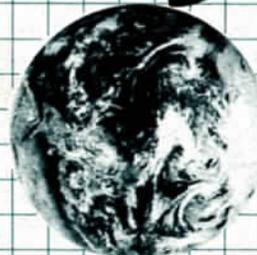


EROS DATA CENTER, SIOUX FALLS, SD

SDATA



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U.S. GEOLOGICAL SURVEY, NATIONAL MAPPING DIVISION

EDC-EPA Cooperation Grows



(l. to r.) **Ed Martinko**, Director of the Environmental Monitoring and Assessment Program, EPA, Washington, D.C., **Denice Shaw**, EMPA, Beaufort, NC, **Gene Thorley**, USGS Headquarters (Asst. Division Chief for Cartography and Research, NMD), **Dave Greenlee**, DSB, EDC, **Wayne Marchant**, Director, Environmental Monitoring Systems Lab, EPA, Las Vegas, **Jay Feuquay**, SAB, EDC, **Gary Johnson**, HSTX Deputy Project Manager, EDC, and **Don Lauer**, Chief, EDC, discuss environmental monitoring issues common to both the EPA and the EDC in the Executive Conference Room.

The Environmental Protection Agency (EPA) is an independent Federal administrative agency established in 1970 to protect our personal safety by correcting the tendency of some businesses to pollute our environment. While this regulatory agency has played an important role in safeguarding our environment since its inception, it may become more prominent under the Clinton Administration. The new Administration is pushing to make the EPA a cabinet-level agency [providing it with more clout]. This Clinton Administration proposal surprises few, given the amount of attention focused on the environment by Vice President Gore during the 1992 Presidential campaign.

Prior to the 1988 Presidential campaign, about the only contact the EROS Data Center had with the EPA was following its standards concerning water discharge during photographic chemical processing. A couple of years ago, this changed when colleagues from both agencies began to interact.

Since 1991, the Data Center and the EPA have worked together on a number of projects. In fact, during the current fiscal year, the EDC budget will feature roughly a half-million dollars in reimbursable funds involving EPA cooperative projects.

While the EPA has always had a research function, there was greater emphasis on research during the Bush Administration (1988-1992). As a result, the agency began getting involved with national-scale

problems - matching the Data Center's national-scale data sets and analysis activities.

According to **Tom Loveland**, Science and Applications Branch senior scientist, EDC-EPA cooperative projects cross a wide range of activities. "Our strongest applications work is with the EPA's Environmental Research Laboratory (ERL) in Corvallis, OR. However, we do more reimbursable production work with the EPA's Environmental Monitoring Systems Laboratory (EMSL) in Las Vegas, NV. We also do some ad hoc types of things with the Research Triangle Park Atmospheric Research and Exposure Laboratory [specializing in atmospheric research] in North Carolina.

The ERL provides the most breath in our activities," adds Loveland. "We got involved with them because of some of our global data set development activities (primarily through the soils work of **Norman Bliss** and the topographic research of **Sue Jensen**). We just started swapping data sets and talking back and forth because the Corvallis group was trying to get involved in large-area analyses that needed large-area data sets. So, it was a natural relationship that developed on a colleague-to-colleague basis.

Through diffusion in the Corvallis Lab, the Watershed Program, which looks at

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UP FRONT

This could be called the "summer of the conferences."

The Center has

hosted a number of technical and policy sessions over the years, but three important meetings are all being held this summer.

In late June approximately 200 representatives from various Department of Defense organizations will meet in Sioux Falls to review plans and requirements for future Landsat satellite systems. Center staff will be heavily involved in these discussions and, of course, the meeting is being held in Sioux Falls largely because of the Center.

In July a smaller group, yet an important group, will hold a World Data Center Directors meeting at

the EROS Data Center. International data collection and management efforts will be reviewed by the group. As a member of the World Data Center organization, EDC will host the session and be "showcased."

Finally, in August, Pecora XII will be held in Sioux Falls. An anticipated 250 scientists and policy makers will meet to discuss the future of space-based information systems. Other EROSDATA articles will describe EDC's involvement in this important conference.

The summer of '93 is going to be a busy time. Again, our hard work and well-deserved reputation are bringing this extraordinary set of opportunities to the community and the Center.

Donald T. Lauer

UN-L and EDC: Partners in Research

The EROS Data Center and the University of Nebraska-Lincoln (UN-L) are working with the Environmental Protection Agency (EPA) to develop worldwide maps on land-use and vegetation cover. The purpose of this multiyear, cooperative project involving EROS, UN-L, and the EPA is to study methods for landscape regionalization as well as impacts on non-point sources of water pollution.

One of the primary participants in this activity is **Jess Brown**, Science and Applications Branch (SAB). While many of us think of Brown as a member of the Data Center's SAB, she's technically considered a "visiting scientist" because she's employed as a research analyst with the UN-L Conservation and Survey Division (CSD). "My position was created to facilitate, develop, and

conduct cooperative research activities between EROS and UN-L," explains Brown. "Since I am up here (from Lincoln) full-time, **Tom Loveland** is my EDC "point-of-contact." He provides me with a lot of day-to-day guidance on where I can be most useful to the project."

While Loveland is Brown's EDC contact, she reports to **Jim Merchant**, associate director of the CSD's Center for Advanced Land Management Information Technologies (CALMIT) at UN-L. According to Merchant, the



Jim Merchant

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Optimism Continues on New Addition

After several months of awaking in cold sweats, **Dennis Hood** is sleeping a little better at night. The Chairperson of the EDC Building Task Force has recaptured his normal sleep patterns now that he knows that the EDC building addition, planned to house the Land Processes Distributed Active Archive Center (LPDAAC), is back on track. "We've made progress," says Hood with a sparkle in his eye, "although it seems mostly to be 'paper progress' to this point. There was some concern about sources of funding and appropriations, but now we're off-and-running very, very hard."

In early June, an agreement was reached between the Department of the Interior and Congress to appropriate \$5 million in 1994 and \$4 million in 1995 for the building addition at the EROS Data Center. The 1994 appropriation legislation will include the authority to release a contract for the full \$9 million. Because the government will fund the construction up-front, there is no need for a lease-purchase arrangement with the Sioux Falls Development Foundation. "Since we'll have the appropriation, we'll go ahead and build the addition. However, we will continue to have a relationship with the Sioux Falls Development Foundation as a part of community relations activities."

Because of this welcome budgetary news, Hood says the EDC has turned up the heat on some of the final design details concerning how the addition will be physically combined with the existing facility. "We had a recent meeting with the General Services Administration (GSA) in Denver that went very well. GSA has offered to assist the USGS Administration Office in Denver, who will have responsibili-

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Gee...No, DLG-E

by Pat McClanahan

The Digital Line Graph-Enhanced (DLG-E) group represents a project that many EDC people do not know much about. What many of you may not realize is that under the 5-year, DLG-E project, our excellent mix of experienced programmers and some less experienced, recent college graduates are taking current USGS digital line graph information and transforming it into a new and improved mathematical model.

While satisfying the production requirements of the National Mapping Division, the new method will speed the process of updating map information by merging DLG data with photographic data from digital orthophotoquads - computer photo-maps.

Our experienced people come from diverse backgrounds, all with excellent "C" and UNIX knowledge. Drawing on this experience, the DLG-E model is UNIX-oriented and uses X-Windows as a user interface on Data General platforms. Experienced or inexperienced, each member of the group has some specific strength that is being put to use in the DLG-E project. Inexperienced individuals have, for the most part, been teamed with one of the experienced programmers and are enjoying lots of "on the job training."

One of the things that makes DLG-E work interesting is the wide variety of technologies that are being put to use. In an effort to bring everyone

"up to speed" on these technologies, a significant amount of training has occurred since March 1992. Training has included expert systems development, object-oriented analysis and design, X-Window programming, and the use of CASE tools. Several in-house sessions have been held covering topics such as introductory sessions about the DLG-E model, and topology and the challenges it presents to programmers.

One of the new technologies being explored for use in the DLG-E project is expert systems. Actually a branch of artificial intelligence, expert systems have enjoyed immense commercial success, as opposed to some of the other areas of artificial intelligence that are still relegated to the research world. Expert systems are a method of trying to represent a human expert's knowledge in software to solve a given problem. The advantage of expert system technology comes from the algorithms, or mathematical formulas, underlying the expert system software. These algorithms speed searches that help determine whether any of the situations the system is watching for have occurred. This is somewhat like a giant IF-THEN-ELSE statement, but much more powerful and extremely quick. The software being used, for this prototype system at least, was developed by NASA's Johnson Space Center and is used extensively by NASA in several systems, including the proposed space station.

Expert systems are being used in the DLG-E project to verify input as the

user attempts to assign values to certain data fields. A database exists that contains certain rules that must be followed for the resulting data to be correct by USGS standards. These rules have been translated into statements readable by the expert system software and are loaded into the DLG-E software. As a user assigns values to the data that have been captured, the expert system keeps a constant watch to ensure that the specified rules are not broken. If a user breaks one of the rules, he gets a message showing him what is in conflict. Expert systems software also will attempt to show the user what he can change to continue. Other areas of the DLG-E software are potential candidates for use of expert systems technology as well. Over the next 2-to-3 years, some DLG-E software may be implemented if it is determined that expert systems provide the best method to accomplish those tasks.

Expert systems software such as this may prove valuable to existing National Mapping Division work by further speeding the process of updating map information by merging digital line graph (DLG) data with photographic information from digital orthophotoquads - computer photo-maps.

"The DLG-E project," explains **Randy Sunne**, Software Development Section Supervisor, "has allowed my staff to take current ideas we have and use them in a new development arena to develop some of the object-oriented concepts that we have been wanting to try and use but have never put in place."

Because the DLG-E project is so large and is projected to be completed in 1996, 15 new software developers have been hired over the last year and a half. **Dave Hair** monitors the progress of the new group for the Computer Services Branch, while **Blaine Ailts**, Assistant Software Development Supervisor, **Kelly Kimball**, Lead for the Data Base Group, and **Karen Zanter**, Lead for the Processor Group, guarantee the project progresses according to schedule. ☺



DLG-E staff members: (Front l. to r.) **Todd Doerr, Mary Jo Martin, Steve Small, Jo Wahle, Dan Akkerman, Charlie Sykora.** (Back l. to r.) **Jon Jamsa, Pat McClanahan, Tom Sohre, Steve Kub, Kirk Evenson, Kelly Kimball, Karen Zanter, Blaine Ailts** (Not pictured are **Dave Hair, Kim Rinehart, Pete Mumford, Mike Wehde, Mike Choate and George Timson**).

PECORA 12 Approaches

by **Dr. Robert Haas**
Pecora 12
Planning Committee Chairman

Final touches are being put on the Pecora 12 Symposium, to be held at Sioux Falls on August 24-26. The Twelfth **William T. Pecora** Memorial Symposium will provide a forum to explore the need for land information, the current capabilities for land remote sensing, and future land information and space-based systems. The program will include 55 papers in plenary and concurrent sessions. In addition to the technical program, there will be a poster session featuring over 35 papers that will embellish the plenary sessions.

Keynote speakers for the three-day symposium will include: **George Woodwell** from the Woods Hole Research Center, Woods Hole, MA (giving a keynote symposium address titled, "To Repair a World Gone Awry"); **Payson Stevens**, President of InterNetwork, Inc. (a multimedia company specializing in interfacing science, art, and technology), Del Mar, CA (presenting a multimedia event titled, "Exploring the Home Planet"); The Honorable **George Brown, Jr.** of California, U.S. House of Representatives,

Chairman of the House Science, Space and Technology Committee (addressing the Pecora Awards Banquet); and **Alexander Goetz**, a former Pecora Award winner from the University of Colorado (providing a special Pecora Memorial Address).

The first Plenary Session on Tuesday, August 24th will look at the need for land information in the biological sciences, requirements for atmospheric studies, and needs in hydrologic and social sciences. A second Plenary Session will discuss "Current Technologies for Providing Land Information. A final session on Thursday, August 26th, will look at the future availability of space-based information, the data's use in monitoring and modeling, and an agenda for progressing into a new area of space-based information.

As the Pecora 12 Symposium fast approaches and the entire Center will be involved in all aspects of hosting this prestigious conference, I'd like to take this opportunity to thank all of you who will help make Pecora 12 a complete success. If you have any questions about next month's Pecora 12 Symposium, please give me a call at ext. 6007. ☎

capabilities at the Space Grant universities within the state.

Space Grant universities in South Dakota are the South Dakota School of Mines and Technology (SDSM&T), Rapid City, and South Dakota State University (SDSU), Brookings. The SDSGC Executive Committee is a three-member group tasked with administering the grant program. **Dr. Paul Smith**, with the SDSM&T Institute of Atmospheric Sciences, serves as the Director of the Executive Committee. **LaDell Swiden**, Director of SDSU's Engineering and Environmental Research Center, is the Committee's Assistant Director. The EROS Data Center representative, **Dr. Fred Waltz**, is the third member. He also serves as the EDC's University Affairs Coordinator in the Science and Applications Branch. The Executive Committee receives its direction from a seven-member Advisory Committee: **Dr. Howell Todd**, Executive Director, South Dakota Board of Regents; the late **Roland Dolly**, Governor's Office of Economic Development; **Dr. Thomas Malone**, Director, Sigma Xi, Scientific Research Society, Research Triangle Park, NC; **Victor Myers**, Brookings, SD; **John Dozzi**, Vice President/Operations, Horizons, Inc.; **Dr. Wallace Sanders**, Consortium Director, Iowa Space Grant College Consortium, Iowa State University; and **Dr. Royce Engstrom**, University of South Dakota.

According to Waltz, this summer marks the third year the EDC has participated in the SDSGC. As a participant, the Data Center provides an opportunity for people from the Space Grant Universities of South Dakota to come to the EDC during the summer to work in areas of mutual interest to the universities and the Data Center. "We've had two geologists from the School of Mines," recalls Waltz, "who have both worked with **Charlie Trautwein**. Last summer, we had a graphics artist from SDSU whose input is changing the way we publish data through CD-ROM."

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The South Dakota Space Grant Consortium

The South Dakota Space Grant Consortium (SDSGC), established in 1990, is a program that aims to improve research capabilities within South Dakota. The SDSGC is funded in part by the Future Fund of South Dakota and the National Aeronautics and Space Administration's (NASA's) branch of Human Resources and Education. Of 52 Space Grant Consortia in the



United States, a group of states promoting educational outreach programs (for students K-12) was established first. A second group of 17 states, called Capability Enhancement States (CES), was formed, where the primary goal is to improve their research capabilities. CES states are similar because they lack NASA research sites and offer relatively few research opportunities. As a CES state, South Dakota's main objective is to improve the research

Early Concerns About EROS

The EROS Data Center traces its roots to 1972, when a small crew of Federal employees began working out of leased office space in downtown Sioux Falls. This downtown facility would serve as the temporary home of the EDC until its permanent home was completed on a tract of land 17 miles northeast of Sioux Falls in the Spring of 1973.

While many South Dakota residents and politicians lobbied hard for the location of the EDC at its present site, the Center really didn't set well with some area farmers. As the EDC building and grounds were completed 20 years ago, there were a number of uncertainties associated with the new, high-tech facility only time could answer. It wouldn't be long before neighboring farmers would discover if their reservations and concerns about EROS and its satellite technology were warranted.

The Data Center was built at this site after locations near Hartford, SD and another 2.5 miles west of this site were rejected. The land was purchased by the Federal government from a couple of long-time farm families, **Alfred and Annettie Hegge** and **Rudolph and Olga Froseth**.

Alfred Hegge's father and his two brothers came to America from Norway. The three Hegge brothers all established farmsteads within a couple miles of each other in 1872. The Alfred Hegge farm was much like any other along the gravel roads of Minnehaha County. The Hegges raised sheep, hogs and chickens. They harvested corn and oats. Directly across from a small cemetery stood a tiny, white chapel known as St. Paul's Lutheran Church. North of the old church (on today's picnic grounds) stood a white, 4-bedroom home. Scandinavian pride showed throughout the homestead - including the chicken coop, barn, garage, hog house and grainery. Across the road to the west there was a one-room school house known as "Hegge School" [attended by **Robin**

Hermanson, Viking Engineering Service Company]. This was a typical South Dakota rural setting. The Hegges and the Froseths were traditional Scandinavian farm families who had tilled this land for three generations. They valued stability and, more often than not, resisted change. Then, one day a letter arrived from the Sioux Falls Development Foundation that would change the lives of both families.

While several EDC employees live and farm in close proximity to the Data Center, two have particularly deep agricultural roots. **Robin Hermanson**, VESCO facility engineer, lives and farms on land home steadied by his grandfather over a hundred years ago. **Kent Hegge**, Customer Services Section, is the 4th generation of Hegges to farm land west of the Data Center. His great Uncle and Aunt sold their land to the Federal government to make room for EROS.

"The Sioux Falls Development Foundation," recalls Hegge, "put out a notice that they were going to build in the Sioux Falls area and they wanted landowners to contact them. They had interested landowners sign letters of intent to sell. When the Federal government selected this

site, the elderly landowners had decided that perhaps they didn't want to sell. But then, it was too late." Because of their letter of intent to sell, the landowners couldn't change their minds. This misunderstanding didn't impress area neighbors, nor did the final price Uncle Sam paid for the land.

Hegge remembers the questions and concerns on the minds of his parents and neighbors as the Data Center was being planned. "One of the big issues was, when this (the EDC) came in we knew we'd have to have special devices installed on the ignition systems or mufflers of our tractors because the static would supposedly interfere with satellite transmissions.

We were told we probably couldn't build any silos or buildings without government approval. And at that time, we were a very rural area so that any time a government person comes in and tells you what to do...it's not exactly what you want."

In addition to special tractor add-ons and government building permits, Hegge says new roads were completed to accommodate the facility. "County Road-121 wasn't paved. It was an all-gravel road. The pavement was put in after EROS was an-

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Alfred and Annettie Hegge (front) officially sell their land for the EROS Data Center by transferring the deed on Oct. 26, 1970. Looking on (l. to r.) **Claude Hamilton**, Attorney for the Hegge's; **Clifford Hegge**, their son; **Dave Stenseth**, Sioux Falls Development Foundation; and **Joe Griffin**, Notary Public.

UN-L and EDC Continued from page 2

EDC/UN-L partnership dates back to 1986 when the two facilities officially agreed to cooperate on research involving remotely sensed data. "I first came up here in 1975 on business from the University of Kansas," recalls Merchant. "Being in Kansas was too distant to try and collaborate on things. When I moved to Nebraska (University of Nebraska-Lincoln) two things happened. One, I was half the distance here, which made it more practical to come up here. Secondly, we were establishing a consortium (at UN-L) that we wanted to form cooperative relationships with agencies, and particularly with EROS because of the proximity. So, we developed a cooperative agreement for general collaboration on things of mutual interest.

Two and a half years ago, Tom (Loveland) was getting this land characterization project going, which happened to be something that interested me, and so we decided to get together on it."

Jess Brown became involved after completing an internship at the Data Center with **Kevin Gallo** of the National Oceanic and Atmospheric Administration (NOAA), who has since transferred to a NOAA facility in Asheville, NC. When Brown had completed her internship, Merchant got the idea of placing her on the UN-L payroll and keep her assigned



Jess Brown, a visiting scientist with the UNL Conservation and Survey Division's Center for Advanced Land Management Information Technology.

here as the University's on-site person.

As a result, CALMIT hired Brown to work on projects funded by the United States Environmental Protection Agency (EPA) and the U.S. Geological Survey. In addition to the University of Nebraska-Lincoln, the EPA project includes Iowa State University, Ames, IA and the University of Kansas, Lawrence, KS. This university triumvirate works together to study the effects of agricultural land-use, vegetation cover and issues involving water quality.

Brown's primary task at EROS is researching ways to use Advanced Very High Resolution Radiometer (AVHRR) data to map and characterize land cover at regional, continental and global scales. Merchant, Brown and EROS scientists, such as Tom Loveland, **Don Ohlen**, and **Brad Reed** have completed experimental projects using satellite data, digital topographic data, climate data and other regional data sets to map the nation and the globe.

"Jess' on-site presence makes the cooperative work going on between Nebraska and EROS daily rather than periodic," says Merchant. "It's meant another set of hands on the project. By virtue of having her here to work on it, it's accelerated the project a bit and definitely strengthened the collaboration between our groups because of the day-to-day contact."

Brown has been at EROS since February 1991 in her current position. She is appointed on a year-to-year basis contingent on the availability of EPA grant funds. According to Brown, the cooperative land cover mapping project between EROS, UN-L, and the EPA will last for about another year. Until then, Brown says she's keeping her eyes and ears open for other opportunities. "Jim has been really great at coming up with more funding to cover me," says Brown. "However, I can't assume that the well will never run dry. When this position ends, I will have been exposed to a wealth of knowledge about land

cover work using satellite data and the day-to-day issues in doing scientific research with the Federal government. My prospects for future work in the field of remote sensing have been improved substantially through my participation in this project.

There is so much going on at the Center, which is "pushing the envelope" in remote sensing. I feel very lucky to be here, and I hope to continue on here for a long time. But if that is not possible, I'll leave EROS with good feelings about working here." ☺

NEWHIRES

U.S. Geological Survey

George Timson - George comes to the Data Center from the USGS Midcontinent Mapping Center (MMC), Rolla, MO to join the Data Center's DLG-E Annex in Sioux Falls. George's one-year assignment will have him performing preliminary work for the DLG-E Initial Production Capability System. George, originally from East Alton, IL, earned a B.S. in Computer Science from the University of Missouri-Rolla. He has worked at the MMC since 1985. George and his wife, **Pamela**, have three boys: **Joel-13**; **Seth-11**; and **Craig-5**. George enjoys running, playing racquetball, and canoeing in his free time.

Jesse Nelson - Jesse is a graduate student in geography at SDSU who is working with **Norman Bliss** on his Global Soils Data Base. The Lake Preston native is a government part-time employee on staff until roughly November. Jesse expects to complete his M.S. in Geography next December. Away from the Data Center and the Brookings campus, Jesse likes to fish.

Kristi Herman - Kristi continues her government student co-op program this summer at the EDC by working with John Dwyer in the S&AB doing some IDL program-

ming. The Computer Specialist Student Trainee from the South Dakota School of Mines and Technology, Rapid City, SD will be at the EDC through August. Until then, she will be reporting to Tom Loveland who refers to her as "Darn near a veteran." Herman expects to complete her B.S. in Mathematics in May of 1994. Originally from Menno, SD, Kristi enjoys riding mountain bikes and reading.

James Dewald - Jim joins the EDC as a Physical Science Technician in the S&AB where he's working with **Dan Steinwand** providing geometric registration assistance. Currently Jim is working on his M.S. in Electrical Engineering at SDSU. He returned to SDSU to study engineering after several years in the commercial print business in Sioux Falls and Minneapolis.

Sharon Ivans - Sharon is at the Data Center as an intern from SDSU. She holds a B.S. in Geography and Landscape Design from SDSU and anticipates completing her M.S. in Geography next December. Sharon, a Sioux Falls native, worked 10 years at the Defense Mapping Agency in St. Louis, MO before returning to South Dakota to continue her education. During her internship, Sharon is working on Land Characterization Projects with Tom Loveland and Don Ohlen. Her hobbies include camping, alpine skiing, and golf.

Mark Hillesheim - Mark is a senior majoring in Electrical Engineering at SDSU. The New Ulm, MN native is working on data visualization projects with Dave Meyer and Jay Feuquay this summer in the S&AB. Mark expects to earn his B.S. in Electrical Engineering next December. His hobbies include hunting, fishing, water skiing, and playing the guitar.

Kevin Larson - Kevin is just beginning work on his M.S. in Computer Science at SDSU. The Madison, MN native is working with Sue Jenson performing raster image processing. Away from his computer, Kevin enjoys reading science fiction books.

Hughes STX

Dawn Buehner - Dawn has been hired as a part-time secretary for the UNEP/GRID office. Originally from Fulda, MN, Dawn now lives on an acreage near Garretson with her husband, **Brad**, and their three children: **Carie**-15, **Tyler**-3, and **Brendyn**-2 months. Dawn attended Mankato Commercial College for a year and earned a degree in the legal secretarial field. In addition to EROS and her acreage, Dawn works part-time at the Brandon Steakhouse and is enrolled at Sioux Falls College - taking night classes two nights a week in general studies. If she has a spare moment, she enjoys gardening and home remodeling.

Michael Choate - A former student intern in the S&AB, Mike has been hired as a programmer at the DLG-E Annex in Sioux Falls. He has earned undergraduate and M.S. degrees in Electrical Engineering from SDSU. His hobbies include all types of sports.

Susan Peterson - Susan is working with **Layth Grangaard** in the International Projects Section managing an African database. The Madison, SD native with a degree in Math from SDSU is "looking for a full-time position anywhere" since she earned her degree in May. Susan prefers to golf, hike, and camp whenever possible.

Harold Christiansen - Harold, Associate Professor and Director of Computer Services at Sioux Falls College, is working with Layth Grangaard on the Famine Early Warning System project involving Africa.

Tricia Gillen - Tricia is majoring in Math and Computer Science at SDSU while competing on a track scholarship. The Jasper, MN native is a middle distance runner specializing in the 800 meters. In addition to running, she spends much of her free time biking and roller-blading. Tricia is participating in the Famine Early Warning System for the IPS. She will continue her FEWS work

until the project ends or until she has been graduated next May.

Eric Wood - Eric is working with **Andrew Nadeau** on Famine Early Warning System work involving Ethiopia. Later this summer he will begin a project with **Gray Tappan** involving Senegal. Currently Eric is working on his PhD in Environmental Monitoring at the University of Wisconsin-Madison. He also has earned an M.S. in Computer Science Education and a B.S. in Natural Resource Management. Originally from Adrian, MI, Eric likes to hike, fly fish, and other types of "outdoor stuff."

Summerhires

Paul Olsen - Paul returns to the EDC for another summer of work involving cartography. Since last summer, Paul was graduated with a B.S. in Cartography from the University of Wisconsin-Madison. He plans to begin work on his M.S. in Cartography/Remote Sensing at the University of Wisconsin this fall. You can find Paul working out of **John Hutchinson's** office off of the S&AB workroom. He's using John's Macintosh computer to work on the Land Characteristics Mapping Project with Don Ohlen, Jess Brown, Tom Loveland, and Jim Merchant. Away from the Data Center, the Waukesha, WI native enjoys playing soccer, fishing, and participating in other outdoor sports.

Chris Taylor - Chris comes to the EDC from Purdue University, West Lafayette, IN, where he is currently working on his M.S. in Electrical Engineering. Before attending Purdue, Chris earned a B.S. in Electrical Engineering from South Dakota State University. Originally from Brookings, Chris is working with **Chuck Wivell** in the Information Sciences section of the Science and Applications Branch using synthetic aperture radar to acquire imagery of Alaska. After receiving his M.S. in Electrical Engineering in May 1994, Chris plans to study for his PhD. When he's not studying,

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EDC - EPA Continued from page 1

national ecological region patterns and their use in better managing water quality problems, caught wind of what we (the EDC) were doing with Advanced Very High Resolution Radiometer (AVHRR) data. This is a group that has been mapping eco-regions across the United States. It was interested in seeing if what the EDC was doing in mapping land cover regions could benefit their eco-regions work."

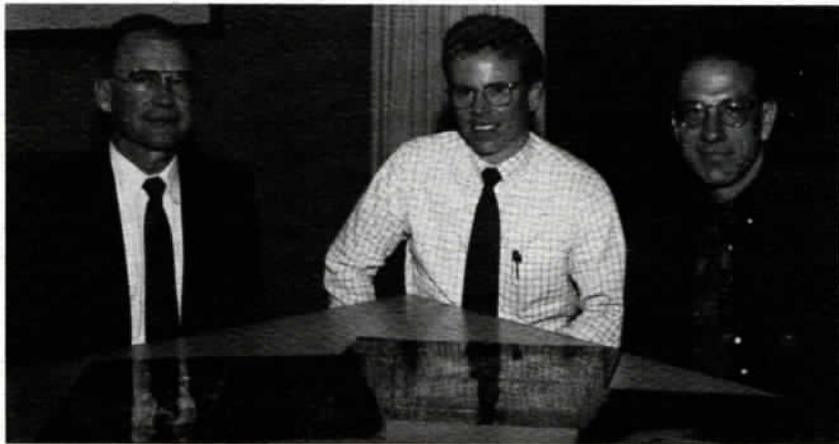
According to Loveland, an event that really started to formalize relations between the EPA's Corvallis Lab and the EDC occurred when **Jim Omernik**, the leader of the EPA's Eco-region Program, visited EROS. "We do a lot of informal work with the Corvallis group - contributing to their mapping of ecological regions of the U.S."

The EDC, as well as the Alaska Field Office, also are collaborating with the ERL and Environment Canada on a pilot project to map eco-regions across northern latitudes. [The present project involves Alaska and Canada.] The driving force behind this cooperative work is the Corvallis Lab's Arctic Contaminants Research Program, which is trying to investigate problems such as why arctic skies are more polluted in winter months than Los Angeles. [Scientists suspect pollutants from eastern Europe may be the cause.]

When the EPA's Corvallis Lab began assessing national patterns of biological diversity, including the risks, **Eric Preston** called the EDC because of its AVHRR activities. Loveland says the EPA liked what it saw in our AVHRR data sets because it thought they might be suited for determining species richness across the U.S. "The EPA in Corvallis, the Survey (USGS), the U.S. Fish and

Wildlife Service, the Forest Service (USDA), and the Nature Conservancy formed a group called the Biodiversity Research Consortium, which recently received approval to start a 3-year, multi-million-dollar project to come up with methods to assess national biological diversity. The EPA has asked us (the EDC), as part of the Consortium, to lead the landscape analysis research, which looks at how you characterize vegetation and habitat as it relates to biological diversity.

The EPA's Corvallis facility views the EDC as its "sister lab" because we have a lot of the data programs underway that feed it's research.



Gene Meyer, EPA Las Vegas, **Jim Sturdevant**, SAB Deputy Chief, EDC, and **Ross Lunetta**, Manager, North American Landscape Characterization Program, EPA Las Vegas, review landscape characterization products produced by the EDC during the EPA visit in March.

While the potential of biodiversity research with the EPA Corvallis unit is exciting, Loveland points out we're also doing a lot of production work with the Las Vegas Lab.

"Probably the most visible project in the building is the Landsat Pathfinder project called the "North America Landscape Characterization (NALC) project. The NALC project, under the direction of **John Dwyer**, Land Sciences Section, will develop Landsat multispectral scanner (MSS) triplets for the 1972 era, the 1986 era, and the early 1990s era of the entire North American continent to study land cover changes. The EDC is producing all the geo-registered MSS data [a 3-year activity]."

The NALC activity has pushed the EDC to improve production efficiency and image processing modelling while forcing the Center to get back into the Landsat business in a hurry. "So in addition to revitalizing and modernizing the EDC Landsat data handling capabilities," explains Loveland, "it's going to help kick us back into a research mode for Landsat research and applications."

According to Loveland, paralleling NALC is an EPA program called EMAP (Environmental Monitoring and Assessment Program). "This is a program the EPA designed to be an environmental census. Through a host of indicators, EMAP would tell us the health of America's environ-

ment. Under this program, periodically the EPA would measure the pulse of America's ecological systems and decide if we're doing better or worse by dividing environmental resources into seven groups: estuaries, surface waters, arid lands, agri-ecosystems, Great Lakes, forests, and wetlands. In the early days of EMAP, the EPA was one of the first to fund the EDC's Conterminous U.S. AVHRR Land Characteristics mapping (Normalized Difference Vegetation

Index [NDVI]) products." [NDVI is an index measuring "greenness" or vegetation maturity over a given period of time.]

In addition to ties with EPA labs in Corvallis and Las Vegas, the EDC has informal connections with the EPA's North Carolina facility. According to Loveland, this work involves experimentation with modeling biogenic emissions. "There's a need to understand the level of natural hydrocarbons released to the atmosphere," explains Loveland. "It's important to understand what the level is across the U.S. to find out what goes above that is actually pollution."

Because this data is difficult to measure, the EPA's North Carolina group uses mathematical models to measure trace gases in the south-eastern U.S. While skeptical of its usefulness for their models, the EPA approached the EDC about using its national land cover data set. The results using this data set were so effective the EPA now is using the EDC National Land Cover Data Set in a biogenic emissions model to estimate natural occurring hydrocarbons nationwide.

March 2-3 six EPA officials from Washington, D.C., as well as the Corvallis and Las Vegas labs, visited the EDC to find out more about the capabilities of our Center and further cement long-term relations between the two parties.

Roger Blair, Watershed Branch Chief of the EPA's Environmental Research Lab in Corvallis, was among the EPA contingent. According to Blair, he didn't know what to expect on his first visit to the EDC, but he was impressed. "I didn't have any idea of the size of the resources you have. This is just an exceptionally well run and organized organization. There have been a lot of folks that have been archiving data for a long time. I've never seen anything that was organized as well and run as well as this one."

Secretary of the Interior, **Bruce Babbitt**, has mentioned a possible proposal to create an agency called the United States Biological Survey. According to Blair, this organizational move interests the EPA almost as much as the Clinton Administration's proposal to provide the EPA cabinet-level status. "We're looking at that with a great deal of interest," says Blair, "because there are some very obvious overlaps and interrelationships between what EPA's research program does and what that's proposed to do. Of course part of the Biodiversity Consortium is EPA-DoI working together on that Habitat Biodiversity Initiative so it's a logical interaction there. Also, EMAP and the Biological Survey will have very close interactions that will obviously have to occur."

Even though it may be premature to discuss the Clinton Administration's proposal to make EPA a cabinet-level agency, Blair says it's nice to think you'll be invited to sit at "the table." "A lot of decisions are made which aren't necessarily strictly environmental decisions, but have an environmental overtone (international policy for instance). There can be some significant environmental issues to be addressed as we saw in the Rio Conference [United Nations Earth Summit, June 3-14, 1992, Rio de Janeiro, Brazil]. As nations interacted, environmental issues are becoming more and more important. It's almost as if this issue has replaced the Cold War in terms of the kinds of issues that we deal with. For instance as we deal with starving populations, many of those are environmental problems that have developed from the history of where we have chosen to spend our resources. Obviously, elevating EPA to departmental status brings them an even footing."

While the EDC works with Blair and the Corvallis Lab primarily through research, the Center is more involved with production activity with the Las Vegas Lab. **Denice Shaw**, Technical Coordinator for EMAP Landscape Characterization, was another of the EPA delegation making her first visit to EROS early last month. She believes EROS will be vital to EMAP production techniques. "I'm not so sure that pulling data out of your archive is going to be as important as putting data into your archive," says Shaw. "We're going to be doing some major acquisitions and we've already got data coming in for a bunch of states. I don't think it's appropriate for us to hold those. I really think they need to be somewhere...like here."

In addition to the EDC's data archive expertise, Shaw appreciated the visible cooperation she noticed among EDC staff members. "I'm really very impressed," admits Shaw, "by the atmosphere of the folks working and pulling together and the fact that there's not much distinction between contractors and Feds, which is something the EPA is going

through pretty tough times with. I just like to see that cooperation and it's been real apparent as we've gone through the tour and just talking to folks. You work together really well."

Shaw believes the cooperation between Federal and contract staff at the EDC will lead to better research, which is good news for strengthening cooperative efforts between the Data Center and the EPA. "I think that we need to be really tied-in to what you folks do with regard to data generation, spatial data, what data products you have out there, keeping track of improvements, figuring out how to link into your automated "clearing house" of data, and just working with you as a user and giving you feedback. We also like the idea of you helping to broker the acquisitions of Earth Observing Satellite (EOSAT), archiving of the raw data. There might even be a distribution function for EMAP data as we generate it. How is it going to be managed? We certainly can learn from you on how to do that better."

As a two-way cooperative exchange, Shaw believes the EDC will be able to learn much from the EPA as well. "We are real, bonafide users of your data and we're going to really push it to the limits in terms of needing good quality data and being able to access it. We're really going to be pushing you guys because we really need to have known confidence about the data we're working with and we have to get that from you."

In summary, what started out as a lot of colleague-to-colleague interaction (government bonding in the truest sense!) has led to what appears to be an exciting and growing list of cooperative research and production activities benefiting the entire Data Center and the EPA as well. ☺



NEWHIRES Continued from page 7

Chris enjoys playing racquetball and reading.

Maureen McManus - Maureen returns to the Data Center for another summer of employment. She is attending the University of South Dakota where she's working on her B.S. in Clinical Psychology. While Maureen has worked in Logistics in the past, this summer she once again will help out in the Computer Archives area. Maureen is a graduate of Sioux Falls O'Gorman and is related (but sometimes doesn't like to admit it) to **Lee McManus**, Technical Information. Maureen will receive her B.S. degree in December 1993 before pursuing her M.S. and PhD also in Clinical Psychology (using her Father as a case study).

Steve Johnson - Steve will be a senior this fall at South Dakota State University where he will earn his B.S. in Geography in December 1993. He's putting his geographic knowledge to work for **Ron Risty** in Customer Services this summer. The Apple Valley, MN native says he enjoys hunting, fishing, and other sports in his spare time.

Holly Singsaas - Holly comes to EROS from the South Dakota School of Mines and Technology in Rapid City, where she's working on a B.S. in Computer Science. The Rapid City native is transferring Normalized Difference Vegetation Index (NDVI) data to CD-ROM. In addition to working with computers, Holly enjoys bike riding, hiking, and playing the piano.

Neil Buesing - Neil joins **Randy Sunne's** Software Development group for the summer. He has earned a B.S. in Computer Science from the University of Minnesota-Morris, and is currently working to complete his M.S. in Computer Science. Neil is a native of Marshall, MN.

Kristin Wengs - Kristin comes to the EDC from Iowa City, IA. She currently holds a B.S. in Landscape Architecture/Geography and intends

to pursue a M.S. in Geography at SDSU.

Michael Rechtenbaugh - Mike joins Electronics Engineering this summer working with Gary Nelson to provide preventive maintenance on PCs in the building. Mike is a student at SDSU majoring in Electrical Engineering and Computer Science. The Canistota, SD native anticipates graduating in the spring of 1995. The recipient of a South Dakota Space Grant Consortium scholarship, Mike enjoys motorcycle riding, volleyball, racquetball, and bicycle riding in his spare time.

Teacher Interns

Dale Solberg - Dale teaches 7th grade Life Science, 8th grade Earth/Space Science, and 9th grade General Science at Dell Rapids Public Schools. Dale and his wife, **Natalie**, have two boys: **Eric**-10 and **Jordan**-4. Dale is working with SLAR data in the Archive Management Section by putting them on CDs. His hobbies include baseball, basketball and family activities.

Ray Christensen - Ray is a math teacher in the Sioux Falls school system. The Christensen family includes his wife, **Alice**, and four children. **Lisa** attends Augustana, **Marin** is going to SDSU, **Erik** is at Washington High School and **Kira** is at Whittier Middle School. Ray will be preparing plots of the Fertility Capability Classification system as applied to the FAO Soil Map of the World. Ray was a "Teacher of the Year" finalist through a US West program, President of the South Dakota Education Association, and recently chaired the Technology Design Group for the Sioux Falls School System.

South Dakota Space Grant Consortium Summer Faculty Fellows

Dr. Colin Paterson - Colin is an Economic Geologist with the Department of Geology and Geological Engineering at South

Dakota School of Mines and Technology (SDSM&T), Rapid City, SD. During his 10-week stay this summer at the EDC Colin will be working with Charlie Trautwein to develop a GIS for the Black Hills to improve knowledge about precious metal deposits. When he returns to the SDSM&T campus, Colin hopes to convert existing autocad maps to ARC/INFO GIS data. Originally from Invercargill, New Zealand, Colin earned his PhD in Geology from the University of Otago, New Zealand. Colin and his wife, **Lynne**, live in Rapid City with their two daughters: **Anna**-12; and **Kirsten**-7. Colin's interests include photography, sports, and outdoor recreation. Colin has been with the SDSM&T since 1982.

Dr. Sung Shin - Sung is an Assistant Professor in Computer Science at South Dakota State University, Brookings, SD. He will be working with Jay Feuquay for 10 weeks this summer on advanced image processing projects. From Seoul, Korea, Sung has been in the U.S. for 12 years. He earned a B.S. in Computer Science from Kentucky State University, Frankfort, KY. He completed his M.S. and PhD in Computer Science at the University of Wyoming, Laramie, WY (becoming the first person in Wyoming ever to receive a PhD in this discipline). Sung has refereed 22 publications and specializes in software engineering, specifically software fault tolerance. Sung's interests include skiing and racquetball. He and his wife, **Ann**, live in Brookings with their two daughters: **Jennifer**-10 and **Sarah**-4. ☺

New Addition Continued from page 2

ty for putting together the contractual arrangements to build this facility."

At another recent meeting involving Spitznagel, the architectural and engineering firm for the new facility, Hood says refinements to the bid package were discussed. "There were a series of studies that had to be completed during the design about very special applications and meeting environmental and ADA [Americans with Disabilities Act] requirements. Those are all complete. "While the required Federal studies are now complete, the Architect is scrambling to assemble roughly 300 pages of bid specifications and over 100 pages of plans into a series of packages for the bid process. "Things are heating up. The normal interval from invitation for bids to a response is 45-to-60 days. This means we had better have that bid package ready to go on the street round about August 1st."

Hood says the Data Center's somewhat optimistic goal is to break ground this fall. "If the bid process goes about as we expect, if our appropriations are fully passed to the Data Center and if we have a Federal budget in place about October 1st, we would seek to award (the contracts) this fall."

Therefore, if the bids are awarded by mid October and there is a 30-day mobilization period, it will be close to frost and winter time before building could begin. "The important thing," Hood stresses, "is to get the contract let. If the construction time is 16-to-20 months, depending on weather, we'll make it (the summer of 1995 deadline to meet the requirements of the Earth Observing System (EOS) Program under the agreement with NASA) if we can start this fall, or even as late as next spring."

While the invitation for bids will be announced nationwide, Hood expects a regional or local contractor to do the work. "Spitznagel believes that a contract of this size (\$9 million) will attract some outside bidders - Omaha, Minneapolis, Kansas

City - but probably regional rather than national bidders. There are a couple of contracting firms in Sioux Falls with sufficient size, bondability, and financial integrity to take on a project of this size and we'd be very pleased to work with one of them."

While building costs increase 2-to-3 percent per year, Hood seems confident the new LPDAAC can be built for \$9 million. "We have prepared the bid package so that there are add-alternates and deduct-alternates so that we'll be able to mix and match to end up with a successful bid."

As reported in the Spring issue of EROSDATA, the schedule and funding for the building addition were uncertain at best. According to Hood, the dim prospects of earlier this spring have brightened considerably. "I guess I'm back on 'full glow.' It really does look optimistic and barring some major catastrophe, we'll get a good, functional, handsome, enhancement to the Data Center that will not only address the needs of the EOS Program, but also the Landsat 7 Program, future archive needs, and some of the shortcomings of this building." ☺

SDSGC Continued from page 4

Waltz says SDSGC visiting scientists can be very useful to the EDC by working on important research topics that, unfortunately, are understaffed because of limited EDC funds. As a result, the scientists add another dimension to the Data Center's pool of talent. In addition, visiting scientists through the SDSGC can further cement our relationships with the university community.

According to Waltz, the SDSGC works like this. "While at the EDC, visiting scientists become exposed to EDC projects and ideas, use advanced equipment, and make new contacts with EDC cooperators, such as NASA and other Federal agencies. When they return to their

respective universities, the scientists surround themselves with undergraduate students on scholarship with funds available from the Consortium. As a result, the SDSGC builds a core of South Dakota expertise, advancing space sciences research and development."

In addition to the scientists who visit the EDC through the SDSGC, the Data Center hosts three or four other visiting scientists during the school year. Currently three other visiting scientists are on board: **Jess Brown**, University of Nebraska-Lincoln; **Larry Tieszen**, Augustana College; and **Ian Flitcroft**, University of Georgia.

While the EDC has always hosted visiting scientists from colleges and universities nationwide, it has never reached its full potential because of lack of funding, space, or other reasons. The issue of inadequate office space has been remedied for the time being by some very inexpensive changes to existing facilities. For example, after a couple of new desks, a little paint, lighting improvements, and some rearranging, the SAB Micro Lab now has room for six guest researchers. The new office space for SDSGC visiting scientists also was outfitted with various computer hardware thanks to the efforts of former SAB staffer **Jack Pursall**.

Jim Sturdevant, Deputy Chief, Science and Applications Branch, sees the SDSGC as one of many important tools the EDC needs to improve its external communication with colleges and universities. The new office accommodations should help in that goal. "In addition to the Hughes STX Summer Hire Program and the Federal Government Co-op Student Program, the South Dakota Space Grant Consortium is an important mechanism for the Data Center to stay fresh with state-of-the-art research taking place at colleges and universities nationwide. We hope the Data Center's participation in the SDSGC will serve state and regional universities with remote sensing and geographic information systems (GIS) technologies." ☺

Early Concerns Continued from page 5

nounced. The EROS access road from 121 used to follow the terrain. It used to go up a big hill before going down into the meadow. The creek was diverted so that the creek entrance was placed where the bridge is now. You can just imagine the amount of fill (soil) they had to bring. Again, when the government comes in and tells you exactly how much land it has to take, they're going to do this, and they're going to do that...that didn't set well."

Back when EROS was being constructed at this site, the Cold War nuclear threat was still an underlying concern. According to Hegge, local farmers joked about their EROS vulnerability. "If the United States was ever attacked," explains Hegge, "locals thought that EROS is one of the first places they (the Soviets) would bomb because of the new technology. With the nuclear problem, they (area farmers) just assumed that if EROS was bombed, everything two miles around would be blown up as well."

While some farmers feared a potential nuclear threat, others worried about their pocketbooks. "There was a farmer who had a milk herd and he thought that static transmissions from the satellites would affect the milk production of his cows."

According to Hegge, while some neighbors feared for their livestock, others worried about their soil. Some landowners feared photographic chemicals in the lake water might contaminate the soil and groundwater.

As the Data Center became closer to becoming a reality...and a neighbor, speculation continued to mount. For example, with all of the new employees hired to work at EROS, some locals wondered where all of the incoming would live. Area residents worried that their rural setting would change as all newcomers formed their own small community around the Center. This theory failed to materialize when the Minnehaha County Planning Commission established a zoning corridor, (still in effect today) from the EDC to Sioux Falls, which restricts the amount and type of construction.

"A lot of the people here in the early years," says Hegge, "tended to look a little fruity. To bring a large number of young, scientific, ethnically diverse people into a conservative, rural, Scandinavian setting really contributed to local humor." According to Hegge, the Data Center's "liberal" work force and jet-set lifestyles earned it the reputation of "Sin City."

Because hindsight is 20/20, it's easy to look back and see what concerns were valid and what were not.

There were no mufflers or ignition systems for tractors, nuclear bomb attacks, or EDC urban development projects.

Conversely, roads changed and building restrictions prohibited the construction of silos and buildings. While photographic chemicals released by the EDC meet safe levels established by the Environmental Protection Agency, some area farmers still question whether these levels equal those before the Data Center was built.

Once the EDC was operating in its new building twenty years ago, common questions among the local ethnic groups were: "Who are all these foreigners...and what do they really do out here?" It's interesting ethnic communities would ask such questions considering their ancestors were once foreigners themselves! ☺

Remember: EROSDATA is published quarterly for EDC employees. The success of this publication depends on your input. EROSDATA coordinators welcome your comments and ideas for future issues.

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Joe Griffin, Notary Public, watches **Rudolf** and **Olga Froseth** cross their T's and dot their I's as they transfer the deed to their land to the Federal government.