



NORTH DAKOTA STATE UNIVERSITY | Summer 2009

BISON SHRINK DISTANCE BETWEEN FARGO AND THE BIG TIME

This title of a March 2009 article in the New York Times summarizes recent developments at North Dakota State University. The article refers primarily to NDSU's first-ever appearance in the NCAA men's basketball tournament, but it also touches on President Chapman's vision for the University when it says "The rise of North Dakota State's basketball program fits the vision that the university's president, Joseph A. Chapman, said he expected of all departments when he took over in 1999. Chapman saw success in athletics as a way to broaden NDSU's visibility and help turn it into a major research university." The article is archived at www.nytimes.com; I think you would find it interesting.

I have been here long enough now to have experienced the scope of President Chapman's vision. It has had a fundamental impact on the Physics Department, most recently through the new STEM-Education initiative, and the Graduate Program in Materials and Nanotechnology. At the University level, there has been a dramatic increase in freshman enrollment, and the number of Ph.D.'s awarded this year will be more than 100, a five-fold increase from 10 years ago. Based on research expenditures, NDSU is listed in the top 100 research universities in the country in several National Science Foundation research categories for FY 2007, the latest year for which statistics are available. When ranked by R&D expenditures among 537 research universities without a medical school, NDSU ranks 41st among the universities and colleges in the NSF report. NDSU also ranks in the top 100 in agricultural sciences, chemistry, physical sciences, and social sciences. Our incoming class of freshman Physics majors will be the strongest academically since I've been here. These are very exciting times at NDSU, and I consider myself lucky to be here and to be able to participate in these developments.

There is, however, one change in the Department that saddens me: Professor Charles Sawicki will retire from NDSU this summer (see page three of this newsletter). He has been here 30 years and has helped guide the Department for much of that time. The Department, College, and the University are very grateful to him for all that he has contributed. Charlie, however, is excited about having the time to pursue other activities that interest him. Already this summer he has been involved in science education outreach at Yunker Farm, leading a "kidcology session" during the first two weeks in June, and developing two interactive hands-on demonstrations, entitled the physics of hybrid cars, and diamagnetic levitation.

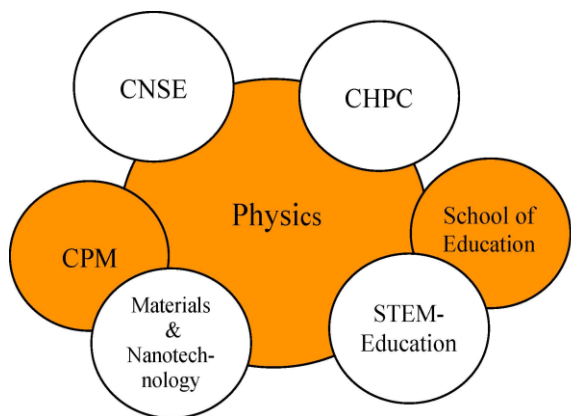
Other developments have been overwhelmingly positive. The President's STEM-Education initiative has resulted in two new faculty appointments in Physics-Education. Dr. Mila Kryjevskaja started last autumn, and Dr. Warren Christensen will begin his appointment in autumn 2009. Both share appointments between the Department of Physics (80%) and the School of Education (20%); their primary teaching responsibilities and research interests lie in the Department of Physics. The article on page five of this newsletter provides a brief description of the STEM-Education Doctoral Program. STEM-Education emphasizes inquiry-based learning; I have participated in a recitation pilot project for physics majors organized by Dr. Kryjevskaja which uses this approach, and was very impressed with its effectiveness at encouraging students to think and reason through a problem. I feel very strongly that our new Physics-

Education faculty will have a significant impact on enhanced student learning and will contribute in a very fundamental way to the success of our program.

The Department has also developed and maintained strong connections to the Graduate Interdisciplinary Program in Materials and Nanotechnology (MNT). The Department's current emphasis on theoretical and computational soft matter physics and biophysics complements other strengths in the Materials program. This relationship has resulted in a new faculty line that we will be shared by Physics (60%) and the Department of Coatings and Polymeric Materials (40%). Dr. Erik Hobbie, currently a staff scientist in the Polymers Division of the Materials Science and Engineering Laboratory at the National Institute of Standards and Technology (NIST), was recently hired to fill this position. The infrastructure provided by the new Appareo building (which will provide approximately 18,000 sq./ft. of space for MNT research) will help the program become competitive nationally.

Finally, NDSU's Center for High Performance Computing (CHPC) has recently received a total of 13.3 million dollars of funding from the Department of Energy. These funds are being used to upgrade its supercomputing resources and hire researchers operating at the cutting edge of computational science. The Center will be one of the top five supercomputer resources in our eight-state region, and NDSU will be conducting a national search for a director of the Center this next year. Andrei Kryjevski, Mila Kryjevskia's spouse, was recently appointed to the first Research Scientist position in the CHPC. His theoretical research on Strongly Interacting Fermi Systems complements current strengths in our Department, and will enhance our understanding of strongly interacting Fermi systems and contribute to the DOE's basic research mission. Development of an *ab initio* numerical technique for dense cold Fermi systems with *repulsive* interactions could also improve existing methods for simulating electrons (such as Density Functional Theory), and may find application in Materials Science, such as predicting properties of new materials and semiconductor device design.

The new STEM-education, Materials and Nanotechnology, and CHPC initiatives have provided our Department with growth opportunities that we otherwise would not have had. They have helped to make the Physics Department stronger and more diverse than I could have hoped even a couple of years ago. I expect that they will continue to provide ongoing opportunities in the future. The accompanying figure summarizes our Department's inter-program relations.



Schematic diagram summarizing existing Department relationships with other programs and departments at NDSU, including the Department of Coatings and Polymeric Materials (CPM), the Center for High Performance Computing (CHPC), and the Center for Nanoscale Science and Engineering (CNSE). Physics faculty member and CNSE faculty associate Orv Swenson participates in a number of research projects and supervises the research and development activities of several Undergraduate Research Assistants at CNSE (see page eight of the newsletter).

As always, we are particularly interested in hearing from alumni, and want to use this newsletter to provide a venue for you to communicate information about your life, career, and family to friends from your time at NDSU. Contributions from several alumni are included

in this issue. For the rest of you, please provide the department with news for our next newsletter.

Finally, I would like to personally thank all of you who have contributed to one of the Department funds that have enabled us to recognize outstanding undergraduate scholarship. Further information regarding these funds and scholarships are provided in the body of this newsletter. Please continue to provide support for these scholarship funds. I encourage all of you to come by the Department when you are in the area. We would enjoy showing you around and hearing about your life after NDSU.

Daniel Kroll
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END OF AN ERA: PROFESSOR CHARLES SAWICKI RETIRES FROM NDSU



After 30 years of service to NDSU, Professor Charles Sawicki retires this year. Professor Sawicki joined the Department of Physics in 1979, having earned his B.S. degree from the California Institute of Technology and his Ph.D. from Cornell University. Throughout his career, he touched the lives of many thousands of students, while actively pursuing research in biophysics and magnetism. Among his lasting contributions to physics are ingenious lecture demonstrations, several published in *The Physics Teacher*.

At a reception on May 13 at the Alumni Center, colleagues and friends gathered to honor Charles Sawicki. Daniel Kroll, Professor and Head of Physics, commended Charlie for his service to the Department and for his exemplary work ethic. Ghazi Hassoun, Emeritus Professor of Physics, remembered Charlie as a reliable colleague and praised his achievements in enhancing the undergraduate labs and in guiding the Department as chair.

Philip Boudjouk, Distinguished Professor of Chemistry and Vice President for Research, Creative Activities and Technology Transfer, addressed

Charlie's legacy, emphasizing the importance of Physics to NDSU's research mission and the bright future of the Department. Richard Hammond, former Professor and Chair of Physics (now at the Army Research Office in Durham, NC), sent best wishes, recounting Charlie's dedication to the Department and his vital role in their collaboration on magnetic field fluctuations and GPS signals.

In recognition of his distinguished service to NDSU, the Department presented Professor Sawicki with a Bison swivel stool and a lifetime subscription to the Department Newsletter. Charlie's wealth of physics knowledge and wry sense of humor will be sorely missed. We wish him and family many happy and healthy years to come.

ASSISTANT PROFESSOR TERRY PILLING LEAVES DEPARTMENT FOR GREENER PASTURES

After four years in the Department, Terry Pilling (Ph.D. 2002) accepted an offer by Crownbutte Wind Power, Inc. October 2008 as Vice President of Operations and Technology. Terry earned his Ph.D. in particle physics and string theory at NDSU in 2002. After postdoctoral studies at the Joint Institute for Nuclear Research in Dubna, Russia, he returned to our department as Assistant Professor in 2004.

On the one hand, the Department is very excited about this great career opportunity for Terry. On the other, NDSU has lost an excellent, inspiring physics teacher who taught our core undergraduate courses and was very well liked by his students. Terry is still keeping in touch with NDSU and has already provided internships for science and engineering students at his company; he retains an appointment as Adjunct Professor.

Crownbutte Wind Power (CBWP: Pink OTC Markets Inc) is based in Mandan, N.D. and was established in 1999 with the purpose of addressing the need for regional utility companies to satisfy increasing public demands for renewable energy. Crownbutte's strategy is to develop, own and operate wind parks in prime wind resource locations that have access to existing and planned transmission systems. The firm is presently working on mid-size utility-scale wind energy facilities, because it has identified locations at which electrical generation from parks of 20 MW to 60 MW could be introduced into the existing

transmission system without expensive upgrades, and where the prevailing wind velocities promise net production capacities of 40% or better.

NEW FACULTY



Mila Kryjevskaja
Assistant Professor
NDSU Appointment 2008

Education: Ph.D. in Physics, University of Washington, 2008

As a faculty member at NDSU, I teach physics courses and conduct research that focuses on how students learn physics. The objective is to conduct an investigation that allows for identification of conceptual and reasoning difficulties that students encounter in studying physics. The results of this investigation then inform the development of instructional strategies designed to address specific student difficulties identified by research.



Andrei Kryjevski
Research Assistant Professor
NDSU Appointment 2008

I did my Ph.D. at the University of Washington in High Energy Particle Physics and Nuclear Theory. I came to NDSU after postdoctoral work at Washington University in Saint Louis and, prior to that, at Indiana University.

My research in the past few years has been devoted to the study of quantum systems of strongly interacting Fermions, such as dilute strongly interacting cold Fermi gases and phases of dense quark matter. My most recent work has been on the properties of a dilute Fermi system with large scattering length (known as Unitary Fermi gas) using an analytical technique called “epsilon expansion”. Also, I have been developing a first-principle numerical technique for dense Fermi liquids with repulsive interactions.

NEW STAFF MEMBER



Paul Omernik
Laboratory Technician

I joined the NDSU Physics Department at the height of summer heat: August, 2008. My previous engagements were in Wisconsin: While earning a BS in Physics at the University of Wisconsin at Stevens Point in 2004, I was able to gain research experience with Dr. Greg Taft in his femtosecond laser lab, and be published. Stevens Point's small, tight-knit department was a very enjoyable experience, and I am glad NDSU has the same feeling, even with three times the student body. Surrounding and after my graduation, I saw work in the automotive parts industry, and as a photographer. Realizing that photography in Central

Wisconsin is better as supplemental, rather than sole income, I began searching for a position that would be challenging and rewarding, and play towards my scientific passions. This charge has been all of those things and more. I would like to extend a thank you to Andrew Buck, Eric Foard, Goetz Kaehler, and Patty Hartsoch—I would not have been able to accomplish in three weeks what normally takes three months without them.

STEM EDUCATION DOCTORAL PROGRAM

I joined the Department of Physics in the summer 2008 as the Science, Technology, Engineering, and Mathematics (STEM) Education doctoral program was launched under the purview of the School of Graduate and Interdisciplinary Studies. As a core faculty member for the STEM Education doctoral program I share my appointment between the Department of Physics and the School of Education; however my primary teaching responsibilities as well as research interests lie within the Department of Physics.

I conduct discipline-based research in physics education. The objective is to examine student understanding, and identify and analyze conceptual and reasoning difficulties that students encounter in studying physics. The next step is to design instructional strategies that target specific student difficulties identified by the research, and to assess the effectiveness of these strategies. Therefore, research, curriculum development, and instruction are all integral parts of this investigation.

Despite the fact that nationally the number of physics faculty who conduct discipline-based research in education grows rapidly every year, it is still not very common for a Department of Physics to invite a physics education researcher to become a member of the Department. However, I strongly believe that it is very important to conduct this type of research within a Department of Physics. Indeed, over the last 3 decades, the discipline-based research in physics education has produced a significant impact on the physics community mainly because it has been conducted by physicists: people with knowledge of physics, instructional goals, research methods specific to physics, and physics culture in general. Most members of the physics education research community are trained physicists with strong backgrounds in physics. Most are situated in physics departments; they teach physics courses and conduct research that focuses on how students learn physics. Physics education researchers primarily focus on investigating student conceptual and reasoning difficulties specific to physics. Typically, the results of such research inform the development of instructional materials and methods that improve student understanding of subject matter.

North Dakota State University is currently offering two independent paths for graduate students aspiring to pursue a career in physics education. Graduate students within the Department of Physics earn a Ph.D. in physics by conducting research on the learning and teaching of physics. Graduate students enrolled in the Interdisciplinary STEM Ph.D. program also conduct research on the learning and teaching of physics. However, the STEM Ph.D. program provides unique opportunities for collaboration with other educational researchers across multiple science and mathematics disciplines.

This fall, the Department of Physics will welcome another faculty member, Warren Christiansen, whose area of research is physics education.

Mila Kryjevskaja

COOPERATION WITH ADDIS ABABA UNIVERSITY

The Department of Physics currently has three PhD students from Ethiopia, Demmelash Mengistu, Alemayehu Gebremariam, and Bekele Gurmessa, who all obtained a Masters degree from the Department of Physics at Addis Ababa University. This number will increase to four in the coming semester with the arrival of yet another Ethiopian student, Fikadu Legesse.

A central person in establishing the connection between the two institutions is Dr. Mulugeta Bekele, who taught and supervised all four students at Addis Ababa University. In March 2009, following the Annual Meeting of the American Physical Society in Pittsburgh, Dr. Bekele took the opportunity to also visit NDSU and witness the well-being and progress of his former students. Dr. Bekele's seminar, "Energetics and optimization studies of a Brownian heat engine," on March 24 2009 was a highlight -- despite the distraction caused by the quickly rising water level of the Red River (culminating in the record stage of 40.82 feet on March 28). During Dr Bekele's visit we have also discussed the setup of a long-term mutual cooperation between our two departments, which could include joint scientific projects, service as external supervisors or committee members, and the exchange of students. NDSU and Addis Ababa University are currently setting up a Memo of Understanding that formalizes the willingness of both institutions to establish and develop such cooperation.

NIGERIAN PROFESSOR VISITS FARGO

In December 2008, Dr. Emmanuel Mbamala (Federal University of Technology Owerri, Nigeria) visited the Department of Physics to conduct research on confined polymers and colloid-polymer mixtures, in collaboration with

Alan Denton and Sylvio May. No stranger to Fargo, having worked as a postdoctoral fellow in the Department, Emmanuel returned in time to brave our snowiest December on record (see Flood of 2009!).

ITALIAN PROFESSOR VISITS DEPARTMENT

Giuseppe Gonella of the Physics Department of Bari University in Italy visited the Physics Department for 10 days in the beginning of June. He kindly agreed to contribute to our newsletter by sharing the experience of his visit.

"There were good reasons to visit the Physics Department in Fargo. The work of Prof. Alexander Wagner on Lattice Boltzmann Methods and kinetics of phase transitions has always been very close to the interests of my research group in Italy and I thought that it could have been very useful to speak with him. I was also interested in better knowing the work of other people in Fargo, for example the research of Prof. D. Kroll in soft matter and in physics of polymers and membranes.

Fargo, however, with respect to Bari, is not just at the other corner of the street - as we say in Italy, so initially I hesitated a bit in buying the plane ticket. I arrived in Fargo the afternoon of the Memorial Day. All the restaurants seemed to be closed so my not so exciting first dinner in Fargo was just a sandwich. The morning after I went by bike to the campus of NDSU. I saw old-style beautiful buildings, a modern library and a student center with good food.

I immediately started scientific discussions with Professor Wagner who was pitiless about my jet lag. I also had scientific discussions with other members of the Departments and I found all interesting for me. In the following days we discussed possible common research projects. For days the big green blackboard in

Alexander's office was full of equations. We spent hours on some formula discussing again and again the same point. At the end with Prof. Wagner we realized that there was something that we both wanted to understand better and we were able to draw up a common research project. We planned that Eric Foard, Alexander's graduate student, will come to Bari to work on this project. So, the visit to Fargo was

professionally useful and I liked the stay in the Department where all people were very kind to me. And what about food and other things? The initial sandwich made me suspicious but I had later very good dinners and a free breakfast at a Hutterite farm. The atmosphere of the town is pleasant ... I will be back in a couple of years!

Giuseppe Gonnella"

AWARDS AND SCHOLARSHIPS

Eivind Horvik Memorial Award

A cash award of \$100 plus a recognition plaque for the best overall performance in the calculus-based physics sequence. The recipient's name is recorded on a permanent plaque in the Physics Department office. Funds are provided by friends and associates of Eivind Horvick.

Sinha Family Scholarship

Initial funds to support this endowment in the amount of \$5,000 were provided by Dr. and Mrs. Mahendra K. Sinha in memory of Mr. and Mrs. Pratap Narain, the parents of Dr. Mahendra K. Sinha, Emeritus Professor of Physics. It is understood that the recipient of this award will meet the following preferred criteria:

- Be properly enrolled at North Dakota State University at the time of application and disbursement.
- A Physics major with Junior or Senior standing.

Special consideration should be given by the selection committee to the applicant's academic merit and financial need.

Physics Scholarship Fund

The purpose of this endowment is to provide funding for scholarships to deserving undergraduate students.

2009 Award Winners

Sinha Family Scholarship

Filipe Betzel
Jason Grimm

Eivind Horvik Memorial Award

Liisa Locker
Elliott Johnson

The Department of Physics wishes to thank all donors who have contributed to our scholarship programs. You are making a significant difference in the lives of our students

2008-2009 Donors

John and Janice Daly
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Your continued financial support is requested to keep the scholarship and awards programs growing

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Thank you!	

2008 - 2009 GRADUATES

Two Physics Majors graduated this academic year. Christopher Mahrer and Mason Swanson graduated in May. Next autumn, Christopher Mahrer is going to graduate school for Biomedical Engineering at SUNY-Stony Brook, and Mason Swanson is going to graduate school for Physics at Ohio State University.

UNDERGRADUATE LIFE

Two physics majors are participating in research and development activities as Undergraduate Research Assistants (UGRA) at the NDSU Center for Nanoscale Science and Engineering (CNSE) under the supervision of physics faculty member and CNSE faculty associate Orv Swenson. They work between 10 and 20 hours per week during the academic year and have full-time (40 h/w) appointments during the summer with state-of-the-art equipment in the new Research 2 facility on campus.

Cody Gette just completed his sophomore year with a physics major and math minor and has been working at CNSE for just over a year. He is involved with laser processing of silicon-containing precursor films to form crystalline silicon on temperature-sensitive substrates such as glass, polymer or stainless steel for flexible photovoltaic applications. The laser processing must be done in an inert atmosphere glove box and Cody has become an expert at making fine optical adjustments while wearing bulky gloves. Cody grew up on a farm growing small grains, corn, beans, sunflowers, and canola near Starkweather (population under 200 near Devils Lake), North Dakota, and graduated

from Starkweather High School with a class size of six. In addition to physics, he enjoys playing the guitar, piano, and the trumpet. Upon graduating, Cody plans to enter graduate school to earn a PhD in physics.

Matt Semler also completed his sophomore year at NDSU with a physics major and math minor and has been working at CNSE for just over half a year. He is involved with laser processing of integrated circuits on silicon wafers as an advanced manufacturing technology for transferring components to flexible substrates. Matt grew up on a farm near Appleton, Minnesota (population 3000) and graduated from Lac qui Parle Valley High School with a class size of 90. His physics interests are in mechanics and optics and during downtime he enjoys playing almost any sport plus video games. After graduation, Matt plans to attend graduate school for a physics PhD in optics and hopes to continue to work on clean renewable energy research, preferably solar technology.

ALUMNI CONTRIBUTIONS

Qun Li (M.S. 2006) “I am now working as a product and test engineer in Solaria Corporation in Fremont California, a Silicon Valley-based start-up solar company in green industry. The company boosts the solar cell power output in a unique approach that is called cell multiplication technology (CMT), and applies the technology in the solar module production. Among many other responsibilities, such as testing and calibration, product performance improvement is the pursuit of our research. Knowledge of physics is of great value in my engineering career. Not only because physics is general, which means that it can be applied to almost every aspect of my engineering work, but also because it is fundamental: usually problems with no direct engineering solution relate back to physics. Computational physics is a blessing because in many projects you cannot retrieve the desired information from the test data sets, unless you can develop a sophisticated, physics-based algorithm for the project. It is no wonder that many physicists perform brilliantly in industries in the Bay Area.”

Marshall Bremer (B.S. 2006) worked one year at CNSE (on the NDSU campus) and is now pursuing a PhD at Michigan State University, East Lansing MI (started fall 2007). He is in the condensed matter group of the physics and astronomy department, focusing on quantum optics.

Nathan Schoenack (B.S. 2001) graduated from Moorhead High School and has lived in the area for all but 16 months of his life. After graduating from NDSU with an Engineering Physics degree in 2001, he was able to work as the Laboratory Technician in the Physics Department from fall 2001 to spring 2006. Nathan left the department in spring 2006 to take a job that continued a more computer-focused career path, starting at General Equipment and Supplies working in a variety of system administrator roles, this time in the world of Windows. He worked there for 18 months, learning a lot about Windows server administration, networking, and SQL database. In December 2007, he started working at Microsoft as a support engineer for the Microsoft SQL Server product. Nathan states that he has learned quite a bit more about SQL and unexpectedly learned a lot about how Windows operates at the process level, how it manages memory, etc. “It’s been a fascinating and challenging job thus far and I foresee myself staying there for a long time.”

NATURE SUMMER CAMP

In early-June, a group of tribal college students and faculty from the NATURE Summer Camp visited the Department for a general introduction to Physics. Nurturing American Tribal Undergraduate Research and Education (NATURE) is an ND EPSCoR-sponsored education outreach project that aims to improve science, technology, engineering and mathematics (STEM) education among North Dakota tribal college and high school students and to foster the pursuit of careers in STEM disciplines. During the two-week camp, students are introduced to STEM disciplines and career opportunities, while experiencing campus and city life at NDSU and UND. In the second week, two students -- Kelcie Cordova (Sitting Bull College) and Katie Vandal (Turtle Mountain Community College) – took to the lab. After researching the history and amazing properties of superconductors, the students set up and videotaped several demonstrations that illustrate the principles of electromagnetic induction and magnetic levitation. The highlight of the project was "floating" a magnet above a high-temperature superconductor cooled with liquid nitrogen. At the close of the camp, all students presented their projects. We wish Katie and Kelcie well in their studies and hope they continue to pursue their interests in science.

Alan Denton

PROFESSOR CHAIRS INTERNATIONAL ORGANIZING COMMITTEE

Last fall Alexander Wagner was elected the chair of the international organizing committee of the *Discrete Simulation of Fluid Dynamics (DSFD)* conference. This is an annual conference that has been held since 1986. This conference serves as a venue to discuss novel methods for the simulations of fluid flow. It has seen among others the advent of lattice gases, the lattice Boltzmann method, the Dissipative Particle Dynamic method, the Stochastic Rotation Dynamics method and several other methods. The *DSFD* conference has long held the leading position to showcase the development of this field and many breakthroughs were first reported at its meetings. The interested reader can learn more about this conference series at <http://dsfd.org>.

FLOOD OF 2009

Anyone with a TV set or internet access will have heard of the record flood that hit Fargo this spring. Of course we are used to flooding, and you will likely have experienced a flood or two when you were at NDSU. But this year's flood had even our mayor scared. I remember clearly when he talked about "going down swinging" and it did not help when a contingency dike was being built between our house in the Oak Grove neighborhood and the city. However, the most amazing part of this flood was the enormous outpouring of volunteer effort where people came from as far as Minneapolis and beyond to help the struggling city. The university was closed for two weeks to allow the students to volunteer full time and to prevent congestion on the main streets that were now used almost entirely by trucks hauling clay and sandbags to build temporary levies.

Of course the Physics Department was also involved in the flood fight. As I live close to the river I helped in my neighborhood, but almost everyone helped in some location. I remember when Dan came over one afternoon and helped build dikes from sandbags across the street from our house. When we decided that our basement was no longer safe, Sylvio and Andrei came over immediately and helped us move our furniture up to the front porch. These are just some examples of the strong

support so many of us close to the front lines received. This helped us immensely, both physically and psychologically, in dealing with the rising threat. When the river was predicted to reach to 43 feet, we started to feel somewhat discouraged, but we pressed on and raised the level of the dikes one more time. However, I am not sure that we would have been able to hold the dikes with so much water pressing against it. We were lucky that the water was content with beating the all time record of 40.1 feet, set in 1857 by 7 inches and stopped just short of the 41 feet mark. The slow decline of the river was followed by a second crest that was initially forecast to be as much as 44 feet, but eventually stayed below 38 feet, so no further damage was done.

I would like to close with many thanks to everyone who came out to help us fight the rising flood. We would not have been able to do this without you! As a result of all this two weeks of classes were lost, and everyone had a bit of a difficult time getting back in the teaching/learning mode. But with a bit of extra effort we did O.K. in the end.

Alexander Wagner

North Dakota
State University

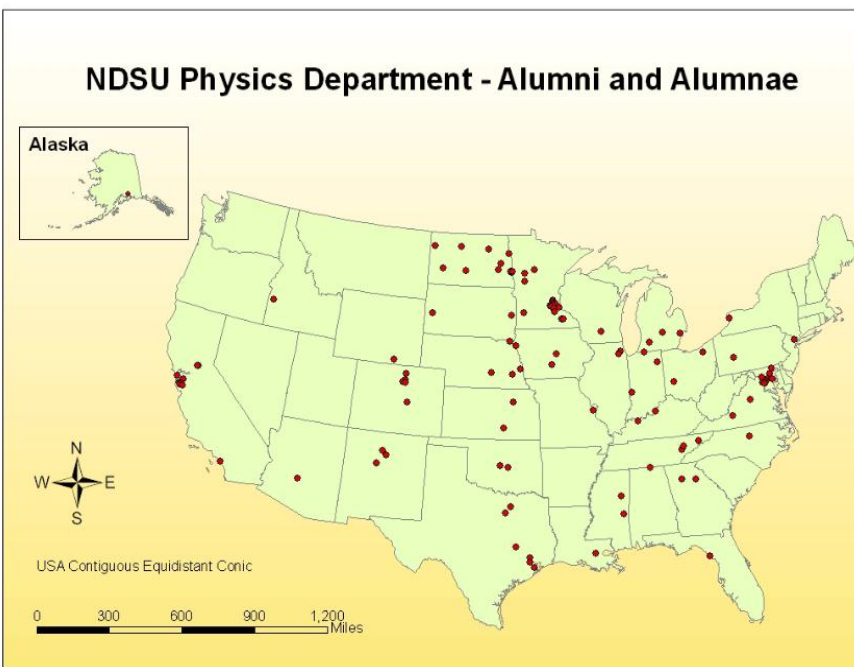


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patty.hartsoch@ndsu.edu