A pearl of a summer: Biology major gets first-hand look at aquaculture research

Senior Anne Marie Moore is doing what she can to sample possible futures as a marine biology researcher, approaching marine life from a different angle each summer. This summer, on an internship at the University of Rhode Island, she studied the environmental impact of the operations of Spatco, an aquaculture company located in Narragansett, RI. Anne Marie was able to take part in this internship thanks to earning the Sears Crowell Scholarship from the Department of Biology at IU.

As an intern, Anne Marie performed a wide variety of tasks and had a high level of responsibility for her project, making her more like a graduate student than an undergraduate. She worked as an equal with graduate students, and learned many things about herself as well as her topics of study.

Perhaps most importantly, she had the opportunity to find out whether she enjoys this kind of research - an invaluable tool in planning her future. She has seen the big picture: the thrills when the research project goes well and produces useful results, and the frustration that accompanies the often present lack of funding to do all the research one wants to do.

Anne Marie explains the circumstances leading to her summer research: “Spatco has a one-half acre lease in one of the deepest locations in [Point Judith Pond]. On this lease they have a raft where they pressure wash their oyster cages and grow out the smallest shellfish. They have approximately 250 cages submerged in a distribution

Anne Marie’s job was to show the residents that Spatco was actually cleaning up the pond, rather than making it worse.

in this area of the pond, similar to how lobster or crab pots are put down by other fishermen; therefore they did not need a specific lease for the number of cages that they have down.

The residents claim that the (see Aquaculture, p. 2)
An aquaculture summer, from p. 1.

pressure washing of the cages pollutes their beaches with remnants of sponges, tunicates, and excess sediment [above] what would occur naturally. They also complain of the noise that the pressure washer makes, and although not a formal part of the case, they basically do not like to see the workers out on the pond.

This controversy came to public attention when Spatco submitted a request to the Coastal Resource Management Council for a larger area to lease so as to expand their operation. The residents then filed their complaints and the CRMC made notice that now Spatco would have to confine their operation to a specific leased area instead of spreading out like a crab pot operation.

This case has yet to be settled and the state of Rhode Island is greatly behind its neighboring states in developing aquaculture. [T]he main reason [for this is] lack of education on its economic and environmental benefits.”

Anne Marie’s job was to identify the environmental impacts of Spatco’s operation in order to show the residents (and the courts!) that Spatco was in fact contributing to the clean-up of the pond, rather than making it worse. Thanks to Anne Marie’s summer research, there has been substantial progress toward making the residents understand this, but they are still a long way from appreciating the situation.

The day-long experiments out on the water were the most rewarding part of the summer. The days ended with Anne Marie “physically exhausted and covered with salt and mud” but inspired by the concentrated education she received. Anne Marie also got a lesson in keeping a sense of humor in research. One morning she was out working on an experimental technique for cleaning the oyster cages. She was collecting periwinkles (a predator of sponges and the like, to be deposited into the oyster cages) on a rocky shore when one false step landed her an unplanned early morning swim!

Anne Marie’s interest in marine biology dates back to age 14, when she visited an aquarium in Boston. She still remembers an exhibit there about (see Aquaculture, p. 3)

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**Get a Job! Biology/Science Job Fair**

Here’s the perfect opportunity for science students to discuss job opportunities with employers. Participating employers are interested in talking with students who will be graduating this year; however, students from all class levels are encouraged to attend and learn about future opportunities.

A list of the employers with job titles, preferred majors, and estimated number of openings per year is available in the Career Resource Library of the Career Development Center, 625 N. Jordan.

Don’t miss How to Prepare for the Biology Career Fair, a workshop presented by the Career Development Center on Thursday, October 6, at 4:00pm, in Jordan A100.

Participating employers will include:
- US Environmental Protection Agency
- Central Indiana Regional Blood Center
- IU School of Medicine
- Boehringer-Mannheim Corp.
- Sigma Chemical Co.
- Peace Corps
- US Navy
- Teach for America
- Cargill Inc.

Also on October 12, be sure to stop by the Frangipani Room at the Union for the Graduate School Fair, where representatives from a variety of graduate schools will be on hand to answer questions, 10:00-3:00.

The Biology/Science Job Fair is sponsored by:
- Arts & Sciences Placement, 625 N. Jordan, and the Biology Advising Office, Jordan Hall A115

**Wednesday, October 12, 1994**

**12:30 - 4:00 pm --- Jordan Hall Atrium**
Aquaculture, from p. 2. efforts to clean up the bay. Now, her long-term objective is to play a role in the making and regulating of marine and environmental laws. She knows that hands-on research experience has given her an edge over her peers - in fact, the graduate students she worked with this summer were "amazed" at the amount of hands-on experience she has at this early stage in her education.

The graduate students were amazed at Anne Marie's extensive research experience.

Anne Marie encourages students to pursue all the research experience they can get as undergraduates, to give them the needed advantage to compete for jobs and entry into graduate programs after college. For students interested in marine science, Anne Marie says Just Do It! The fact that you are studying in Indiana does not mean you can't pursue marine biology, especially in the summer. Be on the lookout for the opportunities that come along, and be prepared to rearrange your life to accommodate them when they present themselves, because you may not get another chance. Meanwhile, she recommends you get a well-rounded education in preparation for graduate school, which is a must for anyone interested in marine studies.

Anne Marie was a Sears Crowell Scholarship recipient last year too. In '93 she used the award to enroll in courses in Biological Oceanography and

### Biofest '94

Once again, the Biology Undergraduate Initiative is proud to sponsor Biofest, to take place Wednesday, November 9, 4:00 - 7:30 pm, in the Jordan Hall Atrium. Take advantage of this opportunity to:

- Meet representatives from various graduate programs in the biological sciences. Here's your chance to make contacts and ask questions of these recruiters!
- Ask questions of a panel of graduate and professional students. These are the folks who know how to get from here to there!
- Hear the experts talk about "How to apply to graduate school and the differences between MD/PhD and PhD programs." This will be a panel session as well, so bring your questions!

**Keynote Speaker:**

IU Alum Louis Myers, an attorney for biotechnology firms, will talk about his very unusual career path. This one you've got to hear. Myers is living proof that there's more than one way to reach your career goal. Come and hear his story, then stick around for free pizza and a chance to talk one-on-one with the speaker.

Barrier Island Ecology at the Duke University Marine Laboratory in Beaufort, NC.

The Sears Crowell Scholarship is a $500 award designed to aid students who wish to enroll in an internship or course, preferably marine, at a field station. Any junior, senior, or graduate student pursuing a major through the Department of Biology is eligible. The number of awards each year varies. Applications for the next awards will be available in the Biology Advising Office, Jordan Hall A115, in late January and early February; recipients are notified in late March/early April.
Introducing BUGS
the Biology UnderGraduate Scene

BUGS is a new electronic bulletin board filled with information important to biology majors. To access BUGS, you must use a Macintosh computer on the campus network. Connect to the Jordan Hall fileserver, Darwin's Mac, with the username biology and the password rabbit. Open the News folder inside the IU Biology folder, and look for BUGS!

Also in the News folder, check out This Week in Biology for a weekly listing of seminars by IU faculty and graduate students, and visitors from other academic institutions all over the world.

Biology student organizations

There are numerous organizations for Biology majors to join. Find one that matches your interests:

AWIS (Association for Women in Science) seeks to improve the educational and employment opportunities for women at all stages in their science careers. Contact Diane Henshel (DHENSHEL, 5-4556) or Anne Marie Moore (ANNMORE). Upcoming meeting topics are listed at right.

Biology Club is the original undergraduate Biology majors organization. This club sponsors a wide variety of activities to provide extra opportunities to Biology majors. Contact: Gene Wickham, 5-1654.

EJOB (Ernest E. Just Organization of Biologists). Ernest Just was an African-American biologist dedicated to getting minorities educated in the sciences, and so is EJOB. Contact: Charles Richardson, 5-1674.

BRAG (Bloomington Rainforest Action Group) educates and raises awareness about all forests, especially rainforests, through letter-writing campaigns, guest speakers, movies, and other events. Check out their display in the 1st floor east wing of Jordan Hall! Contact: Mike Elwert, 332-3289.

Health Professions and Prelaw has the details about several clubs of interest to Biology majors. Call (5-1873) or visit their office (Maxwell 021) for information about these and other clubs on campus: AED Pre-med/Predent Club; Pre-Vet Club; PAD Prelaw Club.

Dates to remember...

Interview Skills Workshops for Pre-med Students: Mondays Oct. 3, Oct. 31, Dec. 5. 5-6pm, Jordan A106.

AED Meetings: Premed Students, Oct. 11, 7:30pm, Myers 101.

Prevent Club Meeting: Oct. 12, 8:00pm, JH A107.

Teach for America: a national corps of talented individuals from all academic majors & cultural backgrounds who commit at least 2 years to teach in underresourced urban & rural public schools across the country. Info session: Oct. 13, 7pm, BH 147.


Last day to withdraw with an automatic W is October 26 (except 8-week courses; see Schedule of Classes).

Get Cookin' - Bloomington-based Cook Inc. annually sponsors a competition for the best design or modification of a medical device. The winner earns $1,000 and the chance to interview for a summer internship with the company. Informational meeting with David Biggs, a departmental alumnus, from Cook Inc: Oct. 5, 4:30pm, JH 123 (Lieber Room).

Biofest '94, Nov. 9: story on page 3.

In the Next Issue....

• Career options in law
• Ins & outs of volunteering
Dr. Spencer Cortwright: Ecologist and Mentor

Dr. Spencer Cortwright, professor of biology at Indiana University Northwest, believes that as a society, we are finally beginning to understand and appreciate the importance of our rich ethnic and cultural diversity. He also thinks that we are beginning to appreciate the importance of biological diversity (biodiversity) on Earth. Spencer cites numerous reasons to preserve biodiversity, including the ethical right to existence due all species, the aesthetic pleasure of a more interesting world, the ideal of religious stewardship, a need for ecological balance to produce natural climate patterns, and the educational benefits of natural diversity as it inspires curiosity, intrigue, and wonder. Biodiversity also promotes tourism and provides medicinal drug discoveries.

Ecologists strive to understand the guiding processes that allow the persistence of biodiversity. Ecological research is performed at all biological levels: molecular, physiology, population, community, and ecosystem. Sometimes the work is focused on only one species; at other times a few or many species may be examined. Dr. Cortwright's research focuses on the means by which sparsely or moderately populated species persist in nature. Most species are not very abundant, and if we are to preserve biodiversity, then we must understand the processes by which this majority of species persists. They're not usually the best at avoiding predators, resisting parasites, outcompeting, or enduring droughts. Spencer suggests that perhaps they do just one thing well enough to persist. For example, they might disperse widely enough to try many sites in order that they might hit the reproductive jackpot in the rare place and time where conditions are good. Many 'weedy' species have long been considered such gamblers, and ecologists are now discovering that many others do this as well.

Spencer has found that amphibians are ideal study organisms because many species' populations are structured such that their breeding and larval populations are found in well-defined wetland habitats, whereas the juvenile stage can disperse among ponds. These structured populations are known as metapopulations. They are ideal subjects for studies of factors that influence the persistence of sparse or moderate density species, their reproductive success in ponds, and the importance of dispersal among ponds.

Spencer's research on metapopulations takes place in Brown County. He prefers to work as one of a team, and as a faculty mentor in the HHMI Intercampus Research Project last summer, he found a valuable coworker in Jennifer Brown, a biology major at IUB. Spencer has some other projects developing that will take place at the Indiana Dunes.  
Continued on page 3

Inside ---->
Jennifer Brown
Summer Research Ops
Overseas Study
Registration for Summer and Fall
Summer Research

Jennifer Anne Brown is a biology major junior with interests in ethology, ecology, marine biology, and environmental science. She intends to sample a little bit of each area before she locks in on a concentration for graduate school. After earning her doctoral degree, she plans to become a professor, "so that I can teach and do research, as my dad and grandad did before me.

Jennifer knew at a very young age that she wanted to be a biologist. She thought that nothing could be more exciting than the study of life itself. When she was eleven years old, she began volunteering at the North American Wildlife Park Foundation (Wolf Park) in Battle Ground, Indiana. Wolf Park is home to bison, coyotes, foxes, sheep, and a pack of hand-raised wolves. Working and interacting with these animals made her realize that she wanted to dedicate her life to protecting wildlife and natural resources.

Jennifer was attracted to the HHMI Intercampus Research program because it offered an opportunity to work in the field. She feels more comfortable outdoors than in a lab and the research internship appeared to be a good way to learn about methods used in field biology while learning forest ecology.

Jennifer's summer research took place in Yellowwood State Forest. She worked with Spencer Cortwright, who has located and sampled about 40 ponds in the area. Two of these were selected as locations for their experiments. On some days, they would work at only the two ponds, but at other times they would sample other ponds to obtain data about amphibian populations.

Jennifer and Spencer covered a lot of ground when they sampled, making stops in Yellowwood, Hoosier National Forest, and Brown County State Park. They took logging roads, grabbing blackberries as they walked. She saw a lot of wildlife besides frogs, toads, and newts -- deer, hawks, lizards, snakes, turtles, butterflies, a wild turkey, and a fox. Jennifer feels that she received a very well-rounded introduction to forest ecology last summer!

Spencer and Jennifer studied the ecology of forest amphibians to try to explain how some species persist even when their populations are sparse. They think that the key to the survival of a species like the gray treefrog lies in metapopulation dynamics. A metapopulation is a set of local populations that interact via individuals moving among them. In this case, the breeding adult frogs at a pond were a local population, and the metapopulation consisted of all such groups in an area.

Jennifer points out that not every pond is a good breeding pond for treefrogs. A source pond is one whose breeding output is greater than that which is necessary to sustain the local population, and a sink pond is one whose breeding output is less than that which is necessary to sustain the local population. Other ponds recruit juveniles from source ponds to supplement their own breeding populations. However, the status of a pond is not constant from year to year -- a pond that has a banner year one year may crash the next. She and Dr. Cortwright focused on determining what factors determine that a pond will be a source pond.

Jennifer examined the possibility of interspecific competition between the tadpole forms of two species -- the gray treefrog (Hyla chrysoscelis) and the green frog (Rana clamitans). Gray treefrogs hatch during midsummer and metamorphose into juveniles within 30-40 days. Green frogs hatch during one summer and spend the entire following year feeding and growing, until they metamorphose in the next summer. The green frog tadpoles are, therefore, much larger than the gray treefrog tadpoles, and Jennifer thought that their size could give them a competitive advantage which might affect production of gray treefrog juveniles.

She measured the effects of interspecific competition on gray treefrogs in three areas: larval period, length at metamorphosis, and survivorship. Continued on page 4
Research is an important component of Spencer's job. He feels that research keeps him up-to-date and invigorated for the teaching that is a large part of his job as a professor. Spencer teaches a variety of classes at IUN that cover subjects such as biodiversity, evolution, ecology, vertebrate zoology, nonmajors' introductory biology, and the social implications of biology. His students include traditional students and adults returning to or attending college for the first time. He believes that the diversity among his students makes teaching more fun.

Dr. Cortwright states that most ecologists have a deep passion for their work. Indeed, some have been working toward an ecology career since their early years. Spencer considers himself one of the relatively late bloomers. As a youth, he worked at a summer camp on the shores of Lake Michigan. One July day prior to his junior year in college, he was walking on the blistering hot dunes and noticed a variety of plants full of bloom and vigor in what appeared to be an extreme environment. He wondered if it was possible to study the biology of organisms in the context of their natural environment. At college, as he started to take ecology and related classes, he found such a course of study. It has required incredible dedication, much more than he ever presumed. Spencer adds, "However, since the first day of graduate school in the fall of 1981, I have not spent a single moment where I was bored. I do not anticipate any in the next thirty years, so all the work was worth it!"

He cautions that becoming an ecologist who is interested in the understanding and the protection of biodiversity takes time. A few classes here and there will not give a student an adequate depth of understanding. Numerous classes in all fields of biology, and some in chemistry, physics, and math, will provide a good foundation.

Continued on page 4
Dr. Cortwright Concludes:

Spencer advises that hands-on research experience is also important. An aspiring student should possess enough self-motivation to read all that he or she can find about the topic. Discussion with fellow students is essential. Many positions that are exciting and ever-changing require a master's or a doctoral degree. With proper training, a variety of careers are available, such as conservation biologist with private agencies like the Nature Conservancy, research scientist with government agencies like the newly formed National Biological Survey or state conservation agencies, or teaching and research. Spencer suggests that there are many other possibilities if you combine your ecology study with that of environmental contamination or degradation.

Spencer knows firsthand that a career in ecology demands extraordinary dedication and takes time. He reminds us that one can make a good living in many careers. "However, the greatest reward comes when your alarm clock sounds. You want to get up and go to work!"

Dr. Cortwright would be eager to discuss research opportunities with biology majors who want to acquire summer research experience in Brown County. If you are interested, you may reach him at (219) 980-7760.

Did You Know . . . ?

That the Student Academic Center offers credit and non-credit instruction? That topics range from quelling pre-exam anxiety, to acquiring time management skills? That the workshops and courses are designed to assist students who are feeling short in the survival skills department along about midterm time? That the courses and sessions will help target existing skills for students with adequate learning abilities who would like to enhance what they have? That the non-credit help is FREE? That the credit courses may apply toward your degree (see your advisor)?

Call or drop by: The Student Academic Center
316 N. Jordan 855-7313

Jennifer's Summer Research

..continued

There were no significant effects on survivorship or on size at metamorphosis, but she did find that the presence of green frogs in varying densities extended the larval period of the gray treefrogs by an average of five days. This finding is significant because each additional day that a gray treefrog spends as a tadpole is an additional day that it is vulnerable to aquatic predators, such as newts or salamander larvae. Therefore, her research shows that competition with other species is a factor that does have an effect on gray treefrog production.

Jennifer is pleased with her accomplishments last summer. She worked very hard, and gained a good background in field techniques and forest ecology. She feels that she was lucky to have had an opportunity to work with Spencer, who is a nationally recognized amphibian ecologist. Jennifer found that Spencer was dedicated, helpful, and concerned about her success in the internship program, the very qualities that make an outstanding mentor for students.

Jennifer was invited to present her research to the IU Board of Trustees and the Indiana State Budget Committee. She felt honored by the invitation and found it exciting to think that she had been selected as a representative of the biology department and of the student body as a whole. Dr. Cortwright and Jennifer plan to submit their findings for publication and Jennifer intends to continue to use research as a tool for her personal education. The Department of Biology and HHMI are very pleased by Jennifer's achievements and hard work!
Bits and Pieces

News from the Health Professions/Prelaw Center

You can now access the most recent information on services and resources available to those interested in health professions or prelaw activities online through the IU computer network. After you log on to your VAX account, simply type "HPPLIC" at the AIE prompt to move directly to a menu of topics. You may choose from a calendar of activities, recommendation services, test dates, available services, allied health, predental, prelaw, premedical, prepharmacy, or preveterinary information. There is also a selection from the HPPLIC menu that lets you review information on office hours and appointments and a menu item that will accept your questions for the Center staff.

Test dates and deadlines:

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AMERICAN WOMEN IN SCIENCE -->

The next two meetings of AWIS will be in the University Club, IMU, Sunday evenings, 6 to 8 pm.

Sunday, March 6: Ethics and Doing Science

Sunday, April 10: How I got to Here: Mentoring in the Sciences

IEØ-SUMMER IN LONDON

The Institute of European Studies (IES) London Center will offer a challenging summer program for students interested in comparative law, British history, and literature. Students interested in theatre arts and studio arts may enroll in summer workshops. Along with the academic fare, London and the surrounding area offer regattas, flower shows, Wimbledon, and famous horse races.

Housing is arranged in London and IU financial aid is applicable to program costs.

You are eligible to apply if you are in at least your first year of college and in good academic standing.

Application Deadline is March 11
OVERSEAS STUDIES FRANKLIN HALL 303 *855-9304*

BIOLOGY ADVISING SEASON!

Continuing Student Registration for Summer Sessions 1994-95 will begin Tuesday, March 22, and will end Wednesday, March 30. During this registration period only, you may register for both summer sessions while you are in the Registration Center.

Registration for Fall Semester 1994-95 will begin Monday, April 4, and ends on Friday, April 29.

Be sure to call or stop by the Biology Advising office soon to make an appointment with an advisor if you need to check on your degree progress before either registration period. *Jordan Hall A115 *855-3810
ARTS AND SCIENCES SPRING WORKSHOP CALENDAR

Resumé & Cover Letter Writing - describes in detail the job placement services provided to Arts and Sciences students. The workshop includes detailed instructions on the student registration system, A&S Resubase (electronic resumé system), and the on-campus interview process. T, 2/22, 3:35-5, CDC Classroom, and M, 4/11, 6:30-8, Ballantine 208.

Finding A Job - explains in detail the blocks of information that should be included on resumés as well as suggestions on different styles. The role of correspondence, including the use of cover letters, is briefly discussed. T, 4/12, 6:30-8, Ballantine 208.

Interviewing Skills - provides information on the different kinds of interviews one can expect to encounter. This workshop explains what kind of information employers are seeking in an interview and how best to provide it. It includes a list of popular questions asked by employers and a discussion of how they might be answered most effectively. W, 4/13, 6:30-8, Ballantine 208.

Attending Graduate School - reviews when and why a student should attend graduate school. The workshop provides information on choosing a school, the admissions process, financial assistance, and taking the GRE. W, 4/20, 6:30-8, Ballantine 208.

JOB FAIR

Indiana Collegiate Job Fair Friday, April 8, 9-4, Indiana Convention Center
Career Development Center 625 N. Jordan 855-0576

NOTICE OF AWARD DEADLINE EXTENSION

Cook Group of Bloomington will award a top prize of $1000, plus the opportunity to interview with Cook for a summer internship, for the best paper on the design, development, and utilization of a potential new instrument or device for medical purposes. The deadline of Monday, March 21, 1994, at 3:30 p.m., has been extended by Cook Inc. to Friday, April 8.

Contact Kris Starzyk or Kathy Wyss at the Biology Advising Office in Jordan Hall for more information. If you haven't picked up the list of available award competitions for biology students, stop by the office for a copy soon!