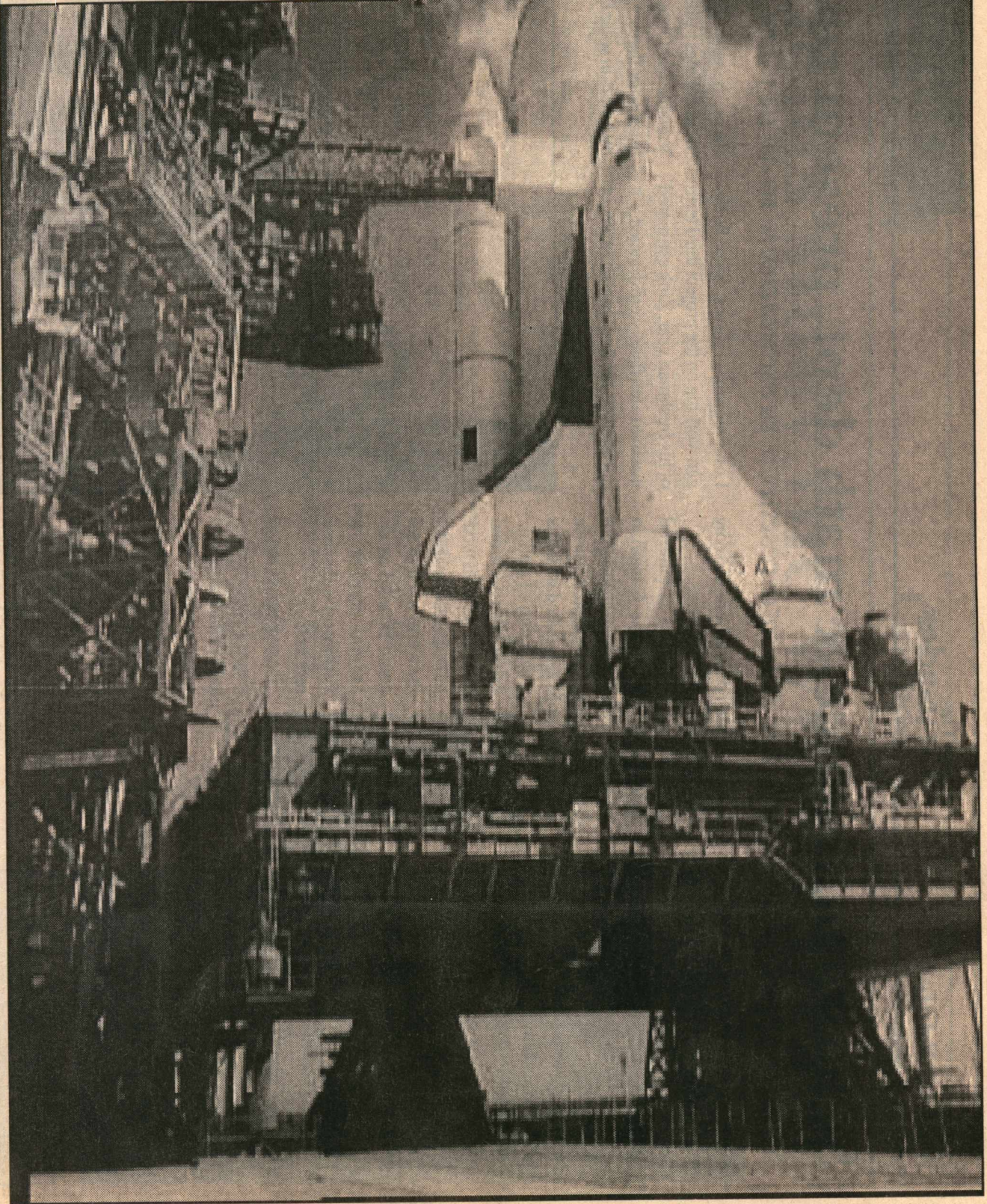


**The
Crusader**
Spring 1998



The Crusader

Special Science Edition

The Student Newspaper of Northwest Nazarene College ♦

Spring 1998

Blast off with Science

The Division of Mathematics and Natural Sciences is presented

Column One

Greetings! This issue of *The Crusader* focuses on the education students here at Northwest Nazarene College receive from the Division of Mathematics and Natural Sciences. And, it is a very good education whether students are majoring in one of the fields offered by the division or are taking courses as part of our general education requirements.

Over the years, the Division of Mathematics and Natural Sciences has established an enviable record of job and graduate school placement. Today hundreds of NNC alumni owe their career success to the faculty of the division and to faculty all across our campus who have invested in their personal and professional development.

Congratulations to faculty and students alike. I trust that the years ahead will be even more productive and rewarding. The base on which you build is strong indeed.

If you are a prospective college student and are reading this issue of *The Crusader*, I urge you to consider NNC as your college of choice. A decision to attend NNC is a good investment in your future.

Richard A. Hagood
President

Published by ASNNC
in co-operation with the
Division of Mathematics
and Natural Sciences

Northwest Nazarene is a distinctly Christian liberal arts college located in Nampa, ID. The school was founded in 1913 by Eugene Emerson as a way for the member of the Church of the Nazarene to educate their children.

The Division of Mathematics and Natural Sciences covers the core of science and math courses for the students of Northwest Nazarene College along with offering majors in the sciences.

In the division are departments for Chemistry, Biology, Physics, Computer Science and Mathematics. The Division is chaired by Dr. David Redfield.

Graduates of the division are considered the top in their fields. Placement in jobs and graduate schools is exceptionally high.

For more information about the division contact the Office of Admissions and Financial Aid at 1-800-NNC-4-YOU or e-mail Dr. Redfield at DARedfield@science.nnc.edu. Also visit the campus web site at <http://www.nnc.edu>.

From the Editor

From my office here in campus I can see all the signs of the approaching spring. All of the changes that I see can be explained in many ways but for our purposes today we will look to the wonderful world of science.

Over the last year, *The Crusader* has run stories on the division to create awareness throughout the campus of the work done on that side of campus. Some of these articles have been reprinted to give you an idea of what is going on and where they are headed.

The Crusader staff is proud to place this issue in your hands and we hope you enjoy it.

Andrew J. Diehl
Editor-in-Chief

Crusader Staff

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"It is a grand and awful thing to be a free man."

-William H. Croghan, West Indian Educator, 1883

Students break ground in laser fiber optics

Blum and Tennyson research the effects of photorefractive focusing on helium-neon lasers

By Gina Grate
Campus News Editor

The action hero lowers his laser gun and takes a bead on the villain, pulls the trigger and a dazzling battle of colored beams of light ensues. The cartoon robots miraculously dodge a plethora of laser shots, take aim with their own weapons and stun their enemies without effort. This is what lasers is all about, right?

Perhaps in popular media, but not in the reality of science. This does not mean that laser research and breakthroughs are not thrilling, Dr. Galen Duree, professor of physics at NNC, would argue. Along with senior Jeff Blum and sophomore Ken Tennyson,

"It could revolutionize computers . . . they could essentially be hundreds of times faster, maybe thousands, I don't even know,"
~ Ken Tennyson, sophomore

Duree spent this past summer studying "photorefractive focusing" and "photorefractive defocusing."

Sound complicated? It is, to the layman. But the findings in this important field will have impact on everyone, from greater telephone efficiency to faster com-

Fiber optics: tubes filled with hundreds of fibers made of glass, along which light flows, carrying information, used recently in telephones.

CCD camera: sensitive digital camera used to take photographic cross sections of the laser.

Helium-neon laser: laser fueled by helium and neon gases.

puter technology.

"The telecommunications industry is going fiber optic," said Duree. Telephone systems used to send data by electrical charges along copper wires. Fiber optics, which send data by beams of light, however are much more efficient.

In 1992, Dr. Duree was a graduate student, assisting his advisor on a laser project for the Defense Advance Research Projects Agency--a branch of the Department of Defense, that, as Duree put it, "had the hush, hush things." The project, according to Duree, was to research ways to "protect army equipment from damage from stray lasers."

"I found this effect by accident," he said of his discovery that electrical voltage applied to a Strontium Barium Niobate crystal, focused laser beams to various diameters without having to change the size of the lens. But because of the DARPA project, he didn't have time to divert his attention to studying the focusing phenom-

ena.

Now that he is teaching at NNC, Duree decided to take time researching the phenomenon. For the past two summers, Duree and NNC students, have been studying the crystal and lasers. Sophomore engineering physics major, Ken Tennyson, said, "I spent about 12 weeks [this summer] working on the focusing aspect of the research. Basically, that's where we use the crystal to focus the laser."

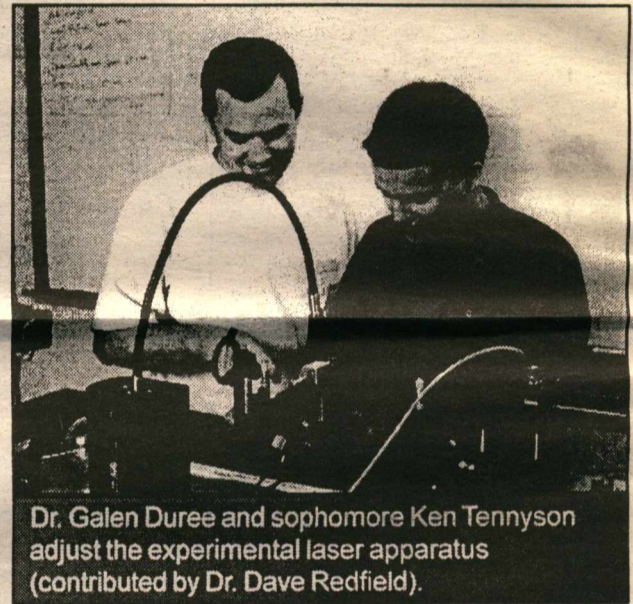
An average day in the lab for Tennyson, consisted of "spending about 9 hours with the lights off so I could see the laser. I spent a lot of time in the dark. I didn't get a tan this summer," he added. He worked with flashlights, "moving little micrometers one-half a millimeter at a time, and taking a picture; moving them again and taking another picture . . . an average data run was about half an hour, and then we'd stop and analyze it and set the crystal's charge back to zero."

Blum worked on a slightly different aspect of the crystal, specifically, on photorefractive defocusing. He actually exposed the crystal to negative voltage, rather than positive. "By reversing the polarity [of the crystal]," he explained, "you can make it focus or defocus."

"If you mess up anything, you have to wait fifteen minutes

to start over," Blum said, and added that he spent a lot of time waiting. "This stuff is really interesting and I like it. . . . No one has done this kind of research; studying how to build optical computers is new. It wasn't difficult research--anybody can turn knobs. But to be able to analyze what's happening and what needs to change took a lot of insight."

The equipment they used was somewhat costly, but much of it was provided by Research Corporation, Science and Math Associates, and the Murdock Foundation. The SBN crystal was donated by Rockwell International, and it is valued to around \$5000. The computer and software is worth



Dr. Galen Duree and sophomore Ken Tennyson adjust the experimental laser apparatus (contributed by Dr. Dave Redfield).

nearly \$10,000, including the CCD camera. The helium-neon laser was already a part of the NNC sci-

Continued on page 3 . . .

What is photorefractive focusing?

Photorefractive focusing is the process of eliminating some of the broadening of a laser the farther it travels from its point of origin. Just like the light from a flashlight gets broader the farther the light travels from the bulb, laser beams also broaden, thus diminishing their power. This presents a problem in fiber optics, because the glass fibers used to channel the laser beams (like a pipe channels water) may have openings too small for all the light of a laser to enter, if the laser beam has gotten too broad. Dr. Galen Duree, Ken Tennyson and Jeff Blum tried to find a way to solve this "light leakage" by focus-

ing lasers with a Strontium Barium Niobate Crystal.

This crystal is actually a cube and is used like a lens through which the laser passes. Just as a magnifying glass can focus sunlight into a very tight, powerful beam of light, this crystal lens focuses a laser. However, even this crystal alone cannot eliminate all the diffusion of the laser. But by attaching a battery to the crystal and sending voltage through it, one can compress the light beam to a very small diameter. The reason the electricity in the crystal focuses the laser beam passing through it, is that the electricity actually distorts the crystal, which results in the compression of light. The distortion in the crystal, how-

ever, is too slight to be detected by the human eye.

Why is photorefractive focusing important?

Telecommunications technology, such as telephones, computers and Internet, all operate using copper wires and electricity. Right now, electrical charges are sent along the wires to your computer or telephone, and these charges send it data. The recent implementation of **fiber optics** in telecommunications, however, has begun to replace the copper wires with tubes that are filled with countless flexible glass fibers. Lasers are sent through various lenses into the glass fibers, and the light travels along the fibers until

it reaches your computer or telephone. Data sent at the speed of light, rather than the speed of electricity, is much faster and more efficient.

Photorefractive focusing has direct bearing on fiber optics, because focusing the laser to send all the data into the fibers is of the utmost importance. At this stage of its development, the variation in sizes of fibers requires various lenses to focus the laser at different breadths. This is costly and inefficient. Duree and Tennyson believe their research on the SBN crystal will eliminate the need for different lenses, because the crystal can be electrified to focus the laser passing through it, at various sizes.

Dr. Leon Powers explores the wildlife of exotic Australia

By Sarah Wolfe
Staff Writer

If you have never ventured to the north side of the campus, you may have never met a truly interesting individual at NNC. Dr. Leon Powers, professor in the Department of Biology, adds a fascinating perspective to the NNC experience. Powers recently traveled to Australia to explore the foreign wildlife as well as the possibility of an overseas study program for NNC students in Australia.

His plan to return to Australia with a group of 10-20 NNC students became a vision while on a mission trip to Australia last summer. He was incredibly impressed with the tremendous variety of interesting wildlife and rich natural history unique to this part of the world.

Dr. Powers said of his first experience in Australia: "With a single field guide and scant time, I was able to become familiar with more than 80 new bird species and a variety of other wildlife that I had never seen nor heard of before. I would like to expand on that experience and share it with other interested people."

Dr. Powers feels that his program would add a wholistic approach to the Australian experience. "To my naturalist mind, a visit to Australia without a concerted study of its



Dr. Leon Powers scans the horizon for wildlife, while in Australia this past summer.

proposal to the Dean. "I propose to develop a course that would offer NNC students an opportunity to travel to Australia and to experience first hand, and study up-close, the 'Natural History of Australia'."

Dr. Powers, along with his wife and two other relatives, left for Australia on August 1. During his stay in Australia, Powers visited Brisbane, Cairns, Darwin, Alice Springs, Adelaide, the island of Tasmania and Sydney. Most of their nights were spent in caravan parks which would compare to low grade motels. The rooms came equipped with two double beds, a small kitchenette and a bathroom and cost the travelers around \$35 a night.

"Australia is a unique and wonderful place to learn about all kinds of wildlife," Dr. Powers answered when asked why he chose Australia to further his studies. "I love Idaho and the birds we explore

unique natural history seems somewhat akin to entering the Louvre merely to use its drinking fountain, or entering the Taj Mahal solely to make a phone call," he stated in a

in Birds of Prey, but I needed to expand my knowledge of a broader range of birds."

Contrary to the popular mental picture of Australia being a continent of brown flatlands, Dr Powers described the scenery as "green forests closer to the coast and the equator, and beautiful reds in the sand and rocks as you move toward the center countries. It is beautiful."

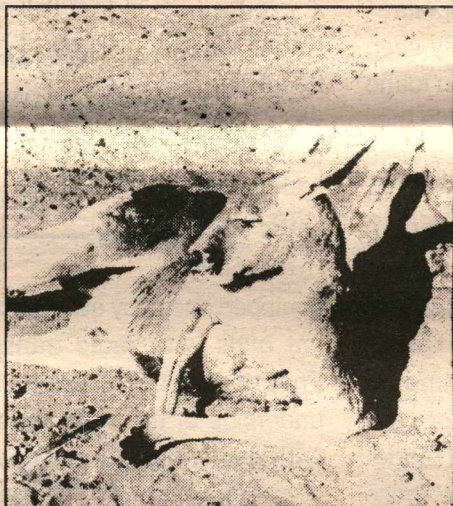
Another magnificent experience for Dr Powers was the sky at night. "It was so impressive to walk outside and see an entirely different set of stars and constellations" This is an aspect that many would not even think of, but as Dr. Powers said, "It is very obvious that you are in a different country in everything from the sky to the people."

Powers spoke of the people of Australia as "friendly and always willing to help." The binoculars, cameras and other paraphernalia of tourists would attract the people to the four explorers and they were always willing to answer questions about anything from birds to wildlife refuges.

Powers also expanded his diet with foods such as wallabie, emu, and camel meat.

He also acquired a taste for pumpkin soup, which was actually made from squash, and a dessert called, sticky date pudding. "My favorite thing to eat was probably the pumpkin soup. It was like nothing I've ever tasted," said Powers.

"I would go back tomorrow," Powers exclaimed. As he plans this study overseas with our sister college, Nazarene Theological College in Brisbane, students are encouraged to get to know this fascinating professor. He will be happy to share his knowledge and his plans to travel to Australia next summer.



A kangaroo lounges in the Australian sun, indifferent to Powers' camera.



A koala stares back at Dr. Powers, startled to be captured on film.

continued from page 2

ence division, and is valued at \$500.

"The phenomenon did not progress in the way we thought it would," said Duree. "I had preconceived notions of how the crystal would focus the laser. I expected a certain progression. It didn't happen the way I expected. I thought we'd be done with it this summer, but we're still doing it. We don't know what conclusions we're going to make yet."

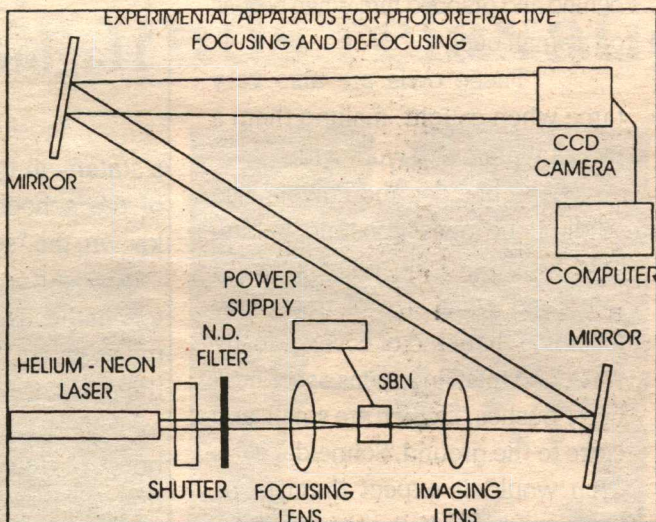
"I guess the biggest question for us," added Tennyson, "is, 'Will it ever be useable?' It works in theory. A lot of times something works great in a lab, but it could break down in a few weeks

[once set up in a daily environment]."

Duree said that this type of research, research on the cutting edge of technology, would not normally be done by undergraduate students.

"It could revolutionize computers," said Tennyson. "... they could essentially be hundreds of times faster, maybe thousands, I don't even know."

"It could make the comput-



A diagram of the experimental apparatus containing the helium-neon laser, the SBN crystal, and the CCD camera (contributed by Duree).

ers we have now archaic," said Duree.

Tennyson felt that his experience in research was valuable. "Hopefully, I'm looking to try to

publish a paper in the Undergraduate Journal of Physics. I'll be presenting a poster at Murdock." Tennyson also mentioned that there is a possibility he could present at an optics conference on the San Francisco. Blum also plans to submit a paper to the UJP.

"I learned [to have] a good work ethic..." Blum said. "... don't slack, so your employer feels good for paying you to do what you're supposed to do. Be a go-getter, try and impress your employer all the time."

Schneider spends the summer chasing owls

By Jenifer Holmquist
Staff Writer
and
Gina Grate
Campus News Editor

Scratching trees and following owls for four months, night and day sounds like a strange way to spend one's summer, but Cody Schneider found it to be exciting. He was privileged to work with Dr. Powers on his study of the habits of flammulated owls after the baby owls have left the nest.

Flammulated owls are named for the rusty (flame-colored) patches of feathers around their faces. According to Schneider, they feed only on insects, and though they are common in Idaho, they are very secretive, and so are rarely observed. Dr. Powers said that the owls he has studied have been known to winter from the mountains of the Southern U.S. to as far south as Guatemala.

These owls are rarely seen or heard even when they are in Idaho which caused people to believe they had small ranges, or that they were scarce. Recent surveys show that they are actually widespread in Idaho.

Schneider and Powers, along with Julia Paz and Erin Chamberlain who were also working on research, traversed five major canyons in the Sublett mountain range.

As with most owls, these owls will only nest in a hollow tree cavity, so they need forests with old, dying trees.

"We located the owls by scratching [trees]. When they hear



This owl was sick and was treated by Dr. Powers several years ago.

the scratching, they think it's a predator climbing up the tree, so they poke their head out and look down," Schneider explained.

The researchers would scratch between 30 and 40 trees before seeing one. "We probably

scratched 500 trees this summer and found four owls."

The intent behind the research project which Cody Schneider undertook with Dr. Powers this summer, was to study a particular behavior trait in the owls.

"They're known to exhibit a phenomenon known as brood divisioning, which [happens] when the young leave the nest; one adult will take care of one young, and the other adult will take the other one or two, so that the young are better protected from predators," Schneider explained. If a predator finds one fledgling, it won't find them all."

To better study this, they

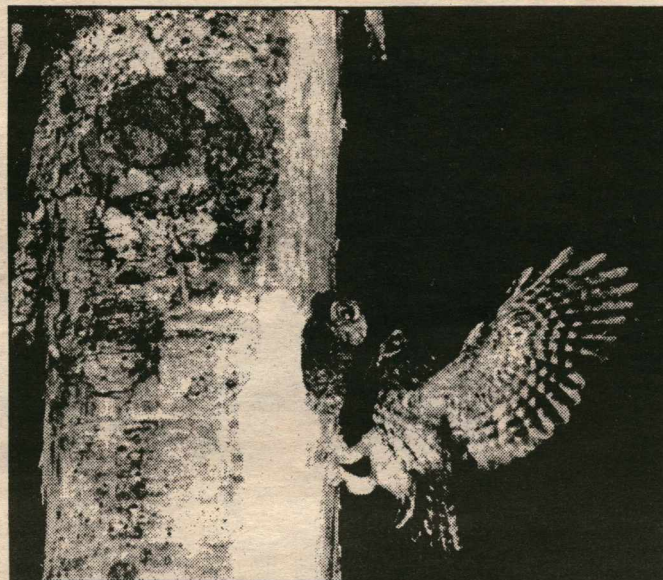
equipped one baby owl and both parent owls with radio transmitters. They tied the tiny transmitters to the underside of the owl's tail feathers with dental floss, and then secured them with glue. This ensured that the owl's flight would not be affected and the transmitter would drop off when the owl lost those feathers.

"Actually, catching the young owl was simple because they are very dumb," Powers explained. "I wiggled my fingers in front of him to distract him, then reached from behind and grabbed him when he was on a small bush".

These owls are also very tame when caught, making them a pleasant animal to work with.

Schneider and Powers also studied the owls' roosting habits. "We were studying what kinds of trees and what size of trees they roost in, what kind of cover. Mostly you found them in aspens or service-berry bushes," which are small and close to the ground, Schneider said. "You wouldn't expect them to be hiding a foot off the ground," he added, revealing his surprise.

The biggest obstacle to the study this summer was unpredictable weather. While the weather might be pleasant here in Nampa, it was often a different story at the research site 35 miles southeast of Burley.



The owl with wings spread is just returning from a successful night scavenge with a caterpillar to feed the female peeking out of the roost (contributed by Powers).

"We had to walk up and down five miles of canyons every day,"
~Cody Schneider, senior

Rainy weather was hard on both the researchers and the owls because insects are not out when it rains. The scientists would drive several hours to get to the research site, then either get nearly stuck in the mud, or not be able to find the owls.

"Sometimes it was windy and raining and lightning everywhere," said Schneider, "sometimes it was hot and sweaty. . . fighting

the bugs wasn't that much fun either."

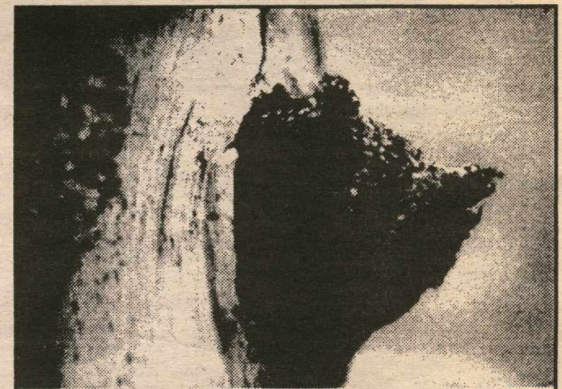
A possible obstacle in the future would be lack of funds because of the research site's distance from campus. Currently, the Murdock Grant provides funds for equipment, gas and pays students to do research over the summer. It would be disappointing to discontinue this research because it is "virtually the only

study on the nesting and post-nesting habits of these owls in Idaho," stated Powers.

After observing this family group of owls for a month, the researchers concluded that while the owls split up to some extent, they also keep "family ties." This was very surprising because a study in Colorado suggested the owls moved more than half a mile away from one another. The NNC study also confirmed that one young owl (this time the one with the transmitter) always goes with the father owl while the rest go with the mother. The NNC research team concluded that dividing the brood like this should keep other animals which might eat baby owls from getting all of the young.

"We plan on putting a paper together for publication in one of the scientific journals," said Schneider.

"It was a great experience," Schneider says. Though working with wildlife has always been his career choice, he has learned recently that there are really no jobs or money for education in this area, so he has changed his direction toward pharmaceutical work. In the near future, Schneider expects to make wildlife study a hobby, and perhaps to return to it as a career farther down the road.



This photo shows what Schneider would see after scratching a trunk which housed an owl (Powers).

Hagood's statement on semesters

President Hagood released a statement this week on the issue of the school calendar, or better known, the "semesters issue."

After summarizing a history of the investigation concerning the possibility of switching NNC to the semesters system, Dr. Hagood explained why he decided not to bring it before the Board of Regents this past week.

"In agreement with the Academic Council, the ad hoc advisory group, and the academic dean, I have concluded that, to this point in time, a compelling case has not been made and/or embraced by the campus community favoring the semester over the quarter calendar."

Hagood said in his statement.

He went on to say that until the NNC community sees semesters as a positive change, "it would be counterproductive . . . to make the change."

Hagood explained that during the next four months, the faculty, administrators, staff and regents will be examining possible measures for "renewed institutional viability."

If a semester plan is viewed as fitting appropriately within the goals for enhancing the present viability of NNC, Hagood will take the issue to the Board of Regents in March.

Counting butterflies for summer research

Erin Chamberlain, Biology major, researches butterflies in Idaho's Sublett Mountain range

By Gina Grate
Campus News Editor

Do camping trips and counting butterflies sound like real summer jobs? Taken together, it's one really fun job at least, says senior biology major, Erin Chamberlain. She spent this past summer working with Dr. Powers, researching butterflies in the Sublett Mountain Range, in southeastern Idaho.

"My project was estimating the number of butterflies in Idaho. No one's ever really studied butterflies in Idaho. No one knows much about them," said Erin.

Between June 13th and August 20th, Erin took nine trips

"It was interesting to see the different species come and go. Some weeks you won't see any [of one species] and another week, a hundred."

~ Erin Chamberlain, Senior.

up to the Sublett range for two to three days at a time, with the help of senior biology majors Julia Paz and Cody Schneider.

"I didn't know anything about butterflies," Erin said, "it was a cool way to do my senior research. And I got paid for it!"

The process for counting

the butterflies involved walking along a line one kilometer in length, called a transect, and counting every butterfly that is seen close to or far away from the transect. Erin walked transects in three different canyons, counting anywhere between 100 to 300 butterflies each time. Once she counted up to 500.

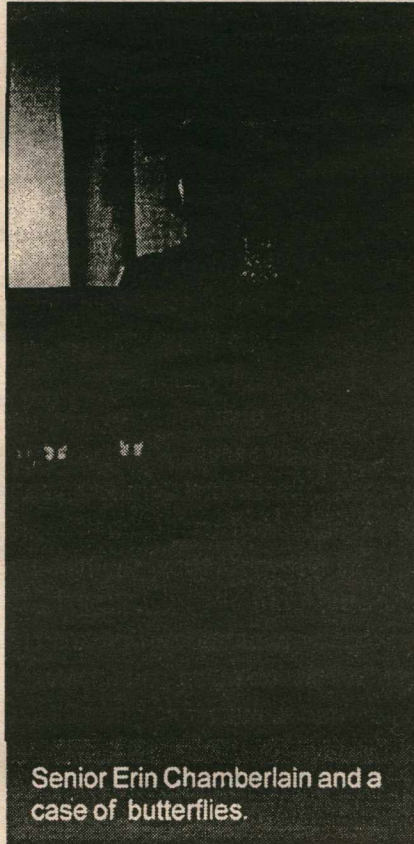
"It was interesting to see the different species come and go," Erin said. "Some weeks you won't see any [of one species] and another week, a hundred."

This was the easy part. Erin also had to build a butterfly trap that was 12 feet tall and just as wide. Formed of metal poles and a light-weight netting, the trap is 4 sided at the base, with an opening at ground level on one side. According to Erin, butterflies tend to fly mostly upward and avoid flying

down. So they would enter the opening and then fly up into the trap and be unable to escape. The trap was collapsible and rolled up for easy transport.

In any project, there are bound to be unforeseen difficulties, as Erin discovered.

"There are a lot of cows up there," Erin said, "we put [the trap] up over the road and we had to watch it sometimes because of the cows. One time I was there by myself and this big, black angus bull was slobbering and being scary and was coming right to the trap!" She was afraid the cow would try to go through the trap and tear a hole in it, in the



Senior Erin Chamberlain and a case of butterflies.

process.

"I was throwing rocks at it and I was yelling. I was getting ready to lower the trap and finally, he decided to go around it. Another time, a herd of cows did go through our trap- it was all fallen down and had two small holes in it." Then she added, "Julia stepped in our trap once."

Marking butterflies was another important part of Erin's research. She chose to mark and study the Weidemeyer's Admiral, which is black with white stripes. First she had to catch the butterfly with a butterfly net.

"You had to learn how- there are certain tricks of the trade that I learned from Dr. Powers. If you see a butterfly laying on the ground, you have to set the net

over it, or tap the ground right behind it and it'll start to fly, so you can whip your net around and catch it," she explained.

Because butterflies are somewhat fragile, Erin had to be careful with them. "When I first started," she said, "I thought I was going to . . . kill them all. You're supposed to reach in and grab their abdomens and pull them out- never touch their wings."

While she or another researcher held the butterflies on the top of their abdomens, one would make a tiny dot with a felt tip pen on one of the white stripes; this actually did not hurt the butterfly at all, as the wings are really made up of tiny scales. "The goal was to catch them again and see how far they moved from the first time we caught them. Out of 200 [we marked] we only recaptured 8."

Erin is currently working on a poster to take to the Murdock meeting, which is a gathering of students from various colleges who have researched under grants from the Murdock foundation.

Butterfly facts

The average life span of a butterfly is only 2 to 3 weeks.

There are up to 50 different species of butterflies in Idaho.

Crusader Choir finds relaxation in McCall



Hiking along a trail in Victor Cove, McCall, Professor Smucker, Amber Jerome, Jonathan Goff, Brad Hays, Linda Folkestad, the bus driver, and Charmine St. Claire, stop for a group photo (Photos contributed by Stillman).



Choir members watch ducks.



An unexpected snowfall at Payette Lake.

Students study the Wilson Drain

by Jennifer Holmquist
Staff Writer

This summer Becky Blair and Marijeanne Uhalde researched the water quality of Wilson Drain. The drain begins south of Nampa and is popular for its fishing and recreational opportunities in the Nampa community.

Blair involved herself in finding out the chemical makeup of the stream, while Uhalde researched the biological components. All of their research was based on research Barry Lewis performed the summer before while trying to test the effects of agricultural run-off on the drain. The main tool they used in analyzing the water was a Water Quality Index. Their method "was originally set up to test water from sewage treatment, and worked very well here," stated Blair.

The way they tested the water involved two techniques. First, they would put a meter in the water that measured some water characteristics in the stream. Then, they would collect samples to take back to the lab.

Marijeanne Uhalde's work mainly focussed on finding the amount of microorganisms in the water from fecal material. She also wanted to discover whether they

all came from animals, or if some might be human. Although her results were not conclusive, "we were pretty sure some of it was human," she stated.

A sample with 2,000 microorganisms is the legal limit in water for swimming, while 10,000 is the limit for fishing and boating. Blair said, "We found 20,000 in some samples." The sample size they tested "was about like a gulp of water," indicating some areas were extremely unsafe.

The emphasis on the research this past summer was mainly focussed on "establishing a protocol so students next summer can work and come up with good data." This would allow students to present their results to government health officials and possible start work on cleaning up the drain.

Another goal that was partially accomplished this past summer was training high school and middle school teachers how to teach their students to perform these tests. This would give re-

searchers an important tool by generating "a statewide database on many bodies of water in Idaho," stated Blair. It benefits the students also because "it shows them practical chemistry."

"High school chemistry isn't like biology, where you can always go out and have fun on fieldtrips, but this gives teachers a chance to do something like that," emphasized Blair.

Becky Blair, who is a senior education major, plans to teach her students the methods used in this project so they can learn this aspect of chemistry. She concluded, "I liked this project simply because it's something I can use with my students someday. I completely plan on doing this with my kids on a local water source."

When asked why she chose this project, Blair stated, "Dr. Redfield (her advisor) chose me!" Because it will help her a great deal in her future, Blair saw the summer research project as a great experience, which will hopefully also help chemistry majors and the public alike in the years to come.

Their method "was originally set up to test water from sewage treatment, and worked very well here," ~ Becky Blair

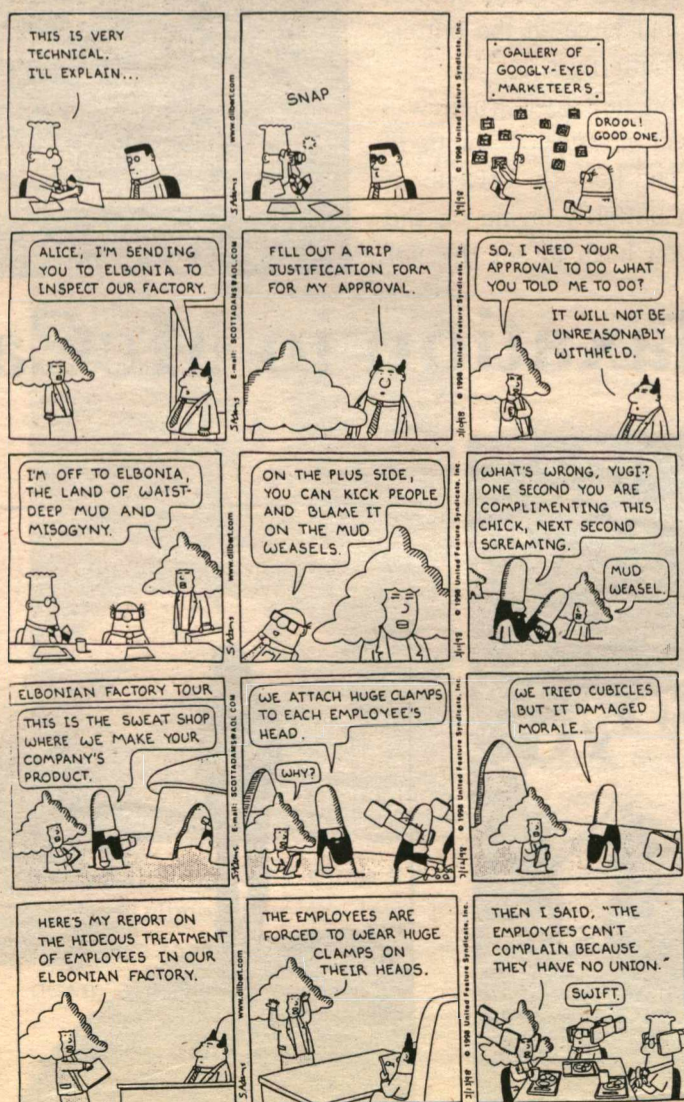
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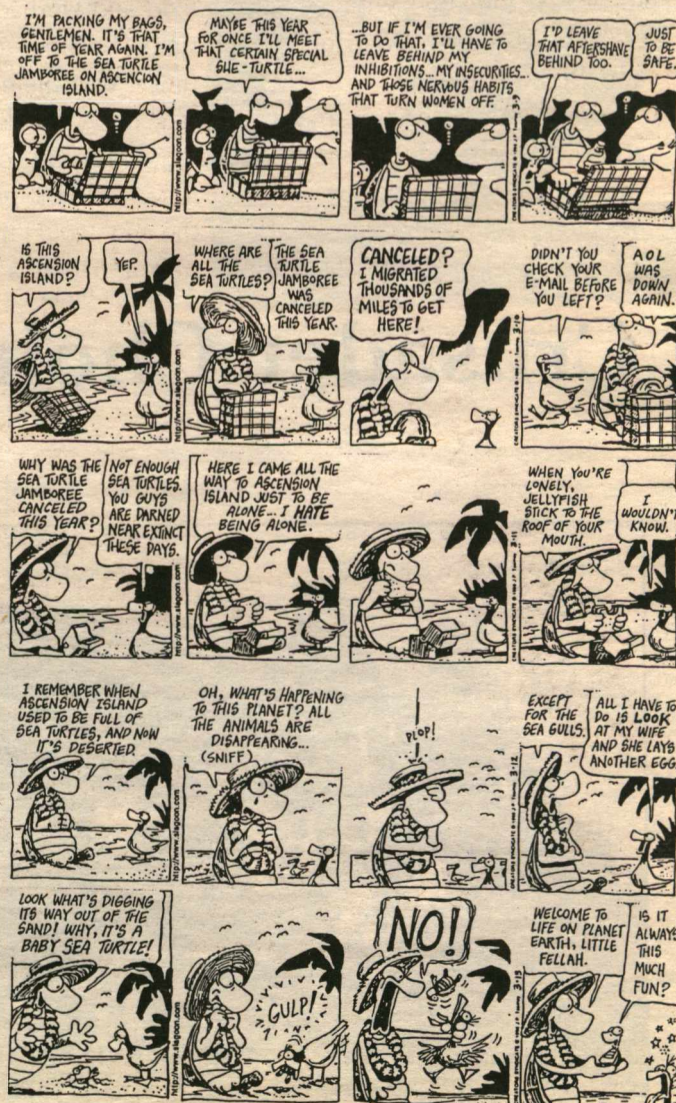
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Seniors in science & math dept. present research

Senior symposium held for science research presentations in Wiley last May

By David Stillman
Opinions Editor

Thirty-three graduating seniors in the science division presented research projects at the Senior Seminar in the Wiley building on Saturday. The seniors put hundreds of hours of research into topics that were chosen, in many cases, before the senior year even began.

The Senior Seminar is a graduation requirement for all graduates of the science division. "It's basically a part of the senior thesis, which requires an oral and written presentation," said Dr. Francis Sharpton, a physics professor. "It can be on any topic relating to the major, as long as it's accepted by a faculty member."

The seminar covered a variety of topics. Robert McDougall, who is majoring in mathematics, statistically analyzed the effectiveness of Relief Pitching in Major League Baseball. By analyzing the season stats of thirteen pitchers from around the league, he came to the conclusion that starting pitchers were still effective in the seventh and eighth in-

nings and didn't need to be replaced by a middle reliever in most cases.

Paul Edmonds compared neuromelanin from the Canadian nightcrawler, Lumbricus, with that from the human brain. Parkinson's disease destroys neurons associated with this

neuromelanin. Edmonds concluded that the melanins were indeed similar, and that the worm's neural net could be used as an animal model in Parkinson's disease research.

Computer science major Joshua Nalley led a group project to develop a multi-user domain (MUD) which would work over the Internet. A MUD is basically a text adventure game in which players interact with each other in real time over the Internet. Nalley began working on the MUD the summer before his junior year, meeting with a group every week for three to six hours. "We're still putting some finishing touches on it, but it should be up and running in three to four months," he said.

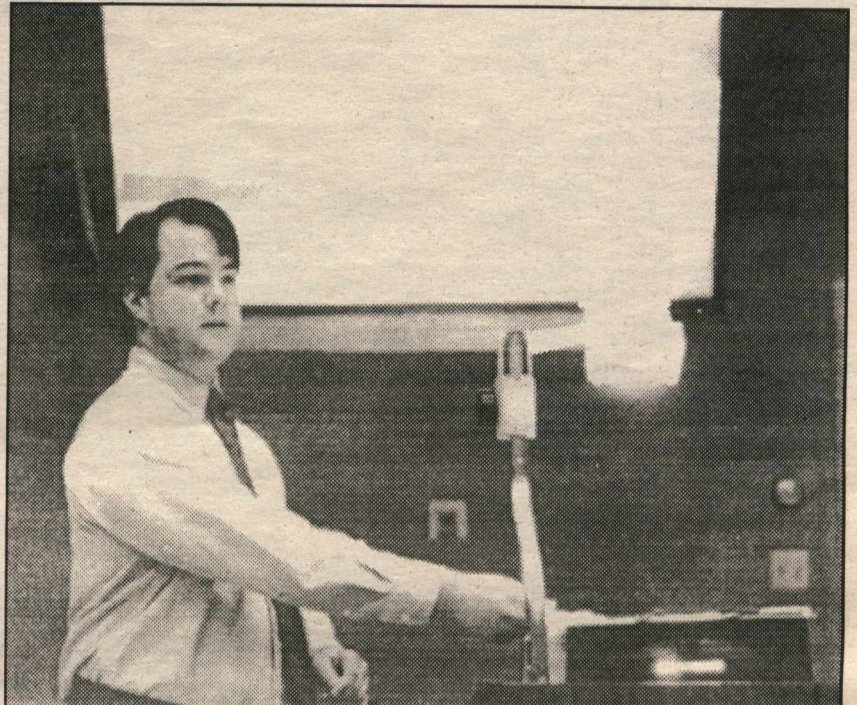
Physics major Dave Zink's project was to build a system that would detect solar flares. Zink detected several flares using a system which analyzed the signal strength of VLF (Very

Low Frequency) waves. Since he began working on the project third term of his freshman year, Zink estimated that five to ten flares were detected. "It only detects the two largest classes of

flares," he said. "Each month we send in our findings to the American Assn. of Variable Star Observers, who publish a list of solar flares." This list can be used by others in solar flare research.



"It's basically part of your senior thesis..."
~Dr. Francis Sharpton



Senior Jim Walker was one of thirty-three students presenting at the science and math department's symposium.

The seniors put hundreds of hours of research into topics that were chosen, in many cases, before the senior year even began.



Heather Hanson presents her research (above). Jenny Hubartt (top left) & Alvaro Ontanon (left).

Poorly Drawn Man

by Dave Stillman

THE ASUNC Pres. results are... It's Poorly Drawn Man by a nose

After getting governing tips from Carey Cook

Our hero gets started on his duties

I wonder who's paying for this coffee?

10:00-12:00 wait for people to come into office and say hi

10:15 Coffee Break

Gallery business? None. Old business? Nope. New business? Not this week.

I move to adjourn second

Wait a minute! I don't even like coffee.

Hmm. I don't do anything.

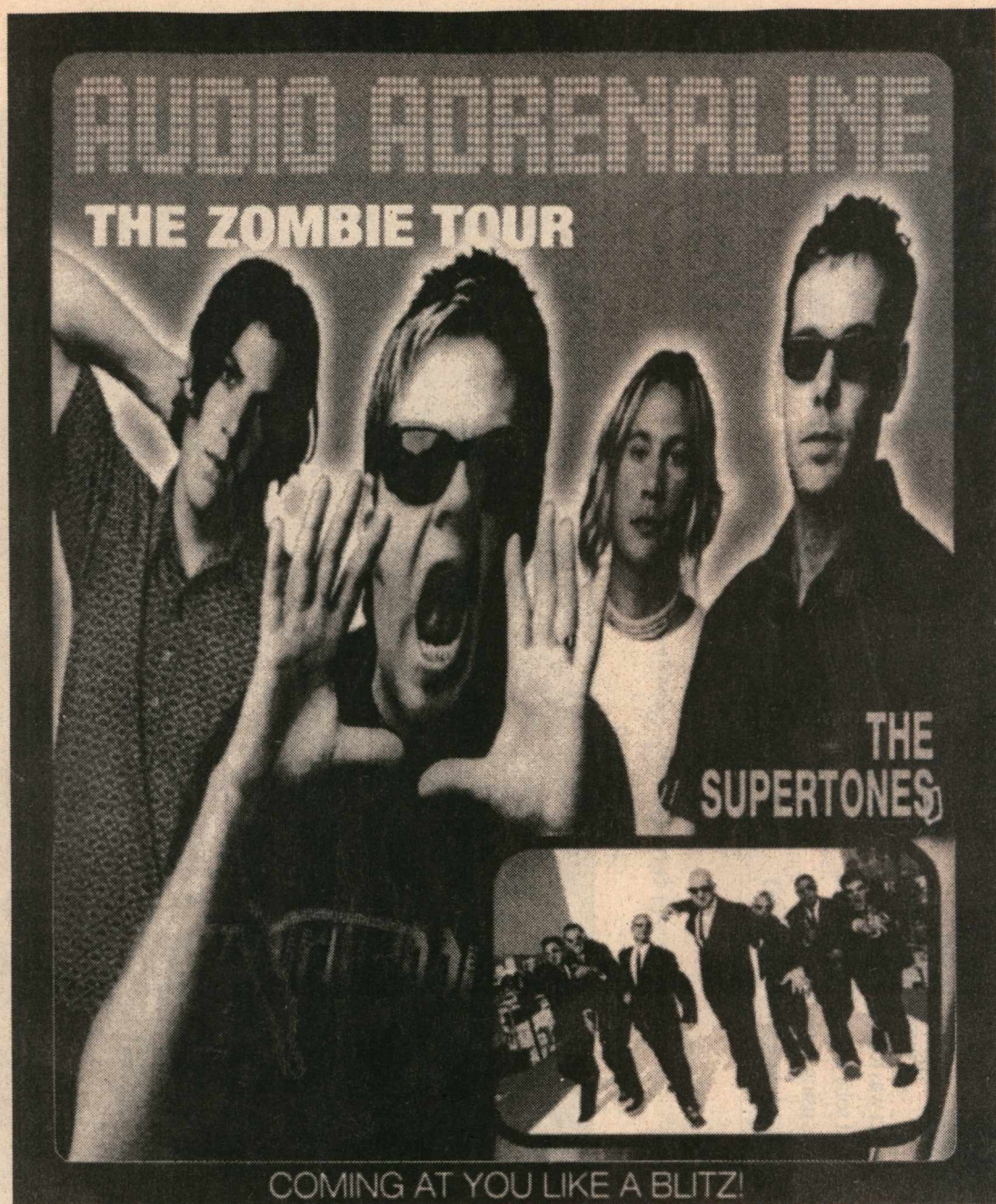
Poorly Drawn Senate. Not a bunch of popsicles.

Wow! That only took 30 seconds

8:10 Coffee Break

8:15 Moment of Reflection

Poorly Drawn coffee cup?



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