

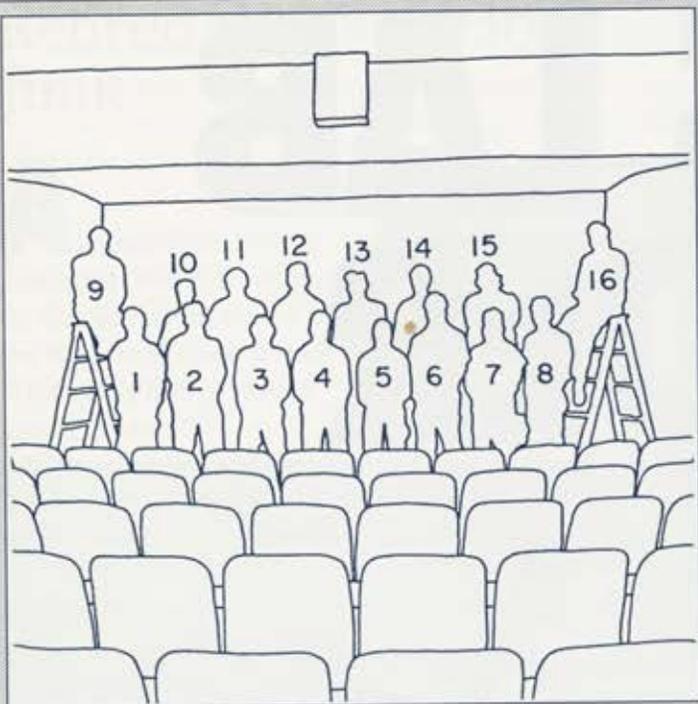
# AMES LAB INSIDER



# Teamwork Gets The Job Done

Pictured on the cover are the workers who renovated the Ames Laboratory's conference room. For more pictures and story about the reconstruction, see pages 4 and 5.

1. James Safly, 2. Bennie Lewis; 3. Michael Pickell; 4. Ralph Appelgate; 5. Darwin Riddle; 6. Ronald Berrett; 7. Gregory Harper; 8. Dana Fullhart; 9. Mike Dotzler; 10. Steven Gilliland; 11. Warren (Bud) Ahrens; 12. John Will; 13. Howard Klemmer; 14. Gary Ault; 15. Daniel Eyanson; 16. Ronald Foderberg.



## Future Belongs To Parallel Computers

**T**he future belongs to parallel computers. They work like a human brain—but at a much greater speed—handling multiple functions by using a large number of processors simultaneously," says John Gustafson, computational scientist in the Applied Mathematical Sciences program. Work on developing software for parallel computers won him an R&D 100 Award for producing one of the most significant developments worldwide in science and technology in 1989.

"The human brain is basically parallel, monitoring and guiding many activities such as breathing, thinking, walking and talking all at one time. If it did not function in parallel, we could not survive. The human brain cycle is



*John Gustafson*

approximately one second, as compared to millions of cycles per second in a computer. Though slow, we can beat computers in image and speech recognition or playing chess, because we function in parallel," according to Gustafson.

"The computers in the year 2000 should resemble this parallel model of human

thinking, using techniques known as neural networks. I suspect by the turn of the century, we will have computers offering enormous performance, but it will take great effort for programmers to make them work. However, once they are programmed they will be very fast.

Drawing an analogy, Gustafson said, "A parallel computer has more than one processor and works on a single problem using multiple processors. Giving work to a conventional serial computer is like bossing a slave, while programming a parallel computer is like managing a group of people or running a corporation by assigning different tasks to various staffers. Actually even personal computers and traditional supercomputers do have parallel functions. Most of us do not recognize that there is a separate processor for keyboard, screen and printer, since only the main processor is programmable by

the user.

"The massively parallel computer made by Thinking Machines Corporation has as many as 65,536 processors in one cabinet to work on certain kinds of problems. Now you can put a thousand computers on one circuit board and forget about miles of intricate wiring and elaborate cooling," he explains.

Before joining Jim Corones' group at the Ames Laboratory this year, Gustafson worked at Sandia National Laboratory in Albuquerque, New Mexico. There, Gustafson and his team were conferred the 'Gordon Bell Award' for beating the conventional supercomputers in speed. They used an NCUBE/ten parallel computer.

The supporters of serials threw the challenge of increasing the speed of parallel computers by a factor of 200. After being unclaimed for over a year, Gordon Bell of Digital Equipment Corporation set up an award for the

maximum speedup attained on a parallel computer.

Working in close coordination for three months on the 1024 processor NCUBE, the three-member team of Gustafson, Gary Montry and Robert Benner achieved a speedup of 1000 times. This helped break a psychological barrier against parallel computing. The national and international press gave it wide publicity, hailing it as a major breakthrough.

"The NCUBE/ten is currently running 6.2 times faster than Y-MP (supercomputer made by CRAY Corporation). The more complex the operation, the greater the advantage

of the NCUBE over vector supercomputers. Parallel computers are at least five to ten times faster than a serial supercomputer, and you can get such a system at one-tenth the price of a CRAY supercomputer," Gustafson explains.

"Vested interests from the established computing industry are opposing parallel computing because once brought into a wide use, it would have a big commercial impact. It would lead to an upheaval. Parallel computing would require modifications in some of the current programs, while many simply would have to be completely rewritten. This would mean a coordi-

nated effort by programmers to modify software.

"The conventional computing industry has realized that the change is inevitable. But they want to put off the change for as long as possible, because of the upheavals it will cause.

"Thus, the opposition to parallel computing is more of a socio-political and commercial nature than a technical matter, as it involves an effort to get over the inertia to change," he clarifies.

"To solve the biggest problems, some mix of high hardware cost, complex facilities, extra programming effort, lower reliability and

limited access is tolerable. The fact that parallel machines trade ease-of-use for high performance is all the more reason to consider them supercomputers," Gustafson elucidates.

"Ever since I got involved in parallel computers six years ago, I've been trying to 'carry the gospel' of parallel computers everywhere, including at the Ames Laboratory. We will soon have some powerful, massive parallel computers here. I hope they will be spectacularly fast and cost-effective," he concludes with a smile. □

*Avinash Pancholi*

## Major Role For Ames Lab

**T**he Ames Laboratory is working with the Department of Energy to become an institution of excellence in the areas of environmental restoration and waste management, according to Jim Corones, deputy director.

Referring to the recent visit to the Laboratory by Clyde Frank, acting head of Office of Technology Development of DOE, Corones says that the DOE official was very impressed by our know-how in these areas.

"The DOE is beginning to redirect its efforts towards environmental restoration and waste management to address production site problems that developed over the past forty years in the weapons production facilities. We are actively engaged in dialogue with DOE as to how the Ames Laboratory and ISU working together could help solve

some of the environmental restoration and waste management problems faced by the DOE.

"We can contribute several different ways, given our variety of programs and high level of expertise; the Laboratory and the larger ISU community have unique capabilities.

"The collaboration with ISU faculty on new projects would provide our Laboratory the opportunity to broaden our relations with the University. We also plan to involve private industry," he says.

"Education at all levels from pre-school to post-doctoral, is one of the key components in the DOE efforts. We are very interested in working with Iowa State to help enrich both educational and research efforts relevant to environmental restoration and waste management.

"The Laboratory and Iowa



*Thomas Barton and Clyde Frank discuss environmental research proposals.*

State can also be sources of neutral, factual information, thereby helping people better understand the issues concerning environmental restoration and waste management.

"Public understanding of technical questions is very important if the public is to make informed decisions. How clean is clean? What is the risk? What is the trade-off between risks and cost of cleaning up the environment?

Asked why DOE is interested in the Ames Laboratory

for such projects, Tom Barton, director, says with pride, "The Ames Laboratory is highly regarded within DOE for the quality of its work. The Department wants to bring to bear its best people on these problems, therefore they are interested in working with Ames Laboratory and Iowa State University. Indeed our unique intertwining with ISU produces the ideal combination of talents to attack these problems of immense national importance." □

# Facelift For Spedding Hall Conference Room



Stage of old conference room was originally constructed in 1949.



Left to right, Dale Link, Howard Klemmer, and Bud Ahrens, construct new lab in space once occupied by old stage.

**A** major remodeling of the conference room on the third floor of Spedding Hall has just been completed. The remodeling was done to allow the stage area to be converted to laboratory space for Dr. Corbett's group and to update the conference rooms to meet current needs. The existing conference room was completely gutted and renovated from the ground up with new carpeting, wall covering, acoustical ceiling and lighting. The stage was replaced with a speakers platform which has storage areas on both sides for tables, chairs, overhead projectors and podiums.

The conference room seats were reinstalled with a wider aisle to provide more leg room and to make it easier to move between seats. In addition, the seats were installed in an arc to make it easier for everyone to see the speaker.

According to Mark Godar, manager of Facilities Services, "The new seating arrangement should improve the auditorium's usability."

The wallpaper, paint and carpeting were selected to blend with and enhance the appearance of the green seats. Original plans called for reusing the walnut wainscoting until it was discovered that the wainscoting was not wood paneling but a thin veneer of wood with a fabric backing that could not be salvaged or reused.

The small conference room and foyer were renovated at this time also. The small conference room received new carpeting, vinyl wall covering, acoustical ceiling and lighting. The foyer received new floor tile, wall covering, acoustical ceiling, lighting and a kitchenette which will be very handy for special functions. The wainscoting in the foyer areas was reused and blends in well with the kitchenette.

The ceiling in the back portion of the auditorium has been lowered to make it more comfortable and pleasant. The divider wall has been refurbished and will still be

used. In fact, having the divider extended also improves the aesthetics of the back portion of the auditorium and it will probably be in the extended position most of the time. Contact the Graphics Communications Office or Facilities Services to have this divider either opened or closed.

Other improvements include both wireless and hard-wired mikes for the new sound system, new spotlights for the speakers platform and controls for the lighting, sound and projectors from a control panel on the podium and at the side wall of the platform.

The motorized screen was reinstalled and can be fastened to the back wall to reduce distortion on overhead projections. The entire back wall was painted white so it could be used for multiple screen projections. Ethernet connections have also been added in the small conference room and in the back portion of the auditorium.

"This project has been a joint effort by nearly everyone in the Facilities group, and their efforts have helped make the new conference room a welcome and inviting place, which enhances the image of the Ames Laboratory. If I had to single out anyone individually, it would be our two hourly undergraduate architectural students, Jonathan Saucke and John Jordan who did much of the design work and color selections," Godar says.

Reservations for use of the Spedding conference room facilities should be scheduled through Engineering Services, 158 Metals Development, 294-3757.

There will be an open house in the new conference facility, third floor Spedding Hall, on March 21 from 2:00 to 4:00 PM. Tours and sound and lighting demonstrations will be given. Coffee will be served. Everyone is invited to attend. □



*Clockwise from top: Craft shops personnel putting final touches on speakers platform in new conference room; left to right, Dale Link, Ronald Berrett, Howard Klemmer and Bud Ahrens installing stage ceiling and wiring; Bud Ahrens installing seats; Ronald Berrett inspecting blueprints; James Saffly, left and Mike Dotzler installing ventilation ducts.*

"Failure to plan on your part does not constitute an emergency on ours." The craft shops average work backlog is three to four weeks and the most efficient service can be provided if minimal changes are made in the coming week's schedule. While legitimate emergencies do arise occasionally, service is provided on a first come, first served basis. The more advance notice that is given, the better the chance will be of meeting your request. For more information on service work and schedules, contact Mark Nelson, Facilities Engineer, 4-7889.

The Rare-earth Information Center (RIC) began its twenty-fifth year on January 1, 1990. The mailing list for RIC News is 9,500 and is climbing toward a goal of 10,000. Congratulations to Karl Gschneidner, Jr., editor; Jennings Capellen, staff writer; and everyone that is or has been involved with the RIC.

The Office of Information, 201 Spedding, has some free issue items available to anyone interested. 1) We have a variety of printer ribbons that have been turned in. 2) We have an old microcard reader. 3) Various documents, books and announcements are available on a continuous basis outside the photocopy room, 209 Spedding.

"One person's junk is another person's treasure." When items are left in a corridor or on the docks it is sometimes difficult to tell what it is. It is a safety hazard, however, as well as being unsightly. Dumpsters are available at each dock for small items. Items too big for the dumpster are not be left on the dock. If you have something you need hauled away or moved into storage, fill out a service work request. Please do not put any loose trash in the dumpsters; trash bags are available from the custodians.

**An open house will be held in the new conference facility, third floor Spedding, Wednesday, March 21, from 2:00 to 4:00 PM. Tours and sound and lighting demonstrations will be given. Coffee will be served. Everyone is invited to attend.**

The Iowa Governor's Institute for Talented and Gifted Students will be held June 16 through July 8. The Institute will bring to Iowa State 80 of the State's very best junior high school students. Twenty of these students will be enrolled in a chemistry class that will be conducted with Ames Laboratory personnel and facilities. The course will be targeted above a typical high school course.

During the same summer time frame Ames Laboratory will be cooperating with the Physics Department and with the ISU CY-TAG program to offer a physics course to twenty precocious ninth and tenth grade students. These students will be selected based upon their performance on either the college level SAT or ACT test. All students will score in the top one percent of their age group. The talent pool will be nation-wide.

It has been requested that heavy carts not be rolled down hallways. The Spedding Hall elevator has a back door into the store-room specifically to keep carts out of the first floor corridor.

In each course an Ames Laboratory graduate student will assist with the teaching and preparation of laboratory materials. Volunteers are needed. You can help by leading a tour of your laboratory, preparing a guest lecture, discussion, or demonstration in your specialty area, or by just stopping by and visiting with one of these students. Group leaders can help by encouraging your graduate student to be a teaching assistant. Contact Lynn W. Glass, Associate, 4-7006, if you are interested.

## COMPUTER SECURITY

This is the first article in a continuing series on Ames Laboratory computer security.

Why must the Ames Laboratory be concerned with protecting our computer resources? In 1978 the Federal Office of Management and Budget published Circular No. A-71, which required all Federal departments and agencies to implement an unclassified computer security program. The DOE responded to the circular and began a five-year implementation of the DOE unclassified computer security program (DOE Order 1360.2). The program was successfully implemented nationwide in 1984. This implementation

included the Ames Laboratory since we have federally funded computing facilities. Current Ames Laboratory computing hardware inventory has an acquisition cost in excess of \$5.2 million. This fact in itself would warrant protecting the computer hardware.

On December 12, 1985, the Office of Management and Budget issued OMB Circular No. A-130. As part of the computer security policy, this circular states that Federal agencies "shall establish a security awareness and training program to assure that agency and contractor personnel involved in the management, operation, programming, maintenance, or use of information technol-

ogy are aware of their security responsibilities and know how to fulfill them. Users should be appraised of the vulnerabilities of such systems and trained in techniques to enhance security."

Congress has also recently declared that improving unclassified computer security is in the public interest. The Computer Security Act of 1987 was signed by the President on January 8, 1988, and became Public Law 100-235. The new Public Law includes requirements for "...the training in security matters of persons who are involved in the management, operation, and use of Federal Computer systems..."

From the above it is quite clear that the Federal govern-

ment is very serious about computer security, and the implementation of computer security awareness training. It is the intent of the Ames Laboratory Computer Protection Program Manager (CPPM) to use this series of articles to provide a part of that training to users of Ames Laboratory computer facilities.

In future articles we will go into detail about the Ames Laboratory Computer Protection Plan. The Laboratory CPPM, Frank S. Carlsen, welcomes reader suggestions for topics to be discussed in future articles. From time-to-time a guest author may discuss a topic of specific interest to Macintosh, VAX, UNIX, and other computer users. □

## I'd Like You To Help With A Tour

**W**hen I call you to participate in a tour, it won't be to an exotic south sea island or to a fiesta in Rio. It will be to a place vastly more exciting and intriguing -- a journey into the realm of science. For 20 to 30 minutes you will be the tour guide as you show others the sights and wonders of your own research. What an opportunity to "sell" science to young and old alike! They come to the Ames Laboratory to find out what you do, to be inspired, and to learn from you!

On a recent Ames Lab tour an ISU freshman honors student lingered well past the 30 minute presentation to visit with Al Bevolo about reflected

electrons.

By participating in an Ames Laboratory tour, you promote your research, bring it to the attention of the public, and you also help the Lab fulfill a DOE commitment to support science education through its national laboratories.

Usually there are more requests for tours in the spring when the weather is fine and schools arrange field trips. Most researchers agreeing to participate in tours of the Ames Lab might expect to be called on two or three times a year. The researchers who have helped me by presenting their science to our visitors seemed genuinely to enjoy the experience. I would



*Cindra Widrig, left, showing students from Waverly-Shellrock High School her scanning tunneling microscope during a recent tour. Saren Johnston, guide, stands by the door.*

like to invite other members of the scientific staff to volunteer their services to help us conduct Ames Laboratory tours. I'm anticipating a

huge response to this invitation, so please RSVP ASAP to Saren Johnston, 201 Spedding Hall, 4-3474. □  
*Saren Johnston*

# Retired But Not Tired: Junk

**A**lthough retired, Greg Junk is not tired of active life. On the contrary; he thinks that 57 is the ripe age to work in the young field of environmental science.

"Fifty seven is too early to retire. I will use my 33 years' research experience to remain scientifically and professionally active. One way I plan to continue my association with the Ames Laboratory is to work as an associate," says Junk. Having stepped down as assistant program director of environmental sciences in October 1988 and retired as senior chemist in January 1990, he plans to maintain an office at the Laboratory. Using his expertise in the area of determining trace levels of organic compounds in the environment, Junk plans to work as a consultant.

For me retirement is not the end of a career, but the beginning of a new chapter," he says beaming a smile. "Having worked for an average of about 60 hours a week at the Laboratory, I plan to work at a more leisurely pace now."

Junk received one of the three ISU Professional and Scientific Excellence Awards last year for leading a team in evolving techniques for assaying tiny amounts of complex organic pollutants in the environment. These procedures are in wide use for determining pesticide and other organic contaminants in solid, liquid and gaseous



Greg Junk

samples.

Voluntary activities in his church and community and relaxing while fishing will take a greater part of his time now. "I have fished all over the United States, and can say Iowa is one of the best. I like fishing because it takes you closer to nature. Fishing provides a forced contemplation, without stress."

Referring to the home front, Junk concluded in a lighter vein, "My wife is a part-time nurse. Mary plans to work at least two days a week instead of the one at present, in order to help prevent sparks at home." □

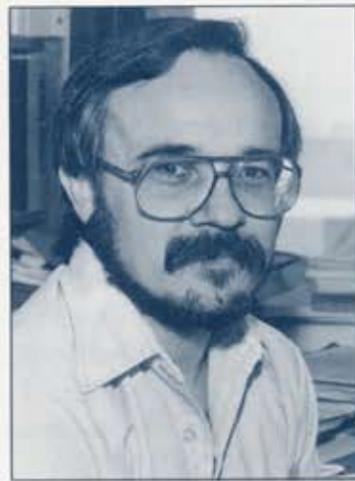
## NEW EMPLOYEES

Salahuddin Ahmed,  
Postdoctoral Fellow  
(R.B. Thompson)  
Barbara Anderson,  
Student Associate  
(James Fritz)  
John Anderson,  
Research Helper  
(Kenneth Malaby)  
Daniel Barnard,  
Research Helper  
(Otto Buck)

# Harmon Recognized

**B**ruce N. Harmon, program director, Solid State Physics, has been recognized by The American Physical Society for his contributions to the advancement of physics through independent and original research. Each year the Society honors a few of its outstanding members by electing them to the status of fellowship. The citation on Harmon's certificate reads: "For theoretical contributions to the understanding of the electron and phonon structure of solids".

The major areas covered by Harmon's research include: electron-phonon interaction, superconductivity, and structural phase transitions; induced magnetic form factors



Bruce Harmon

of metals and mixed balance compounds; non-self-consistent and self-consistent compounds; and nuclear ordering in copper. He has 88 publications to his credit. □

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