first cured a manic depressive, where twenty years of psychoanalysis had failed." Perhaps. Or "products of the chemical industry, may be responsible for... the falling sperm counts of modern men." The evidence of "falling sperm counts" is tenuous, at best. And this: "Natural selection is the proc-

ess by which genes change their sequences." Surely Ridley means "mutation" and not "natural selection." And Ridley's speculation about why some of us are milk drinkers and others cheese eaters veers dangerously toward the ideas of Trofim Denisovich Lysenko, who ruined Russian agriculture with his cockamamie theory that acquired characteristics can be inherited.

Even so, Genome is instructive, challenging, and fun to read. I envy Ridley's talent for presenting, without condescension, complex sets of facts and ideas in terms comprehensible to outsiders. His chapter on Huntington's chorea is a masterly plain-English exposition that any writer of scientific papers could take as a model. Ridley's enthusiasm is so high that it is best to keep the book on your night table. Read a chapter a night.

Robert S. Schwartz, M.D.

Time, Love, Memory : A Great Biologist and His Quest for the Origins of Behavior

by Jonathan Weiner

Editorial Reviews

Amazon.com

In the words of Jonathan Weiner, "Time, love, and memory are ... three cornerstones of the pyramid of behavior." While some find it difficult to view humans as mere machines, molecular biologists maintain that most behavior is genetically based. Even skeptics and opponents agree that molecular biology may well change the way we all live in the 21st century. Little-known outside this exploding field, Seymour Benzer, his mentors, and his generations of students have studied the common fruit fly, Drosophila, and discovered genes that seem to have some influence upon our internal clock, our sexuality, and our ability to learn from our experiences.

Weiner (whose last book, The Beak of the Finch, won a Pulitzer Prize) has written an affectionate history about the development of the science while offering charming glimpses of the people involved--trading haircuts to stretch their grant money in the early years, roaming the laboratory into the wee hours, naming the genes associated with learning after Pavlov's dogs. It's not all sweetness and light, however; ethical questions are raised, some of the hype (and hysteria) surrounding the human genome project is dissipated, and the complicated "clockwork" gene "looks less like an invitation to human intervention and more like a cautionary tale or object lesson for anyone who might try, in the 21st century, to improve on nature's four-billion-year-old designs." That said, the scientists in Weiner's tale reveal a very human side of this fast-moving science, and their belief that they'll find answers to important questions is contagious and compelling. As Benzer himself said, "It's a wonderful, fabulous world, and it's been kicking around a long time." --C.B. Delaney

The Monk in the Garden: The Lost and Found Genius of Gregor Mendel

by Robin Marantz Henig

Editorial Reviews

Amazon.com

The Moravian monk and naturalist Gregor Mendel (1822-1884) labored quietly over the years in his abbey's garden, becoming known locally as a reliable meteorologist with an unusually green thumb. He was much more than that, of course, but his transforming experiments in what a later acolyte would call "genetics" were less well known. When he published the results of his many attempts to discover the mechanisms by which traits are passed from one generation to the next--in Mendel's case, in sweet peas--it was in the proceedings of a local scientific study group, and it would take nearly two decades before researchers in more august institutions would in turn discover Mendel's work and apply it to their own revolutionizing biology in the process.

Mendel's life was full of disappointments: he failed his qualifying examinations to teach high school several times, and he had trouble getting the scientific establishment of his day to take him seriously. In her lucid, often moving life of the great (and to all purposes self-taught) scientist, Robin Marantz Henig gives readers a view of the deeply religious man himself and of his work not only in the context of his time but also in light of recent developments in the constantly changing field of genetics. Taking issue with historians of science who have sought to discount Mendel's contributions to the field, she makes a well-defended claim that the monk in his small garden should be honored as a genius: "a man with a vision and the dedication to carry it to its brilliant, radical conclusion." Her book is a fitting, and very welcome, memorial. --Gregory McNamee

Book listing submitted by Brad Williamson

Measurements:

1,000,000,000,000 Microphones = 1 Megaphone
1,000,000 bicycles = 2 megacycles
500 millinaries = 1 seminary
2,000 mockingbirds = 2 kilomockingbirds
10 cards = 1 decacards
lavatory = 1 demijohn
0.000001 fish = 1 microfiche
453.6 graham crackers = 1 pound cake
1,000,000,000,000 pins = 1 terrapin
1,000,000,000,000,000,000,000 picolos = 1 gigolo
10 rations = 1 decoration
100 rations = 1 C-ration
10 millipedes = 1 centipede
3 1/3 tridents = 1 decadent
10 monologues = 5 dialogues
5 dialogues = 1 decalogue
2 monograms = 1 diagram
8 nickels = 2 paradigms
2 snake eyes = 1 paradise
2 wharves = 1 paradox

The Leaf Floating Disk Assay method to study photosynthesis is a lab with a notorious reputation. It's an inviting laboratory for students and teachers. Everyone likes to see the illuminated leaf disks rise in the buffer solution. However, my students have generally found that replicablity is poor. Last spring I challenged my students to refine this laboratory and make it reliable. I demonstrated the technique outlined in the following protocol. We went into some detail about leaf structure and how that might effect results. Then we went outside and teams of students searched for a number of potential plant species that might work best for this lab. The students were spectacularly successful. For instance, they found that 50% of the leaf disks cut from Pokeberry, Phytolacca americana, rose to the surface after an average interval of 25 seconds of illumination (we used an overhead projector). Not only that but three classes independently got the same results and one class repeated the results the next day. If you haven't tried this lab or if you've tried it before and abandoned it, consider trying this lab again. Here's a protocol that can serve as a starting point for you and your students. (By the way, we simplified this procedure by substituting baking soda for the buffer solution. Our method was literally just "a pinch" of baking soda in 50 ml of deionized water.) Brad Williamson

TITLE: Investigation of Photosynthesis using the Floating Leaf Disk Assay.

AUTHOR:

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KEYWORD TOPICS:

Photosynthesis, CO2 Concentration, Light Intensity, Floating Leaf Disk Assay, Herbicide.

ABSTRACT:

The protocol for a floating leaf disk assay of PS and RS using 20 cc syringes is presented as a tool that can be used to investigate variables that can affect photosynthesis. The assay is based upon the publications of Guy Steucek and Robert Hill in the American Biology Teacher (see References). This exercise was suggested to me and was based upon a laboratory exercise originally written by Larry Reinking (Millersville University), a LABSHOP participant. The FLDA is presented as a cookbook protocol, a tool, and then pose questions to direct students to predict the results of varying the CO2 concentration, the light intensity, the wavelength of light, the chlorophyll content, adaptations of the leaf for high and low light intensities, and respiration.

INSTRUCTOR'S GUIDE

The FLDA is a fairly straight forward protocol most easily learned by reading the original articles. The only changes included in the following version of the FLDA protocol are the use of a Sorenson Phosphate buffer (recipe follows), the pre-mixing of the carbonate solution and buffer, and the infiltration of the leaf mesophyll with the buffered carbonate solution. First, the pH 6.8 buffer will result in some CO2 evolution when mixed, but the amount is small and an equilibrium is quickly reached. Second, infiltrating the leaf disks with the buffered carbonate solution speeds up the assay.

When infiltrating with buffer alone, carbonate must diffuse into the mesophyll before PS can get going. When the infiltration is done at normal room lighting intensities, very little, if any, PS takes place, so the assay will begin when the syringe is placed in a more intense light.

An effective way to pursue this exercise is to have different groups of students design and perform different experiments with an emphasis on the predictions and the design of the experiment to promote clear thinking.

The suggested variations all work, although I recommend trying these variables using your particular lab materials prior to class. I have not as yet gotten the prism to work, although filters can be substituted if of similar density. A light meter might be useful for actually measuring light intensity.

Using simply a ruler, syringes were placed at different distances from light sources, e.g., 10 cm, 14.1 cm, and 20 cm, to produce intensities based on the unity of light intensity at the first syringe, of 1, 1/2, and 1/4. The inverse square law is not obvious to most undergraduate students.

Varigated geraniums with an a chlorophyllous margin worked very well. Not only can you cut "white" disks, but you can cut disks that approximate half &half. Several students thought of that & made the correct prediction about PS rate.

In one 3-hour laboratory period, students should be able do one cookbook assay in the first hour, then work out an experimental protocol for one of the suggested variables, and test their predictions with at least one run. Another approach is to introduce the assay at the end of one period, then have them make predictions, design experiments, and have their ideas worked out, and then use a second lab period to run their experiments one or more times. In a more open investigative approach, students could pursue several variables, designing several experiments based on the FLDA, presenting all of their data and conclusions in a report.

The best argument for using the FLDA is that it is so simple, students understand how it works almost immediately, and the system easily manipulated so they can learn about PS and RS.

Sorenson Phosphate buffer (pH 6.5-7.5)

Solution A: 0.2 M NaH_2PO_4.H2O (27.6 g/L)

Solution B: 0.2 M Na_2HPO_4 (28.4 g/L)

Mix X ml of A with Y ml of B, diluted to 200 ml with distilled water.

Add 1.5 ml of 1.1% $CaCl_2$.

Check pH.

pH 6.5 (X=68.5, Y=31.5)
pH 6.6 (X=62.5, Y=37.5)
pH 6.7 (X=56.5, Y=43.5)
pH 6.8 (X=51.0, Y=49.0)
pH 6.9 (X=45.0, Y=55.0)
pH 7.0 (X=39.0, Y=61.0)
pH 7.1 (X=33.0, Y=67.0)
pH 7.2 (X=28.0, Y=72.0)
pH 7.3 (X=23.0, Y=77.0)
pH 7.4 (X=19.0, Y=81.0)
pH 7.5 (X=16.0, Y=84.0)

STUDENT PROTOCOL

TITLE:

Investigation of Photosynthesis using the Floating Leaf Disk Assay.

Photosynthesis is the metabolic process used by many autotrophic organisms to capture light energy and convert it to chemical energy in the form of carbohydrate molecules. The actual energy capturing molecule is chlorophyll, and generally organisms possessing this green pigment are called plants.

Although numerous intermediary reactions are involved, the overall photosynthetic reaction is simple. Carbon dioxide combines with the hydrogen from water yielding a carbohydrate, the 6-carbon sugar (hexose) glucose, and oxygen. Balance the equation below (Hint: How many carbons are needed to make the carbohydrate?).

$$\_\_\_\_\_CO_2 + \_\_\_\_\_H_2O \text{ ----> } C_6H_{12}O_6 + \_\_\_\_\_O_2$$

The photosynthetic production of oxygen and our knowledge of leaf anatomy allow us to construct a system that can be used to experimentally investigate many of the photosynthetic variables. Many extracellular spaces exist within plant leaves which are normally filled with air for purposes of gas exchange; consequently, a leaf will float on water. If air is forced out and the intercellular spaces are filled with water, the leaf will sink. If we supply the necessary requirements for photosynthesis, the oxygen produced will form gas bubbles and the leaf would re-float. In essence this is our experimental method, however, you will use small disks cut from leaves rather than a whole leaf to perform the floating leaf disk assay (FLDA). This assay of photosynthesis may be used to answer many questions.

What factors affect the rate of photosynthesis? How do changes in light intensity, wavelength, CO_2 concentration, plant adaptations, respiration, and chlorophyll content change the rate of photosynthesis? FLDA has also been used by the Pennsylvania Department of Agriculture in field surveys for detection of herbicide resistant weeds (5).

One problem in measuring a rate of photosynthesis (PS) is that there is a competing process occurring at the same time, respiration (RS), a process that uses oxygen. FLDA actually measures the rate of photosynthetic oxygen production minus the rate of respiratory oxygen use during the same time period. So FLDA measures the net rate of photosynthesis, that is, the energetic "profit" made by the plant. Actual photosynthetic activity is of course greater than this and is called the gross rate of photosynthesis. If RS can be measured separately, a simple calculation can determine gross photosynthesis.

I. GENERAL FLDA PROTOCOL

A. Cutting Leaf Disks:

1. A great variety of plants can be employed with this assay, though some leaf disks are difficult to infiltrate and others are reluctant to float. English ivy and geranium leaf disks work well. Fresh leaves should be used because wilted leaves respond poorly. Collect leaves just prior to the assay and to prevent dehydration, keep them wrapped in moist paper towels in a plastic bag.

2. Use a common one hole paper punch to obtain leaf disks with a diameter of 6-7 mm. Major veins should be avoided as the presence of a vein may bias the photosynthetic rate of the disk. Place cut leaf disks between layers of wet paper toweling to keep them fresh.

B. Setting Up the Experimental Chambers

1. Take a 100 ml graduated beaker and add 20 ml of phosphate buffer (pH 6.8) and 60 ml of 0.2 % sodium bicarbonate solution. This mixture will reach equilibrium while you prepare the syringes used as assay chambers.

2. Prepare 2 (two) syringes as follows.

a. Remove the plunger from a 20 cc syringe and drop 10 leaf disks down the barrel of the syringe. Tap the syringe barrel so that the disks fall to the bottom (i.e. the tip end of the syringe).

b. An infiltration process can remove the air from the leaf disks and replace it with water. Carefully replace the syringe plunger. Do not crush the leaf disks. Pull 6 cc (1 cc = 1 ml) of buffered sodium bicarbonate solution into the syringe. Invert the syringe, tap a few times and push the plunger to the 4 cc mark to remove all air from the syringe. Air fills the intercellular space of leaf tissue (see Figure 1). In order to replace this air with water so the leaf disks will sink, a vacuum will be applied. Under vacuum, the extracellular air is drawn for the leaf disks and infiltration solution enters this space when the vacuum is released; the leaf disks will sink.

c. Hold the needle barrel of the syringe down firmly upon a rubber stopper. Pull the plunger up to the 10 cc mark and hold in this position. Shake the syringe and then release the plunger. Repeat this procedure several times until all the leaf disks sink.

d. After infiltration, invert the syringe and push out any bubbles that formed, then pull in additional solution to bring the volume to 16 ml. Plants can use the bicarbonate solution in place of the normal atmospheric CO2.

e. An instructor will demonstrate the proper arrangement of a lamp, a heat filter, and a test tube rack. Turn off the light.

f. One syringe with submerged leaf disks should be placed in the rack adjacent to the center of the lamp. The other identical syringe should be placed in an unlighted rack nearby.

3. To start a FLDA, simply turn on the light and note the time. Every minute thereafter count the number of leaf disks that are floating, then swirl the syringe so that all disks are suspended in a vortex. Record your data on a data sheet as number of leaf disks floating by minutes. The assay is complete once all or nearly all of the leaf disks are floating.

a. What do you predict will happen to the leaf disks in each syringe?

b. Which syringe setup should be called a TREATMENT and which a CONTROL? Why? Record your answers to these questions before continuing.

4. The time required for a leaf disk to float is an index of the net rate of photosynthesis in that leaf disk. However, since some leaf disks will be "early floaters" and others will be "late floaters", this variable can be reduced in significance by plotting the percentage of leaf disks floating as a function of time. The time required for 50 percent of the leaf disks to float is called the photosynthetic effective time, shortened to PS ET-50, sort of an average rate. The larger the PS ET-50, the slower the rate of PS; the smaller the PS ET-50, the faster the rate of PS. Use graph paper to plot the percent disks floating as a function of time and determine the PS ET-50 for each experimental treatment and control you use. PS ET-50s can be easily compared.

5. You now should have at least one syringe with 10 floating leaf disks.

a. What do you predict will happen if a syringe with floating leaf disks is now placed in the dark?

6. Turn off the light and record the number of disks still floating each minute. The time the disks take to sink in the dark is an index of the rate of respiration (RS). Since some of the leaf disks will be "early sinkers" and others will be "late sinkers", once again this variable will be dealt with by plotting the percentage of leaf disks floating as a function of time, and finding the time required for 50 per cent of the leaf disks to sink. This is called the RS ET-50, or the respiratory effective time for 50 percent of the leaf disks to sink. The larger the RS ET-50, the slower the rate of respiration; the smaller the RS ET-50, the faster the rate of respiration. Use graph paper to plot the per cent disks floating as a function of time.

7. The relative rates of photosynthesis (PS) and respiration (RS) can be calculated. Put these formulae in your notes,

and explain why these two rates are added together to calculate the gross rate of PS.

NET RATE OF PS = 1 / PS ET-50

RATE OF RS = 1 / RS ET-50

GROSS RATE OF PS = 1 / PS ET-50 + 1 / RS ET-50

II. PREDICTIONS AND EXPERIMENTAL DESIGNS

The FLDA is a tool. The previous protocol has been demonstrated to show you basically how this tool works. By altering different variables of the protocol, you can gain information about how PS works. A number of questions are posed. In each case your task is to predict, to guess if necessary, what is expected. Then decide how the FLDA can be used to test your predictions. Be explicit about how to alter the FLDA procedure.

For example, you may wonder how the concentration of CO2 affects the rate of PS, a concern of many scientists as human activities continue to increase the CO2 concentration in Earth's atmosphere.

What do you predict would happen to the rate of PS if the plant cells had, say half as much CO2 available? This could be done experimentally by adding 12 ml of bicarbonate solution to one syringe, and adding 6 ml of bicarbonate solution and 6 more ml of buffer solution to another syringe. What would be your control? The actual PS ET-50s could be obtained and compared.

A. Effect of CO2 concentration on PS.

OK, why not? What do you predict would happen to the PS if half as much CO2 were available? One fourth as much? Make your predictions and design your experiment.

B. Effect of light intensity.

What do you predict would happen to PS if two identical setups were placed at greater distances from the light source, say distances X, 2X, and 3X? Decide how to experimentally determine the results. Hint: Use ratios to compare your experimental results.

C. Effect of Wavelength

As you know, visible light is composed a various wavelengths corresponding to the colors of a spectrum. What do you predict would happen to PS if the light source was directed through a prism in such a manner that different syringes could be placed in different colors of light? Remember ROYGBIV? Could you think of a different experimental setup? What variables might be a problem in such experiments?

D. How does chlorophyll content affect PS?

Chlorophyll is a membrane-bound pigment localized with chloroplasts. Leaf mesophyll cells contain numerous chloroplasts, and generally, the amount of chlorophyll is a function of the number of chloroplasts and chloroplast containing cells present. On average, leaf disks will contain a similar number of mesophyll cells and chloroplasts, and there is no way to extract chlorophyll or enhance the number of chloroplasts without killing or severely damaging the leaf. However, a naturally occurring phenomenon, VARIGATED LEAVES, allows us to seek an answer to the above question. Certain plants produce leaves with patches or areas of cells naturally devoid of chloroplasts.

Predict how does the RS of chlorophyllous and achlorophyllous leaf tissue will compare? Design an experiment to determine the results.

E. Shade versus Sun Adapted Leaves & Plants.

Certain plants have leaves adapted for low light intensities and others have leaves adapted for high light intensities. Some plants grow in shade and others in full sun; some plants, for example sugar maple, may have both sun and shade leaves on the same plant in different portions of the crown. Under higher and lower light intensities, how do you think PS sun and shade leaves, or sun and shade plants will compare? Certain plants have different adaptations for high light intensities, for example maize and sugar cane, both tropical grasses. How do you think such tropical plants' PS will compare with temperate zone plants or shade plants under high light intensities?

Design some experiments using FLDA and whatever materials are provided by your instructor.

F. Impact of herbicides on plant PS.

Herbicides are chemicals that kill plants, used to control agricultural and horticultural weeds. Herbicides fall into two large categories, those that kill "broad-leafed plants" (dicots) and those that kill "grasses" (monocots). So farmers with a wheat or maize field would use broad-leafed herbicides, while soybean fields would be sprayed to control grasses.

How do you think herbicides affect PS? How could the FLDA be used to assay the impact of herbicides on plant PS? For example, does a grass herbicide have any negative impact on the PS of a broad-leafed plant? This would be important

to determine before deciding to use the herbicide or not. Design a protocol, an experiment, to determine whether or not a particular herbicide has an impact on PS.

Should an herbicide be available, your instructor will give special instructions for using, handling, and disposing of the chemicals (5).

III. EXPERIMENTATION

Each working group will explain one or more of their experimental designs to the class. Problems and questions raised by other students will be addressed. Each working group will then perform one or more of the experiments they designed.

IV. RESULTS

Each group will present the results and conclusions of their experiment to the class for discussion and comment. The findings of all working groups will be incorporated into individual reports summarizing what was learned about the factors affecting the rate of PS.

V. REFERENCES

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Election Results

Congratulations to the following individuals who were elected as officers or representatives of KABT for the next two years. Elections were held at our annual membership meeting on Sept. 16. These individuals assume their offices effective January 1, 2001.

President:	Harry McDonald	Blue Valley
President-elect:	Sandy Collins	Lawrence
Vice-president:	Nathan Brown	Wamego
Secretary:	Pat Wakeman	Tonganoxie
Treasurer:	John Wachholz	Salina
Region 1 Representative:	Ernie Brown	WaKeeney
Region 2 Representative:	Pat Lamb	Manhattan
Region 3 Representative:	John Tollefson	Lawrence
Region 4 Representative:	Todd Carter	Seward County
Region 5 Representative:	Mike Fell	Winfield
Region 6 Representative:	Jim Foresman	Pittsburg
Representative-at-large:	Donna Cooper	Hays
Representative-at-large:	Randy Dix	Olathe

In addition, we have the following appointed positions:

Past-president:	Lisa Volland	Topeka
Newsletter editor:	John Wachholz	Salina
KACEE Representative:	Pat Wakeman	Tonganoxie
Journal editor:	John Richard Schrock	ESU
NABT Representative:	Brad Williamson	Olathe
KABT Historian:	Stan Roth	Lawrence

Brief History of Kansas Association of Biology Teachers

Compiled by Paul Jantzen and Stan Roth

Year	President of KABT	Spring Field Trip	Fall Paper Session
1938	O. P. Dellinger		
1942	organization disbanded for the	the duration of WW II +	
1959	Gerald Teague (temporary)	organization revived	KSTC, Emporia
1960	Sherman Nystrom		Wichita West High School
1961	Sherman Nystrom	Bethel, North Newton	McPherson
1962	Virgil Boatwright	Manhattan area, site of proposed Nat. Prairie Park	Lawrence High School
1963	Harland Pankratz	Buhler, Burton, Halstead, Harvey County Park	KSTC, Emporia
1964	John Ransom	Gyp Hills (Barber, Comanche, Kiowa Counties)	Washburn University, Topeka
1965	Evelyn Kovar Thompson	Rock Springs 4-H Ranch	Pittsburg State College
1966	Wayne Stebbins	Rock Springs 4-H Ranch	Ft. Hays State College
1967	Vincent Krabill	Hays area; Chalk beds and grasslands	Hesston
1968	Virgil Boatwright	Pittsburg area	KSU, Manhattan
1969	Myron Schwinn	Eureka (Midwest Inst.)	KSTC, Emporia
1970	Kermit Daum	Cheyenne Bottoms	Garden City Jr. College
1971	Frank Nelson	Quivira Nat. Wildlife Refuge	Manhattan High School
1972	Roscoe Waldorf	Flint Hills Nat. Wildlife Refuge, Burlington	Sacred Heart College, Wichita
1973	Kay Moorman	SWAN Meeting, KSTC, Emporia	Pratt Jr. College
1974	Charles Horner	Hutchinson, site of proposed Sand Hills State Park	KU, Lawrence
1975	Jim Arnewine	Cimarron Nat. Grasslands, Morton Co.	Microzoo, Abilene
1976	Paul Jantzen	Scott County State Lake	Friends Univ., Wichita
1977	L. O. Breckenridge	McPherson Co. State Lake, Maxwell, Hv. Co. Park	Salina Central High School
1978	Fred Trowbridge	Kirwin Nat. Wildlife Refuge	ESU, Ross Reservation
1979	Fred Trowbridge	Crawford County St. Park	KU, Lawrence
1980	Joseph T. Collins	Chikaskia River, Sumner Co.	Sedgwick Co. Zoo, Wichita
1981	Joseph T. Collins	Clark County State Lake	Land Institute, Salina
1982	John Wachholz	Marais Des Cygnes Nat. Wildlife Refuge	FHSU, Hays
1983	John Wachholz	Konza Prairie Research Natural Area	Gage Park Zoo, Topeka
1984	Louis Bussjaeger	Squaw Creek Nat. Wildlife Refuge Missouri	Camp Aldridge, Gt. Bend
1985	Marc Linton	Sherman and Wallace Counties	W.S.U., Wichita
1986	Marc Linton	Milford Lake and Wakefield area	Ozark Underground Lab, Taney Co., MO
1987	Brad Williamson	Quivira Nat. Wildlife Refuge	E.S.U., Emporia
1988	Brad Williamson	Rock Springs Ranch with KATS	Benedictine, Atchison
1989	Pat Wakeman	Pittsburg State Univ. and area	K.S.U., Manhattan

Year	President of KABT	Spring Field Trip	Fall Paper Session
1990	Pat Wakeman	Chatauqua Hills	Prairie Center, Olathe
1991	Pat Wakeman	Salina with Prairie Festival at Land Institue	Rock Springs Ranch, Junction City
1992	Pat Lamb	Milford Reservoir	K.S.U., Manhattan
1993	Pat Lamb	Planned for Cimarron Nat. Grasslands; cancelled	Salina
1994	Pat Lamb	Cheyenne Bottoms/Quivira Nat. Wildlife refuge	K.U., Lawrence
1995	Steve Case	Prairie Center, Olathe	Olathe East H.S.
1996	Steve Case	Matfield Green and Z-Bar Ranch; Pawnee Nat. Grasslands ,CO	E.S.U., Emporia
1997	Terry Callender	Gyp Hills/Belvidere area	FHSU, Hays w/ KESTA
1998	Terry Callender	Kanopolis Lake, Ellsworth Co.	Olathe East High School
1999	Lisa Volland	Eureka City Lake and Fall River--Greenwood County	Sternberg Museum, FHSU, Hays, Ks
2000	Lisa Volland	Cimarron National Grasslands, Morton County	Great Plains Nature Center, Wichita, KS
2001	Harry McDonald	East Johnson Co.	Manhattan
2002	Harry McDonald		

NABT Presidents from Kansas

Homer A. Stephens	1942
John Breukelman	1957
Ted Andrews	1964
Jack Carter	1977
Stan Roth	1980
Brad Williamson	2001

Executive Secretaries of KABT

Stan Roth 1962--1983
Bob Rose 1983--1990

Editors of Newsletter and Journal

John Ransom
Paul Jantzen
John Wachholz
Richard Schrock (KBT editor)

Birding Websites

www.ksbirds.org/index.html — Kansas Ornithological Society
www.audubon.org/ — National Audubon Society
birds.cornell.edu/ — Cornell Lab of Ornithology
www.birder.com — Birder HomePage
www.bbc.co.uk/education/birding — Birding with Bill Oddie
www.petersononline.com/birds — Peterson Online Birds
www.virtualbirder.com — The Virtual Birder
www.nuthatch.birdnature.com — Nutty Birdwatcher
www.texasbirdwatcher.com — Texas Birdwatcher
http://www.eagleoptics.com/ — Learn All About Binoculars and Spotting Scopes
To report bird sightings in Kansas, or see what others have reported, go to
http://home.att.net/~Kansas_Birds

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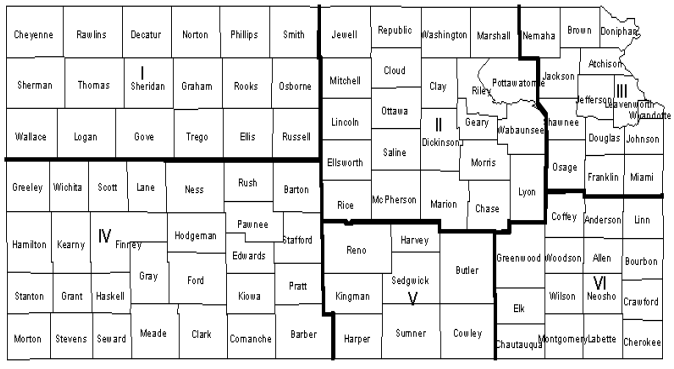
KABT Regions



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Counties, In Region 2

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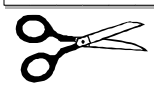
Check Out The KABT Website
http://kabt.org



KABT Membership Application - Renewal - Form

Name: _____

(Mr.-Mrs.-Ms.-Dr.-Miss) First Name Last Name

Mailing Address: _____

City: _____ State: ___ Zip: _____ - _____

School/Institution: _____

Position: _____

City: _____ State: __ Zip: _____ - _____

Phone: Work (____) _____ - _____ Home: (____) _____ - _____

FAX: (___) ___ - _____Internet Address: _____@_____

Enclosed Dues For KABT **$15** / Year
Life Membership Available For **$300**
National Association of Biology Teacher Dues: **$59.00** / Year
Yearly Due Date is September 1st - Make Check Payable To KABT - Tax ID #: 48-0945206
Send Dues & Information To:
Kansas Association of Biology Teachers
2311 Applewood Lane