Issue 16, Winter 2001

NASA's High Performance Computing and Communications Program

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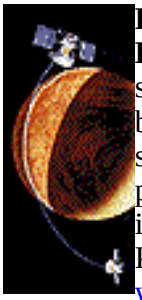
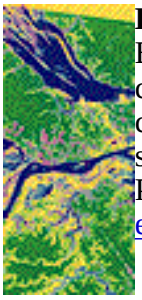
Welcome from the Program Manager

Elements of the High-Performance Computing and Communications Program

Computational Aerospace Sciences (CAS) – Accelerates the availability of high-performance computing hardware and software to the U.S. aerospace community for its use in design processes.
Project manager: Cathy Schulbach
www.cas.nasa.gov/



Remote Exploration and Experimentation (REE) – Extends supercomputing capabilities developed by industry into routine use in outer space, reducing the mass, size and power consumption of computers used in space.
Project manager: Robert Ferraro
www-ree.jpl.nasa.gov/

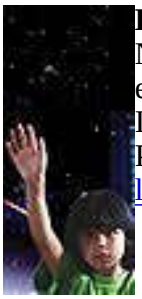


Earth and Space Sciences (ESS) – Builds an assortment of computer-simulated models that combine complex Earth and space science disciplines.
Project manager: James Fischer
esdcd.gsfc.nasa.gov/ESS/

If you are wondering what the High Performance Computing and Communications (HPCC) Program is all about, the current issue of INSIGHTS will give you a look behind the scenes at NASA. Inside these pages are several examples of people and activities that help make HPCC an innovator in high-performance computing and learning technologies.

HPCC's Computational Aerospace Sciences Project is leading the way in developing and applying new computational tools for the advancement of aerospace research. For example, NASA has identified Grid technology as a powerful way to link large and small computers across the nation to solve some of the most complex problems currently facing aerospace, and Earth and space sciences. The NASA Information Power Grid (IPG) links resources at the Ames, Langley and Glenn Research Centers and several partnering academic institutions. The NASA IPG currently serves as a testbed for Grid-based applications across NASA and other collaborating agencies. The IPG Launch Pad featured in this issue is a new component of NASA's distributed computing grid, promising easy access to the Grid.

HPCC's Learning Technologies (LT) Project has forged exciting alliances with the educational community through the *Leading Educators to Applications, Research and NASA-related Educational Resources in Science* (LEARNERS) Program. LEARNERS participants aim to enhance K–12 science and math education. The



Learning Technologies (LT) – Offers NASA science and engineering to the educational community across the Internet.
Project manager: Mark León
learn.ivv.nasa.gov/

NASA Research and Education Network (NREN) – Extends U.S. technological leadership in computer communications by research and development advancing leading-edge networking technology and services.
Project manager: Kenneth Freeman
www.nren.nasa.gov/

LEARNERS effort focuses on Internet-based tools to deliver content from various NASA missions to educators and students. This story illustrates the value of sharing the agency's resources with our nation's schools.

A second story related to LT examines ILIAD and SIMON Internet-search software. When the LT team developed these products, it didn't anticipate that its learning tools would be such a success! In use across the nation, this software allows easy Internet access by e-mail. Schools with limited computer resources find it especially useful. Visually impaired people have discovered ILIAD, too, and value it as a tool to improve the quality of their lives.

To keep pace with science and technology, NASA's HPCC will continue to advance high-performance computing using the nation's challenges as its compass. It will continue pioneering high-performance computing and communications tools while inspiring tomorrow's scientists and engineers to discover the universe through learning activities. The work is challenging, but the rewards are immeasurable and well worth the effort.

Eugene Tu

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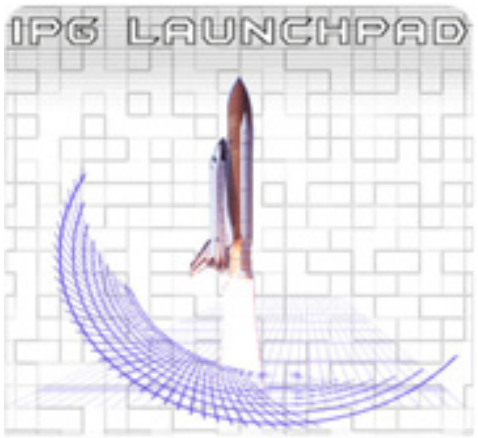
Launching into the Grid

by Adam Frank

In the beginning, there was the Supercomputer Center. The Supercomputer Center had a big machine, and the big machine had many people attending to it and to its users. The users of the big machine applied for accounts and time and disk space and hoped the queues were empty enough to allow their jobs to run before too many months went by.

Although there have been many evolutionary changes in the characteristics of this Supercomputing Center, users-in-the-know are now readying themselves for a potentially revolutionary change, the advent of so-called computational Grids. At the forefront, NASA, along with other government agencies, industry and academia, is preparing for these changes by developing a Grid. Just as important, NASA is also collaborating with these partners to develop the all-important, user-friendly software that will accompany Grid computing and help launch researchers into the brave new world of 21st century supercomputing.

The paradigm of supercomputing has reinvented itself more than once since the introduction of the first supercomputers. It appears that change is once again at hand as the collective ideas known as Grid computing moves from software concept to network reality.



A Grid is a networked set of geographically distributed computers, storage devices, instruments and visualization tools. The promise of Grid computing is its ability to free users from the limits of a single localized resource. The availability of many interconnected machines should allow researchers to tackle problems on scales not possible, even with today's massively parallel computers. While several Grids are in various stages of development both nationally and internationally, the NASA collaboration is taking the lead in pushing the frontiers of this new computational technology. The Information Power Grid (IPG) testbed aims to combine widely distributed NASA computational resources into a single linked entity.

But Grid computing will not become a reality for users until Grids become really easy to use. There are many puzzle pieces that must be assembled before the Grid can be called user-friendly. A critical first step in that process is, however, about to snap into place as the IPG testbed team prepares to release Launch Pad, an Internet-based software tool that gives users seamless and intuitive access to the Grid. The IPG team is a highly interdisciplinary group made up of researchers from across NASA and sponsored, in part, by the High Performance Computing and Communications (HPCC) Program's Computational Aerospace Sciences (CAS) Project at the Ames Research Center. With the launch of Launch Pad, the IPG testbed team is helping Grid computing take its first steps out of the realm of computational science research and

into the hands of the scientists and engineers who need it most.

The idea of the Grid has been around for almost 10 years. Paul Messina of California Institute of Technology, one of the pioneers of Grid computing, says computer and computational scientists drew an analogy with electric power Grids and imagined how users could draw computational cycles from widely distributed resources. The developers of the Grid asked a simple question: "With all the high-performance computers in existence today, is it possible to give users access to more than one machine at a time in a coordinated way?"

Photo by NASA/Conlon

Paul Messina

Sharing compute cycles across fast networks, however, is just the beginning of the Grid's potential. "Grid computing involves more than simply lashing widely distributed machines together," says Messina. Modern high-performance computation projects often involve groups of scientists that are separated by both location and research discipline. These groups must work together by sharing vast quantities of data in assorted forms and formats. The Grid can also provide a means for collaborating groups to interact with each other over high-speed networks sharing, for example, visualization capabilities and data-mining operations. As Messina says, "The IPG testbed is about getting the right peoples' experience combined with the right computational resources."

In principle, the Grid is a powerful idea that holds the promise of transforming high-performance computation. In practice, however, it is a work in progress. "Right now the biggest obstacle to accessing the Grid is the complex set of scripts needed to make things work," says Cathy Schulbach, CAS project manager. "It's like having to issue a full page of commands every time you want to visit a web site. Few people have the time or energy to do this." Before Grid computing can become a reality for the average user, things have to become simple.

What is desperately needed is middleware, which is software that can stand between the Grid and the user to manage the difficulty of simple tasks like *run my job* or *collect my data*. "It's the people who have applications for the Grid that really want this kind of middleware," says Bill Van Dalsem, HPCC deputy program manager. That is where George Myers and the Launch Pad team come in.

George Myers is a computer scientist working with HPCC's CAS Project. Over the past year, Myers and his team have been building Launch Pad, the first NASA Internet platform for the Grid. The task Myers and his team were given was to construct an Internet-based platform capable of managing a user's interactions with the Grid. This means Launch Pad should handle everything from initiating a job to moving data files around when the job is finished. "Right now, just the simple act of copying files from different resources is pretty difficult," says Myers. "When you start addressing multiple jobs that run on different machines across the Grid, the complexity can become mind-boggling."

Photo by NASA/Conlon

Launch Pad is designed to cut through the Grid's complexity by giving users a simple, easy-to-use platform that can handle all the activities associated with high- performance computing. "What we have been shooting for," adds Myers, "is establishing the ability to submit jobs, view their status, track files and then move

them around in a seamless way."

Northern Illinois University's Nicholas Karonis (left) met with NASA's Leigh Ann Tanner and George Myers at Supercomputing 2000 Conference. The Launch Pad uses the Grid Portal Development Kit, which is based on JAVA servlets and server pages.

As a model for the tasks Launch Pad will handle, Myers points to the Portable Batch System or PBS, a popular tool for managing jobs on parallel machines. PBS allows users on a big parallel machine to send jobs to different queues, inquire about their status, change the status and even cancel a job if necessary. But where PBS only deals with a single machine, Launch Pad will manage jobs on many machines linked by the Internet. "We want people to be able to use Launch Pad to help them manage the resources the Grid provides," says Myers. "It will inform you of resources such as CPU cycles on different machines and when you can get them."

Getting even simple tasks to work on the Grid via the web presented significant challenges for Myers' group. "To begin with, you have to make sure all the different machines have the same software resources," says Myers. In the past year, however, the team managed to cross a number of key technical hurdles. "One of the most difficult issues we faced was security," says Myers, who explains that most web servers are considered pretty insecure. "It was our top priority," he says.

To overcome the security issues, Myers and his team made use of a new technology called MyProxy, a joint effort by the National Center for Supercomputing Application, San Diego Supercomputing Center and Argonne National Laboratory. The MyProxy server is used to store a proxy of the user's certificate. A certificate is a software key that a user must have to gain access to information about his or her jobs on the Grid. Normally, a web-user's certificate is stored on the local system by the browser. Using the MyProxy technology, Launch Pad accesses the proxy server from the web server, thus never storing the user's proxy on the local machine.

With this method certificates are accessible from any web browser, so Myers' team can ensure that users always get access to their Grid data no matter where they are. After a short period of inactivity, the certificates expire for security purposes. "With our system, you could log onto the Grid from a computer in an airport, check your runs, walk away and still be very secure."

The version of Launch Pad that Myers and his team are currently constructing allows users to manually select the machine in the Grid on which they want their job to run. Given the complexity of the Grid, this is already a significant first milestone. In the future, Myers sees the real power of Grid computing being exploited when Launch Pad has intelligent adaptive scheduling built into it.

"Once what we have built now is stable," he explains, "then we will try to include adaptation in the process." Adaptation means that the program can look around to see which resources on the Grid are being under-used and switch the job from overburdened computers to those that are less weighed down. "It's a process called cycle-stealing or cycle-sharing," says Myers, "and it is definitely something we would like to include in the future. Right now, however, what we have is still in the alpha testing phase."

Despite the issues that remain to be solved, Schulbach sees Launch Pad as a key step along the way to making the IPG testbed a reality. "The IPG environment," she says, "represents a technical approach to solving many supercomputing problems in the aerospace field." While Schulbach cautions that the experimental nature of the IPG environment means that many tests lie ahead before the NASA Grid is

fully operational, the progress so far has been satisfyingly steady. She points to several other key milestones of the IPG testbed that will come in 2001 and 2002 when the IPG Launch Pad will be used to show a variety of demonstration applications.

Once Launch Pad and the IPG testbed are operational, NASA will have no end of uses for it. "NASA has some exciting applications for pervasive high-performance computing and communications," concludes Bill Van Dalsem. As an example, he imagines a Mars exploration mission in which mission controllers will use simultaneous access to data and simulation capabilities to predict the timing and severity of solar and Martian storms, the stability of the Mars habitat ecosystems and, most importantly, the current and future health of Mars astronauts.

"All that knowledge has to be transparently accessible to allow astronauts to explore Mars in the safest and most productive way," he says. "That is why distributed, high-performance computing and communications research and testbeds are vital to NASA's future activities."

When the IPG Launch Pad testing is complete, it will represent one small step toward making accessible, Grid-based computing a reality. That is exactly the kind of reality NASA will depend on as it plans its ambitious giant leaps of the future.

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Ospreys photo by Judy Voight Englund

Teachers, students use NASA web resources for discovery

by Louis Varricchio

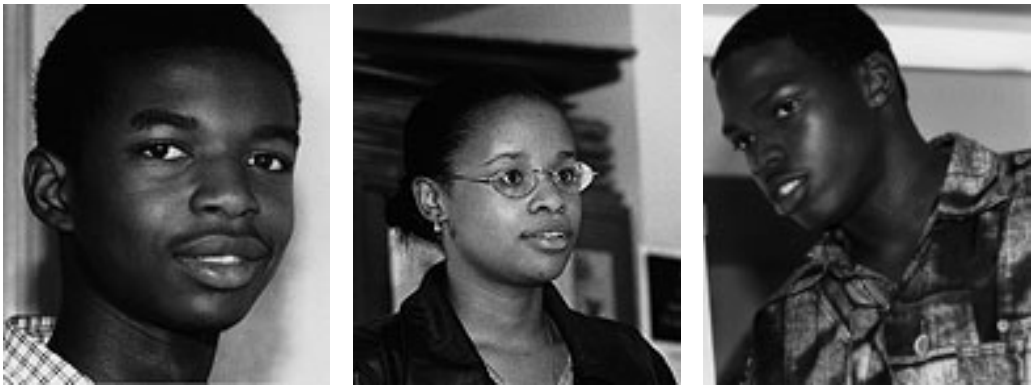
Armed with an eight-foot-tall display board dotted with weather and oceanographic charts, photographs of birds and colorful satellite images, a group of bashful sixth- and seventh-grade students awkwardly greeted several NASA scientists visiting the Ann Street School in Newark, N.J., recently. Within a few minutes, the students set up their poster display to help explain what they had been working on for the past few months.

These inner-city students began their presentation by explaining to the scientists how certain birds such as the eagle, osprey and sandhill crane migrate along seasonal flyways during the spring. The young students used NASA satellite data, which are available on the Internet, to track and record the birds' migratory behavior. They also presented their findings about vegetation in areas where the birds live and the weather conditions during spring migration. The students impressed the visitors by displaying observational details that made their amateur scientific investigations shine.

The boys and girls of Ann Street School are part of an expanding group of student scientists who are

rediscovering the wonders of the Earth and sky, thanks to a ground-breaking NASA-funded effort called *Leading Educators to Applications, Research and NASA-related Educational Resources in Science* (LEARNERS). Spearheaded by the Learning Technologies (LT) Project, part of NASA's High Performance Computing and Communications (HPCC) Program, LEARNERS participants aim to enhance K–12 science, mathematics, technology and geography education in formal classrooms and informal learning environments across the United States.

Photos by Louis Varricchio



New York-area high school students from left Ryan Wright, Monjia Belizaire and Kevin Fields, Jr. delighted in NASA's satellite data. Wright's Signals of Spring research project won first prize at last year's Brooklyn College Science Research Today fair. The ospreys are one species being tracked by students

LEARNERS programs focus on using Internet-based tools to deliver content from various NASA missions. It is a unique cooperative undertaking that links teachers and students with NASA experts and resources. Seven programs, in various stages of development at six U.S. universities and one independent research laboratory, will demonstrate a wide variety of web-based educational technologies delivering content related to NASA's mission.

"As a government agency whose output adds new information to the pool of human knowledge, NASA hopes the inspiration and intellectual excitement inherent in the aeronautics and space program will enrich many fields," says Mark León, manager of NASA's LT Project.

Fields of study that stand to benefit from the space program include social science, life science, physical science, mathematics and technology, León stresses. "So the cooperative agreements we have signed with LEARNERS participants are a two-way street," he adds. "NASA also benefits through new blood and new ideas by everyone involved with LEARNERS."

Signals of Spring

The students of Ann Street School are part of a dynamic LEARNERS activity called *Signals of Spring*. Created and coordinated by Glen Schuster, a scientist with U.S. Satellite Laboratory located in Tarrytown, N.Y., Signals of Spring provides teachers and students with instruction on using geography, meteorology, oceanography and seasonal data to track and record the migratory behavior of birds and sea mammals.

Photo by Louis Varricchio

Glen Schuster loves the challenge of distributing Signals of Spring, which brings science education to inner-city and rural schools, among other areas.

Schuster explains that the Signals of Spring curriculum first instructs teachers how to use NASA satellite information to explain the migration of animals to their students. Next, it requires one week of classroom instruction, followed by research and analysis components. Students go on to become species, geography

and weather experts.

"The students at Ann Street School have worked like real research scientists to produce excellent work," Schuster says.
"I am very excited about the educational potential of these and other students we're working with.
I think this and other LEARNERS programs will make a positive impact on the nation's K–12 science and math curricula."

Using NASA satellite data, students at Canarsie High School in Brooklyn, N.Y., involved with the Signals of Spring learning program tracked four ospreys during their migration from South America to North America in spring 2000. 94k size.

Arlene Richards, who teaches science at Canarsie High School in New York City's bustling Brooklyn borough, sees concrete results from her students' involvement with the Signals of Spring program. "There are so many good things about NASA LEARNERS and the Signals of Spring program," Richards says. "Students really get involved with it and look forward to it. You can see how well students respond because they like to look up information on their own! They also like working on computers, so the interactive aspect of using the web is a definite strength."

Richards is especially proud of Ryan Wright, a Canarsie student whose Signals of Spring research project won first prize at last year's Brooklyn College Science Research Today fair. The college established the exhibition to showcase science projects created by New York-area high school students. Wright's study called "How Does Weather Affect the Migration of Bald Eagles?" used satellite data to track bald eagles during their East Coast migrations.

"Ryan wants to become a medical doctor," Richards notes, "and the Signals of Spring project is helping him venture into the world of science. As a result, he is going to present his work at other competitions this year. We're very proud of him."

Glen Schuster, an enthusiastic spokesman for both Signals of Spring and for bringing interactive science education into inner-city and rural schools, sees NASA's support of LEARNERS activities as a real investment in America's schools.

Teacher Arlene Richards thoroughly tested NASA's Signal of Spring in her classroom at Carnasie High School in New York city's Brooklyn borough.

"Signals of Spring is welcome in minority communities," says Schuster. "It's a switch because most of the time inner-city schools are the last to get this kind of thing."

After getting a start in the New York City metropolitan area, Schuster's program has now expanded to include schools in Houston, Texas, and the District of Columbia. During the coming spring, thousands of students in these schools will be pouring over satellite data, interpreting the signs and signals of migrating animals heading north.

America's Farm

Meanwhile, in the American Midwest, another NASA LEARNERS activity is getting underway. Similar to Signals of Spring, this effort involves teachers and students using data collected remotely via satellite or

aircraft to study the health of our nation's farms. While observing and monitoring the daily activities of a large, working Midwestern farm, this activity hopes to spur students to pursue agricultural studies and to develop an interest in agricultural technologies.

Photo by University of Nebraska-Lincoln

University of Nebraska-Lincoln's Rick Perk believes the educational web site, America's Farm will demonstrate the importance of using Space Age tools to improve farming and the environment.

According to geoscientist Richard Perk, project coordinator for America's Farm – a new NASA LEARNERS program located at the University of Nebraska – many Americans are disassociated with farming while living in the midst of plenty. (See *NASA Why? Files help develop problem-solving skills* to learn of yet another LEARNERS activity.)

"In the past, almost everyone in the U.S. knew a farmer or someone who knew a farmer," Perk says. "That isn't true anymore."

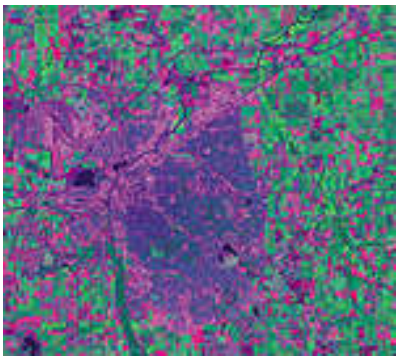
At the University of Nebraska's Agricultural Research and Development Center, Perk and other agricultural instructors and scientists are planning to bring the farm into dozens of classrooms in the Midwest through unique training activities. "We hope to raise teacher and student awareness about the importance of farming to our future and to stimulate an interest in some aspect of agriculture (agribusiness, agricultural production, education, or research)," says Perk.

Much of the farming research that feeds into the main content for the LEARNERS' America's Farm program is carried out at the University of Nebraska's farm, also called *America's Farm*. This 9,500-acre research farm is located near Mead, NE. The giant working farm is an ideal outdoor lab for studying crops such as corn and soybeans with data gathered remotely by satellites.

Inspiring teachers to explore agricultural science in the classroom is a prime mission of America's Farm. This is important considering fewer young people are exploring careers in agriculture.

To help carry the work load on the farm, agriculture is rapidly adapting emerging technologies to aid the small work force. To increase production while decreasing costs, modern agriculture is relying on skilled professionals to employ 21st century tools in the field such as global-positioning satellites, aerial and space-based remote-sensing devices and the Internet.

Using a suite of sophisticated technologies, the web program America's Farm will eventually provide near real-time image delivery of farm operations and data collections via web cam and wireless Internet technologies to school classrooms. The effort will also feature satellite and aerial imagery of the farm for incorporation into classroom activities.



Satellites help future agricultural scientists learn how climate and soils affect crops and livestock. This graphic shows Landsat Thematic mapper data (Bands 742) of the Lincoln city and surrounding area. 94k size

"We're incorporating all our farm research data into classroom activities," says Perk. "For example, the hail-damage data we collected for purposes of our own research can be studied to see how much crop defoliation occurs during a storm." Sample activities may include troubleshooting farm problems such as storm and drought damage, as well as predicting future crop yields – all possible with the application of new technologies.

According to Perk, farmers will play an even bigger role as environmentalists in the future. They will have a greater reliance on what's called *precision agriculture* in which new technologies will make farming practices more efficient and environmentally

Remote-sensing tools are vital to the American farm. Crop varieties such as corn and alfalfa may be quickly inspected from high-flying aircraft and spacecraft for yield, disease and moisture content. The red tones in this color image of the University of Nebraska-Lincoln's farm highlight infrared light reflected by plants. *94k size*

compatible. And through a NASA-funded program such as America's Farm, tomorrow's agricultural students will have an insight into the world of complex, high-tech farming. As a result, students will be stimulated to engage in further study, thus improving the chances the nation's crop and livestock lands will be intelligently managed for generations to come.

From America's urban centers to its rural heartland, LEARNERS programs such as Signals of Spring and America's Farm are involving teachers and students in finding novel ways to exploit the Internet and Space Age technologies to understand the world around us. By working together, LEARNERS participants in government and education will lead the way in stimulating meaningful scientific information that inspires and educates the youth of today to someday explore careers in math and science.

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Navigating cyberspace with ILIAD and SIMON

by Louis Varricchio

When software engineer Robert Shelton and a team of specialists from NASA HPCC's Learning Technologies (LT) Project began developing Internet software tools for educators, they had no idea how their creations would touch the lives of so many people. Their labors hatched a dynamic duo of software products, ILIAD and SIMON, which are helping a diverse group of teachers and students, as well as blind and visually impaired individuals, to effortlessly tap worldwide information resources.

"There was a real need for K–12 teachers to have Internet access a few years ago," Shelton says, "and the technology was coming faster than the time it took to train teachers for its use in classrooms. NASA was in a position to help. So our team visited workshops, talked with educators and assessed their needs. Few schools had Internet access at that time, so the idea was to create software tools that would make that happen and be simple to use."

While in the midst of the rapid growth of PC- and Mac-related software technology, Shelton and the LT Project team at Johnson Space Center (JSC) in Houston, Texas, thought their efforts would be superceded within a year or two. But the big surprise came with a large, loyal user group that is still going strong.

Photo by NASA/Benavides

NASA's Robert Shelton, who met with NASA's Stephanie Smith, believes that ILIAD–a simple but powerful search tool–will open up the internet for many blind users.

The Odyssey of ILIAD

Enter ILIAD, short for I*nternet Library Information Access Device*. ILIAD is a simple but powerful search tool that rapidly retrieves text information from the Internet. "Many teachers still have limited computer access," says Shelton, who is ILIAD LT project manager at JSC. "So there is a real need for simple, time-saving ways to search the World Wide Web. ILIAD is a search agent that provides intelligent, selective access to information. While the user is offline, this computer program, which is located on a JSC server, searches the web for answers to questions. It extracts information, stores it in a temporary directory and then assembles ILIAD's search results and mails them

back to the user. So if you have e-mail, you can easily search the web!"

In addition to classroom use, ILIAD's most intriguing application surprised its developer. "What was unexpected was ILIAD opening up the Internet for me," says Shelton. "I am blind, so it wasn't difficult to realize that a text-based e-mail interface would be ideal for other blind and visually impaired people."

According to Shelton, blind web users like the ease of using e-mail search tools. Popular web browsers use a lot of visuals that are obstacles to them for obvious reasons. ILIAD proved to be a quick, simple non-graphical tool for this growing users' group.

Brenda Cavenaugh, research director of the Rehabilitation Research and Training Center on Blindness and Low Vision at Mississippi State University, was an early champion of the value of ILIAD as a web tool for the blind.

"The mid and late 1990s were the not-so-good old days when it was difficult for a blind person to access the Internet," she says. "While today's speech technology has made significant strides in supporting Windows-based web browsers, ILIAD still stands out." For a blind user, ILIAD is simple to use and requires few keystrokes. In the recent past, getting reading assistance from others or ordering Braille transcripts were important to blind users wanting to ***read*** computer text. Today, ILIAD is still a useful tool as many blind computer users are assisted with text-to-voice software that generates a synthetic voice to recite written text aloud through the PC's speaker.

ILIAD software is designed to be fast. Users type in keywords and then send an e-mail message to ILIAD's home address at NASA. The program allows keyword queries to multiple search engines on the web while screening out graphics and duplicate documents. ILIAD's advantage over similar software is that it performs searches offline. Results are then e-mailed as full-text documents within minutes. Despite today's widespread use of graphical browsers, ILIAD's e-mail approach serves a large, satisfied audience.

For more than 15 million global Internet users, Cavenaugh points out, access to net resources is still restricted to e-mail. For many Americans with special needs, she adds, access is restricted due to the graphical nature of web applications.

At the time the software was first tested, Cavenaugh was so excited about ILIAD for the blind that she strongly promoted awareness of it at meetings with the National Federation of the Blind and the American Council of the Blind.

"Today, blind and visually impaired people are just as excited about cyberspace as people with sight," she notes. "And many have become familiar with it through the help of ILIAD."

Photo by Billy Dugger

One user Cavenaugh cites as a beneficiary of ILIAD technology is E. Marie Lewis, a licensed massage therapist in Texas. The blind therapist praises ILIAD for helping improve service to her clients in the field of therapeutic medical massage. Using ILIAD, Lewis can interact with other therapists and keep abreast of the profession. In addition, she is able to research the web easily for timely medical information about infant massage, a growing area

within this
healing field.

Brenda Cavenaugh, research director of the Rehabilitation Research and Training Center on Blindness and Low Vision at Mississippi State University, devises strategies to make additional use of ILIAD as a web tool for the blind.

ILIAD's versatility continues to win new users from all walks of life. Many first-time visitors to the ILIAD web site learn more about the software and how easy it is to use. And the site continues to grow in popularity, with over 65,000 users since it began operating in 1995.

The JSC project web site – http://prime.jsc.nasa.gov – averages 100,000 hits per month. Whether helping people become better educators or healers, ILIAD is proving to be a faithful servant when it comes to accessing the Internet in an unconventional yet efficient way.

SIMON says 'search the web offline'

Another tool spurred by the limited bandwidth in many classrooms is the NASA LT product called SIMON, which provides more organization and filtering capability than ILIAD. Short for School Internet Manager Over Networks, SIMON software is designed to access and manage information from the Internet.

SIMON is now in its third version and still hard at work allowing teachers and students to do offline browsing of web sites and other searching. For many schools, SIMON is an essential library tool for Macintosh computers. For example, at many rural schools telephone-modem connections to an Internet service provider are not always a local call, while at many inner-city schools computer resources remain limited. In both cases, SIMON gets the job done by facilitating time, money and learning resources by working offline.

"Using SIMON," says NASA's Robert Shelton, "teachers submit queries that are answered with existing library documents or are directly retrieved from Internet sources. Teachers also get to create the presentation documents that are on file in SIMON's library. Students can only access the documents that are filed in the library. This allows teachers to manage the materials used in the classroom while allowing students to research and analyze information from different sources using Internet technology."

With parent and teacher concerns about web access in schools, SIMON acts as a filter that handles requests, much like a proxy server. Downloaded free of charge from JSC's Internet Tools for K-12 Teachers and Students web site, a teacher asks SIMON to begin a search.

SIMON is NASA software developed to access and manage K-12 Internet resources. It expands a school's local computer network, retrieves Internet information and helps teachers organize lessons.

The software submits the request to several major search engines, filters and consolidates the results, and delivers them to the teacher. The teacher then reviews documents retrieved by SIMON, selecting materials on target for the lesson. The teacher can include instructions and questions for the students to answer, as well as create a web-based lesson in the local SIMON library with a simple click of a button.

SIMON can be a big timesaver because the

software handles the time-consuming search and retrieval tasks automatically. Once the materials are downloaded and reviewed by the teacher, they are available to the students without requiring direct Internet access because SIMON stores lessons on a local hard drive. Students still use their web browser to access the lesson materials, but they can only reach content reviewed and approved by the teacher.

More tools for schools

On the heels of the success of ILIAD and SIMON, the Learning Technologies Project team at JSC are busy launching other web-based software and programs that captivate students about topics ranging from robotics to aerospace careers.

Joining ILIAD and SIMON are several interactive offerings that make use of the World Wide Web. ROVer Ranch software educates students about robotic engineering through building, testing and running Remote Operating Vehicles in simulated environments such as the International Space Station. Another product, called Qwhiz, combines the challenges of learning with the fun of an interactive quiz game. Students match wits with other students around the nation or beat the clock on a single-player game board. And topping off the LT toolbox is the critically acclaimed Space Team Online, which focuses on men and women who make the space shuttle fly. Technologies such as webcasting allow students to peek behind the scenes as astronauts prepare for shuttle missions.

Not content to rest on their laurels, Shelton and the JSC team are plunging into the task of creating the next generation of learning tools to leverage the web.

"We're a small team," says Shelton, "but we derive a great deal of satisfaction from the work. It's rewarding just knowing that, somewhere in the world, NASA technologies are helping blind and sighted people – maybe even the next Albert Einstein or Marie Curie – explore and discover the universe through cyberspace!"

How to get ILIAD and SIMON

ILIAD and SIMON are easy-to-use search tools developed by the Learning Technologies Project, a part of NASA's High Performance Computing and Communications Program. The software may be downloaded free of charge from the World Wide Web. Information about ROVer Ranch, Qwhiz and Space Team Online is also available. Click on the appropriate hypertext links for instructions about each product: http://prime.jsc.nasa.gov/.

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NASA Web site attracts visitors

by Judy Conlon

"I want students to wake up in the morning and ask, 'What's happening on NASA Quest web site today? What scientists can I talk to? What's the chat of the day?' I want them to visit this web site and say, 'This is really cool. What features can I check out?'" says NASA's Geoffrey Bruce, who led a recent redesign of NASA Quest – an educational web site where information inspires and educates the youth of today to become the scientists of tomorrow.

With hits to this web site snowballing, students and teachers may be thinking "cool" when visiting NASA Quest. Use of the Quest web site has recently increased since the new web site design has been put in place.

The web site has been redesigned to improve usability and access to information – factors that may have contributed to tripling the number of hits on the newly designed web site. NASA Quest now gives easy access to content on the main page, as well as a quick view of *What's hot @ NASA Quest.* Whether it is a chat, an event, a feature or a unique collaboration, direct access to these updated events is now provided from the main page.

No one will be left behind as the public takes advantage of this treasure of NASA content. The site meets the requirements of the Americans with Disabilities Act (ADA) and is accessible by all computers, even those with low bandwidth.

"Everybody wants NASA content," adds Bruce. "The challenge is to disseminate that content to the education community in an engaging way." Consistent organization across the web site teamed with more multimedia features, including Flash animations, interactive simulations and virtual reality, have captivated visitors. Rollovers are another new feature on the web site. For example, when a student points

to *Space Team Online* – one of the five main content areas – a short description pops up on the home page. A similar left-side panel that appears on the home page is included on every Quest page for a consistent look and feel.

New performance metrics for the Quest team are wedded to the new look and feel of the site. According to Bruce, the goal is to maintain five events plus five additional chats per month. These events are supported by further Quest collaborations with other NASA educational resources.

These collaborations already are proving beneficial to students. For example, Classroom Connect provides opportunities for students to meet the men and women of NASA. The Astro-Venture project also supports Quest's goal to drive more information directly to the students. In this educational, interactive, multimedia web environment targeting grades 5-8, these students are transported to the future where they role-play NASA occupationsand use scientific inquiry as they search for and build a planet with the necessary characteristics for human habitation. The Distance Learning Outpost at NASA's Johnson Space Center in Houston, Texas, provides a monthly *tour* of the International Space Station web casts, where students can view a Mars panorama, among other things.

This kind of cross-utilization of NASA content with multimedia allows students to gain more from their educational tours of NASA cyberspace. Disseminating NASA technology in this manner is what NASA Quest is all about. NASA Quest will continue to explore new ways to integrate innovative technologies into its educational events disseminated on the web, Bruce says. "If we can continue to provide students and teachers with the NASA content in a live, interactive way, we'll capture even more users."

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Welcome

From the HPCC Program Manager.

Launching Into the Grid

NASA's High Performance Computing and Communications.(HPCC) Program researches distributed computing. But Grid computing will not become a reality for users until Grids become really easy to use. Working toward that goal, the IPG testbed team prepares to release Launch Pad, an Internet-based software tool that gives users seamless and intuitive access to the Grid.

Teachers, students use NASA web resources for discovery

Students studying science, mathematics, technology and geography related to NASA's mission will benefit from a variety of Internet-based educational products generated with the aid of NASA's Learning Technologies Project and other institutions.

Navigating cyberspace with ILIAD and SIMON

Two innovative NASA Johnson Space Center software tools funded by HPCC Learning technologies are examined: SIMON manages Internet resources for teachers and students; ILIAD, an offline search engine, provided Internet access via low-cost e-mail and a web-based form.

NASA web site attracts visitors

The NASA Quest web site has recently been redesigned to improve usability and access to information by all users, including those with disabilities.

Upcoming HPCC Events

On the cover: NASA, along with other government agencies, industry and academia, is developing a computational Grid. NASA computer scientist George Myers (right) and his team are working with the HPCC Program to build Launch Pad, the first NASA Internet portal for the Grid. Photo by NASA/Conlon.

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Events

CAS 2001 Workshop

July 31–August 2

The Computational Aerospace Sciences (CAS) Project will hold its sixth workshop at NASA Ames Research Center in Mountain View, Calif.

The NASA-wide High Performance Computing and Communications (HPCC) Program will host this technology exchange to explore the reach of CAS technology, tools and applications. The conference
will showcase work from a collection of innovative groups, including NASA, other government agencies, academia and industry.

Topics to be discussed in the technical presentations include:

1. design and development of aircraft, reusable launch vehicles and propulsion systems;

2. high-performance computing needs in aviation operations, safety and capacity; and

3. developments in high-performance computing hardware and software.

The conference will include time for discussion of aerospace community programs, needs, requirements, directions and collaboration opportunities.

To learn more, please contact pelson@mail.arc.nasa.gov

Upcoming NASA Quest events

Women's History Month
March

Month-long series of chats, forums and web casts featuring NASA women from history, retired NASA women and historical slants on women involved in math, science and technology careers.

Live from NASA at the Johnson Space Center
March 6–8 &
March 13–15

In cooperation with JSC's Distance Learning Outpost, NASA Quest presents a series of web casts and chats, complete with lesson plans, that focus on engineers in human space exploration.

Women in Aviation International Convention
March 9–11

Women in Aviation will be honored at the convention in Memphis. Highlights of the conference will be showcased by Young Women of NASA Advisory Council reporters attending the convention.

Spectroscopy featuring Yvonne Pendleton
March 20

The Educational Technology Team will present an event on Spectroscopy featuring Yvonne Pendleton and the alpha version of an interactive

National Science Teachers Association (NSTA)
March 22–25

NASA HPCC's Learning Technologies (LT) Project will be represented at NSTA's 49th National Convention – the world's largest gathering of science educators – held in St. Louis, Mo. NSTA's mission is to promote excellence and innovation in science teaching and learning. LT will offer its web-based Earth Science, Space Science and Aerospace Technology products to educators across the U.S.

URL for information is
http://www.nsta.org/conv/natgen.asp

U.S. FIRST Robotics Competitions sponsored in part by NASA

Many of the For Inspiration and Recognition of Science and Technology (FIRST) Robotics Competitions are sponsored in part by NASA HPCC's Learning Technologies (LT) Project. While exposing students to the thrill of robotics technology, these competitions are also likely to inspire them to pursue careers in science and engineering.

Upcoming events:
Kennedy Space Center Southeast Regional
March 1–3
Kennedy Space Center
Kennedy Space Center, Fla.

Langley Research Center/VCU/School of Engineering FIRST Robotics Competition
March 8–10
Virginia Commonwealth University Richmond, Va.

Johnson & Johnson Mid-Atlantic Regional
March 15–17

multimedia spectroscopy animation and activity. Pendleton will define spectroscopy and how it is used in astrophysics and astrobiology.

Women of NASA Annual Virtual Take Our Daughters to Work Day
April 26

Day-long series of chats, forums, web casts and more, featuring high-profile women from NASA.

Sun Earth Day Event
April 27

In partnership with the Stanford Solar Center, host Paul Mortfield talks with students as they share their results of sun-related experiments.

Space Day
May 3

Check the calendar of events for the times of those events and web casts surrounding Space Day.

Global Science and Technology Week
May 7–12

Week-long series of web-based events for young people, featuring international scientists involved with the space station.

***Aqua* Launch Web cast**
July 12

Come watch the launch and chat with experts of the *Aqua* spacecraft. *Aqua* is a major mission of the Earth Observing System (EOS), an international program centered in NASA's Earth Science Enterprise to study the Earth in detail from the unique vantage point of space.

Rutgers University
New Brunswick, N.J.

Southern California Regional
March 15–17
Los Angeles Memorial Sports Arena
Los Angeles, Calif.

National Championship
April 5–7
Epcot, a Walt Disney World Resort
Orlando, Fla.

URL for information is
http://robotics.nasa.gov/a_events.htm

Farming In Space
Ongoing

Two events per month; check web site for dates. Join one of the First International Space Station Space Biology Investigations!

K–12 teachers and students can participate in a cross-school, International Space Station plant science investigation. The investigation, called Farming in Space, is an adapted version of the Biomass Production System 24-Day Test, scheduled to be launched in January 2002.

Space Team Launch Countdown Online
Ongoing

Watch live video coverage of special events such as *Under Construction - The International Space Station* live interactive web casts. Archives are maintained of past web casts. Also available is live NASA TV coverage for other events, primarily space station-involved shuttle launches.

Aerospace Team Virtual Skies
Coming Soon

This event offers an in-depth look at air traffic management and NASA's research into aviation operations systems and safety. Students will learn about airport design; aviation navigation, meteorology, and communications; air traffic management systems; and future flight research through interactive tutorials and simulations. Students in grades 9–12 will have opportunities for online chats with NASA experts. They can also view research facilities such as Future Flight Central and the Crew Vehicle Research Facility through web casts.

Aerospace Team
Coming Soon

This content group will be sponsoring a series of

online collaborations. Students will be given an air-traffic management scenario to resolve by collaborating with other students. After students pass a series of certification quizzes, teachers can sign up their classes or after-school groups to participate in air-traffic control.

Aerospace Team Planetary Flight
Coming Soon

This event will cover atmospheric and non-atmospheric flight as it pertains to designing an aircraft. Classroom materials provide a problem-based learning approach and demonstrate how these tools can be integrated into grades 5–12 curricula.

To learn more about specific NASA Quest events and activities, please visit http://quest.nasa.gov.

Contact: Geoffrey Bruce, Educational Technology Team / Quest Manager
bruce@mail.arc.nasa.gov

Terri Littlejohn-Jones, Learning Technologies Channel studio lead
Littlejohn@mail.arc.nasa.gov

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Feedback

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Tell us what you think of this issue or send any suggestions for improving the web edition of INSIGHTS to the Web Curator or write to:

HPCC Insights on the WEB
M/S T27B-1
Moffett Field, CA 94035-1000

Please include the following information in the body of your email:

name
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Credits for Insights Magazine go to the following people along with the writers and photographers who contribute to each issue and the researchers and specialists whose material is highlighted:

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