

New research shows how marine organisms help oceans sequester carbon



Ellery Ingall of the Georgia Institute of Technology lowers a water-sampling instrument into Effingham Inlet on Vancouver Island, British Columbia, Canada.

By Jared Sagoff

As the international search for ways to remove carbon dioxide and other greenhouse gases from the environment intensifies, a team of scientists has identified a process by which marine organisms influence the amount of atmospheric carbon the sea absorbs.

Oceanic diatoms — unicellular glassy algae — harvest a key energy-storing molecule containing phosphorus from the dissolved compounds in ocean water. Instead of processing the phosphorus and releasing it back into the environment, the algae collect and store it in a compound known as a polyphosphate, said Argonne physicist Ian McNulty (XSD). McNulty collaborated with researchers from the Skidaway Institute of Oceanography, Georgia, and the Georgia Institute of Technology and the University of South Carolina.

The algae then convert these polyphosphate compounds into microscopic pellets that they store for energy. When these diatoms die, however, the polyphosphate pellets contained in their skeletons sink to sediments at the bottom of the ocean. With time, the polyphosphates are transformed into a mineral phosphate called apatite, thus completing the sequestration of phosphorus from seawater.

“If we can understand how phosphorus uptake, metabolism and sequestration take place within marine organisms, we could uncover information that might give us clues as to how carbon uptake and sequestration take place in the ocean and affect the global carbon balance,” McNulty said. “This research is of huge interest to climatologists and bears directly on and the

potential to combat global warming.”

Phosphorus is one of the principal ingredients of fertilizer as well as many other compounds present in significant quantities in agricultural runoff that winds up in large bodies of water, said oceanographer Jay Brandes of Skidaway, who collaborated with McNulty on the research.

“Oceans are the repositories of everything that washes off of the lands, and phosphorus is an important nutrient for all kinds of life, especially plant life,” Brandes said. “The interesting thing about this particular process is that because these diatoms need it to survive, the levels of phosphorus will control the size of the algae population. As the diatoms use up the available phosphorus and turn it into polyphosphates, they will die off in large numbers, altering the phosphorus balance.”

In most regions of the ocean, nutrient levels in the water dictate the rate of both phosphorus and carbon sequestration. The removal of carbon from the environment is controlled by the removal of phosphorus and nitrogen, according to Brandes.

During the course of their research, McNulty and his colleagues were surprised to discover that the diatoms created polyphosphates even in waters that contained relatively low concentrations of dissolved phosphorus. The polyphosphates created by the diatoms also proved more durable than anticipated, Brandes said, allowing the researchers to glimpse their entire lifecycle from solutes to apatite.

Much of the research, led by oceanographer Ellery Ingall of Georgia Tech, was performed at Argonne’s **See “Sequestration” on page 4**

Argonne scientists unlocking the secrets to colloidal suspension

By Jared Sagoff

A glass of milk, a gallon of paint and a bottle of salad dressing all look like liquids to the naked eye. But when viewed under a microscope, these everyday liquids are revealed as “colloids” — substances containing small globules or particles that stay suspended in solution.

These colloids require a delicate balance of opposing forces to remain stable: Forces that attract must match those that repulse. A new colloidal stabilization method characterized by Argonne scientists might give researchers a new way to control the stability of some colloidal suspensions.

In this approach, known as nanoparticle haloing, highly charged nanoparticles and negligibly charged colloidal microspheres are mixed together in solution. The nanoparticles automatically organize themselves around the microspheres to form a halo-like structure that stabilizes the solution. This new pathway to producing materials would not be possible utilizing traditional routes.

The structure of the halo — the key to understanding this kind of stable col-

loid — has remained a mystery because the nanoparticles that form it are more than 100 times smaller than the microspheres they surround.

Using X-rays produced by Argonne’s Advanced Photon Source (APS), Argonne scientists, in collaboration with researchers from the University of Illinois at Urbana-Champaign, uncovered the structure of the nanoparticle halo. The researchers used the ultra-small-angle X-ray scattering instrument at X-ray Operations and Research to discover that nanoparticles form a loosely organized layer a small distance from the microspheres’ surfaces.

This discovery suggests a weak attraction between nanoparticle and microsphere, corroborating earlier theoretical predictions that the halo can form only in such an environment.

“Because we have established a methodology to determine the structure of nanoparticle halo, it opens a window to the systematic study of the entire nanoparticle-microsphere phase diagram for this type of novel colloidal stabilization mechanism,” said Fan Zhang (XSD). ▀

Several employees receive SPOT Awards



The SPOT Award allows “on-the-spot” recognition of employees who exhibit good safety behavior or initiative. SPOT Awards were presented to employees from Facilities Management and Services (FMS) June 9. From top left: Harold Dolgner, June Saragossa, Gail Stine, Anna Mikos, Anna Baran and Rogelio Santos. Bottom left: Mark Boyd, Anna Rondinella, Susan Pinder, Marianna Kuczaj and Roger Bergquist.

INSIDE

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UChicago
Argonne LLC



ARGONNE NATIONAL LABORATORY IS MANAGED BY UCHICAGO ARGONNE, LLC FOR THE U.S. DEPARTMENT OF ENERGY

Argonne-UChicago joint venture bolsters genomic sequencing capabilities

The Institute for Genomics and Systems Biology (IGSB), a joint venture of Argonne and the University of Chicago, has acquired two new instruments that provide an enhanced ability to sequence genomes more quickly and broadly.

"Sequencing used to be like locating a golf ball by searching only on the fairway, but not the rough," said IGSB Director Kevin White. "It used to be that only species that could be cultivated, or grown in pure culture, could be sequenced. The capabilities of the new Roche 454 FLEX and Illumina Solexa Genome Sequencer now allow scientists that use the machines to skip the cultivation step. Eliminating that step will save time and speed up the research process, while maintaining accurate sequencing results."

The 454 FLEX is ideally suited for studying microbial communities by de novo sequencing. It provides 400,000 DNA fragments of about 250 base pairs each or 100 million base pairs per run that represent either a significant part of the genome of a single organism or a random snapshot of parts of multiple genomes.

The Solexa Genome Sequencer is targeted at resequencing. Compared to the Roche 454 FLEX, it generates more but shorter reads, creating 40 million reads with a current read length of 18 to 36 base pairs or about 1 billion base pairs per run depending on the application.

The machines were purchased to facilitate research for three Argonne Laboratory-Directed Research and Development projects. A project led by

Michael Miller, a terrestrial ecologist, and Folker Meyer, a computational biologist in IGSB, will enhance our understanding of soil CO₂ sequestration capability on the microbial level.

In another project, Argonne's soil ecology group is using metagenome sequencing to study the microbial population in chronoserries plots at DOE's Fermi National Accelerator Laboratory. In a third project, Argonne's environmental remediation program is studying the role played by microbial communities in subsurface remediation of inorganic contaminants using metagenome sequencing.

IGSB's sequencing group plays an active role in the design and optimization of experiments using DNA sequencing technology, such as developing and optimizing protocols for DNA isolation from environment as diverse as subsurface soil and plant leaves. The group also works with researchers to develop protocols for DNA extraction and to conduct downstream bioinformatics analyses.

The new machines are also open to other Argonne and University of Chicago researchers who need genetic samples sequenced. In the near future, the sequencing instruments will be available to select peer-reviewed proposals from researchers from other organizations.

Argonne's genomics research is primarily funded DOE's Office of Science, which supports research that provides a fundamental scientific understanding of plants and microbes necessary to develop strategies for sequestering carbon gases, producing biofuels and cleaning up waste. ▀

DOE submits Yucca Mountain license application; Argonne contributes science, engineering support

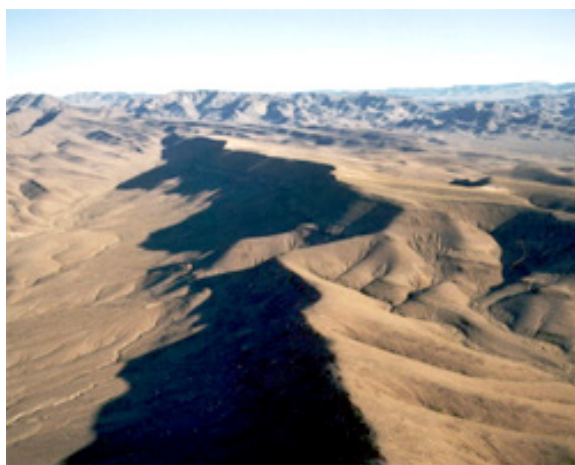
The U.S. Department of Energy reached a milestone in its efforts to help enable the renaissance of nuclear energy in the United States June 3, when Energy Secretary Samuel Bodman announced that the department had submitted the formal license application for the federal nuclear waste repository at Yucca Mountain, Nevada, to the U.S. Nuclear Regulatory Commission.

Argonne played a role in developing the license application, and — along with nuclear power generators in Illinois — will benefit from the repository should the NRC approve the license.

"A huge amount of science underpins the application, and most of the national laboratories were involved," said Mark Peters, deputy to the associate laboratory director for Energy Sciences and Engineering. Eight national laboratories were involved in conducting the research and analyses. Sandia National Laboratories coordinated the scientific work.

"Argonne's contribution included characterizing spent fuel and high-level waste glass performance in the repository," Peters said. "This included experiments and helping to develop the models for various waste forms."

Much of this work was performed in Argonne's Chemical Sciences and Engineering, Nuclear Operations and Nuclear Engineering divisions. Their work may not be done yet, Peters said. Those who worked on the program may be called on to defend their results during the three- to four-year license review process. If the NRC approves the repository for construction, the agency will conduct



Research conducted at national laboratories, including Argonne, underpins the DOE's license application for the federal nuclear waste repository at Yucca Mountain. The 4,950-foot ridge is on federally-controlled land in Nevada, about 100 miles northwest of Las Vegas.

Proposals sought for time on world's most powerful computers

The U.S. Department of Energy is accepting proposals for a program to support high-impact scientific advances through the use of some of the world's most powerful supercomputers at four of DOE's national laboratories. Through the Innovative and Novel Computational Impact on Theory and Experiment (INCITE) program, DOE's Office of Science plans to award approximately 680 million supercomputer processor-hours at four laboratories, including Argonne, for large-scale, computationally-intensive science projects in 2009.

This is the sixth year of DOE's INCITE program, which encourages proposals from scientists and engineers from universities, industry and other research facilities for large-scale science projects requiring the use of high-performance computing systems not commonly available in academia or the private sector. The number of processor-hours expected to be awarded in 2009 is more than double the amount allocated in 2008, and is made possible by the new 550 teraflop/s (550 trillion calculations per second) IBM BlueGene P supercomputer recently installed at Argonne.

The term "processor-hours" refers to allocation of time on a supercomputer.

A project receiving one million processor-hours would take 500 hours, or about 21 days, on a 2,000-processor supercomputer. The same project performed on a single-processor desktop computer would take more than 114 years.

For 2009, the INCITE program provides the only opportunity for researchers to request allocations on the Cray XT4 supercomputer at Oak Ridge National Laboratory and the IBM Blue Gene supercomputer at the Argonne Leadership Computing Facility. Other available computing resources are the Cray XT4 supercomputer at Lawrence Berkeley National Laboratory (Berkeley, CA) and the Hewlett-Packard massively parallel system at Pacific Northwest National Laboratory (Richland, WA).

Proposals will be accepted until the call deadline: 11:59 p.m. EDT Monday, Aug. 11. Winning proposals will be selected through a peer-review process and are expected to be announced later this year. Current DOE sponsorship is not required for this program. More information on the call for proposals is online. ▀

hpc.science.doe.gov/

Clemson University honors Argonne scientist Robert Ross



Argonne Computer Scientist Robert Ross, who received a 2008 Outstanding Young Alumni Award from his alma mater Clemson University, stands with Clemson Dean Esin Gulari at the award reception.

Computer Scientist Robert Ross (MCS) received an Outstanding Young Alumni Award for 2008 from Clemson University, an honor the institution reserves for alums "making significant contributions to the world around them," through significant career success and notable contributions to society.

Ross received a bachelor of science in computer engineering in 1994 from Clemson, followed with a Ph.D. in 2000. He's been recognized with a Presidential Early Career Award and R&D 100 Award, a mark of excellence recognizing the most innovative ideas of the year. His work with MPICH2, a high-performance software application, enables developers to run the same code on a wide variety of platforms, from laptops and workstations to the largest and fastest parallel computers in the world. Applications include materials science, combustion simulation, astrophysics, climate modeling and bioinformatics.

Clemson is a nationally recognized research university in South Carolina where 5,500 students are enrolled in engineering and science courses. ▀

long-term monitoring and performance studies of its operation.

DOE has spent 20 years and more than \$10 billion conducting scientific evaluations that have led to the decision to pursue licensing of the Yucca Mountain site.

The 8,600 page application describes DOE's plan to safely isolate spent nuclear fuel and high-level radioactive waste in tunnels deep underground at Yucca Mountain, a remote ridge on federally controlled land in the Mojave Desert 90 miles northwest of Las Vegas. Currently, some 57,000 tons of waste is stored at

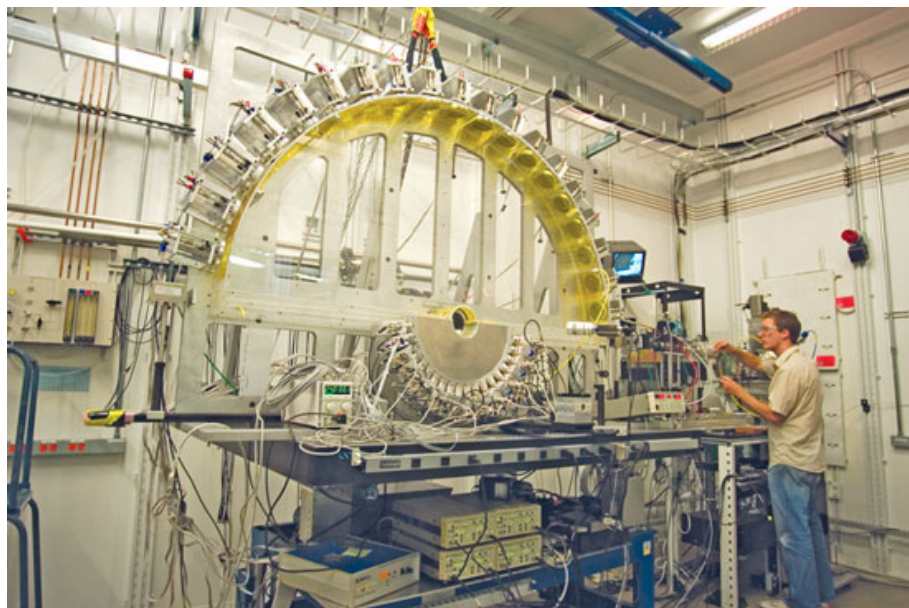
121 temporary locations in 39 states across the nation.

"Submittal of the Yucca Mountain license application will further encourage the expansion of nuclear power in the United States, which is absolutely critical to our energy security, environmental goals and national security," Secretary of Energy Samuel Bodman said.

For more information on the license application and DOE's Yucca Mountain Project, visit the Office of Civilian Radioactive Waste Management's Web site.

www.ocrwm.doe.gov/

Tim Fister Earns Henderson Prize from University of Washington



Tim Fister, winner of the University of Washington's Henderson Prize, at the LERIX detector installed on the XOR/PNC 20 I-D-B beamline.

Tim Fister, a postdoc in Argonne's Materials Science Division working with Paul Fuoss, was awarded the Henderson Prize by the University of Washington (UW) Physics Department for the outstanding Ph.D. thesis from his graduating year. The title of his thesis was "Momentum-dependent X-ray Raman scattering."

As part of his Ph.D. research, Fister designed, helped construct and commissioned the lower-energy-resolution inelastic scattering (LERIX) spectrometer permanently installed at Advanced Photon Source (APS). The LERIX instrument is a large multi-element spectrometer consisting of 19 analyzers arranged in a semicircle and mounted in an aluminum frame. The LERIX allows high-energy, nonresonant inelastic X-ray scattering experiments with a great deal of adaptability to the needs of individual users.

Jerry Seidler of the University of Washington, Fister's thesis advisor, said, "Tim's dissertation was outstanding in all regards: instrumentation, experimentation, data analysis and theory. His work on instrumentation will likely have the longest-lasting impact. LERIX is the first instrument optimized for rapid measurement of the momentum-transfer dependent component of nonresonant X-ray Raman scattering. In three years of regular operation, there are well over 20 LERIX-based manuscripts completed or in preparation with applications spanning battery technology, catalysis, hydrogen fuel storage, actinide chemistry, magnetism, correlated electron phenomenon, geophysics and even gas-phase atmospheric science."

The Henderson Prize commemorates Professor Joseph Henderson and his wife. Henderson joined the faculty of the University of Washington in 1929. Mrs. Henderson was precluded from regular faculty appointment by the anti-nepotism rules in effect, although she taught occasional courses. The first Ph.D. awarded by the Department of Physics was earned by one of Professor Henderson's students in 1934, and in all 25 students received Ph.D.s under Henderson's guidance. Research in nuclear physics at UW began when he and his students built a high-voltage X-ray source for the Swedish Hospital to use in cancer therapy. Henderson contributed substantially to the physics war effort in World War II and he established the UW Applied Physics Laboratory afterwards, of which he served as director until

1969. The prize is financed by the Henderson Family Fund, established through gifts from the Hendersons, their family, friends, colleagues and former students.

More information on LERIX is available online. ▀

www.aps.anl.gov/Science/Reports/Annual_Report/APS_Science_2006.pdf

General to speak at Director's Special Colloquium

The commander of the U.S. Air Force's "Mighty Eighth" will present a talk at a director's special colloquium Friday, June 20.

Lt. General Robert Elder Jr. commands the 8th Air Force, based at Louisiana's Barksdale Air Force Base, which is responsible for the security and defense of the Air Force's global computer enterprise network. He is also the joint functional component commander for global strike and integration at U.S. Strategic Command and commands USSTRATCOM's nuclear bomber as well as reconnaissance Task Force 204.

Elder's staff experience includes senior leadership positions with the Joint Staff, Air Staff, Air Combat Command and NATO. He has commanded at all levels, led unit deployments to Southwest Asia, Europe and the Pacific, and held senior command positions in operations Southern Watch, Enduring Freedom and Iraqi Freedom. He holds a doctorate in engineering from the University of Detroit, Mich.

The colloquium will begin at 10 a.m. in the Building 402 Conference Center. All employees whose schedules permit are welcome to attend. ▀

Parking in loading dock zones is a traffic, safety violation

Parking in building loading dock areas is a serious traffic offense that might result in the suspension of on site driving privileges.

In several recent instances, riggers and delivery drivers had a difficult time using building loading dock areas because of personal vehicles that were parked illegally in the area. Argonne's Protective Force will strictly enforce no-parking zones.

The laboratory's traffic and parking policies can be found in the Environment, Safety and Health Manual section titled "Traffic Safety and Vehicle Incident Reporting" and were discussed in a 2007 memo from Argonne Director Robert Rosner. ▀

www.tis.anl.gov/db/memos/download/DDD/2151.pdf

www.tis.anl.gov/db/manuals/esh-man/document/DDW?w=docid=eshman_015_001_000_000_000

Second group attends Strategic Laboratory Leadership Program

The second group to take part in the Strategic Laboratory Leadership Program (SLLP) attended the opening session "Effective Leadership" at the University of Chicago's Gleacher Center May 27. A total of twenty-six participants from Argonne, Fermilab and the University of Chicago faculty will take part in the year-long program.

Fifteen Argonne employees are selected annually by Laboratory Director Robert Rosner to participate in the SLLP. The highly rated University of Chicago Graduate School of Business developed this non-degree executive education leadership for programmatic

and operations staff of Argonne and Fermilab.

"The Strategic Laboratory Leadership Program is the first of its kind," said Argonne Lab Director Robert Rosner. "Those of us from academic backgrounds often stumble into leadership without any kind of formal professional development. This program brings experienced lab managers together and teaches them how to think more strategically about the 'business' of national laboratories. It also focuses on the importance of forming collaborative partnerships across disciplines and laboratories to ensure that the science and

engineering research conducted meets the needs of the nation."

SLLP is an executive education program developed and led by the University of Chicago's Office of the Vice President for Research and National Laboratories and University of Chicago Graduate School of Business. The university committed to this program for five years beginning in September 2007 as part of the laboratory management contract for both Argonne and Fermilab.

More information is available on the SLLP Web site. ▀

inside.anl.gov/sllp



The current group of Strategic Laboratory Leadership Program participants includes (front row, left to right) Sergei Nagaitsev, Kirsten Laurin-Kovitz, Gary Wiederrecht, Cristina Negri, Mark Champion, Chris Grandy and Rich Karuhn. In the middle row, from left to right, are Lisa Durham, Bob Webber, Regina Rameika, Jamie Stalker, Ravi Madduri, Cindy Conger, Susan Zitzka, Ann Frankowski and Carol Giometti. In the back rows, left to right, are Patrick Hurh, Ted Krause, Rustem Ismagilov, Mike Lindgren, Chris Grandy, Leon Reed, Scott Dodelson, Patricia McBride, Chuck Prokuski and Susan Rogers.

UChicago Argonne, LLC Board of Governors to honor employees and children at annual awards program

The UChicago Argonne, LLC Board of Governors for Argonne will honor 10 employees and one child of an employee with awards at its 2008 Awards Program Tuesday, June 24.

Distinguished Performance Awards, which recognize the outstanding scientific or technical achievements or a distinguished record of achievement of select Argonne employees, will be awarded to Khalil Amine, senior materials scientist, group leader, Chemical Sciences and Engineering Division; Orlando Auciello, senior physicist, Materials Science Division; James E. Cahalan, senior nuclear engineer and department manager, Nuclear Engineering Division; and Stephen Gray, senior chemist – theoretical chemistry, Chemical Sciences and Engineering Division.

Outstanding Service Awards, the highest honor the university gives to Argonne employees in support positions, will be awarded to Maria Heinig, administrative specialist, Intense

Pulsed Neutron Source Division; Joseph L. Midlock, computer scientist, APS Engineering Support Division; John E. Pearson, engineer, Materials Science Division; and Susan Barr Strasser, manager, User Programs, X-Ray Science Division.

Each DPA and OSA winner will be presented with an award and a check for \$3,500.

The Pinnacle of Education Award, which recognizes employees for their leadership in science through the Division of Educational Programs, will be shared this year by Gian P. Felcher, senior physicist, emeritus, Materials Science Division; and Dennis M. Mills, deputy director, Scientific User Facilities. Both Felcher and Mills will be presented with an award and a check for \$1,750.

The University of Chicago will award an undergraduate scholarship to Yi Ren, son of Yang Ren, physicist in the X-Ray Science Division.

The UChicago Argonne, LLC Board of Governors 2008 Awards Program will begin at 2:30 p.m. in the Building 402 Auditorium. A reception will follow in the lower level gallery. All university, Argonne and U.S. Department of Energy employees whose schedules permit are invited to attend. Shuttle bus service will be provided lab-wide. ■

Argonne Club offers discounted Six Flags tickets

Argonne Club is selling one-day Six Flags tickets for several weekend days this June for only \$28 per person, a savings of \$26.99. The tickets are good on June 21, 22, 28 or 29 and can be purchased at the Argonne Credit Union.

For more information, contact Argonne Club President Todd Hayden at ext. 2-6143 or argonneclub@anl.gov. ■

Sequestration

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Advanced Photon Source. The results were published in the May 2 issue of the journal *Science*.

McNulty's work on this research project was funded by the U.S. Department of Energy's Office of Science, Office of Basic Energy Sciences. Brandes' and Ingall's work was funded by the National Science Foundation. ■

Employees asked to report fraud, abuse to DOE

Argonne and DOE employees should report suspicions or knowledge of fraud, mismanagement or abuse involving the U.S. Department of Energy, its employees, programs, contractors or subcontractors to the DOE Office of the Inspector General at (800) 541-1625 or (202) 586-4073. ■

Classified ads

MISCELLANEOUS

RIDING MOWER – MTD Yard Man, 24" cut, 8 yrs old. Like new. \$300 OBO. Michael Kaminski. (815) 588-0292.

WATCH – Brand new Nike Triax Elite watch with heart rate monitor, shoe pod, USB PC/Watch Link, Manual and PC software. \$225. Robert Scott. (630) 890-2988.

ENTERTAINMENT CENTER – Cherry wood, Cabinets, drawers, shelves. Brand new condition. Dimensions: 56.25" (wide), 57.75" (high), 17" (deep). Picture available. \$250. Jeff Rest. (630) 527-0074.

SUNGLASSES – Original men's sunglasses Dolce & Gabbana. Brand new with certificate of originality included. \$100. Maria Heinig. (708) 645-0406.

FURNITURE – Black microfiber sectional sofa, excellent condition. \$400 o.b.o. Kitchen table (wood) with 6 chairs. \$75 o.b.o. Jennifer Seivwright. (815) 467-4496.

MATTRESS SET – Used for two weeks, Serta King box spring and frame. Paid \$360, make offer. Dean Carbaugh. (815) 405-7247.

PIANO – Baldwin Acrosonic, upright, compact. \$400. Gladys Klemic. (630) 428-0863.

MISCELLANEOUS – Crib. \$100. Colgate crib mattress. \$60. PegPerego stroller. \$100. All items top rated by Baby Bargains book. Kenmore A/C. \$100. Octagon rug, 6 ft. \$100. Ashot Melikyan. (630) 963-5816.

DESK – Wooden desk 2x3 feet with one file drawer and three other drawers. Great office desk. \$75 OBO. Jennie E. Munster. (631) 525-6014.

TACKLE BOXES – Tackle Logic, 18x9x12; Plano 20x11x14. Both have

many compartments and/or drawers. Never used. \$20 each. Ron Kmak. (708) 301-1269.

ESTATE SALE – Family-run, Friday and Saturday, June 20-21, 9 a.m. - 3 p.m., 5527 W 25th Place, Cicero. Cedar chest, chest of drawers and dresser, egg collection, toys, sewing machines and a few surprises. sofa, chairs, dining room set, full and twin beds, kitchen set, kitchen items, collectibles, books, and lots of miscellaneous items. Everything must go. Cash. Betty Iwan. (630) 953-0324.

ANTIQUe TOOLS – Crosscut one- and two-man tree saws. \$50 and \$75. Buck saw. \$30. Cast iron kettle. \$75. Taps, dies, sockets and more. Carl Webster. (630) 963-9604.

FURNITURE – Pecan double dresser. \$20. Pine desk. \$70. Pine Grandmother clock, shaker style. \$250. Antique pine cupboard. \$250. Antique carpenter's tool set. \$300. More on Web site: www.sanibelweb.com/furniture. Susan Webster. (630) 963-9604.

STROLLERS – Jog stroller good for infants four months through 40 lbs., with sun shade, two cup holders and large storage bin, adjustable handle bars and seat, excellent condition. \$50. Deluxe backpack/stroller combo, super for anywhere a full-size stroller isn't convenient, padded shoulder and hip straps, lightweight steel frame, removable/adjustable tilt-top canopy, safety harness, stands alone or converts to stroller, accommodates up to 35 pounds, excellent condition. \$25.

BIKES – Sun EZ-3 Trike 21-speed recumbent, under 300 miles. \$500. Trek Navigator 200 Comfort bike, mirror, rear rack. \$250. Carl Nelson. (815) 886-9386.

AUTOMOBILES

1996 FORD – Taurus, well maintained,

new tires and radiator, 29 mpg highway. \$1,895 or best offer. Gregg Kulma. (630) 810-0270.

1998 PLYMOUTH – Grand Voyager, like new body condition, excellent mechanical condition, orig. owner: AT, PS, PW, PDL, cass. player, rear AC, 78K mi. \$4,500 obo. Marshall Mendelsohn. (630) 852-7092.

2000 VOLVO – V40 wagon, 71K miles, very good condition, side air bags, ABS, stability control, heated seats, CD, moonroof, new brake rotors. KBB \$7,150, asking \$6,900. David Horner. (630) 717-5544.

2004 YAMAHA – YZF 600R Sport Bike, liquid silver, 3150 mi., 600cc, 6-speed manual, excellent condition. Pictures available upon request. Call after 5 p.m. \$5,400 neg/obo. Charles Vulyak. (708) 636-1426.

1993 TOYOTA – silver Camry station wagon, 118,000 miles V6, ABS, 3rd row seat, Excellent condition except AC does not work and needs new antenna. \$2,000 or OBO. Cindy Boggs. (630) 690-0854.

1988 CHEVY – Caprice, rusty but runs well, 122,000 miles. \$750. Laura Morisco. (630) 710-0143.

2000 MAZDA – Protege, ES, 4 dr, manual, moonroof, good condition, very good gas mileage, 73k miles. \$3,000 obo. Brian Lally. (773) 354-5437.

HOUSING

HOUSE/SALE – 2 bedroom, 1 bath home located on a quiet cul de sac in Goose Lake Subdivision in Morris. Home offers a finished 2 1/2 det. heated garage, patio, mature tress with lots of shade, big storage shed, low utilities, and all Lincoln, Beaver and Goose Lake privileges. Coal City Schools and minimal traffic. \$175,000. Kathy Vanoskey. (815) 726-7040.

HOUSE/SALE – or rent w/option to buy in Burr Ridge, 4br/2bth, first floor hardwood, vaulted beamed family room. Totally updated, new kitchen, new baths. Private quiet setting, 7 min driving to Argonne. \$379,000(\$1,900 for rent). Julia Golova. (630)728-5385 or jgolova@akonni.com.

APARTMENT/RENT – One-room apartment for rent in downtown Downers Grove, near groceries and restaurants. Half furnished. 15 minutes from Argonne and 1 block from the Metra. \$880/month. Daniel Torres Rangel. (630) 815-3237.

HOUSE/SALE – Beautiful 2004 built house in Naperville for sale. 5 bedroom, 3 bath over 3,200 sq. ft., three-car garage. Excellent 204 schools. Must see. \$493,000. Mohan Ramanathan. (630) 254-4235.

HOUSE/SHARE – Fully furnished, private bath, very close to the lab, utilities included. \$450.00/month. Rose Pausche. (630) 739-0126.

CONDO/RENT – 1 bedroom, 1 bath, Willowbrook. Fully updated. Heating included. Swimming pool, tennis court, exercise facility. Available July 15. \$790 mo. Hong Zhang. (630) 986-2811.

WANTED

APARTMENT/RENT – Would like to rent apartment or small home close to lab on a month to month basis, that will allow three very neat, clean pets starting sometime this summer/fall. Marlene Nowotarski. (630) 901-5774.

MOTOROLA PAGER – Must be in good working condition, reasonably priced. Alice Birmingham. (630) 257-8160.

BIG WHEEL – Original 16-inch big wheel with adjustable seat, good condition. Teri Huml. (815) 730-9109. ■