First Visiting Master Teacher in Biotechnology at ISU
The first Visiting Master Teacher in Biotechnology will begin work on campus in mid-January. Mike Zeller, high school science teacher and department head at Woodward-Granger High School, will spend spring semester working for Iowa State University's Public Education Program in Biotechnology.

"We are grateful to the Woodward-Granger School District, its School Board, and administrators for loaning us Mike," said Walter Fehr, Director of Biotechnology at ISU. "Mike was one of our original master teachers in biotechnology and for the past four years has been one of our most enthusiastic teachers," Fehr said.

Zeller has 20 years of science teaching experience and currently instructs high school courses in anatomy and physiology, biology, chemistry, ecology, physical science, physics, and molecular biology and DNA. Zeller regularly attends national meetings for science teachers and is currently president of the Iowa Science Teachers' Section of the Iowa Academy of Science. He has won many awards, including being named a 1994 State of Iowa Finalist in the Presidential Awards for Excellence in Mathematics and Science Teaching in Secondary Science.

His academic background includes a master of science degree in science education from ISU with a thesis titled A Study to Determine Content in Biotechnology for the General Biology Curriculum. Zeller has earned graduate hours through the National Science Foundation for curriculum development in biotechnology and received a grant from Pioneer Hi-Bred International to study recombinant DNA techniques through Cold Spring Harbor's DNA literacy program.

"With ISU's help, biotechnology has exploded onto the education scene in Iowa," Zeller says. "Because of the efforts of ISU in training and supplying equipment to science, agriculture, and family consumer science teachers in the state, it was a great honor for me to be named the university's first Visiting Master Teacher in Biotechnology."

Although many educators have implemented biotechnology into their curriculums, Zeller says that many more need help learning techniques,
locating equipment and supplies, and finding the technical support they need to get started. He plans to accomplish a lot during his stay at ISU.

"I want to take biotechnology to the educators who would like to implement it in their curriculums but don't have the training. I also hope to convince all educators in Iowa that biotechnology can be a valuable addition to their courses. I'd like to share my insight and experience as a high school science teacher who has incorporated biotechnology into my classes at all levels," Zeller said.

He plans to use some of his time at Iowa State to develop new curriculum materials, organize workshops, and work with ISU faculty to bring their expertise into the Biotechnology Public Education Program.

"For molecular biology, I really believe that the future is here," Zeller explains. "The popular press announces new advances every day. Iowa's students need to understand the basic concepts of this science in order to make informed decisions that will affect their lives." Zeller says that molecular biology developments will play an important role in shaping the state's economic future and providing jobs for its best students.

After mid-January, Mike Zeller may be contacted at his campus address at the Office of Biotechnology, 1210 Molecular Biology Building, ISU, Ames, Iowa 50011-3260; phone (515) 294-9818 or 1-800-643-9504 in Iowa; fax (515) 294-4629; or e-mail biotech@iastate.edu.

[Funding Available for Schools to Access Internet College Biology Courses]

High school students who want to get a head-start on college or teachers who need credits toward re-certification both could benefit from a new distance education program initiated by Iowa State University's Project BIO.

Project BIO is a partnership for biology education involving ISU, the state's community colleges and high schools, and selected Iowa industries. One of its goals is to develop and share biology education resources via the Internet computer network. Project BIO's new program offers financial and on-site technical support to help Iowa high schools establish computer learning stations to access ISU biology courses taught on the Internet.
Doug Bull, Project BIO's systems support specialist, says that each participating school in the learning station program can use an existing computer terminal with an active Internet connection and sufficient processing power and memory to handle transmission of the courses. In addition, the terminal should be accessible to students during normal school hours.

"If needed, Project BIO will provide a free sound card, headphones and microphone, and Internet phone software for the learning station," Bull says. "We'll also provide technical support for software installation, including on-site school visits, and instructional support to students enrolled in the course."

These services to participating schools are being financed by ISU's College of Agriculture, College of Liberal Arts and Sciences, Department of Zoology and Genetics, Professional and Scientific Council, Office of Biotechnology, and the ISU Howard Hughes Medical Institute Education Initiative.

Bull says that 20 schools have established a learning station and 15 more have expressed interest.

Using their school's learning station, students can take two courses, Biology 201 --- Principles of Biology and Biology 109 --- Introductory Biology, for three credits each during ISU's spring semester 1997. One course that might interest teachers is Genetics 308X/508X --- Biotechnology in Agriculture, Food, and Human Health.

Lecture notes for the courses are presented as World Wide Web pages, and audio lectures are heard using RealAudio®, an Internet application. Students interact through e-mail and news groups. As students complete assignments, they e-mail or fax them to the instructor. Tests are administered by a local proctor who returns the student's completed exams to the instructor.

According to Bull, many of Iowa's students have not been able to take full advantage of provisions in the Postsecondary Enrollment Options Act. This act allows 11th and 12th grade students to enroll part-time at an eligible community college or state or private college or university. The school district is then billed for the cost of the course, which cannot exceed $250. For many students, not cost but transportation is the insurmountable barrier.

"At ISU, students in the Postsecondary Enrollment Options Program generally live in nearby communities," Bull says. "Through the learning stations, we want to make college-level science courses equally available to students in Keokuk, Sioux City, or wherever they live in the state."
Schools interested in establishing a learning center should contact Doug Bull, 1210A Molecular Biology Building, Iowa State University, Ames, Iowa 50011; phone (515) 294-7255; or e-mail ddbull@iastate.edu. Students and schools also will find additional information about the Internet courses and Project BIO on the World Wide Web at http://biotech.zool.iastate.edu/Project_BIO/Homepage.html.

[In This Issue]

Biotechnology School Enrichment Offered in SE and NW Iowa

Teresa Findlay and Ryan Groen are recent additions to ISU Extension's Biotechnology Team. Findlay and Groen are biotechnology school enrichment personnel who help teachers incorporate biotechnology into their curriculums. The two were hired with funds provided by ISU Extension, including several county offices, in cooperation with the ISU Office of Biotechnology and private contributors.

Teresa Findlay is the biotechnology school enrichment coordinator for the Southeast Iowa Extension Area. Counties she serves include Des Moines, Henry, Jefferson, Keokuk, Lee, Louisa, Van Buren, and Washington.

Findlay grew up in Cedar Falls, Iowa, where she received from the University of Northern Iowa a B.A. in biology and chemistry and an M.A. degree emphasizing molecular biology. While at UNI, Findlay taught general biology laboratory classes, tutored college students, and worked as a research assistant.

Findlay's molecular biology work experience includes being a laboratory technician in Cedar Rapids at Genencor International, a company that uses production scale fermentation to produce enzyme products such as proteases for laundry detergents. She has also worked full-time at Northrup King in Washington, Iowa, where she currently works part-time testing seed corn for genetic purity using starch gel electrophoresis. She is working on an isoelectric focusing (IEF) electrophoresis process to be used for testing at Northrup King.

Teachers of grades 4 to 8 can contact Findlay for a series of biotechnology-related lessons that she will partner-teach with them. "The teachers present the lessons with which they are comfortable, and I teach the remaining lessons with the teachers' help," Findlay explains. "I give the teachers some new ideas for teaching biotechnology, help them become more comfortable with the subjects,
and train them to do activities such as DNA extraction and electrophoresis on their own."

Findlay says that she will make repeat visits to a teacher's classroom until the teacher is confident with the materials on his or her own. Findlay offers continuing support by answering teachers' questions and providing curriculum materials and supplies, such as the DNA extraction and electrophoresis kits.

Findlay is housed in the Washington County Extension Office in Washington. Teachers can contact her at the Washington County Extension Office, P.O. Box 29, Washington, Iowa 52353; phone (319) 653-4811; fax (319) 653-6712; or e-mail x1tfind@exnet.iastate.edu.

Ryan Groen is the youth sciences coordinator for the Northwest Iowa Extension Area. He serves Sioux County in a half-time position, and spends the rest of his time in nine other counties: Lyon, Osceola, O'Brien, Plymouth, Woodbury, Crawford, Cherokee, Clay, and Buena Vista.

Groen graduated from Dordt College in Sioux Center, Iowa, last May with a bachelor's degree in biology. "Science is exciting," Groen says, "and my main goal is to generate enthusiasm for the sciences among students."

Groen offers teachers five days of enrichment programming in biotechnology for their 4th through 8th grade students. For the younger grades, activities include solving a dog DNA mystery, building a giant cell, constructing DNA models, exploring heredity traits, and extracting DNA from common fruits and vegetables. Seventh and eighth grade students explore genetic mutations, perform paper gene splicing, do DNA fingerprinting, and extract DNA from fruits and vegetables. Teachers of older students may follow up with a bioethics discussion activity.

"We want students to learn about DNA and biotechnology through hands-on activities and laboratories," Groen said. "We also want to make materials available to teachers so that they can do these activities with subsequent classes.

There's a wide range of career opportunities in science-related fields. I hope that what students learn in this program will encourage some of them to select science as a career."

Groen is housed in the Sioux County Extension Office in Orange City.
Teachers can contact him at the Sioux County Extension Office, 805 Highway 10 W., Orange City, Iowa 51041; phone (712) 737-4230; fax (712) 737-3590; or e-mail x1groen@exnet.iastate.edu.

[In This Issue]

Protocol Change for Bacterial DNA Extraction

Mike Zeller, high school science teacher from Woodward-Granger, reports that the new Ultra Dawn® dish detergent does not work in the bacterial DNA extraction protocol distributed by the ISU Office of Biotechnology. He theorizes that the pH of the new detergent formula may be the problem.

Zeller now uses the balsam and protein variety of Suave® shampoo (other Suave shampoos may also work). He says that the EDTA in Suave can digest the proteins, eliminating the use of the meat tenderizer called for in some protocols. For more information, Zeller can be contacted at the Woodward-Granger High School, 306 West 3rd Street, Woodward, Iowa 50276, phone (515) 438-2115 or e-mail mikezellbr@aol.com.

[In This Issue]

Summer 1997 Workshop Dates

Update your lab skills at one or more of the summer 1997 biotechnology workshops. Watch for details in the March issue of Iowa Biotech Educator.

- June 16-20 for all biotech educators
- June 23-27 for agricultural education instructors
- July 7-11 for family and consumer sciences educators
- July 14-18 advanced workshop for all biotech educators, including participants of any previous summer workshop

[In This Issue]

The Safety of *Escherichia coli* Bacteria in the High School Lab

A number of experiments designed to demonstrate principles of molecular biology use strains of bacteria called *Escherichia coli*, abbreviated *E. coli*. Unfortunately, some strains of *E. coli* have been mentioned in the news recently as the cause of a variety of food-borne illnesses. For the very young, the very old, and for others who lack a healthy immune system, these diseases can be fatal. Consequently, it's reasonable to ask the question, "Can a person become sick by doing experiments with *E. coli*?"

**Different kinds of bacteria**
In many species of microorganisms only certain members are capable of causing disease. The *E. coli* species is like this. Some types, or strains, of *E. coli* are normal inhabitants of the human intestine where they live and cause no problems.

Only strains of *E. coli* that acquire genes for "virulence factors" become converted to disease-causing bacteria. Without these virulence genes *E. coli* cannot cause disease. Some types of *E. coli*, such as the ones described in the news recently, have obtained virulence genes from sources in their natural environment.

**E. coli used in laboratory experiments**

*E. coli* strains designated *E. coli* K-12 are commonly used for laboratory experiments. Since these particular strains are never grown outside of a laboratory, they cannot acquire virulence genes. Therefore, there is no danger that they can be converted to a disease-causing strain of *E. coli*. In addition, the K-12 strains used in the laboratory grow very poorly in the human intestine.

**Safe or not?**

By following standard procedures of laboratory cleanliness it can be assured that commonly used *E. coli* K-12 strains present no unreasonable health hazard. These strains are safe, easy to grow in the lab, and have well-characterized genetic systems, making them an excellent choice to teach the principles of molecular biology, genetic engineering, and biotechnology.

Greg Phillips, Ph.D.
Assistant Professor of Microbiology
Iowa State University
October 1996
is built around a topic central to agricultural biotechnology.

Available issues are:


To obtain a copy, please contact Lori Miller at the Office of Biotechnology, 1210 Molecular Biology Building, ISU, Ames, Iowa 50011-3260; phone 1-800-643-9504 in Iowa or (515) 294-9818; or e-mail lorimill@iastate.edu.

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**Biotechnology and Food Guide Available from University of Wisconsin**

The University of Wisconsin Biotechnology Center has two North Central Regional Extension Publications that may be of interest to teachers and Extension educators. *Biotechnology: Tools for Genetic Ingenuity*, NCR publication no. 570, is a full-color, double-sided poster, approximately 22" x 34", which highlights the development and uses of biotechnology. The poster is a companion piece for *Biotechnology and Food*, NCR publication no. 569, a 90-page leader and participant guide that contains seven lesson modules.

Both publications, are available from the University of Wisconsin-Extension, Cooperative Extension Publications, 630 W. Mifflin Street, Room 170, Madison, Wisconsin 53703-2636, phone (608) 262-3346. As this is written, the cost of each was $3 plus shipping.

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**The Waksman Challenge Hits the Internet**

A group of faculty from the Waksman Institute of Rutgers - The State University of New Jersey - has established a monthly bioinformatics research project that teams of high school students can do using the resources of the
Called "The Waksman Challenge," the competition involves a research problem devised at the beginning of each month during the academic year (except this January) by a group of faculty from the Waksman Institute. The problem will be of moderate difficulty and will require students to access molecular databases and similar resources found on the Internet.

Students from participating high schools work in one or more groups to answer the question and are encouraged to interact with each other and with groups from other schools. Teachers whose Internet knowledge is less than comprehensive should be glad to know that the Challenge is a student activity and it is not necessary for teachers to be experts on the Internet, molecular biology, or bioinformatics in order for their students to participate.

A new challenge question is posted on the Waksman World Wide Web site http://morgan.rutgers.edu at the first of each month. Student groups must register for each month's challenge before the 15th of the month in which the Challenge is posted. Each student group must have a teacher sponsor who may sponsor more than one group at a school.

When a student group believes that it has the answer to the challenge, it submits the answer to an e-mail address at Rutgers. Answers must be received by the last day of the month in which the Challenge was issued.

Student responses will be judged by scientists from the Waksman Institute and Rutgers University. Judging criteria include originality, accuracy, thoughtfulness, organization, and thoroughness. Special recognition of outstanding answers will be posted on the Waksman Challenge Web site.

For more information about the Waksman Challenge, interested teachers and students should check the WWW site at http://morgan.rutgers.edu.

[In This Issue]

We're Changing Our Look
The homepage of Iowa State University's Public Education Program in Biotechnology is being redesigned. Check out our new look in early 1997 at this location: http://biotech.zool.iastate.edu/biotech_public_ed.html.
Biotechnology Education Conference Attracts International Participants

Nearly 200 Extension professionals, school teachers, and other biotechnology educators from the U.S., Canada, and Venezuela attended the conference *Extension's Role in Biotechnology Education* held October 20-23 at Iowa State University in Ames.

During the four days, conference participants updated their biotechnology laboratory skills, ability to facilitate discussion of controversial issues, and knowledge of biotechnology teaching resources. More than 40 successful biotechnology educators from around the nation shared their expertise and materials with those at the conference.

Highlights of the conference included addresses by keynote speakers Tom Zinnen, Biotechnology Education Specialist for the University of Wisconsin Biotechnology Center and University of Wisconsin-Extension in Madison; Donald Weeks, Director of the Center for Biotechnology at the University of Nebraska-Lincoln; and Margaret Mellon, who directs the Agriculture and Biotechnology program for the Union of Concerned Scientists in Washington, D.C.

Zinnen challenged Extension professionals to help people make informed, insightful personal choices and public policies about genetic engineering. Science literacy involves teaching not only about what we know, but how we know it, Zinnen said.

Weeks discussed current and anticipated biotechnology developments in medicine, industry, food production, and other areas. Weeks told Extension educators to pay attention to global issues and to "hit ethical issues head-on" and start talking about them well in advance.

Society should not accept biotechnology developments as a package deal, but should select which technologies to develop and which to reject, much as one selects dishes from a restaurant menu, advised Mellon. She urged biotechnology educators to be sure that the health, safety, and environment of the people in their charge is their top priority --- not protection of the technology.

In addition to the formal workshops and events, conference participants shared their materials and methods at informal sharing sessions and a presenters'
The conference was jointly sponsored by Iowa State University Extension and the ISU Office of Biotechnology; the U.S. Department of Agriculture Cooperative State Research, Education, and Extension Service; University of Wisconsin-Extension and UW Biotechnology Center; and the National Network for Science and Technology.


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**The Best (and Worst) of a Biotechnology Biofest**

This month's Tip for Teachers is by Julianne Fischer, ISU Extension in Scott County. If you would like to contact her for more information, her address is Julianne Fischer, Scott County Extension Office, 875 Tanglefoot Lane, Suite B, Bettendorf, Iowa 52722; phone (319) 359-7577; fax (319) 355-6569; or e-mail x1fischr@exnet.iastate.edu.

After ISU Scott County Extension hosted a Biotechnology Biofest for 120 sixth-grade students at Bettendorf Middle School, I quickly determined what we would and would not do at the next Biofest. Before giving you my recommendations, I'll tell you about our Biofest experience.

**The Biofest**

The sixth graders in Bettendorf are assigned to one of three different "pods." Our Biofest was held for one of these pods, a group of 120 known as the "Terrier Troops." Working within the school's actual time periods of 42 minutes each, we planned six different sessions. The students travelled from session to session as a homeroom group of 20, along with their regular homeroom teacher. The six sessions were:

1. DNA Extraction --- Students extracted DNA from onion.
2. Chymosin --- A history of the protein chymosin and its development was discussed. Students observed chymosin's effectiveness in coagulating milk, giving the same result that rennet has provided for years, but with a higher purity. Using plastic ziplock bags, the students made and enjoyed homemade ice cream containing chymosin.
3. Biotech Trivial Pursuit --- Media celebrities from a local TV station hosted the game. The students, divided into two teams, challenged each other by tapping into their knowledge of biotechnology.
4. Genetic Engineering of Plants --- The uses and effects of biotechnology in plant production were discussed. The students sampled Flavr Savr™ tomatoes and did a taste comparison of a low-fat muffin made with soybean oil and texturized vegetable protein versus a fattier muffin containing vegetable oil. Students ended the session by tasting regular soybeans with the enzyme lipoxigenase and genetically altered soybeans without lipoxigenase.

5. DNA Fingerprinting --- The fingerprinting procedure was demonstrated for students, helping them understand why each individual's DNA is highly unlikely to be identical to another person's DNA. Students observed the use of electrophoresis equipment.

6. What is DNA? --- Students learned that DNA is made up of the four amino acids adenine, thymine, cytosine, and guanine arranged in a ladder-like structure. We discussed replication and used the activity "Building DNA" to show students how DNA duplicates itself. The students also encoded a secret message utilizing the amino acid letters.

Sources
Activities for the sessions "DNA Extraction," "Biotech Trivial Pursuit," "DNA Fingerprinting," and "What is DNA?" were from the curriculum notebook A Crime, a Clue and Biotechnology produced by ISU Extension in cooperation with the ISU Office of Biotechnology. A new, revised version of the notebook can be borrowed from your local Area Education Agency and some Extension Offices. To purchase a copy, contact Extension Publications Distribution, 119 Kooser Drive, Iowa State University, Ames, Iowa 50011, phone (515) 294-5247. The publications number is 4H 950 and the cost is $15.

Information for the sessions "Chymosin" and "Genetic Engineering of Plants" was from the workshop "Get Your Hands on Biotechnology" conducted by Brian Cummings, Jan Temple, Tom Ingebritsen, Jim Jensen, and Patty Steiner. Materials for these sessions are available from the ISU Office of Biotechnology.

Session instructors were local and area Extension personnel, biotechnology professionals, and volunteers familiar with the 4-H Urban Program.

Evaluation
The students' evaluations ranked "Biotech Trivial Pursuit" as best session of the Biofest and "What Is DNA?" as their least favorite. Here are my own recommendations to educators planning to hold a similar event:
DEFINITE DO'S

- Do recruit local biotech professionals to help.
- Do have homeroom classes move from session to session as one unit with their homeroom teacher to reduce discipline problems.
- Do work within your school's regular time periods, if possible.
- Do invite local celebrities to emcee learning games like Biotech Trivial Pursuit.
- Do hand out biotechnology information to the students to review two weeks before the Trivial Pursuit game is played.
- Do try to get local sponsors to help with costs.

DEFINITE DO NOT'S

- Do not assume your schedule is right the first time. Double- and triple-check your schedule.
- Do not believe that you can hold students' attention by lecturing. We needed more hands-on activities.

A MAYBE

- Preparing all of the chymosin/ice cream mixture was very time-consuming. Maybe have a volunteer make up the mixture to save on staff hours. However, the kids enjoyed making the ice cream (and eating it!).

About the ISU Public Education Program in Biotechnology

The Public Education Program in Biotechnology is supported by the Iowa Soybean Promotion Board; Pioneer Hi-Bred International, Inc.; the Roy J. Carver Charitable Trust; West Central Cooperative; and the Iowa Farm Bureau Agricultural Leadership and Promotion Foundation.

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