



## NEBRASKA MATH AND SCIENCE INITIATIVE

**T**HE NEBRASKA STATEWIDE SYSTEMIC INITIATIVE HAS undergone substantial changes since last year: a new name, new funds, a new director, four new principal investigators, new programs and new success with continuing programs.

The Statewide Systemic Initiative is now officially called the Nebraska Math and Science Initiative or NMSI for short. It remains a project addressing reform in K-12 mathematics and science education in Nebraska. It is a project of the Nebraska Mathematics and Science Coalition, and is funded through a cooperative agreement with the National Science Foundation. Although NMSI has its offices off campus (at 11th and P Streets in Lincoln) UNL remains its fiscal agent.

NMSI was successful with a supplementary proposal to NSF. In October an additional \$5.3 million was received and the time for the Initiative was extended one year. This means by the end of September, 1997, NMSI will have spent ten million dollars of federal funds and a great deal of matching funds on its programs. With the new funding, four new Co-PIs were added: Betsy Kean, UNL professor of science education; Douglas Christensen, deputy commissioner of the Nebraska Department of Education; Lois Veath, professor of physics and astronomy at Chadron State College; and Sandy Scofield, Gov. Nelson's budget director. Profs. Jim Lewis and Mel Thornton continue as Co-PIs of the expanded Initiative.

Alumna Karen Ward, who was the Initiative director has returned to teaching as the mathematics department chair at Lincoln Southeast High School. At that time she was named as the director of the Nebraska Mathematics and Science Coalition and continues to help guide the NMSI's efforts. In October Co-PI Sandy Scofield resigned her position in the Governor's office and became the full-time director of NMSI. Sandy had teaching experience at Omaha's Westside High School and as a state senator from Chadron, successfully introduced the legislative bill which has been funding the JUMP (JUNior Mathematics Prognosis) testing program.

The new funding will allow NMSI to work with several new programs. Seven regional math and science coalitions are being formed. These locally-based groups will support math and science education in their areas. They will support cooperation between community-based educational activities and school classroom opportunities. The Nebraska Curriculum Frameworks now being

developed by the Department of Education will be supported and disseminated through the regional coalitions. Many forms of informal science education will also be supported through the regionals. And the new funds will provide a bit more support for the statewide use of the Internet in mathematics and science classrooms.

*See NMSI, p. 9*

## GRADUATE TEACHING AWARDS

**T**HE DEPARTMENT IS PLEASED TO ANNOUNCE THAT IN THE FALL of 1993 two Outstanding Graduate Teaching Awards were given. The two recipients this year were Nancy Campbell and Cheryl Olsen. Each received \$500 fellowships for her hard work.



*Outstanding Graduate Teaching Awards to Nancy Campbell and Cheryl Olsen*

Later, in the Spring of 1994, Cheryl received additional recognition for her teaching when she won the Alumni Association's 1994 GTA Award. This is a very prestigious award which is given to only one GTA across campus each year. She also received a \$500 fellowship for winning this award.

Not surprisingly, Cheryl receives remarkably good evaluations from her students. In addition, she has played a major role



in the introduction of graphing calculators into Math 103, has attended a technology in education conference, and has served as a course convenor. Cheryl was one of three GTAS who organized, wrote and conducted a two day workshop on the new graphing calculators.

Nancy has also consistently received superb evaluations from her students in Stat 180. Her students praise both the quality of her instruction and her willingness to help students outside of class. In the two previous years of the award Nancy has been recognized in the Honorable Mention category.

Receiving Honorable Mention this year for the department's Outstanding Graduate Teaching Award are: Kurt Herzinger, Sandeep Holay, Kristi Pfabe and Tony Verbsky.

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## UNL MATH DAY 1993

ON THURSDAY, NOVEMBER 11, THE DEPARTMENT OF Mathematics and Statistics at UNL hosted 979 students from 84 Nebraska high schools at its 4th annual UNL Math Day. Our goals are to promote mathematics and the mathematical sciences as exciting majors and professions, to promote UNL as a good university at which to pursue such a major, and to have fun.

Math Day focuses on three distinct competitions—one for individuals and two for teams—with the team competitions divided into classes A,B,C,D, according to the size of the school. The individual competition consists of a preliminary one hour multiple choice exam of 25 questions, called PROBE I; and for the top 50 scores, a final one hour essay exam of 8 questions called PROBE II. The top ten competitors, based on the combined scores of the two exams, are awarded 4-year scholarships to UNL, totaling \$34,000. The PROBE team competition is judged by the sum of the top 5, 4, or 3 scores (depending on class) on the PROBE I exam from each school. Plaques are awarded to the 1st and 2nd place teams in each class. The Bowl team competition is a double elimination contest which consists of two 3-member teams in a fast paced, spectator charged, head-to-head duel where quickness wins. Trophies are awarded to the 1st and 2nd place Bowl teams in each of the classes.

Interim Dean Steven Hilliard of the College of Arts and Sciences began the day with an inspiring opening address to a packed Kimball auditorium. Then, after Lisa Schmidt, Director of the Office of High School and College Relations, gave a short advertisement for UNL, we presented our now famous bowl skit.

For the 4th year straight, Omaha North won the Class A Math Bowl. Once again they had to come from behind to do it. In fact with a finish like last year the winners of the Math Bowl in Classes A, B and D all had one loss going into the final rounds.

Congratulations to Beatrice (3rd on PROBE I, Class B), Chase County (4th, C), and Hemingford (13th, C) for a strong showing in their 1st UNL Math Day. The Most Improved award should probably go to Beaver City who went from 23rd in '91 to 10th in '92 and 3rd in '93 on PROBE I in Class D. For consistent strength

we must mention Lincoln East (Class A), Grand Island Central Catholic (Class B), and Pius (Class B) for a 1st or 2nd place finish on PROBE I the last three years. Also in this category are Omaha Central (Class A), Omaha North (Class A), and Nemaha Valley (Class D) for finishing in the top 3 each of the last 3 years.

See Math Day, p. 9



*Mystery Mathematicians! Can you recognize the two mathematicians in the picture? See the article on p. 9*

## ALUMNI IN THE NEWS

WE ARE DELIGHTED TO HEAR FROM KEVIN TEBEEST. KEVIN received his MS degree in applied math in 1986 from our department under the guidance of J. David Logan. Kevin went on and finished his doctoral degree in Mechanical Engineering here at UNL in 1992. During the 1992-1993 academic year he was an Assistant Professor of Engineering Physics at South Dakota State University. Recently he has accepted a tenure-track position as Assistant Professor at the GMI Engineering & Management Institute in Flint, Michigan. In addition to his teaching and research duties, he is helping GMI to develop a degree in applied math.

Previous MS student Daniel Kaiser took a position as Assistant Professor of Computer Science & Math at Doane College. Dan is currently working on his doctorate in Computer Science here at UNL. He spent a year in Eindhoven in the Netherlands doing research for his dissertation. Dan recently presented a paper titled, "Power Over the Pyramid" at a regional meeting of the Mathematical Association for Computing Machinery and the Mathematical Association of America. Previous UNL masters degree student Peggy Hart is a part-time instructor at Doane College.

Kudos go out to David Cooke for winning a teaching award at Hastings College. David graduated with distinction from UNL with a bachelor's degree in Math and Physics. He went on and received his PhD in math from the University of Minnesota in



1989. He then became an Assistant Professor of Math at Hastings College. David was awarded the 1993 Burlington Northern Faculty Achievement Award. David received \$2,500 for winning this teaching award.

Jerry Diaz also won a teaching award last year. Each year the Mathematical Association of America recognizes outstanding teachers by instituting Awards for Distinguished College or University Teaching. The Rocky Mountain Section of the MAA selected Jerry as the 1993 recipient of this award. This is the same award that Mel Thornton (see last year's newsletter) won last year from our section of the MAA and Jim Lewis won this year (see this year's newsletter).

We are glad to hear from John Boyer, Jr. John graduated from UNL in 1969. After two years in the service John went to graduate school at Michigan State University. There he got a masters degree in Math in 1972 and a PhD in Statistics in 1976. From 1976-81 he taught in the Department of Statistics at Southern Methodist University. Since then he has taught in the Statistics Department at Kansas State University. A high school talk by Walter Mientka helped influence John to be a math major here at UNL. John's mother also had Mientka as a teacher at a NSF Summer Institute in the early 60's. John says that Jerry Johnson had a big influence on his choice to pursue graduate work.

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## GRADUATE STUDENTS' SEMINAR

**S**PRING SEMESTER OF 1994 MARKED THE ARRIVAL OF THE FIRST ever Graduate Student Seminar. Designed as a forum for all graduate students in mathematics and statistics to get together and enjoy each other's company and brand of mathematics, the Graduate Student Seminar has been met with overwhelming success.

A partial list of past speakers includes Robert Jajcay, Tim Huffman, Vesna Kilibarda, Bob Moyer, Aihua Li, Sandeep Holay, Regina Bade, Vipin Arora and Nuri Cimen. Topics have ranged from "Partially Ordered Sets Of Prime Ideals" and "Abstract O.D.E.s," to "Feynman-Fourier Transforms" and "Kernel Density and Empirical Bayes Estimations," to "Semigroup Diagrams". There was also a special two-week "Job-Hunting" session which focused on techniques and strategies in finding employment in today's job market.

Deconvening on Friday afternoons at 4:30, the Graduate Student Seminar reconvenes at a fine local establishment for a subsequent social hour, which is also well-attended. Faculty have been encouraged to frequent both phases of the GSS, also. Cookies are graciously provided by the department (to help stave off the hunger pangs of the proverbial starving graduate student).

The GSS affirms itself as a valuable asset to everyone's graduate career. It not only provides an opportunity for senior graduate students to present current research, but also allows junior graduate students to sample and become acquainted with different areas of mathematics and statistics. Speakers are already slated for the Fall

of '94. It appears the Graduate Student Seminar will become a long-lasting tradition here at UNL.

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## ERDÖS AWARD TO MIENTKA

**O**N APRIL 11, 1994 PROFESSOR PETER J. O'HALLORAN, University of Canberra, Australia presented the Paul Erdős Award for Enrichment of Mathematics Using the Stimulus of Mathematical Challenges to Walter Mientka on behalf of the World Federation of National Mathematics Competitions. This honor is in recognition of all that Walter has done to promote mathematics awareness throughout the United States and abroad.



Erdős Award Winner Walter Mientka

In 1976 Walter became the Director of the American Mathematics Competitions for the Mathematical Association of America. At that time the AMC was giving one exam, the AHSME (American High School Mathematics Exam) which was taken by about 200,000 students from 4,000 schools. Under Walter's leadership there has been an increase to about 300,000 students from about 9,000 schools taking the exam. The AMC also gives a second exam to junior high students. About 200,000 students each year take this exam. Walter is also involved with the American Mathematics Olympiad. Walter Mientka is the fourth mathematician and the first American mathematician to win this prestigious award.

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## PI MU EPSILON

**T**HE UNDERGRADUATE MATHEMATICS HONOR SOCIETY, PI MU Epsilon, had an active year. The year started with a pizza party to welcome new members, and to hold officer elections. In the fall, two members who had attended summer REU's (see "Undergraduates in the News" this newsletter), Scott Anin



and Eric Smith, gave presentations on their research experiences. In the spring, Karna Bryan—the retiring president, Kevin Keyes, and Scott McMaster spoke on their honors theses. The year ended with a very well attended picnic in Van Dorn Park, and the induction of 24 new members.

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## RECENT PHD GRADUATES

**T**HIS SUMMER A FINE CROP OF STUDENTS IN THE DEPARTMENT are expected to complete their theses and graduate with PhD.

Jae-Hak Lim will finish his doctoral degree in May. He defended his dissertation on Feb. 22. With his advisor, Dong Ho Park, and Professor Lu, Lim has submitted two joint papers, "Stochastic ordering of the number of repairs under several maintenance policies" and "Bayesian imperfect repair model" for publication. Additionally, with his advisor, Lim has published a paper, "Test for DMRL class using randomly censored data," in the *Journal of Nonparametric Statistics*, and submitted another paper, "Trend change in mean residual life". Jae-Hak Lim and his family are planning to return to Korea in June.



*New PhD's, Aihua Li, Sandeep Holay, Tim Huffman, Vesna Kilibarda*

Nuri Cimen, working under the supervision of Professor Roger Wiegand, expects to receive his doctorate in August, 1994. His dissertation completes the classification of one-dimensional local rings of finite representation type. This important class of rings arises in the representation theory of groups, in algebraic number theory, and in algebraic geometry. In the classical case of rings essentially of finite type over the integers a 1966 theorem of Drozd and Roĭter, refined in 1978 by Green and Reiner, gives two easily checked criteria (called the Drozd-Roĭter conditions) for finite representation type. When the ground field is not algebraically closed, the classification is harder. Roger Wiegand of our department showed in 1987 that the Drozd-Roĭter conditions are always necessary for finite representation type and are sufficient

except when the characteristic of the field is 2 or 3; and in 1991 he gave an argument that handled fields of characteristic 3. This left the case of characteristic 2, which is often a serious stumbling block in representation theory.

In his thesis Cimen uses techniques from commutative algebra to reduce the problem in characteristic 2 to a family of explicit test cases. He then treats these cases by means of intricate matrix operations. During the process, the original matrices appear to grow hopelessly complicated, but eventually they begin to split up into blocks of smaller and smaller size. In the end, after many pages of subtle tricks and grueling calculations, the matrices break up into blocks, each of which has at most four rows.

After receiving his doctorate, Cimen will return to Turkey along with his wife Özden and their daughter Deniz.

Tim Huffman is also hoping to finish his doctoral degree in August. He is working under the supervision of Dave Skoug. Tim's dissertation concerns Fourier-Feynman transforms and convolutions in Yeh-Wiener space. He recently had a research paper (co-authored with Chull Park and Dave Skoug) accepted for publication in the *Proceedings of the American Mathematical Society*. Tim did his undergraduate work at Concordia College in Seward, Nebraska.

Sandeep Holay, working under the direction of Brian Harbourne, will submit his doctoral dissertation this summer. The dissertation studies projective embeddings of certain rational surfaces. Given a subvariety of projective space, much useful information can be gained from studying the resolution of the homogeneous ideal that defines the subvariety, and this raises the question of how in fact to effect a resolution. Holay has shown how this can be done for certain embeddings of blow-ups of the projective plane at the points of a complete intersection of two plane curves of the same degree, and he has partial results in more general circumstances. His results also suggest a number of avenues for extending this work in the future.

Aihua Li, a graduate student from Beijing, China, who is now a permanent resident of the U.S., expects to receive a PhD in August, 1994. She is writing her dissertation under the supervision of Professor Sylvia Wiegand on prime filtrations and prime spectra in Noetherian rings. Aihua was one of ten graduate students nationwide selected to participate in the Association for Women in Mathematics workshop in Cincinnati last January. She had prepared a beautiful poster for the poster session with many intricate pictures of prime spectra and it aroused great interest from the other participants and the spectators at the workshop. Aihua also gave a ten minute talk on prime filtrations at the Cincinnati meeting and went through the employment register.

Vipin Arora is hoping to finish his doctoral degree at the end of the Fall Semester, 1994. The title of his dissertation is "Empirical Bayes estimation in finite population sampling". Vipin has already submitted a joint paper with his advisor, P. Lahiri, and K. Mukherjee to the *Journal of American Statistical Association* entitled, "Empirical Bayes estimation of finite population means from stratified samples in presence of auxiliary information". Vipin is just starting the long process of looking for a job.



Vesna Kilibarda will finish her doctoral degree in August. She is working under the supervision of Professor John Meakin. Vesna's dissertation concerns the algebra of semigroup diagrams—a geometric technique for studying semigroups presented by generators and relations. Her work uses many ideas from geometry, topology and combinatorial group theory, in addition to semigroup theory. Vesna has accepted a position at the University of Alaska

in Juneau. Last January she gave a talk about her results at the annual meeting of the American Mathematical Society in Cincinnati and she also presented her results at the regional meeting of the Mathematical Association of America at Nebraska Wesleyan University in April.

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*University Of Nebraska Outstanding Teaching Award for Mel Thornton*

## THORNTON HONORED, PROMOTED

**W**E ARE PROUD TO ANNOUNCE THAT MEL THORNTON HAS won another teaching award. Mel is one of two recipients of the 1993-94 University of Nebraska Outstanding Teaching and Creativity Award (OTICA). The OTICA Award is intended to be the highest award given in the NU system to honor teaching. It gives recognition to those who have developed meritorious and sustained records of excellence in teaching and creativity related to teaching.

We are also very happy to report that Mel has been promoted to Full Professor. Mel received his doctorate from the University of Illinois in 1965. From 1969-1969 he taught at the University of Wisconsin. Since that time he has been here at UNL. Recently Mel has been a co-Principal Investigator in six grants that total over \$12,000,000. The largest of these is the NSF funded Statewide Systemic Initiative that you have been reading about for the last few years in this Newsletter (see this year's article in this Newsletter). Thornton was one of three PI's for the Nebraska Mathematics Scholars. Two of the four years of this program he was the project director.

Last year Mel received an Award for Distinguished University Teaching of Mathematics from the Mathematical Association of America for the Nebraska-Southeastern South Dakota section of the MAA. In 1987 Mel received an AMOCO University wide

Distinguished Teaching Award. In 1990 he received a UNL Parents Association and Teaching Council Recognition Award for Contributions to Students and in 1991 he received a Heads Together Award for enabling an environment at UNL for students with disabilities. We are indeed very fortunate to have a high quality person like Mel Thornton here at UNL.

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## MORE TEACHING AWARDS

**W**E ARE VERY HAPPY TO REPORT THAT JOHN ORR HAS WON a 1994 University of Nebraska Distinguished Teaching Award. We now have thirteen members of our department who have won University of Nebraska teaching awards. John received his B. Sc. degree from Imperial College in London in 1985. One year later he received his Certificate of Advanced Study from the University of Cambridge and in 1989 he earned his PhD degree from King's College in London. He came to our department two years later after having post-doctoral positions at the University of Lancaster and the University of Waterloo. We were immediately impressed with his teaching abilities. He is one of only two Assistant Professors in our department to win a University of Nebraska teaching award. Students get very excited when they tell you how good of a teacher he is. They are very impressed with the time he is willing to spend with them outside of class. John's area of research is operator theory, and not only is John a top-notch teacher, he is also a top-notch researcher.



*Distinguished Teaching awardee John Orr*



We would also like to congratulate eight Math-Stat faculty members who were recognized by the UNL Parents Association and the UNL Teaching Council on February 18, 1994. Each awardee was nominated by one or more students (in cooperation with the student's parents) as having made a significant contribution to their lives while at UNL. Those recognized in our department

this year are: Timothy Deis, Kurt Herzinger, Steve Johnson, James Leitzel, J. David Logan, Thomas Marley, Cheryl Olsen, and David Skoug. David Skoug is one of only four university professors who has been recognized all six years of the program. Next year David Skoug will be on leave and we are taking bets on whether he will win the award anyway!

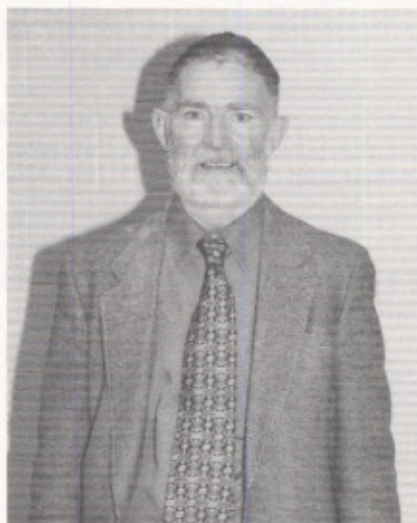
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## MERITORIOUS SERVICE AWARD FOR SKOUG

AT THE JANUARY, 1994 NATIONAL AMS-MAA MEETING IN Cincinnati, Ohio, Dave Skoug received a "Certificate of Meritorious Service" from the Mathematical Association of America. Each year approximately six such awards are given for distinguished service to the MAA at the local or national level.

Since 1966 Skoug has been very active in the Nebraska-Southeastern South Dakota section of the MAA. He served a term as Section Chair and was on the Board of Directors from 1984-1987. He has been on the Executive Committee of the Section since 1984 and has been Co-Editor or Editor of the Section Newsletter since 1985.

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Meritorious Service Awardee David Skoug

## UNDERGRADUATE WOMEN IN SCIENCE AWARD

SIX MATHEMATICS AND STATISTICS MAJORS WERE HONORED AT the Graduate Women in Science award dinner for outstanding undergraduate women in mathematics and science disciplines, held on February 15, 1994, at Valentino's near East Campus. The department was well-represented at the dinner with Professors Beck, Hines, Lewis, Sylvia Wiegand, and Woodward in

attendance as well as five of the honorees. The following students were presented with citations in recognition of outstanding achievement:

Mary Kay Drake of McCook, Nebraska, who is interested in chemistry and medicine. Currently a junior with a 3.8 GPA, Drake is president of the UNL running club. Tara Free of Lincoln, a senior with a 3.97 GPA, plans to go to grad school eventually, but may take some time off first. She is interested in pure mathematics and will graduate in May. Ann Nelson of Omaha is interested in actuarial science, statistics and German. She spent a semester in Germany and will graduate this May; her grade point average is 3.9. Christina Nielsen, who is interested in actuarial science, is currently a junior with a 3.7 GPA. She is from Corning, Iowa. A junior with a 4.0 GPA, Joyce Yen of Hastings is interested in operations research. Yen was offered financial support to attend a Research Experience for Undergraduates (REU) at Florida State this summer. She assisted our department by serving on the Academic Review Team last December. Lucinda Zmarzly of Lincoln, who transferred here from Northwestern University two years ago, will also be supported at the Research Experience for Undergraduates (REU) at Florida State this summer. She has a 4.0 GPA as a junior and is interested in pure mathematics.

While presenting the citations to the young women, Professor Jim Lewis remarked that this year women are dominating several of the hardest undergraduate courses offered. The proportion of female students is much higher than it used to be in our courses.

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Outstanding Undergraduate Women in Science: (back) Joyce Yen, Ann Nelson, (front) Christina Nielsen, Mary Drake and Tara Free



## LEWIS WINS MAA AWARD

PROF. JIM LEWIS HAS BEEN RECOGNIZED FOR HIS TEACHING AND leadership of the profession. Three years ago the Mathematical Association of America (MAA) started a program to recognize outstanding teachers by instituting Awards for Distinguished College or University Teaching. The MAA selects three awards each year. Each section of the MAA nominates one of its members for the national award. The Nebraska-Southeastern South Dakota section has chosen Jim Lewis as the recipient of the section award for 1993. We congratulate Jim on his sectional Award and nomination for the national award. We also note that last year, Mel Thornton was the sectional Award winner and nominee.

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The Putnam team, and faculty advisors: David Jaffe, Scott Shald, Scott Anin, Eric Smith, and Tom Marley

## PUTNAM EXAM

THE RESULTS OF THE 54TH ANNUAL WILLIAM LOWELL PUTNAM Mathematical competition held last December are in. A total of 2,356 students from 408 colleges and universities in Canada and the United States participated, earning a median score of 9.5 points out of a possible 120. The top score was an 88, which was earned by a student from Duke University. Only 25 students had a score of 50 or above.

We are proud to say that this year our team ranked 28th out of the 291 institutions which fielded full teams (i.e., which had at least three students take the exam). This was our highest team rank ever, as far as we know. We were helped by the fact that the three students who were designated as our team members (which must be done prior to the exam) turned out to be our top three scorers. Eric Smith had the best score from UNL and will receive a prize of

\$75. Scott Annin and Scott Shald each had the next best score and will split the \$50 second prize. The top three scores from UNL were 28, 20, and 20. Here is a sample problem from the exam:

Let  $(x_n)_{n \geq 0}$  be a sequence of nonzero real numbers such that

$$x_n^2 - x_{n-1}x_{n+1} = 1, \text{ for } n = 1, 2, 3, \dots$$

Prove that there exists a real number  $a$  such that  $x_{n+1} = ax_n - x_{n-1}$  for all  $n \geq 1$ .

See Page 12 for a solution!

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## GRADUATE STUDENT AWARDS

THIS YEAR'S OUTSTANDING FIRST-YEAR STUDENT AWARD WENT to Quingling Zhang. She is working on a graduate degree in Statistics. Jaeyong Lee won this year's award for the Best Qualifying Examination. These two awards carry \$500 and \$700 scholarship stipends respectively.

Five students were awarded \$500 scholarships from the Emeritus Faculty Fellowship Fund. The scholars are: Paul Dawkins, Kurt Herzinger, Jaeyong Lee, Susan Szaniszlo and Quingling Zhang. The Emeritus Faculty Fellowships are made possible by the generous donations of the faculty who have contributed to this program in recognition of former faculty. Scholarship is the major factor in choosing the awardees.

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Emeritus Faculty Scholars: Susan Szaniszlo, Quingling Zhang, Paul Dawkins, Jaeyong Lee, and Kurt Herzinger

## DEPARTMENT GETS A HIGH GRADE

IN DECEMBER OF 1993, THE DEPARTMENT HAD WHAT IS KNOWN at the university as an Academic Program Review (APR). As part of the process, Professor Brian Harbourne led the department through a review of what we have achieved over the



past 6 years as well as an assessment of our goals and priorities for the next 5–6 years. The result, once we included all faculty vitas and countless charts and other appendices was a 500 page document.

A Review Team spent two days on campus interviewing faculty and students in the department and visiting with UNL administrators. The external members of the team were 'Spud' Bradley, Associate Executive Director of the American Mathematical Society; Jack Hale, Georgia Tech; Judy Roitman, University of Kansas; and Ronald Randles, University of Florida. Internal members included Stuart Margolis from Computer Science and Engineering; David Brooks, Curriculum and Instruction; Kurt Herzinger, graduate student; and Joyce Yen, undergraduate student.

Following their visit the Review Team issued a report that might be interpreted as giving the department a very high grade. Here are a few sample comments from their report:

- The Review Team was favorably impressed by the excellent and balanced contributions the Department is making to the university and its students.
- The University of Nebraska can be justifiably proud that the Department is meeting new challenges while continuing to nurture its research program. There is evidence that the total research productivity of the faculty is at an all-time high.
- The department has a high-quality, student-friendly graduate program. At the same time the faculty is doing an outstanding job in undergraduate education, including the modification of its approach to teaching based on a forward looking vision of the future.
- The total amount of outside funding obtained by this department is unusually high for a mathematics department of this size.
- There is a "fantastically positive" atmosphere for women students in the department.

There was a "down-side" to the report and as readers might guess, it had to do with money. Perhaps the most telling statement was as follows:

"We also found a department with severe resource problems whose ability to sustain current activity, let alone respond to new challenges, is threatened by those resource problems. We urge the university to respond immediately to the most pressing needs discussed in this report."

All of us in the department were quite pleased with the APR report. We were especially pleased that there was clear respect for the scholarly achievements of our faculty and by the fact that our students were so complementary. We are hoping that the university responds to the need for new resources.

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## INSTRUCTIONAL TECHNOLOGY

USE OF INSTRUCTIONAL TECHNOLOGY MADE SOME BIG advances in mathematics classes at UNL during the past year. Many of our classes are taking advantage of ad-

vances in calculators, computers, and software to make mathematics easier to understand and interpret, more fun to learn, and more powerful in applications. Technology is even changing the way we teach some classes and directing our curriculum into the future.

The largest use of instructional technology, at least in numbers of students, is with graphing calculators in pre-calculus and calculus. National trends in pre-calculus and calculus education, increasing use of graphing calculators in high school, and the affordability and utility of the calculators prompted the change to calculators. After a pilot project led by graduate students Sandeep Holay, Cheryl Olsen, and Stephanie Fitchett during the Fall Semester of 1992, the Math 103 College Algebra and Trigonometry course went to all graphing calculator-based sections in Spring Semester 1993. A change to a textbook which emphasizes the use of graphing calculators in the explanations and the exercises accompanied the use of graphing calculators. We expect that students will gain increased abilities to visualize the concepts of functions and trigonometry. Students will also have increased higher-thinking, reasoning, and explanatory skills. More than 200 students took this course in Fall Semester, 1993.

After a successful semester with graphing calculators in the precalculus course, the Department decided to pilot the use of graphing calculators in Math 106, Calculus I. We experimented with calculators in calculus in some of the Summer Session classes of 1993 to get a feeling for textbooks and ideas. The Department had a two-day orientation workshop on using and teaching with the calculators in mid-August, just before the start of the semester. Again, our calculator-experienced graduate students Sandeep, Cheryl and Stephanie led the workshop with faculty participation. The workshop was well-attended, with faculty, new and returning graduate students, local high school teachers and faculty from UN-O all attending.

Two large lecture sections of Calculus I with about 200 students total, taught by Profs. David Pitts, and Prof. Rao Chivukula began using the Texas Instruments TI-85 graphing calculator in the Fall Semester. The sections used the same textbook that we have used for several years, along with a calculator-specific supplement. The pilot project worked very well, and Profs. Pitts and Chivukula are enthusiastic about using a graphing calculator to teach calculus. This spring continued the pilot with Prof. Tom Marley and Prof. David Pitts teaching Math 106 again, and Prof. Chivukula teaching Math 107, Calculus II with the graphing calculator. Student reaction to the project has generally been favorable. Next year, all sections of calculus will be use the graphing calculator. We are also changing textbooks, and an important criterion for textbook selection will be the incorporation of calculator-based exercises and explanations.

Starting this Fall Semester, 1994, all students will use a graphing calculator for pre-calculus and calculus. We recommend using the Texas Instruments TI-85 graphing calculators in our entry-level courses in Mathematics. The TI-85 graphing calculator is an inexpensive, portable, hand-held computer. The TI-85 can do many operations which a few years ago were only possible on dedicated graphical mainframe computer systems. Many students



will already have such a calculator from high school, since most of the high-schools are also incorporating this technology into their curriculum. UNL is working closely with high schools to ensure that we have common goals and approaches, in order to make it easier for students to come to UNL well prepared. The instructors have a TI-85 calculator with a projection panel that works with an overhead projector right in the classroom to give "keystroke-by-keystroke" instruction. This means we can take the high-technology instruction right to the classroom anywhere on campus.

*See Technology, p. 16*

## MYSTERY MATHEMATICIANS

SOME OF YOU MAY HAVE RECOGNIZED THAT THE ELDERLY MAN in the picture on page 2 was the famous mathematician George Polya. The little girl in the picture is well-known to us here in the UNL mathematics-statistics department. She is Krista Taylor. Krista received her bachelor of science degree in mathematics from the University of Oregon in 1993. She started doing her graduate work here at UNL during the Fall Semester of 1993. Krista's mother, Janet Bausch, received her masters degree in mathematics from Stanford University by attending four successive summer sessions at Stanford University. During this time Janet had three problem-solving classes from the famous George Polya. She really enjoyed having Polya as a teacher. The picture was taken at George Polya's house during the summer of 1974. Polya loved playing with the children that came to the summer Stanford math picnics.

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## HONORARY DEGREE

DR. MARY GRAY, MATHEMATICIAN, STATISTICIAN, AND LAWYER, was awarded an honorary degree by the University of Nebraska-Lincoln at Spring Commencement, May 8, 1993. As founder and first president of the Association for Women in Mathematics, chair of Committee W (the committee to promote women's issues) of AAUP, Vice-president of the American Mathematical Society, president of the Women's Equity Action League, and treasurer of Amnesty International, Dr. Gray has served the public in a great variety of ways. She has also been chair of her department and of the Faculty Senate at American University in Washington D.C. Dr. Gray's mathematical research has been in algebra; she is the author of "A Radical Approach to Algebra" and a calculus textbook.

During her visit to Lincoln, a reception was held in her honor for the Department of Mathematics and Statistics and hosted by Dr. Joan Leitzel.

Dr. Gray grew up in Hastings, Nebraska, and graduated from Hastings College. She has many friends in Lincoln and in the Department of Mathematics and Statistics.



*Honorary degree recipient, Dr. Mary Gray*

*NMSI, from p. 1*

The K-12 Teacher and Curriculum Enhancement program of NMSI continues to work with its eleven partners. Last summer, three distinct five week institutes were held for the K-3, 4-6, and secondary Lead Teachers. This summer the K-3 Lead Teachers, having finished their second summer institute, will be leading two-week workshops for other K-3 teachers across the state. In June, three more summer institutes will begin: for 4-6, secondary and middle level Lead Teachers.

The distance learning projects of NMSI have also had a very busy year. Practical Pre-College Mathematics (PPCM), designed by alumnus Matt Larson and taught by alumnus Dan Hohensee, is being broadcast three times a week over satellite. This high school senior level course is aimed at students who are college-intending but may not be bound for the traditional college calculus sequence. PPCM is being used by 29 Nebraska high schools and serves about 300 students. Arrangements have just been made to have PPCM be broadcast nationally as part of the Satellite Educational Resources Consortium (SERC) offerings. SERC will be providing some financial support so that again PPCM will be able to be offered free to any Nebraska high school. PPCM has been nominated for the 1994 Central Educational Network education award in the distance education category.

Math Vantage is another project of NMSI which is going national. The Math Vantage materials are video tapes and a printed curriculum designed for the middle level mathematics student in the year before algebra one. De Tonack, a Lincoln middle school teacher, is directing the Math Vantage project. By August 1994, eleven of the planned twenty-two video tapes will be available. The first Math Vantage unit on Patterns is commercially available through Sunburst, Inc. and has been receiving rave reviews. Several other SSI states have been considering its use. Math Vantage



has also been nominated for a 1994 Central Educational Network education award. This nomination is in the Best Secondary Program in a Series category.

Last fall, Math 801, Geometry for Elementary Teachers, was taught using satellite television by Mel Thornton. This semester-long course was the same one now being required for elementary certification by UNL. There were over 140 in-service teachers statewide who took the course at one of sixteen sites from Auburn to Scottsbluff and Trenton. The course required a special project of all the teachers: either work with the computer language LOGO, use of the Internet, or the design and piloting of a special geometry unit in their classrooms. Many of these teachers report they are now teaching some geometry that they used to skip in the book.

In August, Prof. Jim Leitzel, with a grant from the Nebraska Coordinating Commission for Post-Secondary Education and NMSI funds, directed the fourth annual Mathematics and Science Education Conference. This conference showcased many of the NMSI projects and began the process of forming the regional coalitions. More recently, Leitzel and De Tonack have received another grant from the Coordinating Commission to hold a conference on Assessment in Mathematics.

In January, NMSI took a "mid-term" exam. The National Science Foundation had all of the original SSI states, who are now half-way through the five-year grant period, make mid-point presentation to a review panel. Jim Lewis and Mel Thornton were part of the team that made Nebraska's presentation. NSF was quite pleased with NMSI's progress and promise for the future.

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Departmental Postdoc, Desiree Beck

## POSTDOC POSITION

**D**ESIREE BECK JOINED THE DEPARTMENT THIS YEAR TO HOLD a post-doctoral position which carries a 2/1 teaching load. In the Fall Semester, Desiree taught Contemporary Mathematics (203) and Combinatorics (450/850), and in the spring she taught Contemporary Mathematics.

Desiree received her PhD from the University of California,

San Diego in June, 1993 under the direction of Jeffrey Remmel. Her area of specialization is algebraic combinatorics, in particular symmetric functions and representation theory.

This summer Desiree leaves the department to take up a permanent position with the National Security Agency, in Washington, D.C.

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## NEW MATH FACULTY

**W**ENDY HINES JOINED OUR DEPARTMENT DURING THE FALL Semester of 1993. She received her bachelor's degree in mathematics in 1986 from the University of Illinois at Urbana-Champaign. She received her masters degree in 1988 from Brown University and her doctorate in 1993 from Georgia Institute of Technology. She specializes in dynamical systems with applications to delay, and partial differential equations. Her specialties will greatly enrich our research and teaching activities in applied mathematics.



New Faculty Member Wendy Hines

Jamie Radcliffe is a tenure track Assistant Professor in the area of combinatorics, with particular interest in extremal set theory and probabilistic methods. His PhD is from the University of Cambridge in 1989. He has been at Carnegie Mellon, University of Pennsylvania and most recently the Georgia Institute of Technology. This year he taught a topics course in combinatorics and is now teaching a course in graph theory.

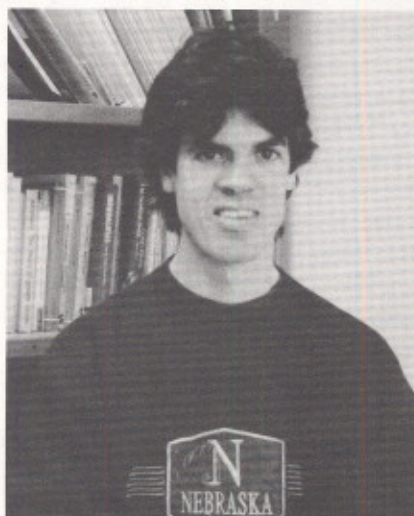
Chris Rogers also joined the Division of Statistics as a new tenure track Assistant Professor during the Fall Semester of 1993. Chris did his undergraduate work at the University of Oregon. He received his masters degree in Math from Indiana University in 1986. Chris received his masters degree in Statistics in 1990 and expects to get his doctorate in Statistics from Rutgers University in



1994. His dissertation is concerned with data analysis, statistical computing, hypothesis testing and non-parametrics. Chris likes to describe himself as a mathematician who likes mathematical models.

The department is fortunate that Prof. Marc Sapis, who has held a visiting position for the last two years, accepted a tenure-track position as Associate Professor this year. Marc came to the department in 1991 from Ural State University in Russia, by way of California State University at Chico.

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*New Faculty Member Jamie Radcliffe*

## NEWS FROM THE DIVISION OF STATISTICS

**P**ROFESSOR PARTHA LAHIRI HAS STARTED THE JOB AS THE Director of the Division of Statistics from Fall of 1993. Professor Dong-Ho Park served as the interim Director for a short time until August, 1993 when he took a leave from UNL to visit Hallym University of South Korea.

We are pleased to announce that Professor Chris Rogers joined the division last Fall. Professor Rogers works on exploratory data analysis. Professor Kanchan Mukherjee, a Michigan State University PhD, visited the Division in the Fall of 1993. Professor Mukherjee joined the National University of Singapore in January, 1994 as a full time faculty member.

We are fortunate that a number of outstanding statisticians have agreed to visit the Division for this Spring Semester and give colloquium talks. The list includes Professor Jongwoo Jeon (Seoul National University), Professor K.B. Kulasekera (Clemson University), Professor Noel Cressie (Iowa State University), Professor Malay Ghosh (University of Florida) and Professor Peter Bickel (University of California at Berkeley). The department is supporting the visits of these scholars.

Under a students' seminar series organized by the division,

advanced graduate students are presenting their own work, or papers which have appeared recently in statistical journals. The list of students who are presenting includes Vipin Arora, Regina Bade, Nancy Campbell, Jae-Hak Lim, Kyung Nam and Jaeyong Lee.

We are pleased to announce that Jae-Hak Lim will receive his PhD degree in May, 1994. His dissertation title is "Stochastic comparisons of maintenance policies and Bayesian imperfect model" which he has written under the supervision of Professor Park. Jae-Hak has already submitted three papers from his dissertation. Jae-Hak plans to return Korea in June of this year.

Professor Jian-Jian Ren and Professor Kun-Liang Lu have been awarded Summer Research Fellowships by UNL in 1993 and 1994 respectively. Professor Ren received travel grants from NSF and NSA to attend the first North American New Research Conference and IMS travel fund to present a paper at the annual meeting of the IMS in August, 1993, held in San Francisco. Professor Lal Saxena attended the annual ASA meeting at San Francisco last August. Professor Saxena is still on the editorial board of the American Journal of Mathematical and Management Sciences. Professor Lahiri presented papers at the ASA Winter Conference in Fort Lauderdale in January, 1993, and the ASA annual meeting in San Francisco in August, 1993. He also attended NIH Conference in Washington DC in January, 1993, and gave colloquium talks at the U.S. Bureau of Bureau Statistics and Oregon State University. Professor Park gave colloquium talks at Northern Illinois and Wright State University.



*New Faculty Member Chris Rogers*

Professor Lahiri is currently working on a three year NSF funded project. Vipin Arora, a PhD student, was supported last Fall by Professor Lahiri's NSF grant and a research contract with the U.S. Bureau of Labor Statistics. Professor Lahiri received \$5,000 last year as a supplement to his NSF grant to support the research of the undergraduate student Jeff Fitch. Jeff is working on a project on estimation of employment using data collected by



the U.S. Bureau of Labor Statistics.

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Putnam Exam, from p. 7

(Solution to the Putnam problem on Page 7.) For  $n \geq 1$ , define  $a_n$  by

$$a_n = \frac{x_{n+1} + x_{n-1}}{x_n}.$$

It suffices to show that  $a_n$  is independent of  $n$ . By induction on  $n$ , it suffices to show that  $a_n = a_{n+1}$  for all  $n$ , i.e. that

$$\frac{x_{n+1} + x_{n-1}}{x_n} = \frac{x_{n+2} + x_n}{x_{n+1}}.$$

Cross multiplying, one sees that this is equivalent to showing that

$$(x_{n+1} + x_{n-1})x_{n+1} = (x_{n+2} + x_n)x_n.$$

Otherwise said, we need

$$x_{n+1}^2 - x_n x_{n+2} = x_n^2 - x_{n-1} x_{n+1}.$$

This follows from the defining property for the  $x_n$ 's.

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Math Day, from p. 2

Congratulations to Beatrice, Bellevue East, McCook, and Wauneta-Plaisade for their 1st time appearance in the PROBE II top 10 list. Repeat performers this year were Steuard Jensen and Eric Hu. This is Eric's 4th year among the top 10 (1st in 92). It will probably be a long time before someone else matches his record. Four other students have placed twice in the top 10, but that's it. We know of one 7th grader who may be able to top Eric—time will tell. By the way, if Eric comes to UNL, his Math Day 4-year scholarships will total \$18,000. Once again Lincoln East and Omaha Central had the most students place among the top 10 on PROBE II. Over the years Lincoln East has run up a total of 35 students in the top 10, while Omaha Central has had 21, Omaha North 17, and Creighton Prep 15, all very impressive. The top 10 PROBE II scholarship winners were (1st to 10th): Igor Pavlosky (Lincoln Northeast), Igor Terentyev (Beatrice), Steuard Jensen (Lincoln Southeast), David Wietzke (Neb. Evangelical), Michelle Bylund (Omaha Westside), Brian Cintani (Lincoln East), Daniel McCarthy (Creighton Prep), Marc Wagner (Omaha Central), Kaylee Huebert (Omaha North), Eric Hu (Lincoln East). Terentyev and McCarthy are juniors, the rest are seniors.

Math Day is an expensive operation: scholarships, trophies, plaques, lunch (on us at the various dormitories), and travel assistance for those that have to stay overnight due to distance from Lincoln. The \$3.50 registration fee covers lunch at most. We were

very fortunate to get additional financial backing from the Colleges of Arts and Sciences, Business, and Engineering, and also from the Vice Chancellor for Student Affairs. But it takes much more than money. We are proud to say that everyone in the Department of Mathematics and Statistics at UNL put in a lot of time to help make Math Day a success. Special recognition should go to Professor Earl Kramer for once again creating a challenging, but doable, PROBE II and to Professors Al Zechman and Paul Krajewicz for their 4th annual version of the PROBE I exam. An equally enormous job is putting together the 200 and some Math Bowl questions. Professor John Orr took on this task and did such an excellent job that we'll try to get him back for a repeat performance next year. Math Day co-chairs Professors Rao Chivukula and Gordon Woodward want to thank the over 100 people that helped to make Math Day '93 a success.

Here are a couple of problems from PROBE II you might want to try. (We will be happy to provide a complete PROBE II exam with answers, to any one who asks.)

1. Show that the product of the 99 numbers  $(k^3 - 1)/(k^3 + 1)$  for  $k = 2, 3, \dots, 100$  is greater than  $2/3$ . ( $k^3 = kkk$ )

2. The numbers 1, 2, 3, ..., 1993 are written on the blackboard. One can erase two of the numbers and replace them by their difference. This process continues until there is only one number left. Prove that this last number is not 0.

If you have any questions you want to suggest for Math Day 94, please send them to Professor Rao Chivukula. Of course Math Day volunteers are always welcomed.

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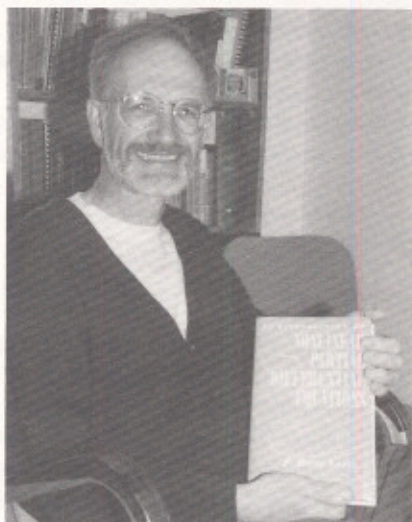
## FACULTY LEAVES

DAVID LOGAN, AN APPLIED MATHEMATICIAN, USED HIS Faculty Development Leave during the Spring Semester of this year as an intensive study period to develop contacts and some expertise in the area of hydrogeology. He has been working jointly with Professor Vitaly Zlotnik, a hydrogeologist in the Geology Department, and Professor Glenn Ledder of our own department, to study the dispersal of groundwater contaminants in aquifer systems. Groundwater problems are of tremendous interest not only in Nebraska, but nationally as well. Logan says that many of the mathematical techniques used to investigate groundwater phenomena are the same as in other areas of application, for example, heat transfer. He said the Faculty Development Leave program has afforded him the opportunity to retool and learn the language of the hydrologists; such interdisciplinary interaction would not be easy without the research time provided by the leave. He hopes to interest some PhD students in this area by offering a summer reading course in mathematical hydrogeology.

In March, David Logan's book, *Nonlinear Partial Differential Equations*, appeared. The book was published by Wiley-Interscience in the prestigious Pure and Applied Mathematics series, a series inaugurated in the early 1950's with the classic treatises of Courant and Hilbert. Logan's book is a graduate level



treatment of some of the nonlinear problems that occur in biology, chemical engineering, combustion, and fluid mechanics. This is Logan's third book. *Invariant Variational Principles* appeared in 1978, and *Applied Mathematics* appeared in 1988. The latter is used as a textbook for graduate courses at several universities across the country and has gone into its second printing. He said that the market for his new book is much thinner because of a narrower scope, but he hopes the book will be useful to pure and applied scientists, as well as mathematicians, as an introduction to nonlinear phenomena modeled by partial differential equations.



*David Logan with his New Book*

Prof. Brian Harbourn has also been on leave this year. He reports that he has been getting a lot done, including proving a result he had wanted to prove for years. While he has mostly concentrated on his work here in Nebraska, he has made one trip to Queen's University in Ontario, Canada, and plans at least one more trip.

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## UNDERGRADUATES IN THE NEWS

THREE STUDENTS COMPLETED UNDERGRADUATE THESES IN THE department this year, and in general, it has been a good year for undergraduate research.

Karna Bryan wrote an undergraduate thesis under the direction of Prof. John Orr. The thesis, titled "Cutting intervals in decreasing sets," studied a surprisingly hard geometric problem which arose in another field. A decreasing line in a plane is one which moves down and to the right, and an "interval" is the region between two decreasing lines. A third decreasing line "cuts" an interval if part of the interval lies below the line and part above. Understanding some questions about these simple ideas in two dimensions is hard, but was accomplished by Orr, and a colleague, Ken Davidson,

in Waterloo, Canada. There is a natural generalization to three (and higher) dimensions, which seems to be qualitatively harder to understand. Karna studied this in her thesis, and proved several results involving a very complicated geometric argument. Karna graduated in May with Highest Distinction, and will be pursuing graduate studies at Yale next year.

Kevin Keyes completed an REU and an honors thesis under the supervision of Professor Richard Rebarber. The project, entitled "Controllability of Damped Beam Equations", was funded by the National Science Foundation. Kevin studied steering problems for partial differential equation models for damped vibration of beams. In a steering problem the aim is to find a control which steers one state of the system to another. Kevin's project was to rewrite the steering problem as a moment problem. There are many classical results known about moment problems, and he and Rebarber applied some of these results to solve the steering problem. Kevin graduated in May with highest distinction. Next year Kevin will be starting graduate work in control theory at the University of North Carolina, Chapel Hill.



*Karna Bryan and Kevin Keyes*

Scott McMaster wrote an undergraduate thesis on "Invariant Manifolds and Nonlinear Boundary Value Problems" under the direction of Prof. Steve Dunbar. Solving nonlinear boundary value problems is an important task in differential equations and applied math. Scott's thesis presented an approximate method for solving a certain type of boundary value problem by using a notion from dynamical systems theory called an invariant manifold. The method used Mathematica on the computers in the Mathematics Computer Lab to perform formidable algebraic manipulations. Scott also used numerical differential equation solvers to produce computer-generated three-dimensional graphs revealing the likely shape of the invariant manifold, which was quite unusual. A portion of Scott's thesis will appear in a forthcoming issue of *Mathematica in Education* in the Students and Mathematica column.



Several of our students have been involved in the National Science Foundation's Research Experience for Undergraduates (REU) program. Scott Anin, Karna Bryan and Eric Smith attended summer research programs of several weeks' duration last summer, where they studied problems in mathematical research. Scott and Eric subsequently gave presentations at the Annual Meeting of the American Mathematical Society in Cincinnati on the work they did over the summer.

Writing about the time he spent doing research in finite group theory, Scott writes, "I worked round the clock on a problem raised by our program director at the beginning of the summer. I used a group theory programming language, CAYLEY, to search for possible theorems, and then I used a lot of 'hard thinking time' to try to prove these theorems." Scott went on to say that his feelings ranged, "from frustration to ecstasy... at certain points in the program." Eric pointed out that, for him, "the best part of the summer, though, was getting to know the other math students, and making eleven new friends."

Karna Bryan and Kevin Keyes were also supported by REU supplements to their thesis advisor's grants, and Ann Nelson also completed an REU project under the supervision of Professor Richard Rebarber, entitled "Analysis of Transfer Functions for Vibrating Systems". A transfer function is a complex function associated with a control system, and the properties of the transfer function determine many of the properties of the control system. Ann's project involved finding and analyzing transfer functions for complicated partial differential equation systems. Much of this work was done using the mathematical software, Mathematica.



REU students Lucinda Zmarzly and Joyce Yen

This summer two more of the department's undergraduates will be attending summer REU programs. Joyce Yen and Lucinda Zmarzly will both be spending several weeks at Florida State University. Joyce will be working on Optimization and Lucinda will be working on Complex Analysis. Both are excited about the chance

to learn first-hand about what mathematical research involves.

Later in the summer, Joyce will be attending a conference entitled "Women as Leaders" in Washington, DC, at the Washington Center, sponsored in part by Sears-Roebuck. This is a two-week workshop involving people from all over the country. Joyce will be the only UNL student to attend. Congratulations are also due to Joyce for recently winning a State Farm Exceptional Student Fellowship, an award which is offered nationwide to only 50 college juniors. And, continuing in her recognition, Joyce has also been honored by the Vice Chancellor for Student affairs as one of three Outstanding Student Leaders on campus. In the math department we are particularly grateful to Joyce for serving as student member of the APR team (see article in this issue). Next year Joyce returns to UNL for her senior year, when she will be writing a senior thesis with Profs. Steve Cohn and Jennifer Meyer (CBA).

Congratulations are also due to Ed Wiley, a math major from York, Nebraska, who was voted this year's homecoming king.

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## AAHE PROJECT

THE DEPARTMENT OF MATHEMATICS AND STATISTICS IS participating in a project sponsored by the American Association of Higher Education (AAHE) to evaluate and improve college teaching. The project title is "From Idea to Prototype: The Peer Review of Teaching." Steve Dunbar and Mel Thornton will be the project leaders for the the Department of Mathematics and Statistics. The goal of the project is to get faculty to work together for the evaluation and improvement of teaching.

The project developers selected the University of Nebraska-Lincoln as one of twelve representative campuses regarded as leaders of the new movement to improve undergraduate education. The Vice-Chancellor for Academic Affairs at UN-L then asked the Department of Mathematics and Statistics to be one of the three departments from UN-L to participate in the project. The Vice-Chancellor asked Mathematics and Statistics because of the work the Department has done in understanding the context and climate for effective teaching, and the Department's willingness to work toward the interaction of teaching and research. The other two departments at UN-L are the Department of English and the School of Music.

Project activities will be undertaken by teams from similar pilot departments. The faculty team of Dunbar and Thornton will spend a week in June at a special institute at Stanford University, along with similar teams from math departments from some of the other universities in the project. The goal of the institute is to suggest strategies and pave the way for pilot projects back on campus. In the Fall of 1995, faculty teams will implement their plans for peer review of teaching. This phase will involve a larger circle of departmental colleagues. By Spring of 1995, faculty teams will come back together to share what they've done, trade good ideas, and examine emerging lessons. The goal is to have effective channels for faculty to contribute to the development of



each other's teaching in the same way they do when it comes to research. The result will be better teaching of mathematics and statistics at the University of Nebraska-Lincoln.

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## NATIONAL FACULTY INVOLVEMENT

**M**ANY MATHEMATICS AND STATISTICS FACULTY AT UNL contribute to the profession by serving as reviewers or referees for journals and funding agencies. In addition, several faculty assume important administrative, leadership, or committee roles that support the professional mathematical sciences associations on a regional or national level. These responsibilities enhance the reputation of the department and these contacts serve to bring current information about research, undergraduate and graduate programs and courses, career information, and policy issues confronting the profession into the planning and development of the department's efforts.

Both Earl Kramer and Rao Chivukula serve in the MAA Nebraska-Southeast South Dakota Section. Earl is currently section chair, and Rao chairs the Awards Committee.

Partha Lahiri has just completed a term as President of the Nebraska Chapter of the American Statistical Association.

Jim Leitzel is chair of MAA's Committee on the Undergraduate Program in Mathematics and the Committee on the Teaching of Undergraduate Mathematics. He also serves on the Panel on Higher Education for the Mathematical Sciences Education Board.

Jim Lewis, in addition to serving as chair of the department, is a member of the Committee on Science Policy and the Committee on Resource Needs for Excellence in Mathematics Instruction of the American Mathematical Society (AMS). He has recently been appointed to membership on the Joint AMS/MAA Committee on Teaching Assistants and Part-time Instructors and a member of the Advisory Board for the Departmental Network being established by the Mathematics and Education Reform Network. At the state level, Governor Ben Nelson has appointed him to the Nebraska Accountability Commission.

John Meakin is managing editor for the International Journal of Algebra and Computation which is based at the University of Nebraska-Lincoln.

Walter Mientka serves, through MAA, as Executive Director of the American Mathematics Competition (the group that administers the American High School Mathematics Examination and the United States Mathematical Olympiad). In fact, he has just been designated as the Leader for the U.S.A. International Mathematical Olympiad team which will compete in Hong Kong, July 8-20, 1994. As Vice President of the World Federation of National Competitions, he will be attending (and giving presentations) at the Second International Congress of that group in Pravetz, Bulgaria, July 23-28, 1994. He also serves as director of the Nebraska JUMP program, a high school mathematics testing program.

Allan Peterson is member of the editorial board for both the Journal of Non-Linear Differential Equations, Theory-Methods

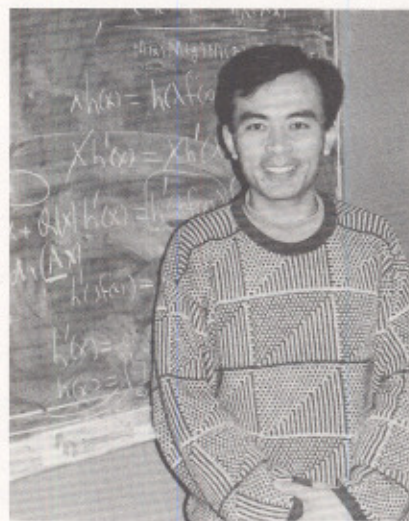
and Applications and the Journal of Difference Equations and Applications.

Lal Saxena continues his service as a member of the editorial board of the American Journal of Mathematical and Management Sciences.

Mel Thornton serves as the Governor of the Nebraska-Southeast South Dakota Section of the Mathematical Association of America (MAA) and the representative of the American Mathematical Society on Section T of the American Association for the Advancement of Science. In his role as Section Governor, he is also a member of the MAA Board of Governors, the main policy making body of the MAA.

Sylvia Wiegand is a member-at-large of the AMS Council (the governing body of the AMS) and chairs the Policy Committee on Meetings and Conferences for the Society. She is also a member of the MAA's Ford Prize Committee and, for the Association for Women in Mathematics, is a member of the Committee for the Emmy Noether Lecturer. She is also active in efforts to encourage young women to choose mathematics as a career and has participated in many national and regional conferences addressing that concern.

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Associate Professor Bo Deng

## DENG AND JAFFE PROMOTED

**W**E ARE PLEASED TO REPORT THAT ASSISTANT PROFESSORS Bo Deng and David Jaffe have been promoted to Associate Professors with tenure.

Bo Deng received his Bachelor of Science degree in 1982 from Fudan University in Shanghai, China. In 1987 he received his doctorate in applied mathematics from Michigan State University. Bo spent what otherwise would have been his first year here on leave as a postdoctoral fellow at Brown University. His areas of specialization include evolution equations, dynamical systems



and bifurcation theory. Bo is a very important addition to our department and we hope he stays here for a long time.

David Jaffe received his B.S. from San Francisco State University in 1981 and his doctorate from Berkeley in 1987, specializing in algebraic geometry. From 1987 to 1989 he was a Research Assistant Professor at Purdue University, and he came to UNL in 1989. He works on classical problems in geometry, such as determining the number of equations necessary to define a variety in projective space, using the powerful machinery of modern commutative algebra and algebraic geometry. He has brought new energy and expertise to our research group in commutative algebra and algebraic geometry.

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Associate Professor David Jaffe

## MER

THE MATHEMATICANS AND EDUCATION REFORM NETWORK (MER) is a loosely organized group of mathematicians interested in education issues, both at the collegiate level and at the precollege level. Funded by successful NSF grants over the past six years, MER sponsors 3-5 workshops a year and regularly sponsors special sessions at the annual AMS-MAA meeting. As part of the renewal of MER's NSF grant, the leaders proposed the organization of a MER Department Network to promote the development of model departments in research universities where both research and education are well balanced and integral to the department's mission. Our department is involved in the MER Department Network in two ways.

Our Chair, Jim Lewis, was invited to be a member of a task force that would advise the MER Co-Directors regarding the development of the MER Department Network. Other members of the task force are from SUNY Stony Brook, University of Washington, the University of California, Santa Barbara, University of Maryland, University of Texas and Wesleyan University. The co-directors of the MER grant come from Pennsylvania State Uni-

versity, University of Minnesota and the University of Illinois at Chicago.

Our department was also one of thirteen research and PhD granting departments invited to be a part of the MER Department Network. The other departments are from University of Arizona, UC-Santa Barbara, Howard University, University of Illinois at Chicago, University of Maryland, University of Michigan, Oklahoma State, Penn State, Rutgers, University of Texas and University of Washington. This is pretty good company for the department to keep and is evidence of the solid reputation the department has both as a research department and as a department that has been a leader in education reform.

The first major MER Department Network was a workshop held in Austin, Texas. Representing the department were Roger Wiegand, Jim Leitzel, Brian Harbourne and Jim Lewis. As part of the program, Jim Leitzel gave a presentation about the Nebraska Math and Science Initiative and Jim Lewis was a member of two panels that presented their ideas regarding how the MER Network could best accomplish its goals. The workshop was a good opportunity to get to know our colleagues from the other universities and a chance to learn about their programs. Over the next two years we look forward to what can be achieved as part of the MER Department Network and to potential for UNL to serve as a national leader among research departments that also give serious attention to teaching and educational outreach activities.

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## VISITOR

PROFESSOR GAETANO ZAMPIERI, WITH HIS WIFE ROSA AND THEIR two daughters Viola (11 yrs) and Arianna (2.75 yrs), is visiting our department this academic year from Padova, Italy. His visit is being supported by a NATO-CNR Fellowship which he won, and also by a leave of absence from the Dipartimento di Matematica Pura e Applicata Universite di Padova (where Galileo spent the years 1592 to 1610). Gaetano regularly attends a seminar on injectivity of mappings being run by Professor Meisters for his benefit; and he has been a frequent speaker in this seminar. Professors Deng, Hines, and Radcliffe have also been helpful participants.

In January, Gaetano received news from Padova that he has won one of the twenty Full Professorships newly created at several universities in Italy. This means that he must leave Padova to another Italian University. Consequently, Gaetano has been under considerable stress, trying to determine to which university he will go on his return to Italy.

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Technology, from p. 9

In another development, mathematics students are coming to a newly equipped High-Tech classroom for upper-level instruc-



tion with the latest mathematical software. In Spring of 1993, the Vice-Chancellor for Academic Affairs asked the Department of Mathematics and Statistics to be a lead department in the development of high-technology classrooms. The Department requested that Bessey 104, the classroom next-door to the Mathematics Computer Lab, have a computer, video, sound and projection system. Profs. Tom Shores and Steve Dunbar together with Joe Goodwater of Facilities Management and Lonnie Thier of Thier and Associates, designed a refit of the Bessey 104 classroom with a console holding the required equipment.

The room now has a ceiling-mounted color video projector, a NeXT computer connected to the Mathematics Lab and the Internet, a Macintosh computer, a TV and VCR combination, and a sound system. Both computers and the TV/VCR can send their screen images to the front of the classroom through the overhead video projector, for all to see. This means the instructor can work directly at the computer, solving problems and demonstrating, while the class observes.

An increasing number of our courses now use the Mathematics Computer Lab, and computers in general. For example, this year we had 330 user accounts on our networked Mathematics Computer Lab. Computers are used in; Math 107H-208H, Honors Calculus; Math 201/801S, Geometry for Elementary School Teachers; Math 221 and 221H, Differential Equations, Math 310H, Introduction to Modern Algebra.

All Math 201 students must do a special project using LOGO in computer labs on campus. The purpose is to have students experience LOGO as a student so they can use it confidently with elementary students when they teach. The 801S student must do a special project. The choices are LOGO, electronic communication or design and teach a geometry unit to students. Over half the 801S students have chosen LOGO. For both 201 and 801S students the projects count as 25% of the grade. Math 221, and 221H, Differential Equations for Engineers, makes considerable use of the computer algebra system software Mathematica to symbolically solve and analyze differential equations, and related concepts. The idea is that computer-based algebra systems perform many of the tedious calculations freeing the students to concentrate on the conceptual aspects of the course. Also the calculational possibilities allow better examination of real-life examples. Students use the software and hardware in the lab for graphing, example calculation, making conjectures, comparison of functions, drawing conclusions, visualization, and conceptualization. In Math 310H *Introduction to Modern Algebra* students use the Mathematics Computer Lab with computer algebra system software Mathematica to do concrete calculations. This enhances understanding of the abstract material.

The Department of Mathematics and Statistics is working very hard to stay current on instructional and computer technology. In four of the past six years a member of our Department has attended the International Conference on the Technology in Collegiate Mathematics (ICTCM). In 1992, two faculty attended the ICTCM along with 4 graduate students. This year, the Vice-Chair of the Department and a graduate student attended the conference

along with about 1,000 mathematical educators from across the nation. In October 1993, Profs. Chivukula and Pitts, teaching the calculator-required Math 106 Analytic Geometry and Calculus course, attended the Greater Kansas City Mathematics Technology Conference. This fall, our Department sponsored a televideo conference on technology and reform of calculus teaching. Also this fall, our Department sponsored two nationally known leaders on integrating calculators and technology into calculus and pre-calculus; Profs. Frank Demana from Ohio State University, and Prof. Mike Shenk from University of California-San Diego, to visit and give colloquia.



*Departmental Visitor, Gaetano Zampieri*

The exciting challenge for the department is that technology is bringing about an increased emphasis on conceptualization and digitization of mathematics, which forces the meaning of the mathematics to the fore for students. The technology reduces the importance of computation, which has been a major part of mathematics education in the past. Many instructors feel it is important that students get into the habit of using technology in a routine fashion.

When the calculation is automatic, it is the problem solving approach that becomes the important part of mathematics. Problem formulation, choice of algorithm and understanding the consequences of the choice made, are important, rather than accurate reproduction of the details of the algorithm in a slavish way. We are working hard to meet that challenge in our classes in the most appropriate way.

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## MATH LIBRARY

**W**E ARE EXCITED TO REPORT THAT FUNDING HAS JUST BEEN obtained for the *Math Reviews* electronic database, which will substitute for hundreds of printed volumes, at present housed in the Math Library. The database is the defini-



tive database in the mathematical sciences; it contains citations and reviews of thousands of articles. The existing part of the database resides on four compact discs, which will be plugged into the Library computer, and thus accessible to all members of the University community. It will then be possible to do author/title/keyword searches, from any networked computer on campus. We will re-

ceive periodic updates, to keep the database current.

On a less cheerful note, we expect this summer to hear from the Library Administration regarding yet another round of journal cutbacks, driven by escalating journal prices. We are proud of our library and do not look forward to this bloody process.

*MS-News* ◀

## GPOTS

**T**HE 1994 EDITION OF GPOTS (GREAT PLAINS OPERATOR THEORY Symposium) will be held May 25–29 at UNL. GPOTS is a conference series which began in Lincoln in 1980 and is held annually at universities in the mid-North America region. Since its inception, it has become the biggest and most central annual meeting dealing with operator theory and applications. This will be its first return to Lincoln since it began.

The conference has had remarkable growth over the years: it began with only 40 participants, and by 1992 had over 130 participants from more than 10 countries around the globe. The meeting traditionally mixes principal speakers from the Great Plains region

in equal numbers with eminent scholars from outside the region, which showcases the high quality of mathematics in the Great Plains. This year, principal speakers will come from Denmark, Canada, Singapore, California, Kansas, Texas and Ohio. Other speakers will attend from Argentina, England, Greece, Germany, and from universities across the United States.

The Operator Theory group at UNL; Professors Chivukula, Orr, Pitts and Woodward are very excited about hosting such a prestigious event.

*MS-News* ◀

## LETTER FROM THE CHAIR

**I**T HAS BEEN A GOOD YEAR FOR THE DEPARTMENT. IN FACT, IT has been a great year. Not even the depressing fact that salary increases at the start of the year were almost zero (1.3% with the starting date delayed for half a year) could stop our faculty and students from distinguishing themselves in many ways. Throughout the pages of this newsletter, you have been able to read about all that is happening at the Department of Mathematics and Statistics at UNL. We hope you are proud. Looking back, I thought I might give you my own "Top Ten" list of reasons I am proud of the department.

1) We have superb undergraduate students. Our honors program is booming, the Eastman Scholarship Fund supports around 70 majors with grade point averages well above 3.5, and our Putnam Exam team was 28th in the nation. At least 3 students had REU (Research Experiences for Undergraduates) opportunities last summer, five more during the academic year, and three more are expected to have such opportunities this summer. Standing out among an outstanding group is Joyce Yen who was recently recognized as the outstanding female student leader on campus.

2) Teaching awards have come to both faculty and to the department as a whole. John Orr received a College Teaching Award while Mel Thornton was recognized with the OTICA award as the Outstanding Teacher in the university system. For the second year in a row, the department was one of four campus nominees for the systemwide department teaching award. This is ample evidence that good teaching is viewed as a collective department responsibility. In a similar vein, Walter Mientka received an international award named after the famous mathematician, Paul Erdos, in recognition of his contributions to education through his leadership of

the American Mathematics Competitions.

3) Bo Deng and David Jaffe received tenure this year and were promoted to the rank of Associate Professor. Also, Mel Thornton was promoted to the rank of Professor.

4) External recognition of the good job being done by the faculty in the realm of teaching and educational outreach came from two sources. The American Association for Higher Education invited UNL to be part of a 12 university national pilot effort to highlight and improve teaching. UNL administrators chose the Mathematics and Statistics Department as one of three departments that will represent the university. Also, the Mathematicians and Education Reform Network invited our department to be one of 13 major research departments to be part of a Department Network to create models of departments in which educational goals are integral to the departmental mission and are supported by broadly based faculty participation in educational programs.

5) Our faculty are enjoying a particularly successful period in terms of research. The number of papers published by faculty over the past few years is about 50% higher than was the case 5–10 years earlier. Judging also by the number of faculty invited to give talks at national and international meetings, we can be quite proud of how the faculty meet the research mission of the department.

6) External funding is at an all time high in terms of dollars and number of faculty funded. We have passed the halfway point in terms of faculty with external support. In particular, at least 17 faculty now have support from the National Science Foundation, a particularly important validation of the quality of our faculty. Among the faculty to recently learn that they would be funded by NSF are Jim Leitzel, Jamie Radcliffe, Bo Deng and Wendy Hines.



7) Our graduate program is also enjoying a sustained period of success. Currently, over 30 graduate students have passed their qualifying exam and about 6 are expected to receive their Ph.D. this year. Graduate students are active in many ways, attending professional meetings in record numbers. On the teaching side, Cheryl Olsen was recognized as the outstanding GTA teacher on campus.

8) The external Review Team for our Academic Program Review was particularly complementary of our faculty and students. This too serves as external evidence of the prestige the department enjoys among its peers.



*Math-Stat Chair, Jim Lewis*

9) Earlier this spring the faculty voted to join the "brave new world" of calculus reform. Starting next fall, we will be using the textbook produced by the Harvard Calculus Consortium with NSF support. We will also be using graphing calculators in all sections of first semester calculus. We are quite excited recently to learn that the UN Foundation will award the department a nearly \$57,000 grant to support our efforts to make the transition to these new curriculum materials.

10) Within weeks the department will take a giant step forward

with respect to the computing facilities available to faculty and graduate students. Using indirect cost monies collected by the university on our federal grants together with some funds from the Research Council and some from individual grants, the department will purchase about 14 new computers (PC's with 486 chips, 20 meg RAM, 1.2 Gigabyte hard disk, etc.) capable of running the software Nextstep. Faculty will be connected directly to the department's NeXT computer lab and will have access to both Mathematica and Maple software. This should substantially aid faculty both in their research and in adding a computing component to their courses. With the addition of these new machines, it should be noted that about 3/4 of the faculty will have truly first class computers or workstations in their offices. (All faculty have some type of computer.) It should be noted that a partnership between the department, the College of Arts and Sciences, and the Senior Vice Chancellor enabled the campus to get a campuswide site license for Maple and also to remodel a high tech classroom which the department will be able to use.

Well that's my list for the year. Others might have a different list but one that would also make clear the fact that we have an outstanding department in all phases of the profession.

Continued support by our alumni has also been very important. This year your support will enable the department to purchase a high quality copy machine. For over a decade, we have shared a machine owned by the college with many other departments in Oldfather Hall. The machine is quite old and had become unreliable. The College then decided to get out of the business of providing a machine for group use. If not for your contributions, we might not have been able to purchase our own machine for this important service.

Well that's it for another newsletter. We hope you enjoy reading about the department and we want you to know that we would like to read about you. Drop us a line and tell us how you are doing or tell us about your memories of the department.

Sincerely,

Jim Lewis

#### SHARE YOUR NEWS

We would like to hear from you. In the space below, or in a separate letter if you prefer, note any items of interest or other matters of concern. We are especially interested in how you have used your degree from UNL over the years. Please mail to: Professor James R. C. Leitzel, Department of Mathematics and Statistics, P.O. Box 880323, Lincoln, NE 68588-0323.

Name \_\_\_\_\_ Phone \_\_\_\_\_

Address \_\_\_\_\_

City/State/Zip \_\_\_\_\_

UNL Degree(s)/ Date awarded \_\_\_\_\_

Other Degrees/Date/University \_\_\_\_\_

Present Position/Title \_\_\_\_\_

News Notes (Professional activities, promotions, career changes, other items of interest)



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