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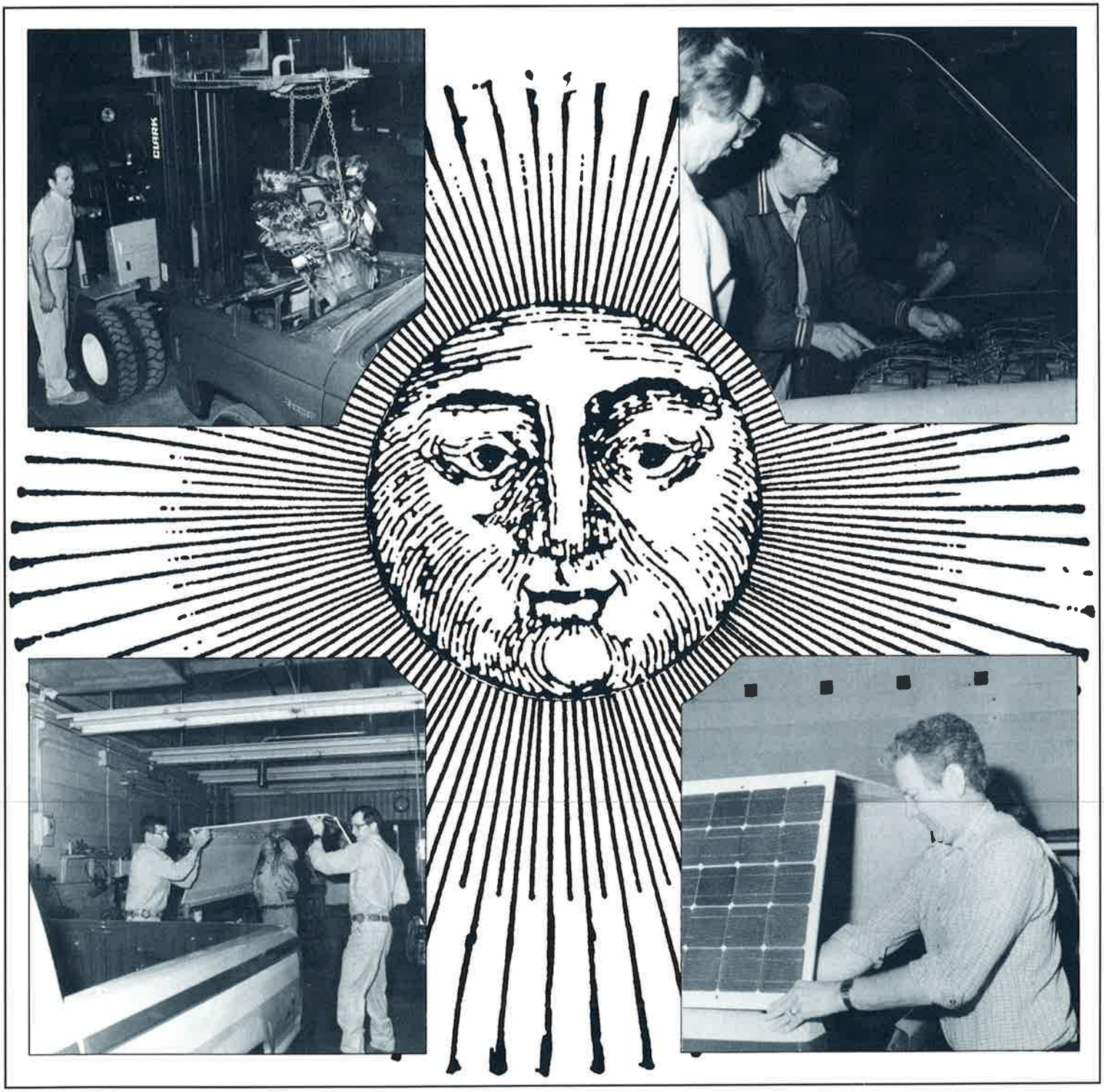
AMES LAB INSIDER



EXPERIMENTAL SOLAR TRUCK READY TO ROLL • Page 4

Gschneidner Wins Award Named for Mentor

Karl A. Gschneidner, Jr., senior metallurgist and director of the Rare-earth Information Center is the sixth winner of the Frank H. Spedding Award. He received the award in July at the 19th Rare Earth Research Conference held in Lexington, KY.

Gschneidner worked with Spedding for several years and was one of his graduate students. "It's an honor to receive an award that is named after someone I've known, worked with and thought very highly of," says Gschneidner. "He was my mentor and my friend."

Gschneidner is the second Ames Lab scientist to win the Spedding Award. In 1983, Sam Legvold was a co-recipient of the third award.

Rhone-Poulenc, an international producer of rare earth materials, is the sponsor of the award. The Rare Earth Research Conference, Inc. named the award after Spedding, the first director of Ames Lab, because of his intense interest in rare earth chemistry, metallurgy, physics and spectroscopy. The award honors the person(s) whose leadership in the rare earth field comes closest to the model set by Spedding during his career of over 50 years.

After receiving his doctorate from ISU in 1957, Gschneidner worked at Los Alamos National Lab for six years. Since his return to the Ames Lab in 1963, Gschneidner's career has flourished. He is the founder and director of the Rare-earth Information Center. A prolific writer, he has published 223 articles in refereed journals, written 101 chapters in books, published 28 reports and bulletins and 204 phase diagram evaluations, and written or edited 19 books. He has received numerous awards, four patents, and is editor-in-chief of the *Handbook on the Physics and Chemistry of Rare Earths.*

Karl Gschneidner

Gschneidner's research interests include the physical metallurgy of rare earth metals and alloys, theory of alloy phase formation, electronic transformation of cerium, spin fluctuations in exchange enhanced solids, heavy fermions and superconductivity. ❑

NATO Grant Backs Magnetics Research

Ames Lab Senior Physicist David Jiles is excited about a recent NATO Collaborative Research Grant that is allowing him to investigate the secrets of Terfenol with a scientist from the University of Hull in the United Kingdom (U.K.).

Studying how the material is magnetized, how it performs and how it can be applied to existing and new technologies, Jiles views the international project as a giant step toward increasing awareness of the Lab's magnetics research outside the U.S. "I'd like to see the area of magnetics grow so that people in Europe are aware of what we're doing," states Jiles. "It's important that we have international collaboration to get exposure for Ames Lab and our magnetics activities, as well as gain some contacts for our students who are working on the project."

Over the last few years, scientists in the U.K. and Sweden have started following Ames Lab's work in the development of highly magnetostrictive materials. "The Europeans are proving quite superior at discovering applications for these materials, but have not achieved the quality product that we have," explains Jiles. "Researchers at Ames Lab have found ways to change the chemistry of Terfenol and improve the material to a very high degree, but have not yet looked closely at possible applications," he says. "So we've got this wonderful material, now what do we do with it?"

A premier application is the use of Terfenol to dampen out vibrations, which it does first by detecting them as they come into an object. Sensing the magnetic field created by a disturbance, the elements within Terfenol change lengths so they exactly counteract and absorb the vibrations coming in. This type of vibration control is being applied to worktables where technicians toil over circuitry for tiny microcomputer chips and where the most minute vibrations can cause significant problems.

David Jiles

Jiles believes Terfenol has great potential in science for vibration damping of optical equipment and almost any kind of positioning device.

Looking at the magnetization and magnetostriction mechanisms in Terfenol and prying loose the secrets of how it performs will provide information that Jiles intends to use in developing a computer model to predict how the material behaves or will behave under specific conditions. The model will allow researchers to set up the starting configuration of the material. Simulating the effect of a magnetic field on the computer, scientists can observe how the material changes. Altering the starting conditions from time to time will aid in learning how the material performs and provide an idea of what the optimum starting configuration would be.

The opportunity for international collaboration with the U.K. made possible by the NATO grant provides a perfect opportunity for cooperative learning, sharing our expertise in making high

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New Faces in SH&PP

Joining the Ames Lab community in July, James Withers and Hugh Hammond are new members of the Safety, Health and Plant Protection (SH&PP) team. "The two positions were driven by a new federal laboratory safety standard and increased training requirements resulting from new OSHA standards and DOE orders," says Lowell Mathison, SH&PP manager.

JAMES WITHERS is the Lab's new laboratory chemical hygiene officer. He will develop and implement a state-of-the-art chemical hygiene plan for Ames Lab that will assure compliance with federal and state statutes and requirements and DOE orders. "I'm excited about being a member of the Lab's health staff and being around the academic environment at ISU," says Withers, who received his master's in environmental health from the University of Iowa in 1989.

James Withers

Withers and his wife Jenifer came to Ames from Minneapolis, where he was employed by Pace, Inc. as an industrial hygienist. Safety and health seem to run in the family as Jenifer is a certified medical assistant. Withers says he's happy to be back in Iowa, where he was born and raised. Having a strong background in environmental consulting, he will provide support to Ames Lab researchers concerning handling and use of chemicals and disposal procedures for hazardous wastes.

Outside of the Lab Withers spends some of his weekends playing bass guitar in a five-piece band called Jackson Junction. "We play 50's and country music, and we're looking for gigs," Withers smiles.

HUGH HAMMOND worked at Des Moines Area Community College before coming to Ames Lab. With a safety background developed in a previous job with United States Fidelity and Guarantee insurance company, Hammond assumes the position of laboratory safety training coordinator. He is responsible for overseeing Ames Lab safety training programs to assure compliance with the training requirements found in federal and state statutes and DOE orders.

Hugh Hammond

As part of his job, Hammond plans to develop a database and expand on the different types of safety training available. Having a strong interest in computer-assisted learning, Hammond comments, "I'd like to network with other Ames Lab employees who may be working on educational or training packages for computer-aided instruction."

This fall semester at ISU Hammond will simultaneously complete a master's degree in adult and vocational education general training and begin a doctorate in adult education. Commuting to the Lab from Des Moines where he lives with his wife Charlene and daughter Beth, Hammond has a busy schedule, but will still find time for leisure activities that include race walking, running and tennis. ❑

Retired Technician Saw Work Sent Around the World

"Alloys I've made have been sent around the world," reflects Jim Holl, senior research technician, who retired on June 28. "The Terfenol-D I made is used in many different countries. I helped hand-fabricate an alloy of the rare earth metal praseodymium and nickel that was sent to Tokyo and used in an experimental refrigerator that achieved the all-time low temperature, 27 millionths of a degree above absolute zero."

Jim Holl and his wife enjoy his retirement reception.

Holl spent his first year at Ames Lab in materials handling as a truck driver. He then transferred to Norm Carlson's group in 1966 and received on-the-job training for melting and refining rare earth and refractory metals as alloys.

"For the past 25 years he has been an integral part of the melting and fabricating capability of the Metallurgy and Ceramics Program and the Materials Preparation Center (MPC)," says Rick Schmidt, MPC director. Holl has cast and fabricated thousands of alloys for researchers at the Lab and other institutions. He has developed various techniques during arc melting to make it easier to form rod-like castings of very brittle materials.

Holl grew up near Maxwell, Iowa and farmed for a few years before coming to Ames Lab. He is very happy he made the move saying, "I wouldn't be taking early retirement if I had stayed on the farm."

Holl currently lives south of Nevada. He is proud of owning the only round barn in Story County and one of only 160 in the state of Iowa.

His retirement plans include working occasionally for Dale McMasters at Edge Technologies and doing odd jobs for a neighbor. He and his wife will continue to spend time each year fishing in Canada. With three children and six grandchildren living nearby, Holl knows he will definitely keep busy! ❑

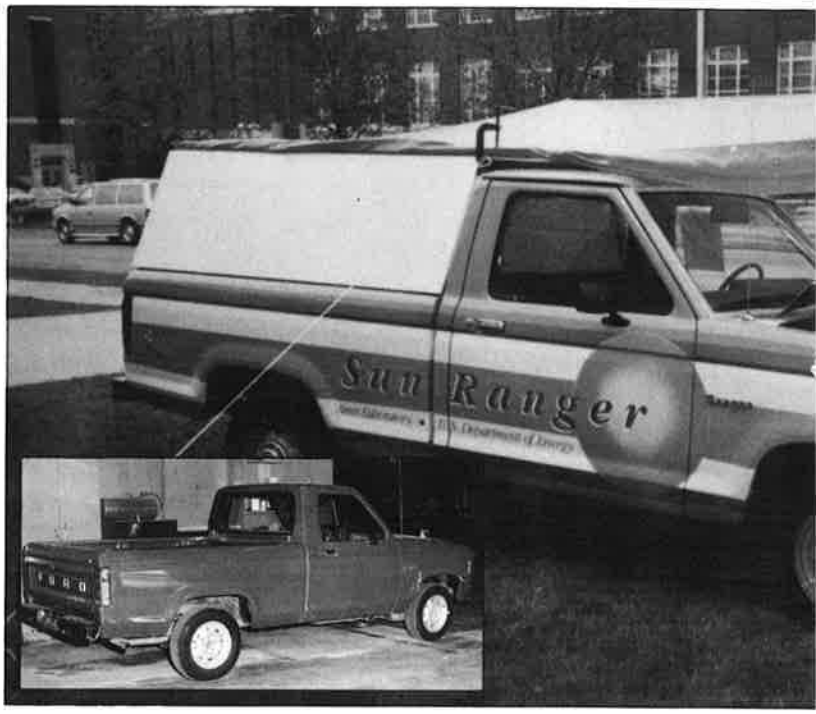
Experimental Solar Truck Ready to Roll

Beaming around Ames in a solar pickup is a fun job if you can get it, and now you can. The Sun Ranger, Ames Lab's new solar vehicle, is ready for use. The 1984 Ford Ranger pickup, modified and rebuilt by the Lab's shops, runs entirely on solar power.

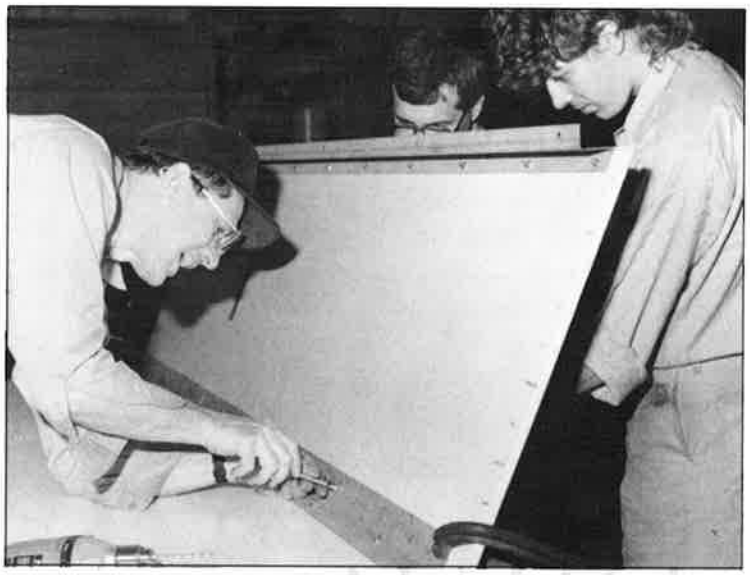
"The truck looks very distinctive and should get lots of attention," says Rollie Struss, associate director for Operations and the originator and coordinator of the project.

A high-efficiency 10-pound electric motor and eight batteries weighing 180 pounds replace the 400 pound, 4-cylinder gas engine that originally powered the truck. The new motor is hooked up to the truck's original drive system through a modified transmission input shaft. A small fan cools the motor and replaces the radiator system usually used for cooling.

Eight golf-cart-type batteries installed under the hood can store enough power to drive the truck 35 to 40 miles. When completely drained, the batteries take approximately four or five hours in full sunlight to recharge. When there is insufficient sunlight available, a wind-powered generator can charge the batteries, or the batteries can be plugged into a 110 volt AC charger.



The Sun Ranger before (inset) and after modifications.



Jim Safly, Tim Aspengren, and Jason Ahrens build solar collector panels.

The solar cells gather more energy on a day with scattered high cumulus clouds than on a perfectly sunny day because the clouds reflect additional sunlight. Even on an overcast day the cells can take in some power.

The 430 solar cells, mounted on three collector panels, gather and store energy to power the Sun Ranger. The solar panels, installed over the pickup bed, are attached to a plywood shell covered with soft foam that helps control breakage. The cells are as brittle as potato chips and crack very easily. Even when cracked, the cells can function at a substandard level if the wires within the cell, which are more durable, do not break. Engineers anticipate that damage from rocks and other road debris will occasionally make it necessary to replace some solar cells.

A separate array of solar cells on top of the truck's cab supplies power to a ninth battery, which powers accessories such as the radio, windshield wipers and turn signals.

The solar truck's accelerator works just like the accelerator on a gas-powered vehicle. As the operator pushes the pedal down, acceleration will increase. As the operator lets up on the pedal, the motor will begin regenerating electricity, using the same energy that turns the wheels to generate electrical energy that goes back into the batteries. This regeneration process will slow down the truck. Regeneration transforms 70 percent of the momentum of the truck into electricity and puts it back into

the truck's batteries.

The truck's average cruising speed is 35 mph with a maximum speed of 50 mph. It can accelerate from a stopped position to 35 mph in about seven seconds. From a stopped position, the truck's new motor can deliver 20 horsepower, enough power to beat many gas cars.

"The eerie thing about the truck is that there is no motor noise," says Struss. Without the combustion reactions of a gas engine, the truck's new engine only produces a mild humming noise even when it is accelerating to high speeds.

Ames Lab maintenance personnel will use the Sun Ranger to haul light loads, carry personnel between buildings, and occasionally pick up supplies in other parts of Ames.

The Sun Ranger will be on display in Ames Lab's booth at the Iowa State Fair, August 14-25 in the Varied Industries Building. Stop by and take a look at the Lab's new solar vehicle. ❑

Cover Photos:
Upper left: Ralph Appelgate, left, and Ray Gress pull original motor from the '84 Ford Ranger.

Upper right: Ron Foderberg, right, and Ray Gress examine the eight batteries that replaced the truck's motor.

Lower left, left to right: Tim Aspengren, Ray Gress, Ralph Appelgate and Jim Safly lift the solar collector panels onto the bed of the pickup.

Lower right: Ralph Appelgate attaches the solar panels to the pickup bed.

Ray Gress, left, and Ralph Appelgate install electric controls.

Future of Solar Cars

When will it be practical for me to buy a solar car?

"The major obstacle is the batteries," says Rollie Struss, coordinator of Ames Lab's solar truck project. "The distance the batteries allow you to go is so small that solar cars aren't practical except for use around town." Ames Lab's solar truck has a 35-40 mile range and the Impact prototype built by General Motors has a maximum range of about 70 miles. Adding more batteries doesn't help since their weight and bulk cut down on efficiency.

"Solar cars aren't sluggish," Struss adds. "The Impact lost all other cars from a dead stop except the Mazda sports car. That's because they have such high torque. It's instantaneous."

Another obstacle is the higher cost of solar cars. While charging the batteries with electricity costs about half what gasoline would cost, the increased expense is in replacing the batteries that wear out. Batteries can be charged about 1000 times before needing replacement and their replacement cost is between $4,000 to $6,000.

Another limitation is the cost and efficiency of the solar collectors. The cells are not only expensive, they're very fragile. "They are very brittle," Struss explains, "even worse than glass. If you push on one with your thumb, you'll crack it."

One advantage of solar vehicles is reliablility; the engineering is simpler. They require less routine maintenance and they are easier and cheaper to repair than a gasoline vehicle. Solar cars are also quiet and inexpensive to operate.

The major advantage of solar-powered vehicles is their environmental impact. Solar cars emit no pollutants because there is no exhaust.

Struss predicts we'll soon start seeing solar vehicles in cities where smog is a problem, but it could be several years before they become popular with the general public. ❑

BULLETIN BOARD

FROM THE DIRECTOR'S OFFICE...

Overhead rates have been lowered for the first time since FY1986. The rate was 50% and is now 48%, effective October 1990. This overhead reduction results in returning dollars for programmatic use.

CONTRACT SIGNED

Design planning for Ames Lab's new building is officially under way. The contract was signed in July with Rudi/Lee/Dreyer and Associates and construction should begin early next year. Completion is expected in late 1993.

ASSESSING THE DISPOSAL SITE

Ames Lab has received $130,000 from DOE to more fully characterize the chemical disposal site near the Applied Sciences Complex. The additional environmental studies will begin this month and will include more surface water and soil sampling and the boring of more test wells to sample subsurface water and soils. Initial results should be completed by early 1992.

Due to the heavy backlog of work in the machine shops, projects submitted in August may not be completed this fiscal year. Please contact Dave Birlingmair at 4-7892 if this compromises your research commitments; an effort will be made to accommodate your needs.

STATE FAIR

Volunteers working in Ames Lab's booth at the Iowa State Fair need to attend a training session Tuesday, August 6 at 10:00 a.m. or Wednesday, August 7 at 2:00 p.m. in the large Spedding Hall Conference Room. You are welcome to attend one or both sessions. T-shirts and tickets for the fair will be distributed at that time. Please call Saren Johnston at 4-3474 if you have any questions or conflicts.

This year the exhibit will feature the Sun Ranger, Ames Lab's solar-powered truck, and information on the Lab's capabilities in the areas of analysis, materials and environmental mangement.

Learn to examine complex electrical circuits easily and quickly by computer simulation using SPICE. Instrumentation services invites interested researchers to attend the SPICE class consisting of four sessions to be held on August 6, 8, 13 and 15 in the 158 Metals Development Conference Room from 1:00 p.m. to 5:00 p.m. Led by Paul Zylstra, each session will include a video tape, discussion and hands-on computer exercises. Please call Paul Zylstra at 4-7912 or engineering services at 4-3757 to register or for further information.

Reminder: Standing reservations for use of the third floor Spedding Hall Conference Rooms are accepted for only one semester at a time. Those reservations can be made for fall semester 1991 by calling Jeanine Crosman at 4-3757.

NEW EMPLOYEES

Chad Baker, Custodian Helper (Runge)
Stanley Bajic, Postdoctoral Fellow (D'Silva)
David Baldwin, Associate Chemist (McClelland)
Huan-Tsung Chang, Research Helper (Yeung)
Xiaoshan Chen,Graduate Assistant (Houk)
Christopher Clausen, Research Helper (Mathison)
Preston Clemons, Graduate Assistant (Houk)
Laura Clifford, Research Helper (Conzemius)
Alexandru Degeratu, Graduate Assistant (Moulder)
Timothy Dorpinghaus, Lab Attendant I (Cummings)
Matthew Douglas, Summer Student Trainee (Gerstein)
Jan Drzymala, Visiting Scientist (Wheelock)
Paul Eichinger, Research Helper (Straszheim)
Alan Epps, Research Helper (Feinberg)
John Ferguson, Graduate Assistant (Trahanovsky)
Teri Freeburg, Research Helper (Edelson)
Sunjeev Gulati, Research Helper (Harmon)
Jose Hahn, Research Helper (Bluhm)
Cathy Hansen, Clerk Typist II (Hamilton)
Sara Henry, Research Helper (Espenson)
Brian Jarding, Research Helper (B. Lograsso)
Cynthia Kelchner, Graduate Assistant (DePristo)
Mohamed Khalafalla, Research Helper (Ng)
Douglas Klumpp, Graduate Assistant (Trahanovsky)
Georgios Kopidakis, Graduate Assistant (Soukoulis)
Jana Lande, Clerk Typist II (T. Johnston)
Eric Lee, Research Helper (Torgeson)
Christopher Legan, Research Helper (Stassis)
Audrey Levine, Associate (Buttermore)
Jennifer Loos, Photo Assistant (Pedersen)
Shen Luan, Graduate Assistant (Houk)
Satish Malik, Visiting Scientist (Gschneidner)
Marcia Maronn, Typist Clerk (Edelson)
Jeffrey Meyer, Research Helper (Akinc)
Yinan Ni, Research Helper (Torgeson)
Piang Peng, Research Helper (J. Shinar)
Rachel Peters, Research Helper (Norton)
Jennifer Ransdell, Typist Clerk (Gschneidner)
Tim Ray, Student Associate (Evans)
Christi Rezabek, Typist Clerk (Jenison)
Cindy Schaben, Typist Clerk (D. Meyer)
Daniel Smith, Associate (Chriswell)
Robin Tompkins, Typist Clerk (Bates)
Matthew Trainum, Student Associate (Conzemius)
Jennifer Trumpy, Research Helper (Buttermore)
Robert Tucker, Programmer (T. Johnston)
Gene Vaughn, Custodian Helper (Runge)
Robert Vincent, Visiting Scientist (Gerstein)
Yili Wang, Graduate Assistant (Trahanovsky)
Douglas Welsh, Maintenance Helper (Appelgate)
Jianming Wen, Graduate Assistant (Thiel)
Brandon Wilson, Research Helper (Gschneidner)
Craig Wilson, Research Helper (Mathison)
Yongjun Xue, Graduate Assistant (Yeung)
Hongping Yuan, Graduate Assistant (Woo)

PROMOTIONS

Diane DenAdel from Programmer-Analyst III to Assistant Manager Data Systems
Connie Dowling from Clerk III to Buyer I

➪ **NATO**/*Continued from Page 2*

quality Terfenol and their skill in developing novel applications for the material. "It is this type of joint effort that will advance the area of magnetics research," emphasizes Jiles. "There is a great need to get this program together on an international basis." ❑

Lab Helps Power Journey to Sun

Ames Lab recently received recognition for contributions to Ulysses, a joint U.S.-European probe of the sun launched from the space shuttle last October. The DOE Outstanding Achievement Award was given to the Ames Lab and Senior Metallurgist Bernard Beaudry by Robert Lange, director of the DOE Office of Special Applications, for helping develop the capsules that hold the fuel in the generator powering Ulysses.

Like all spacecraft, Ulysses needs its own independent and compact source of electricity. To gather solar data and beam it back to Earth, Ulysses will rely on power supplied by a radioisotope thermoelectric generator (RTG) developed by DOE. RTG's have successfully provided power for space missions since the early 1960s. Ulysses is the 23rd U.S. space mission to use this type of power source. These generators also powered Galileo, a probe of Jupiter launched in 1989; the Voyager probes of the solar system's outer planets; the Viking probes of Mars; the manned Apollo to the moon; and other probes.

Beginning its five-year mission, Ulysses is currently on its way to Jupiter where it will use the massive planet's powerful gravitational force to boost itself into orbit around the north and south poles of the sun. This special orbit will give scientists their first look at the energy and particles being emitted by the polar regions of the sun.

Ulysses will arrive at Jupiter in January 1992 and will be close enough to observe the sun 28 months later. The sun is responsible for a variety of interesting phenomena in space that scientists would like to study. One example, the solar wind, is an outward stream of energetic particles. The sun also sometimes has a pronounced effect on Earth's weather and communications. ❑

Slip-Sliding Away

Bumps, bruises, banged-up knees and thumbs all came as part of a package deal when some Ames Lab employees traveled to the Spinning Wheels roller skating rink in Ogden on June 20 for an evening of thrills and spills. Balance and luck were scarce commodities as both good and bad skaters fell victims to a slick floor and lack of practice and went slip-sliding down to their knees and elbows!

Ila Haugen looks happy as she takes off her skates--a justifiable smile since she did not fall once!

Wobbly skates make wobbly skaters. Saren Johnston has her skates adjusted by Chuck Clark, owner of Spinning Wheels.

Group photo--a chance to rest! Back row, left to right: Kathie Hawbaker, Kris Voga, Paul Mack, Carol Mack, Ila Haugen, Saren Johnston. Middle row, left to right: Sandi Bishop, Karen Voga. Front row, on knees: Bob Dawson, Bill Bishop, seated, Michael Purdy.

Ames Lab skaters tease the photographer and chow down at Godfather's in Boone on their way to Ogden and the Spinning Wheels. Left to right: Saren Johnston, Bob Dawson, Kris Voga, Ila Haugen, Michael Purdy.

"Look, Mom, no hands!" Michael Purdy wavers ever so slightly, at the edge of equilibrium.

A jammed thumb and swollen knee did not prevent Kathie Hawbaker from taking first place in a game of musical corners. Rolling the lucky number four, Kathie won a free pass back to the Spinning Wheels!

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Address correction requested
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