UN-L MATH-STAT NEWS

DEPARTMENT OF MATHEMATICS AND STATISTICS

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NSF MSPRF to David Pitts

Assistant Professor **David Pitts** has just received a prestigious two-year National Science Foundation Mathematical Sciences Postdoctoral Research Fellowship (NSF MSPRF), thereby becoming the first UN–L faculty member ever to obtain the award. The awarding of NSF MSPRF's is a yearly national competition among the best

Prof.s Voiculescu and Pitts

recent Ph.D.'s; only thirty are awarded each year. The award makes it possible for young investigators to concentrate on research. Professor Pitts will use his award to continue his investigations into Operator Theory; he is expected to begin his fellowship tenure at UCLA.

Mohr Chair to Meakin

Professor **John Meakin** was recently chosen as the first recipient of the Milton E. Mohr Distinguished Professorship of Mathematics. Meakin, a popular and effective teacher, is also one of the world's leading researchers in the algebraic theory of semigroups and its connections with automata theory and formal language theory. Together with the research team he heads, Meakin makes UN–L an international center for research in semigroups.

The Milton E. Mohr Distinguished Professorship of Mathematics was established as a result of an endowment from Dr. Milton E. Mohr, a long-time supporter of the University. Dr. Mohr completed his Bachelor of Science Degree in Electrical Engineering at UN–L in 1938, earning the reputation as the brightest student to ever graduate from the College of Engineering. After graduation he embarked on a distinguished career as a research engineer for Bell Laboratories, Hughes Aircraft, and Ramo-Woolridge. In 1959, when Dr. Mohr received an Honorary Doctor of Engineering degree from the University of Nebraska, he was cited for his leadership in the fields of digital computers, communications and navigation systems, (see Mohr Chair, p. 2)

Math/Stat Hosts Major Scientific Meeting

As a result of an initiative by Professor **Roger Wiegand**, the Department of Mathematics and Statistics played host to a major meeting of the American Mathematical Society (AMS) from October 30 to November 1, 1987. This was the first time in the 99-year history of the Society that Nebraska had been chosen as the site for one of its meetings. With over 300 participants, the conference provided an unprecedented opportunity to show off our state, the University, and the Department, bringing to Lincoln a large group of internationally known mathematicians and computer scientists. (see Math Meeting, p. 2.)

(Mohr Chair, cont. from p.1)

missiles and electronics. Dr. Mohr is currently president and chief executive officer of Quotron Systems, Inc., a leading supplier of information services to the nation's financial services community.

The professorship that Dr. Mohr has established has a very significant impact on the Department of Mathematics and Statistics. In addition to fostering Professor Meakin's mathematical interests, it also recognizes the quality and dedication of the Department as a whole and the central and fundamental role that the Department plays in the University's educational and research missions.

(Math Meeting, cont. from p.1)

Many of this group extended their stay in order to participate in special seminars and other activities being held on campus during the two-week period surrounding the meeting.

AMS Assoc. Sec. Fossum with Prof.s Katz of OSU and Speiser of BYU

The scientific centers of the meeting were the four invited hour lectures, and the seven special sessions in which scholars gave public talks on the forefront of current research. The main social event of the meeting was the reception Friday evening, October 30, from 9:00-11:00 p.m. at the Hilton Hotel. With the significant help of many Math-Stat graduate students and faculty members, under the direction of the local arrangements committee (comprising Professors Roger Wiegand, **Sylvia Wiegand** and **Gordon Woodward**), this meeting was one of the most successful AMS regional conferences run in recent years.

The invited hour lectures were delivered by: Carolyn S. Gordon of the University of Pennsylvania and Washington University of St. Louis, speaking on "When you can't hear the shape of a manifold"; David Griffeath of the University of Wisconsin, speaking on "Random

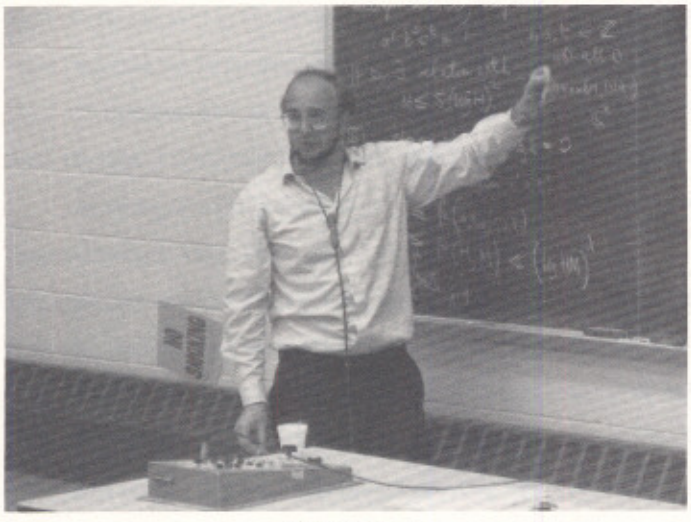
Prof. Gordon

cellular automata: A survey" (see photos p.2); David Masser of the University of Michigan, speaking on "Transcendence without transcendental numbers" (see photo p.3); and

*Graduate student **R. Ruyle** with Prof.s **Chouinard, Logan** and Griffeath*

Dan Voiculescu (see photo p.1) of the University of California, Berkeley, speaking on "Hilbert space operators modulo normed ideals". Of the seven special sessions, four were organized by Math/Stat faculty. These, with their organizers, were: Commutative Algebra and Algebraic Geometry–**Brian Harbourne** and Roger Wiegand; Finite Geometries and Combinatorial Designs–**Earl Kramer**, Spyros Magliveras, and **Dale Mesner**; Operator Theory–**Frank Gilfeather**; and Semigroups and Connections with Automata and Formal Languages–Stuart Margolis and **John Meakin**.

Among the speakers in the special session on Commutative Algebra and Algebraic Geometry were Professors M. Hochster of the University of Michigan and



Prof. Masser

Robert Fossum of the University of Illinois (see photo p.2), outgoing Associate Secretary of the American Mathematical Society (AMS). Also in attendance was Professor Andy Magid of the University of Oklahoma, who will succeed Fossum as Associate Secretary. Overall there were thirty speakers over four sessions. Chairing the sessions were Roger and Sylvia Wiegand, Brian Harbourne, **Jim Lewis** and **Bill Leavitt**. Extending their visits beyond the conference were L.S. Levy of the University of Wisconsin, and C. Huneke and W. Heinzer of Purdue.

The special session on Finite Geometries and Combinatorial Designs was extremely successful with 54 speakers and 15 to 20 other participants. Many of the world's top geometers and design theorists were present—coming from throughout the U.S. and Canada, plus England, Belgium, The Netherlands, Germany, Italy and Scotland—some of whom extended their stays to interact with UN–L faculty and students in seminars and public Colloquia. Especially noteworthy is that the Proceedings of

Prof.s Schellenberg and Mesner

this special session will be published under the editorship of Professors Kramer, Magliveras, and Mesner by the AMS in their book series *Contemporary Mathematics*.

Not including Voiculescu's hour address, the special session on Operator Theory had 28 speakers from around the country. As with the other special sessions, these talks were all of very high quality and there was much interaction among the participants both during breaks between talks and at the social events in the evenings. These events included

Prof.s Miller and Nambooripad

dinner at the Spaghetti Works and a gathering hosted by Frank Gilfeather.

The special session on Semigroups and Connections with Automata and Formal Languages attracted approximately 80 mathematicians from all over the U.S. and from many foreign countries, including Canada, Brazil, Italy, France, Hungary and India. Among the speakers were UN–L visitor **K.S.S. Nambooripad** (see photo p.3), and former UN–L students **Joseph Stephens** and **Pascal Weil**. Ten of these speakers remained in Lincoln for periods of one to two weeks after the conference ended to join in an intensive semigroups seminar here at UN–L. A particularly exciting feature of the conference and the seminar that followed was the interaction between several of the world's top researchers in regular and inverse semigroups on the one hand and others in finite semigroups and language theory on the other. These areas have developed independently and this meeting represented one of the first bringing together leading scientists in both areas.

Academic Program Review

Every six years each department in the University undergoes an elaborate self-study called the "Academic Program Review" (APR) in which the department examines every aspect of its program. Alumni participate in the review, too; many have already received and returned questionnaires. A comprehensive document entitled "The Self-Study Report of the Department of Mathematics and Statistics" will be ready for review early in March. In early April a review team of three faculty from other institutions will visit the Department for several days, consult with UN–L administrators, and give an evaluation of the program. This year's review is unusually significant since we will be choosing a new department chair also, making an evaluation of our status and goals even more important. T.S.

Letter from the Chair

This continues to be an active year for our department. Every five or six years the department undergoes an Academic Program Review, and that event will take place during this current Spring Semester. A review committee will be appointed by the Administration to evaluate our programs and their strengths and weaknesses. Three members of the review team are chosen from outside the university. To prepare for this event we must submit a written "self-study" for the review team to evaluate before their visit. Thus, much of our energy has been devoted to this self-study; many internal discussions have resulted and the dialogue has been valuable in identifying our needs, resources, and so on.

Secondly, we have been authorized to hire three new faculty this year, two junior level mathematicians and a senior level statistician. The Search Committees should have recommendations soon and the interviewing process can begin. Finally, this year ends my five-year term as Chair and the Dean has appointed a Search Committee to recommend to him candidates for a new Chair. At the present time it appears that we shall search internally for someone to fill the position.

Besides these activities, we have also enjoyed some successes this year. Professor **Mel Thornton** was awarded the AMOCO Distinguished Teaching Award last spring, and this fall Professor **John Meakin** was named the first Milton Mohr Professor of Mathematics (see story p.1); this research professorship was generously endowed by Dr. Milton Mohr, an engineering alumnus. Professor **Jim Lewis** was elected President of the Faculty Senate and he has been leading the efforts toward bringing the faculty-salary issue to the Regents and Unicameral. This issue, which was termed "a crisis in the making" by the recent accrediting team, has become one of the critical issues in the effort of the university to retain our best faculty; UN–L lags its peers by over twenty percent and many faculty have left for greener pastures during the last three years.

The regional meeting of the American Mathematical Society that we hosted last November was a tremendous success. The feedback that we received indicated that it was one of the best-attended and most successful regional meetings ever. You can read about it elsewhere in this newsletter, along with other activities and achievements of our staff.

Speaking for our faculty, staff, and students, I want to thank you—our alumni and friends— for your support of our many activities. Private funds help us gain that margin of excellence we seek as well as provide us the flexibility we need to respond to various needs for which State or Federal support is inadequate. We shall work diligently to earn your continued support.

Please write to us and tell us about your activities, or stop to visit us when you come to Lincoln. Best wishes for the new year,

David Logan

David Logan, Chair

Uncertainties in Library's Future

Having no laboratories, a department of mathematics, more than any other scientific discipline, depends on its library for the vitality of its research life. Shortfalls in library budgets and the spiralling cost of library materials put this vitality in jeopardy. Problems are looming and they appear to be long-term and of national scope.

Part of the problem is the rise in subscription rates of foreign journals. Three large European publishers account for 12% of the UN–L library system holdings but 23% of the costs. In the last five years journals have seen price increases of up to 150%, faster even than that of foreign consumer goods imports. Moreover, these prices do not include postage, and are 50% to 100% above those paid by European libraries. But domestic subscription costs are also rising, two-and-a-half times faster than the cost of living.

One long-term solution to these problems may involve setting up regional library systems (with perhaps electronic data access—requiring substantially upgrading Departmental information networking capabilities) to cut costs by sharing resources and materials. Any such solution will be examined very carefully, since the current location of the Math/Stat library on the 9th floor of Oldfather Hall in the midst of the Department itself keeps the latest developments in mathematics at the fingertips of the faculty. Any move restricting access of faculty and students to technical journals raises the fear of impairing the Department's ability to fulfill its mission.

Current year shortfalls of $200,000 or more for the UN–L library system, and $5,000 for the Math/Stat library, were temporarily avoided by a special appropriation from Chancellor Massengale, using heating plant funds left unspent by milder than expected weather. This forestalls the immediate crisis, but the problem remains and promises to grow worse; it seems certain next year will see a significant elimination of subscriptions. The alumni and friends of the Department have been generous in the past, and it is hoped that future donations to the Department of Mathematics and Statistics will provide the means to reduce the impact on the Math/Stat library of the coming crisis. S.D./D.M.

Calculus . . . In a State of Flux

Calculus courses need to be reevaluated, reorganized, revitalized, reinvigorated, restructured and all sorts of other "re's". So say the nation's top mathematics and science educators and advisors. The word is that more emphasis needs to be placed on the *concepts* of calculus and less on routine drillwork. More emphasis also must be placed on modeling techniques, which is to say, on *meaningful* problem solving. In addition, calculus instruction must take full advantage of computers and other modern technology.

This is definitely easier said than done! "Theory" and "story problems" are precisely what most students have trouble with; routine drillwork, no matter how dull, can at least be done by most students. Clearly, the prescribed calculus course of the future will not be an easier course! While most students would argue that calculus is tough enough already, the counter-argument is that the "new calculus" will be more interesting so students will be better motivated to learn.

Is this just another "new math" controversy? Probably not. One eye-opener is the fact that there now exist computers which are capable of earning a "B" on a typical calc exam. There are even hand-held calculators that will solve equations,

graph functions, differentiate, and integrate both symbolically and numerically—the very things calc students do over and over again. And this technology is advancing rapidly.

The UN–L Math-Stat faculty is carefully studying ways of improving calculus instruction. Mathematics Professor **Frank Gilfeather**, having spent the last three years at the National Science Foundation in Washington, D.C. and now back at UN–L, was involved in the early stages of the national reform effort and he continues to be a consultant to the Board on Mathematical Sciences of the National Research Council. Gilfeather, Professor **Jack Eidswick** and others are developing interest in calculus reform and in efforts to obtain an NSF planning grant in collaboration with Dartmouth College and Prairie View A & M College. Along a different line, Professors **Paul Krajkiewicz** and **Albert Zechmann** have been studying the use of placement exams in helping students evaluate their preparation for calculus.

The Department of Mathematics and Statistics welcomes thoughts on these matters. Especially valuable are inputs from alumni indicating how their calculus experience has affected their professional lives. J.E.

Computers and Math/Stat

The Department of Mathematics and Statistics is looking to bring to the forefront the usage of computer technology in both teaching and research, and while we have far to go we can look back on substantial progress. Five years ago the Department's computer facilities amounted to one microcomputer and a few terminals and printers. We hope eventually for all professors to have PC's in their offices and to have facilities for integrating computer usage into the classroom. Currently nearly half of the Math-Stat faculty have personal computers and the secretarial staff have three more. And while our software library, which makes it all go, is still extremely modest, it is slowly expanding. Unfortunately, our present classroom computer capabilities are all but nonexistent, lacking even a monitor suitable for presenting demonstrations in class, and our networking capability is still limited to modems and telephone lines. This puts us far behind our counterparts at other universities and even behind other UN–L departments.

The increasing importance of computers in mathematics has brought increased pressure for Math-Stat computer facilities adequate for our mission of education and research. Along with addressing the issues of creating a computer lab for Math-Stat students and bringing the computer into the classroom, we are working toward our goal of bringing the computer into each professor's office. We hope to follow this by tying them all together with creation of a departmental network. Connecting this network to HUSKERNET will bring into each office high-quality access to campus mainframe computers and all major national computer networks.

In the meantime, some recent acquisitions promise to have a significant impact in both research and teaching. By coordinating contributions from grants held by **Brian Harbourne** and **Richard Rebarber** and other funds from the Computer Resource Center and the Physics Department, **Steve Dunbar** has for the first time brought to UN–L a computer symbolic algebra capability with campus-wide access. The program, ScratchPad II™ from IBM, will soon be installed, and available for use with classes by next semester. A big problem not only for professors doing research in mathematics but also for students studying mathematics is that intricate algebra hides important concepts and makes impossible the treatment of important real-life situations. With ScratchPad II™ the computer does the drudgery: the factoring, the integrating and differentiating, the simplifying; and the student can concentrate on the end results.

We are also awaiting delivery of a Macintosh II™ computer from Apple Computers. Much more powerful than a PC, capable of being expanded to the work-station class and of being the mother node for a departmental network, our Macintosh II™ was made possible by donations, coming mainly from alumni and in modest amounts, made to the University in the name of the Department of Mathematics and Statistics. Our financial resources are slim so these donations

have a significant impact, and we are happy to thank these donors for their generosity. Also of great use to the department are donations of software. Although the advancing tide of technology may seem to make some software obsolete, our equipment turns over very slowly so we can put seemingly obsolete software to many years of use; **Leo Chouinard** will be happy to field inquiries. T.S.

Graduate Program News

This year Math-Stat has forty-six teaching assistants and a total of over sixty graduate students—over a hundred counting students in the Nebraska Math Scholars and MAT Programs—representing many states and nations. Professor **Frank Gilfeather** has taken over from Professor **John Meakin** this year as Chairman of the Graduate Committee; Professor **Rao Chivukula** continues to be in charge of the graduate examinations.

The national trend to increased interest in graduate study in mathematics and statistics is being felt here. And the enhanced job opportunities in mathematics and statistics is also being felt, as our graduates are obtaining multiple job offers. Together with industry's desire to favor computer scientists and others with a strong mathematics background, this is making graduate study in mathematics and statistics ever-more attractive.

Indeed, we are always eager to spread the word that UN–L is a good place to do graduate work. With our moderate sized program and our active faculty, students can build a strong academic program while receiving lots of individual attention. For more information on the Math-Stat graduate program, our latest graduate program brochure can be obtained by contacting Professor Frank Gilfeather, Department of Mathematics and Statistics, UN–L, Lincoln, NE 68588-0323. F.G.

NSF Teacher Grant In Second Year

The three-year "Nebraska Mathematics Scholars Program for Secondary School Teachers", funded under a grant from the National Science Foundation (NSF), is now in its second year. Professor **Don Miller**, first year project director, has been succeeded this year by Professor **Mel Thornton**, who will be followed in the final year by Professor **Jack Eidswick**. In addition to Professors Eidswick, Miller and Thornton, the project is staffed by faculty from Nebraska Wesleyan, Midland and Hastings Colleges, together with six Senior Scholars chosen from among the best secondary school teachers in Nebraska. The project has been supported this year by $270,000 from NSF; the request for project support next year is $250,000.

The project involves work during both the summer and the academic year. Chadron State College, Hastings College, and UN–L host the instructional phase each summer. Over a five week period this past summer twenty-one Fellows and four staff participated at each of the three sites, during which the Fellows took two graduate mathematics courses, attended computer and dissemination seminars, and learned how to use GEnie (an electronic network) via computers and modems.

The project continues during the school year. Each semester two "dissemination activities" are expected of each of the sixty-three Fellows. Qualifying activities include talks to various groups, presentations at meetings, preparation of informational materials, running mathematical contests, and in fact any activity disseminating what the Fellows learn during the summer instructional phase and which furthers mathematics education and awareness in the state. At least once each year each Fellow is visited at the Fellow's school by a project staff member, and throughout the year staffers and Fellows keep in touch via the GEnie computer network.

The following Fellows, listed below with their high schools, are new to the project this year:

Tom Becker	Ogallala H.S.
Phil Cary	Chadron H.S.
Mark Fegan	Falls City H.S.
Rod L'Heureux	Beemer H.S.
Sandra Meyer	Lexington H.S.
Kay Miller	Syracuse-Dunbar-Avoca H.S.
Dale Montgomery	Omaha Central H.S.
Tom Price	Norris H.S.
Robin Schulz	Dorchester H.S.
Andrew Shiers	Norfolk Catholic H.S.
John Waterman	Omaha Central H.S. M.T.

New Math/Stat Building??

For almost twenty years the Department of Mathematics and Statistics has been primarily located on the 8th and 9th floors of Oldfather Hall. Initially this space sufficed, but with our increasing enrollments and our growing number of faculty and teaching assistants it has become a tight fit. In fact, for several years we have had to put teaching assistants in satellite office space and this year most of the first year assistants are located in the basement of the 501 building—across 10th street from the stadium! This is an unfortunate situation for them, of course, but also for their students. Since their students have a harder time tracking them down, the inconvenient location discourages these students from seeking their instructors' help. On top of this, some of our space has been given up to an expanded library on the 9th floor and we are hardpressed to find room for a needed expansion of our computational facilities.

For several years the administration at UN–L has been interested in providing a new building for our department. Governor Orr's initiative this year for enhanced research and development in Nebraska has brought this interest to a focus. Several documents have already been drafted outlining our needs for a new building; we look forward to seeing this effort succeed. F.G.

Junior Mathematics Prognosis Program

A program developed in Ohio to foster better mathematical preparation for incoming university students is being brought to Nebraska.

In 1978 the mathematics department at Ohio State University initiated an experimental early college mathematics placement program for high school juniors. The objective was to decrease the number of college freshmen whose high school background forced them to begin their college mathematics at a remedial level.

The instrument designed to achieve this objective was a mathematics examination covering arithmetic, first and second year high school algebra, geometry and trigonometry. From a modest start, the program has grown rapidly. Last year nearly 70,000 high school juniors from 620 Ohio high schools took the examination.

Students that participate receive personalized reports on their performance, including a list of mathematics courses required at OSU in their intended majors, and an indication of the remedial courses that would be required if their skills do not improve.

As a result of participating in the OSU testing program, many high schools report that their senior mathematics enrollments have increased markedly, and freshmen enrollment patterns in mathematics courses at OSU have begun to show a significant shift. The percentage of OSU freshmen whose first college mathematics course was a remedial one decreased from 42% in 1977 to 25% in 1984. During the same period the percentage of freshmen whose first college mathematics course was calculus increased from 6% to 11%.

This testing program is now being used successfully throughout the U.S. in a cooperative venture between universities and local school districts. This spring a similar program, called the Junior Mathematics Prognosis (JUMP) Program, will be inaugurated in Nebraska on an experimental basis in 21 high schools, including one from each of the state's Educational Service Units.

By translating this successful program to Nebraska we will be offering a significant service. College–bound high school students in the state are served by motivating them to extend and deepen their mathematical education in their senior year, by offering them career information and guidance on the demands of their proposed major, and by placing them on a faster and more secure track to college graduation. Nebraska's high schools are served by increasing their enrollments in upper level mathematics courses and strengthening the resolve of the students in those courses. The University of Nebraska is served by reducing the number of students in remedial courses and by improving the performance of students in all freshman mathematics courses. And finally, the citizenry of Nebraska is served by shifting teaching responsibilities of college faculty from remedial to college–level instruction and so increasing the

scientific human resources base in the state by providing better educated university graduates.

The steering committee for JUMP is chaired by Math-Stat Professor **Donald Miller**. The other committee members are UN–L Director of Admissions John Beacon, Lincoln High School mathematics teacher and Presidential Award winner Patience Fisher, UN–L Assistant Dean of the College of Arts and Sciences Steven Hilliard, Nebraska Department of Education mathematics consultant Deborah Romanek, Lincoln Northeast High School mathematics teacher and Presidential Award winner Buren Thomas, and Math-Stat Professors **Frank Gilfeather, James Lewis,** and **Walter Mientka**. D.M.

Outstanding Senior Math/Stat Women

Every year we honor our most outstanding women majors at the Graduate Women in Science February Forum. This year's honorees are **Cheryl Sue Grieser** and **Carla Peterson** of Lincoln and **Linda Sue Nelson** of Hastings. As has become traditional, the February Forum will be hosted at Valentino's. Following dinner, certificates will be presented to these and other outstanding undergraduate women in science and related fields.

American Mathematics Competitions

The American Mathematics Competitions, comprising four exams—the American Junior High School Mathematics Examination (AJHSME), the American High School Mathematics Examination (AHSME), the American Invitational Mathematics Examination (AIME), and the USA Mathematical Olympiad (USAMO)—are administered by a committee of the Mathematical Association of America (MAA) headed by Professor of Mathematics **Walter E. Mientka**. These exams foster increased interest in mathematics through the excitement of friendly competition at problem solving in a timed format, and they help to develop mathematical talent by bringing together students of similar interests.

Each year more than 600,000 students take one of these exams. In 1987 the totals were 93 for USAMO, 3794 for AIME, 379,956 for AHSME, and 226,075 for AJHSME. This figure for AJHSME establishes a new record for participation. Also noteworthy is Nebraska's record enrollment of 9750 students, ranking it tenth in the nation in participation. Overall, students from the USA, Canada, APO/FPO schools and fourteen foreign countries take part.

Most prestigious is the USAMO. The top eight students in the USAMO are honored at elaborate ceremonies held each year in Washington, D.C. by joint invitation of the Science Advisor to the President of the United States and the President of the MAA. Following the ceremonies, the eight travel either to the Military Academy at West Point or (in alternating years) to the Naval Academy at Annapolis for a four week training period. Based on their USAMO test score and their performance at the training sessions six of the eight are chosen to represent the U.S. at the International Mathematical Olympiad (IMO), which involves from thirty-five to forty other national teams. The U.S. has sent a team to the IMO every year since 1976, never coming in under fifth place and three times coming in first. This year's IMO is being held in Canberra, Australia, July 9-21; Professor Mientka will accompany the US team. W.M.

New Officers for πμε

The math club, also known as πμε, has new officers. **Julie Ward** is President, **Michelle Spurgeon** is Secretary and **Brian McIntyre** is treasurer. The faculty advisers are **Al Peterson** and **Sylvia Wiegand**. Activities of the club include monthly meetings, talks on mathematical topics of interest, and making available to students in lower level math courses previous year exams.

New Math/Stat Lounge

The Department of Mathematics and Statistics now has a true lounge for the first time. The space which the new lounge occupies was formerly used for faculty mailboxes, storage and as a work area. By moving the departmental supplies and the

staff mimeograph machines to another room and moving in donated furniture, the new lounge was created. With the addition of a blackboard, we now have a space where faculty, students and visitors can interact outside the formal setting of classroom and office.

Taking AIM at Mathematics

Produced by the Mathematical Association of America for high school grades 10 through 12, AIM is a series of applied mathematics curriculum packages integrating video, written and computer media. The original package comprised three modules entitled: A Backwater Curve for the Windsor Locks Canal, Pricing Auto Insurance, and Testing Surface Antennas. Another package is now available with three new modules entitled: Routing Telephone Service, Capturing a Satellite, and Volcanic Eruption Fallout. For more information, interested readers can contact UN–L Mathematics Professor **Jack Eidswick**, Nebraska section leader of the AIM series.

Math/Stat Undergraduate Scholarships

The Department of Mathematics and Statistics has awarded a total of $5754 in scholarships to a number of its deserving majors. This year's recipients and the sources of their scholarships are listed below (note: DHSMF is the Dr. Hubert Schneider Memorial Fund, IDMS is the Irwin Dubinsky Memorial Scholarship, JSF is the Joel Stebbins Fund, and USHF is the U.S. Harkson Fellowship):

Rory Cejka	JSF
Daniel Edwards	JSF
Darrin Frey	USHF
Angela Grossart	JSF
Kim Hoffman	JSF
Dawn Hogan	JSF
Kayla Kadlec	JSF
Brian McIntyre	USHF
Kurt Meyer	JSF
Eric Moss	USHF
Matthew Mueller	USHF/JSF
Julie Pribnow	IDMS
Sheryl Richardson	JSF
Robert Smits	JSF
Michelle Spurgeon	USHF
Jennifer Thornton	DHSMF
James Van Vleet	JSF

Math/Stat Ph.D. Awards

Abdel El-Abyad
Adviser: **J. Dauer**
Thesis(1986): Geometric approach to multiple objective optimization with application to multiple criteria decision-making
Current Location: Egypt

Darrell Hankerson
Adviser: **A. Peterson**
Thesis(1986): Boundary value problems for n^{th} order difference equations
Current Location: Auburn University

Yi-Hsin Liu
Adviser: **J. Dauer**
Thesis(1986): Analysis of objective space in multiple objective optimization
Current Location: University of Nebraska-Omaha

Ossama Saleh
Adviser: **J. Dauer**
Thesis(1987): A characterization of proper minimal points as solutions of sublinear optimization problems
Current Location: University of Nebraska-Lincoln

Joseph Stephen
Adviser: **J. Meakin**
Thesis(1987): Applications of automata theory to presentations of monoids and inverse moniods
Current Location: Northern Illinois University

Items of Interest

The Department has two new faculty members this year, Assistant Professors **Bo Deng** and **Marek Slaby**. Professor Slaby, who received his Ph.D. from Case Western Reserve University in 1987, works in probability theory. Professor Deng, who received his Ph.D. from Michigan State University in 1987 and studies dynamical systems, is on leave this year. Also on leave this year are Professor **Gerald Johnson**, for the year, and Professor **Lal Saxena**, for the spring. In their place are full-year visitors Professor **K.S.S. Nambooripad** of the University of Kerala at Kariavattom, India and Visiting Assistant Professor **Ossama Saleh**.

It is mid-February as this is written, so it is especially appropriate to report that **Tim Fosnaugh** and the former **Linda Dobson**, both Math-Stat graduate students, were married last May, and we all extend them our best. Other congratulations go to Associate Professor **Mel Thornton**,

who received the AMOCO Foundation Award for distinguished teaching, as mentioned earlier in the Letter from the Chair. Thornton, who receives $1500 with the award, makes an effort to know his students personally and always keeps an eye out for real-world applications to bring mathematics to life in the classroom. Also receiving accolodes is Professor **Walter Mientka** who will receive the Mathematical Association of America's Certificate of Merit this August in Providence. His efforts on behalf of the Mathematical Olympiad, described on p. 9 of this newsletter, are typical of his extensive work in promoting mathematics.

The Department welcomes **Denise Glissman**, who temporarily joins **Rhonda Bordeaux** and **Joyce Kapke** in the head math offices, replacing **Roxann Roggenkamp** who has taken a job in the Sociology Department. Professor emeritus **William Leavitt** recently made a trip Down Under. In August he gave the invited lecture "Recent developments in radical theory" at the Conference on Rings, Modules and Radicals held at the University of Tasmania, Hobart, Tasmania. Associate Professor **William James Lewis**, in addition to his new role as President of the Faculty Senate, is in charge of the undergraduate program for the Department. In other news, we congratulate Professor **Sylvia Wiegand** on her recent promotion to Full Professor, and, as Professor **David Logan** prepares to finish his term as Chairman, we thank him for his efforts on behalf of the Department for the past five years.

Fifteen Math/Stat Counselors Help Math Students

For a number of years, the Department has hired fifteen students as Mathematics Counselors. Their chief responsibility is to run evening tutorials around campus for the benefit of students in calculus and precalculus. Chosen for their dependability, their ability to communicate and their scholastic achievement in mathematics, competition is keen. This year's counselors are: **Michael Brannon, Kris Deutscher, Darrin Frey, Kayla Kadlec, Kurt Meyer, Eric Moss, Linda Nelson, Carla Peterson, Julie Pribnow, Jerry Putnam, Robert Smits, Michelle Spurgeon, Joe Steele, Jennifer Thornton,** and **Kathryn Wildy.**

The Putnam Exams

The 48th Annual William Lowell Putnam Mathematical Competition was held Saturday, December 5, 1987. This test, taken by interested students in Canada and across the United States, has a morning session and an afternoon session in each of which the students write out solutions to 6 problems which challenge the creativity and mathematical ability of the test-takers. The competition is at both the individual level and at the school level; prior to the exam a team of three is chosen at each school. These three work independently, but their individual scores are totalled to determine the team or school score. In 1986, UN–L's team of **Rory Cejka, Robert Smits** and **David Mitchell** ranked 77th of 270; UN–L's top scorer in 1986 was **Keith Williams**, with Rory Cejka second. This year's team was Rory Cejka, Robert Smits and **Darrin Frey**. Results will be out in March. E.K.

Change Ringing

By **D. Mesner** and **J. Eidswick**

Most bell towers in England have from five to twelve large bells, weighing from a few hundred pounds to several tons, tuned to notes of a scale. The ringers, one person per bell, ring out permutations of the bells instead of playing melodies. A permutation in which each bell sounds once is called a *change* and the objective is to run through a sequence of perhaps hundreds or thousands of these changes without repetition.

A typical set of five bells might be tuned in a major scale from middle C to G above middle C. By tradition these are denoted G=1, F=2, E=3, D=4, and C=5. The following example shows a sequence of changes which begins and ends with a descending scale and employs ten distinct permutations:

0: 1 2 3 4 5	4: 4 5 2 3 1	8: 3 1 5 2 4
1: 2 1 4 3 5	5: 5 4 3 2 1	9: 1 3 2 5 4
2: 2 4 1 5 3	6: 5 3 4 1 2	10: 1 2 3 4 5
3: 4 2 5 1 3	7: 3 5 1 4 2	

The reader who wants to know how this sounds should produce (or imagine!) the bell sounds occurring at the rate of

two to four per second, the above sequence taking fifteen to twenty-five seconds. The rate is uniform except that a brief pause is inserted at the end of each even numbered row, beginning with row 0. Change–ringing sounds only vaguely like music but it has the advantage of giving every bell an absolutely fair chance to be heard.

The above sequence of 11 changes could be modified so that row 10 contained a new change rather than the initial one, which need not reappear until all 5!=120 possible changes on five bells had been rung. Bell–ringers over the last 300 years have developed methods for going through long sequences of changes without repetition, and although the ringers seldom had mathematical training, many of the methods exhibit mathematical precision and symmetry. The basic goals underlying the construction of these methods are to simultaneously: (1) maximize the number of different changes (which can never be better than n! for n bells) and (2) to make the transition from one change to the next as simple as possible. This optimization problem leads to some very interesting questions of group theory. In fact, some of the theory of permutation groups, in an applied form, was first discovered by change–ringers.

Although a sequence of 5000 changes on seven or more bells takes three or four hours to perform, such performances are not uncommon in England, where thousands of bell towers are equipped for change–ringing. Performances are featured in a brief weekly broadcast on the BBC and the Dorothy L. Sayers mystery "The Nine Tailors" includes an informative and entertaining description of change–ringing in an English village. Change–ringing can be done indoors on small handbells and in this form it has migrated to this country. In the 1930's Lincoln, NE had a Change–Ringing Society which practiced its art on handbells with a notable exception: by special arrangement they once rang 4!=24 changes on four bells in the tower of St. Paul Methodist Church in Lincoln. There are only a few dozen bell towers in the U.S. where this would have been possible, since the bells have to be hung in a certain way to permit the precise timing change–ringing requires.

The Lincoln Society of Change–Ringers is no longer active, but members of the handbell choir in at least one Lincoln church have taught themselves to do change–ringing. Two members of the UN–L Department of Mathematics and Statistics have become interested in mathematical aspects of the subject. **Dale Mesner** (see photo p.3) has programmed his home computer to produce the permutations and simulate the sounds of such change–ringing methods as Grandsire Doubles and Kent Treble Bob Major. He gave a talk on the subject to the April, 1987 meeting of the Nebraska section of the Mathematical Association of America. **Jack Eidswick** has incorporated change–ringing into his applied mathematics course in the Nebraska Mathematical Scholars Program (see article p.7), as an application of group theory. The high school teachers taking his course this summer should be able to hear a live demonstration of change–ringing on handbells.

Interested readers with mathematical tastes can find an article on change–ringing by Arthur T. White in the October, 1987 issue of the American Mathematical Monthly. Chapters on change–ringing can also be found in the books Groups, Graphs and Surfaces, by White, and The Fascination of Groups, by F. J. Budden.

Dynamical Systems Occur in Many Forms

By **G. H. Meisters**

In this sentence, the number of occurrences of 0 is _____, of 1 is _____, of 2 is _____, of 3 is _____, of 4 is _____, of 5 is _____, of 6 is _____, of 7 is _____, of 8 is _____, of 9 is _____.

The sentence above (due to Raphael Robinson) is clearly a puzzle. The object is to fill in the blanks with cardinal numbers, presumably in Arabic decimal notation, in such a way that the resulting sentence is TRUE. If we begin in a straightforward manner we immediately run into what seems to be an impass at the third blank: If we agree to write each tentative solution as a row (vector) with ten components $\langle n_0,n_1,n_2,n_3,n_4,n_5,n_6,n_7,n_8,n_9\rangle$ then a first attempt at a solution yields ‹1,2,?,_,_,_,_,_,_,_,_›. We begin to suspect that

we have been tricked. Perhaps there is no solution at all. For example, ‹1,ten,1,1,1,1,1,1,1,1› is one "solution", but not according to the rules (implicit in the sentence itself). We call such a "solution" a pseudo-solution. Does this puzzle have any real solutions? If so, how many? And how can we find them? *Answer*: Regard this puzzle as a dynamical system and use the methods (long known) for solving dynamical systems.

A *DYNAMICAL SYSTEM* is a collection S (called *state space*) of *STATES* x and a *LAW-OF-EVOLUTION* E which assigns to each state x a next state $x' = E(x)$.

The first dynamical systems were defined by differential equations such as Newton's Second Law of Motion for mass particles moving under the influence of some force field such as gravitation. But in recent years the concepts and methods of dynamical systems have been deepened and broadened and applied with spectacular success to such diverse areas as number theory, logic, complex analysis, Julia sets, Fractals, geometry, economics, biology, ecology, and the evolution of the universe itself.

The puzzle above, when viewed in this manner, already illustrates several salient features common to many dynamical systems: *Fixed points*, *periodic orbits* or *cycles*, *attractors*, *basins of attraction*, *stability*, *iteration*, *covergence*, *rate-of-convergence*, and *solvability by the method of successive approximations*.

We can choose as state space S (for the puzzle) any one of the following: all 10-tuples of finite cardinal numbers (written in Arabic decimal notation); all 10-tuples of rational numbers; all 10-tuples of real numbers; all 10-tuples of complex numbers; all 10-tuples of surreal numbers; all 10-tuples of hyperreal numbers; etc. But no matter what you choose for state space S, we choose the following rule E as our LAW OF EVOLUTION:

If $x = \langle n_0,n_1,n_2,n_3,n_4,n_5,n_6,n_7,n_8,n_9 \rangle$ is a given state (trial solution or initial state or way-of-filling-in the blanks), then the next state $x' = E(x)$ is obtained by COUNTING the number of occurrences of the symbols 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 in x, and adding 1 to account for each of their occurrences in the original sentence.

Then ITERATE and note that

1) Each fixed-point $x = E(x)$ corresponds to a true statement (hence a solution to the puzzle), and conversely.

2) There is more than one fixed-point (and hence more than one solution). How many can you find?

3) Starting at any (arbitrary) initial state and iterating, one is led (in only a few steps) either to a fixed point or to a 2-cycle.

4) Every true solution (fixed-point) must be an *attractor* (i.e., is the end result of iterating some other state).

5) Convergence is rapid. Can this be made precise and proved?

6) The original PUZZLE can thus be solved by the method of successive approximations applied to this dynamical system.

7) While the choice of state space is not unique, it must contain (all?) 10-tuples of (finite only?) cardinal numbers; finite cardinals being written as arabic decimals.

Can you describe the basins of attraction for all the attractors of this dynamical system?

Recent and Soon-to-Appear Math/Stat Publications

Algebra

- ◊ Cubelike puzzles: What are they and how do you solve them? Amer. Math. Monthly, 93(1986), 157-176 (**John A. Eidswick**).
- ◊ A rational surface with infinite automorphism group and no antipluricanonical curve, Proc. A. M. S., 99 (1987), 409-414 (**Brian Harbourne**).
- ◊ Automorphisms of K3-like rational surfaces, Proc. A.M.S. Summer Research Institute on Algebraic Geometry, Bowdoin, 1985, Proc. Symp. in Pure Math. 46, Part 2(1987), 17-28 (**Brian Harbourne**).
- ◊ Multiple fibres on rational elliptic surfaces, to appear (**Brian Harbourne**, joint with W. E. Lang)
- ◊ Iterated blow-ups and moduli for rational surfaces, to appear (**Brian Harbourne**).
- ◊ Minimal generators of radical classes, Comm. in Alg., 14(1986), (**William Leavitt**, joint with R. Rossa).
- ◊ Cogenerators of Radicals, to appear (**William Leavitt**).
- ◊ Some decision problems for inverse monoid presentations, in Semigroups and Their Applications, D. Reidel, (1987), 99-110 (**John C. Meakin**, joint with S.W. Margolis).
- ◊ Presentations of inverse monoids, Proc. Kerala Conf. on Semigroups, Centre for Mathematical Sciences, Trivandrum, India, (1987), 80-96 (**John C. Meakin**).

◊ E-unitary inverse monoids and the Cayley graph of a group presentation, to appear (**John C. Meakin**).

◊ The topology of torsion classes, to appear (**Thomas S. Shores**).

◊ Stable isomorphism of modules over one-dimensional rings, J. Alg., 107(1987), 425-435 (**Roger A. Wiegand** and **Sylvia M. Wiegand**).

◊ Decompositions of torsionfree modules over affine curves, Proc. A.M.S. Summer Research Institute on Algebraic Geometry, Bowdoin, 1985, Proc. Symp. in Pure Math. 46, Part 2(1987), 503-513 (**Roger A. Wiegand** and **Sylvia M. Wiegand**).

◊ Nilpotent elements in Grothendieck rings, to appear (**Roger A. Wiegand**).

◊ Ranks of indecomposable modules over one-dimensional rings, to appear (**Sylvia M. Wiegand**).

Analysis

◊ Bifurcation of a unique and stable periodic orbit from a homoclinic orbit in Banach spaces, to appear (**Bo Deng**, joint with S-N Chow).

◊ The bifurcation of a homoclinic orbit from two heteroclinic orbits-a topological approach, to appear (**Bo Deng**, joint with S-N Chow and D. Terman).

◊ The bifurcation of a homoclinic and periodic orbits from two heteroclinic orbits-an analytic approach, to appear (**Bo Deng**, joint with S-N Chow and D. Terman).

◊ Means with values in a Banach lattice, International J. of Math and Math Sciences, 10(1987), 295-302 (**Rao Chivukula**, joint with I.R.Sirma).

◊ A branching random evolution and a nonlinear hyperbolic equation, to appear (**Steven R. Dunbar**).

◊ Isomorphisms of quasitriangular subalgebras of the Calkin algebras, Pac. J. of Math., 122(1986), 263-286 (**Frank L. Gilfeather**).

◊ Automorphisms of CSL algebras, J. Functional Analysis, 67(1986), 264-291 (**Frank L. Gilfeather**).

◊ A stochastic integration formula for two-parameter x two-parameter Wiener space, SIAM J. of Math. Analy., 18(1987), 919-932 (**Gerald W. Johnson** and **David L. Skoug**).

◊ Functions in the Fresnel class, Proc. A.M.S., 100(1987), 309-218 (**Gerald W. Johnson** and **David L. Skoug**, joint with K. Chang).

◊ Necessary and sufficient conditions for membership in the Banach algebra S., to appear (**Gerald W. Johnson** and **David L. Skoug**, joint with K. Chang).

◊ A noncommutative multiplication of Wiener functionals and Feynman's operational calculus, C.R. Acad. Sci. Paris Ser. I Math., 304(1987), 523-526 (**Gerald W. Johnson**, joint with M.L. Lapidus).

◊ Functions in the Banach algebra S(v), J. Korean Math. Soc., 24(1987), 151-158 (**Gerald W. Johnson** and **David L. Skoug**, joint with K. Chang).

◊ Noncommutative operations on Wiener functionals and Feynman's operational calculus, to appear (**Gerald W. Johnson**, joint with M.L. Lapidus).

◊ The analytic operator-valued Feynman integral, to appear (**Gerald W. Johnson**).

◊ Polynomial flows on R^n, to appear (**Gary H. Meisters**).

◊ Solution of the global asymptotic stability Jacobian conjecture for the polynomial case, to appear (**Gary H. Meisters**).

◊ A poly-flow formulation of the Jacobian conjecture, to appear (**Gary H. Meisters**, joint with C. Olech).

◊ Green's functions for (k,n-k)-boundary value problems for linear difference equations, J. of Math. Analy. and Appl., 124(1987), 127-138 (**Allan C. Peterson**).

◊ Existence and uniqueness theorems for nonlinear difference equations, J. of Math. Analy. and Appl., 125(1987), 185-191 (**Allan C. Peterson**).

◊ On a theorem of Elias for difference equations, Lecture Notes in Pure and Applied Mathematics 109, Nonlinear Analysis and Applications (1987), 229-234 (**Allan C. Peterson**, joint with D. Hankerson).

◊ A classification of the solutions of a difference equation according to their behavior at infinity, to appear (**Allan C. Peterson**, joint with D. Hankerson).

◊ A comparison theorem for linear difference equations, Proc. of the Int. Symp. on Non-linear Analysis and Applications to Biomathematics, to appear (**Allan C. Peterson**).

◊ Factorization problems for nest algebras: factorization methods and characterizations of the universal factorization property, to appear (**David R. Pitts**).

◊ Global solutions of the two-dimensional relativistic Vlasov-Poisson system, Transport Theory and Stat. Phuys., 16(1987), 61-87 (**Mohammad A.H. Rammaha**).

◊ Development of singularities of smooth solutions of nonlinear hyperbolic Volterra equations, Comm. Partial Diff. Equations, 12(1987), 243-262 (**Mohammad A.H. Rammaha**).

◊ Finite-time blow-up for nonlinear wave equations in high dimensions, Comm. Partial Diff. Equations, 12(1987), 677-700 (**Mohammad A.H. Rammaha**).

◊ On the asymptotic behavior of solutions of generalized Korteweg-de Vries equations, to appear (**Mohammad A.H. Rammaha**).

◊ The Feynman integral of quadratic potentials depending on n time variables, to appear (**David L. Skoug**, joint with C. Park).

◊ A note on Paley-Wiener-Zygmund stochastic integrals, to appear (**David L. Skoug**, joint with C. Park).

◊ A simple formula for conditional Wiener integrals, to appear (**David L. Skoug**, joint with C. Park).

◊ A noncommutative but internal multiplication on the Banach algebra A_t, to appear (**David L. Skoug**, joint with K.S. Ryu).

◊ On the upper bound for large deviations of sums of i.i.d. random vectors, to appear (**Marek Slaby**).

Combinatorics

◊ On the Steiner systems S(2,4,25) invariant under a group of order 9, Annals of Discrete Math., 34(1987), 307-314 (**Earl S. Kramer**, joint with S.S. Magliveras and V.D. Tonchev).

◊ Coloring the perfect squared square, to appear (**Earl S. Kramer**, joint with S.S. Magliveras).

Applied Mathematics

◊ Controllability of nonlinear systems via fixed-point theorems, J. Optimization Theory Appl., 53(1987) (**Jerald P. Dauer**, joint with K. Balachandran).

◊ Analysis of the objective space in multiple objective linear programming, J. Math. Anal. Appl., to appear (**Jerald P. Dauer**).

◊ Numerical methods in multicriteria optimization, in Applications of Multicriteria Optimization in Engineering and in the Sciences, edited by W. Stadler, Plenum Press(1987), 27-47 (**Jerald P. Dauer**).

◊ Controllability of perturbed nonlinear delay systems, IEEE Trans. Aut. Control, to appear (**Jerald P. Dauer**, joint with K. Balachandran).

◊ Solving multiple objective linear programs in objective space, Eur. J. of O.R., to appear (**Jerald P. Dauer**, joint with Y-H Liu).

◊ Models of dispersal in biological systems, to appear (**Steven R. Dunbar**, joint with H. Othmer and W. Alt).

◊ Applied Mathematics: A Contemporary Approach, Wiley-Interscience Publishers, New York (1987), xviii+572 (**John David Logan**).

◊ Model solutions of the Wood-Kirkwood equations, to appear (**John David Logan**).

◊ A Laplace transform relevant to holomorphic semigroups, Proc. Royal Soc. of Edinburgh, 105(1987), 243-258 (**Richard Rebarber**).

◊ Spectral assignability for distributed parameter systems with unbounded scalar control, to appear (**Richard Rebarber**).

◊ Canonical froms for a class of distributed parameter control systems, to appear (**Richard Rebarber**).

◊ Bifurcation problems in non-linear parametric programming, to appear (**Chris A. Tiahrt**, joint with A.B. Poore).

Statistics

◊ Robust empirical Bayes estimation of means from stratified samples, J. Amer. Stat. Assoc., 82(1987), 1153-1162 (**Parthasarathi Lahiri**, joint with M. Ghosh).

◊ Robust empirical Bayes estimation of variances from stratified samples, Sankhya, Series B, 49(1987), 78-89 (**Parthasarathi Lahiri**, joint with M. Ghosh).

◊ Bayes and empirical Bayes analysis in multistage sampling, to appear (**Parthasarathi Lahiri**, joint with M. Ghosh).

◊ The exact mean squared error of Stein rule estimator in linear models, to appear (**Parthasarathi Lahiri** and **Shyamal Das Peddada**).

◊ Small sample study of estimators of life distributions and of mean survival times using randomly censored data, Comm. in Stat.; Sim. and Comp., 16(1987), 221-232 (**Dong Ho Park**).

◊ The class of better mean residual life at age t_0, Microelctronics and Reliability, 27(1987), 725-735 (**Dong Ho Park**, joint with K.B. Kulasekera).

◊ A short note on Pitman nearness for elliptically symmetric estimators, J. of Stat. Planning Inference, 16(1987), 257-260, (**Shyamal Das Peddada**, joint with R. Khattree).

◊ Comparison of some common ratio estimators using Pitman measure of nearness, Comm. in Stat., 16(1987), 2017-2028 (**Shyamal Das Peddada**, joint with C. Lee).

◊ Selection procedure for multinomial populations with respect to diversityindices, Contrib. to the Theory and Appl. of Stat., ed. by A. E. Gelfand, Academic Press, (1987), 485-510 (**K.M. Lal Saxena**).

Other

◊ The American Mathematics Competitions, Proc. of the Fifth Int. Congr. on Mathematical Education, Birkhäuser, (1986), 244-248 (**Walter E. Mientka**).

◊ Grace Chisholm Young, in Women of Mathematics, ed. by Louise Grinstein and Paul Campbell, Greenwood Press, (1987), (**Sylvia M. Wiegand**).

◊ Math-Stat Departmental Newsletter, 1987 (ed. **Sylvia M. Wiegand**).

◊ Math-Stat Departmental Newsletter, 1988 (ed. **Brian Harbourne**).

Please let us know what's new with you, or with other graduates you know, or with anyone who is interested in Math/Stat here at UN–L! To help us and the Alumni Association keep our files up to date send us your latest address and telephone number:

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You will probably hear from the Alumni Association during this spring's Annual Fund Drive. Funds donated in the name of Math/Stat are very important to the Department. We describe in this Newsletter some of the ways we use this money, including fostering research, keeping our library up to date, providing more and better computer equipment for our students and faculty, and funding undergraduate scholarships. If you do not hear from the Alumni Association, donations to Math/Stat can be made by sending a check, payable to the University of Nebraska Foundation, together with a note indicating how you would like your donation used, to: David Logan, Chair, Department of Mathematics and Statistics, University of Nebraska, Lincoln NE 68588-0323.

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