

# Argonne National Laboratory-East



## Summary Site Environmental Report for Calendar Year 2001



ANL-02/2 (Summary)

Argonne National Laboratory is operated by The University of Chicago for the U.S. Department of Energy under Contract W-31-109-Eng-38.

# A message from the students

By **Caitlin Daly and Kimberly Garvey**

We, the Biology II class at Downers Grove South High School, summarized the Argonne National Laboratory-East Site Environmental Report for 2001, an annual publication that is too thick and technical for most of the public to bother to read. We hope that our summary will give the public a better understanding of how Argonne monitors and protects the environment.

Dr. Norbert Golchert, a scientist at Argonne, asked Community High School District 99 if a class of high school students could write a summary booklet for Argonne. The district agreed, because the project fit with Illinois State educational goals. Biology II was selected because of the problem-solving approach we use to answer questions.

The class has recently been studying ecology. We researched how ecosystems interact with each other and learned about different factors of an ecosystem, including abiotic and biotic factors, density-dependent and -independent population factors, etc. A few months ago, the class decided to explore ecology in real life and took a field trip to Treehaven, a natural preserve to research how species interact with each other. We were there for a total of four days and had an awesome time.

We took a field trip to Argonne to learn more about the laboratory we would be writing about. We were grouped into pairs to research and write about the different aspects of Argonne's Site Environmental Report. We had about 3-4 weeks to research and finalize our

write-ups. We were writing papers left and right, first drafts, second drafts, even third drafts! We were trying to gather information to inform the public and to show what we learned. At first we thought that we would not be able to take on this huge task of rewriting a 300-

page book ... but in the end we started to see it all come together.

As for what the students think about the project, we feel that it has opened our minds to a broader form of science:

■ "When you are sitting in class learning about cells and environments, you never think that you are going to write a scientific book that is going to be read by the public." – Jessica Bridges, junior, Downers Grove South High School.

■ "It was hard to get all the information necessary and research in a short amount of time, but in the end it all seems to kind

of come together." – Chad Meador, junior, Downers Grove South High School.

■ "It's a good experience, because it relates to many of the fields our classmates want to go into, such as journalism, public relations, and of course, science." – Nicole Young, junior, Downers Grove South High School.

Overall we feel that the project helped us develop a better understanding of science, while still being able to work with our peers and have a great time. When we saw what classes of past years had done, we thought we would never be able to match up to their hard work, but as the finished project came through, we saw that we were successful in many ways.



*These Downers Grove South High School students helped create this summary report. In the front row are Kenneth Bartels (12th grade), David Augustine (11), Garin Jones (12), Courtney Shillington (11), Iris Moy (11), Jessica Bridges (11) and Caitlyn Daly (12). In the middle row are Kathryn Pruyt (12), Christopher Samsa (11), Kimberly Garvey (11), Elizabeth Kochan (11), Laura Biehl (11), Mrs. Kathleen Luczynski (teacher), Samantha Sullivan (11), Brian Azriel (11), Christina James (11), Scott Mandru (11) and Travis Atkinson (12). In the top row are Stacey Stepek (11), Nicole Young (11), Kathryn Podmokly (12), Jason Sloma (12), Jacqueline Hoogland (11), Brian Hutchens (12), Chad Meador (11) and Doug May (12).*

For more information about Argonne's Site Environmental Report, please contact Norbert Golchert at (630) 252-3912 or [ngolchert@anl.gov](mailto:ngolchert@anl.gov). For more information about Argonne and its programs, contact Argonne's Office of Public Affairs at (630) 252-5575 or see the World Wide Web site at [www.anl.gov](http://www.anl.gov).

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## What is Argonne?

*By Nicole Young  
and Stacey Stepek*

Argonne National Laboratory's Illinois site is located at 9700 South Cass Avenue, near Lemont, Ill. Other towns near Argonne are Darien, Naperville, Downers Grove, Woodridge, Palos Hills, Hickory Hills, Wheaton, Elmhurst, Aurora, Goodings Grove, Joliet, Burbank, and Palos Heights. About 3,300 Argonne employees work full time at the site.

Argonne occupies approximately 1,500 acres in DuPage County. The terrain in the area is gently rolling hills, partially wooded forests, former prairies, farmlands, small ponds, and streams.

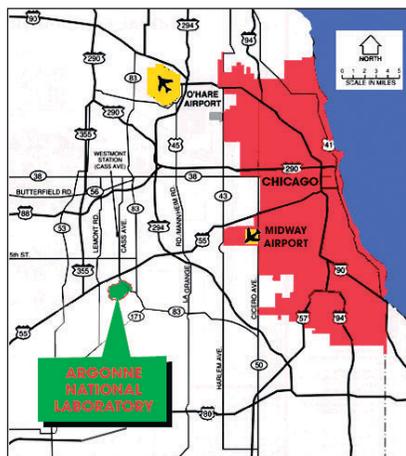
The climate in the area has a monthly average temperature of 10.5 degrees Celsius (51 degrees Fahrenheit). The geographical area received 90.7 centimeters (35.7 inches) of precipitation in 2001. The highest historical monthly average temperature that the



*Argonne-East*

The vegetation on the Argonne site is mainly oak and hickory forest, surrounded by tall grass prairie, sugar maple, red oak, and basswood. In poorly drained areas, there are silver maple, elm, and cottonwood trees. There are two types of aquifer: Niagara and Alexandrian dolomite. Shale separates the two.

The site's main water resources are groundwater, Sawmill Creek, and Freund Brook. Freund Brook and Sawmill Creek flow across the Argonne site. Sawmill Creek eventually empties into the Des Plaines River to the south. The animals on the Argonne site include five species of amphibians, seven reptile species, 40 summer resident birds, and 25 mammals. Among the mammals are fallow and white-tailed deer.



Argonne area reached was 23.2 C (73.8 F). That was 22 percent higher than the long-term Argonne monthly average. The lowest monthly average temperature was -4.0 C (24.8 F). In March and June 2001, the average temperature was way below normal.

# Executive summary

By **Brian Hutchens**

This report is a summary of the actions taken by Argonne National Laboratory in 2001 to keep the public and environment safe. Over the last year, Argonne has monitored, evaluated, and taken steps to control problems or potential problems on its DuPage County site. The problems that have or might occur are things like spilled or leaked radiological waste, non-radiological wastes or hazardous materials. Argonne is keeping its promise to be a good neighbor, and this report confirms its commitment to its neighbors, both human and environmental.

Argonne's commitment to have minimal effect on the environment was tested vigorously over 2001.

Argonne's first priority is keeping the people around it safe. This was verified through tests done on the air. The air can be the most damaging way to pollute an area. This is why Argonne was so extensive in its testing. They followed guidelines of the Clean Air Act, which covers radioactive emissions, asbestos, and conventional air pollutants. Air was tested, and after all calculations were

finished, the effect on the public was found to be so minimal that it almost didn't register. The sources of pollutants from Argonne are exhausts from laboratories and other facilities, the steam plant that provides space heating for Argonne's buildings, and emissions from emergency generators when they are operating. The traces that were found were evaluated and reduced, even though they were originally well within regulatory limits.

The same trends — further reduction of concentrations that were already safe — were found in the water analysis, as well. Water was sampled and evaluated many times over the course of the year, and what was found was good news. The radiological elements were

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## *Argonne's first priority is keeping the people around it safe.*

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very minimal, and most of the trace amounts were due to naturally occurring radiological sources. The only measurements that exceeded standards a few times were of total dissolved solids (TDS), essentially road salts dissolved in rainwater runoff. These problems were detected and then controlled. To put numbers to

the situation, 1,600 measurements were taken over the last year, and out those measurements, only seven were outside the limits set by the Illinois Environmental Protection Agency.

Argonne has another priority as well: keeping the environment around its site safe. The ecosystem surrounding Argonne, including Waterfall Glen Forest Preserve, is a valuable resource for our area. Argonne knows the value of this ecosystem and



works in every way possible to keep it free of pollutants, both radiological and non-radiological. Many of the factors involved in keeping the public healthy also keep our forest and its inhabitants healthy.

Argonne is not always told to keep environmental contaminants at a specific level, but the laboratory works at it anyway and often sets its own standards stricter than national and state standards. Argonne has a commitment, and that commitment leads the laboratory to be a better neighbor. Argonne is a valuable resource for the community, working to keep the public and the ecosystem safe and healthy.

# Argonne's history

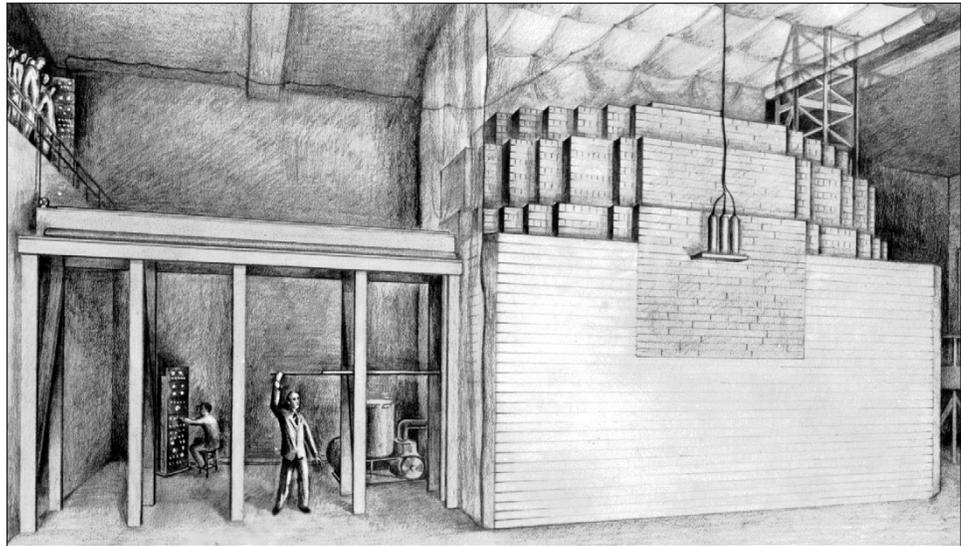
*By Christina James and Kenneth W. Bartels*

Argonne National Laboratory is operated by the University of Chicago as part of the U.S. Department of Energy's national laboratory system.

Argonne is a direct descendent of Chicago Pile 1, the world's first nuclear reactor, which came to life Dec. 2, 1942, in a squash court under the stands of the University of Chicago's Stagg Field. The team that created Chicago Pile 1 was led by Enrico Fermi. By February 1943, Chicago Pile 1 had been dismantled, moved to a remote location in the "Argonne Forest" section of the Cook County Forest Preserve, and rebuilt as Chicago Pile 2. The laboratory that sprung up around the reactor came to be known as "the Argonne Lab." Fermi was its first director.

Argonne was the first national laboratory, chartered in 1946. Its initial mission was to study peaceful rather than military uses of atomic power. Argonne quickly outgrew its small site in the forest preserve and moved to its present DuPage County location in the late 1940s.

Over the years, Argonne's missions grew to include basic and applied research in various fields, such as biology, physics, applied mathematics, advanced computing, materials science, nuclear engi-



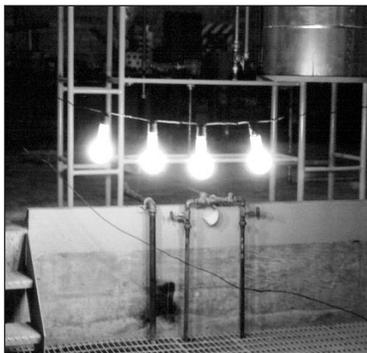
*CP-1, the first nuclear reactor.*

neering, and energy and environmental research.

Another of Argonne's missions is to design build and operate large, one-of-a-kind user facilities. These facilities, such as the Advanced Photon Source, attract researchers from all over the world to carry out research that cannot be done anywhere else.

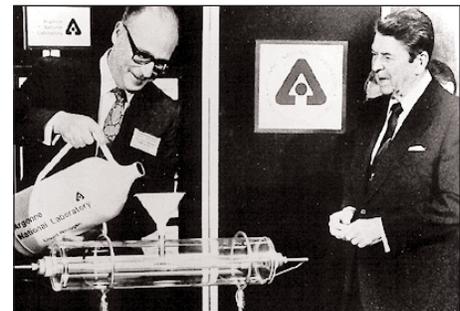
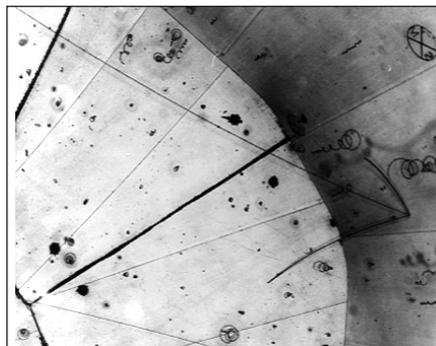
Argonne also helps train the next generation of scientists and engineers by operating the largest educational program in the U.S. Department of Energy's national laboratory system. Each year, about 3,000 students and educators from K-12 through the university level participate in Argonne's educational programs.

Argonne's annual operating budget is about \$480 million. The laboratory's Illinois site has about 3,300 employees.



*An Argonne reactor produced the first usable nuclear electricity in 1951.*

*Below, the world's first neutrino observation in a hydrogen bubble chamber. It was found Nov. 13, 1970.*



*Former Argonne Director Alan Schriesheim (left) demonstrates high-temperature superconductivity to President Ronald Reagan in 1987.*

# Current projects

By Jacqueline Hoogland and Iris Moy

Argonne was the first national lab. Its dozens of research programs include computer science, materials research, chemistry, bioscience, physics, and energy and environmental science, and the peaceful use of nuclear energy. Argonne has been described as “One of those places where the Ph.D.s wear blue jeans.”

People mistakenly think Argonne is a government building used to design secret weapons for military use, and the fact that the site is completely surrounded by fencing doesn't help much.

## Parallel computers

Working with advanced computers is one of Argonne's major current projects. Argonne's newest supercomputer is a Linux cluster capable of performing more than one trillion calculations per second (1 teraFLOP). Called “Jazz,” the supercomputer is designed to provide the highest performance for many research fields, such as chemistry, physics and reactor engineering. The computer ranks among the fastest in the world and is the first supercomputer to provide sustained teraFLOP speeds to Argonne.

## Biochip technology

Argonne is also developing biochips, which basically are thin glass slides with 8,000 little gels on them that function as mini-test tubes. Robots insert test samples into the gels, and then computers decipher the chemical reactions that take place. At the moment biochip technology can identify viruses and bacteria such as anthrax. In a few years Argonne is hoping to



'Jazz' teraflop computer



have this technology ready for use in the field.

## Nanomaterials research

Nanomaterials are made of grains so small that the properties of materials change, and the disciplines of chemistry, biology, physics, materials science, and engineering intersect. Argonne's nanoscience research could lead to major advances in such fields as magnetics, laser technology and molecular electronics.

## Advanced Photon Source

An important Argonne mission is to design, build, and operate large, one-of-a-kind user facilities for the nation's research community. One such user facility is the Advanced Photon Source (APS), the nation's brightest source of X-rays to study the structure of metal alloys, chemical polymers, biomolecules, and many other materials. One recent example of APS research was the analysis of a lock of Beethoven's hair. The scientists found that his hair had extraordinarily high levels of lead infused into its cells, suggesting that lead poisoning contributed to Beethoven's health problems and death.

*Continued on next page*

**Continued**

**Ancient bacterium protein knot**

The APS is also used to study the structure of large proteins. Researchers at Argonne and the University of Toronto used the APS to discover the first knotted protein from the most ancient type of single-celled organism, an archaeobacterium. Scientists are very interested in this organism for its ability to break things down and produce methane gas.

**Atom Trap Trace Analysis**

Another project that Argonne scientists have been working on is Atom Trap Trace Analysis (ATTA). It is a tracing technique that can detect single atoms within samples. It is much like carbon-14 dating, but is much more advanced and precise.

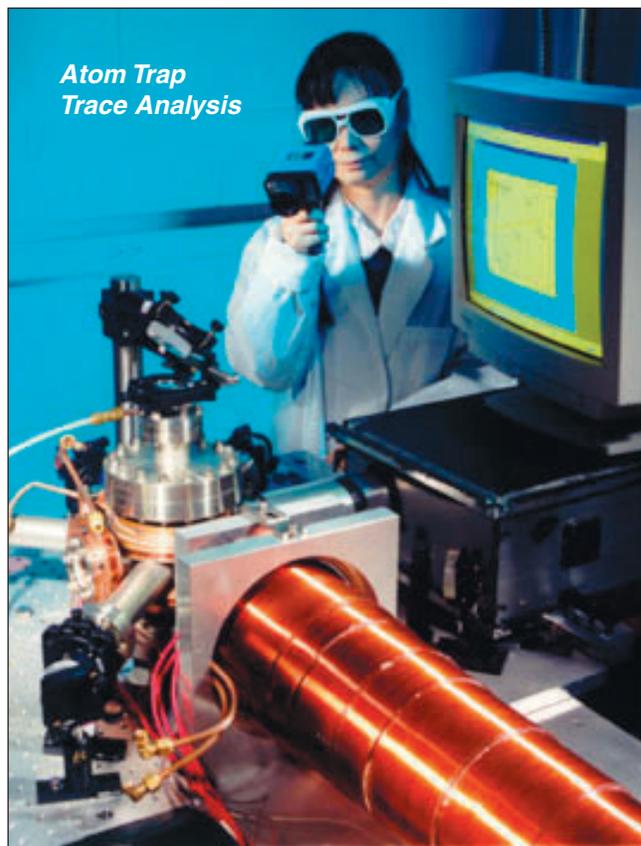
**Interesting facts**

Did you know that the first amino acids and the building blocks for proteins could've come to Earth via comet? Scientists at Argonne and the University of Chicago found that the three key ingredients of life — water, energy and organic material — could have survived on a comet that was brought to our planet by skimming off its surface instead of crashing into Earth.

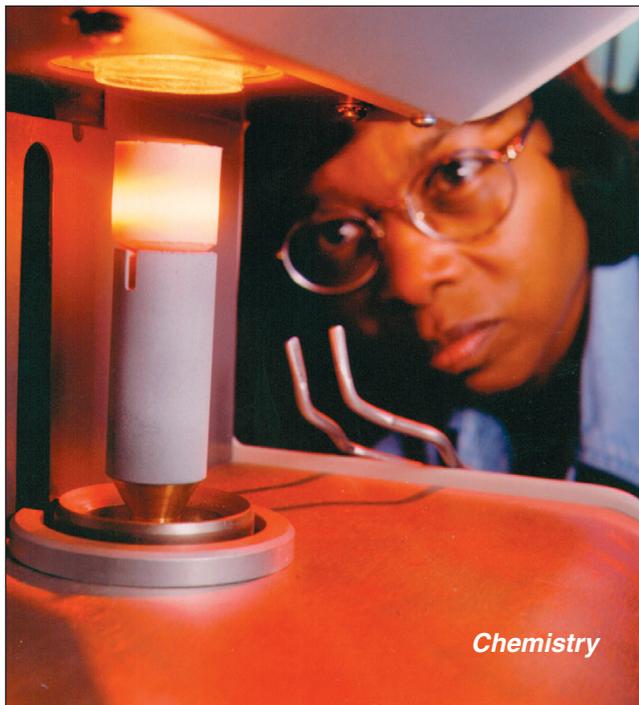
Did you know that Argonne started out as a tiny laboratory hidden in the Chicago suburbs? Or that this original Argonne Lab branched off Enrico Fermi's famous Chicago Pile 1?



**Advanced  
Photon  
Source**



**Atom Trap  
Trace Analysis**



**Chemistry**

# Environmental monitoring

*By Katie Podmokly and Samantha Sullivan*

When you drink a glass of water or take in a deep breath, did you ever think that you might be in danger? Well, don't worry because the scientists and researchers at Argonne National Laboratory's Illinois site have conducted multiple tests to make sure that the water we drink and the air we breathe are not affected by Argonne.

The name for what these scientists and researchers do is called "environmental monitoring." These programs are designed to determine the effect of Argonne's operations on the surrounding communities. The U.S. Department of Energy and Argonne require these environmental monitoring programs. Their policies require that all Argonne activities comply with applicable environmental statutes, regulations, and standards. Protection of the environment, human health, and safety always is given the highest priority. The air and water samples for testing are collected from different areas on and off the Argonne site.

## Air

Argonne conducts an air-monitoring program to assess the impact of its operations on the environment and public health. Air monitoring also estimates radiological releases that might occur if Argonne's high-efficiency particulate air (HEPA) filters were to fail. Much of Argonne's research involves the use of radiation to study the structure of materials and how they behave in hostile environments. Argonne uses HEPA filters to trap airborne particles in laboratories and prevent them from entering the environment. Argonne continually collects and analyzes particles and other pollutants collected on filters in laboratories and at other air-monitoring stations on and off site.

## Water

Argonne also monitors the water on its 1,500-acre DuPage County site. The scientists monitor the water for radionuclides and hazardous chemicals. Radionuclides and hazardous chemicals used or generated at Argonne may enter the environment by the water pathway. Argonne takes surface water samples from Sawmill Creek below the point at which Argonne releases its treated water. These samples are combined into a single weekly composite sample. A continuous sampling device at this location has been installed to improve the accuracy of the samples collected. Sawmill Creek empties into the Des Plaines Rivers south of Argonne. Argonne samples and tests Des Plaines River water for radionuclides twice a month below the mouth of Sawmill Creek and once a month above.

Argonne also monitors water under the ground. Subsurface water samples are collected quarterly at 51



monitoring wells near areas that have potential for negatively impacting groundwater. These ground water samples are analyzed for both chemical and radiological components.

Bottom sediment is sampled from streambeds to detect the presence of radionuclides. The sediment accumulates any radionuclides present in the stream. The sediment samples are also tested for other chemicals.

## Radiation

Argonne also monitors radiation emissions on and around its site to calculate the radiation dose that members of the public might receive from Argonne operations. Aluminum oxide thermoluminescent dosimeters (TLDs), measure radiation emissions. These devices are provided to Argonne by a commercial vendor, who reads them and sends the results to Argonne. TLDs are located at 17 locations on the Argonne site and around its perimeter. Five TLDs off site are used for comparison. The TLDs are collected and changed quarterly.

# Radiation

By David Augustine and Chris Samsa

To many people, radiation is a terrifying, invisible substance that scares all. The term conjures up frightening images associated with the words “power plant,” “chemical laboratory,” “nuclear facility,” and nuclear bombs. But what is radiation? Is it that harmful? Potentially, yes. But it comes in different types, and all can be handled safely if you know how.

There are three different types of radiation: alpha, beta, and gamma. All three can kill you, but each has different doses that are harmful. Alpha radiation can be blocked by a single sheet of paper and scarcely

Annual Average Dose Equivalent in the U.S. Population	
Source	Dose (millirem)
Radon	200
Internal (potassium-40 and radium-226)	39
Cosmic (from space)	28
Terrestrial	28
Diagnostic X-rays	39
Nuclear medicine	14
Consumer Products, domestic water supplies, building materials, etc.	10
Occupational (medical radiology, industrial radiography, research, etc.)	1
Nuclear fuel cycle	<1
Fallout	<1
Other miscellaneous sources	<1
<b>Total</b>	<b>360</b>

penetrates the dead outer layers of our skin. Radioisotopes that give off alpha radiation are generally not a health hazard unless they get inside your body through an open wound or are ingested or inhaled. In those cases, alpha radiation can be especially damaging, because its energy is deposited over a short distance, concentrating any damage in a few cells. Beta radiation from nuclear decay typically penetrates a centimeter or two into living tissue. This means it deposits energy over many cells, resulting in little damage to any single cell. Gamma radiation is extremely penetrating and can pass through most materials; only dense materials, such as lead, can block it significantly.

So how much of each type of radiation is in the air and water right now? There is radiation around us right now, which we call background radiation. It

Summary of the estimated dose to a hypothetical individual, 2001 (millirems/year)

Pathway	ANL-East estimate	Standard
Air total	0.037	None
Water	0.016	4 (EPA)
Direct radiation	0.010	25 (NRC)
Maximum dose	0.063	100 (DOE)

comes mainly from naturally occurring radiation and medical and dental X-rays. On average, we each get about 360 millirems (mrem) every year with no noticeable impact on our health. For comparison, a typical chest X-ray delivers a dose of about 10 mrem. Check and see how much radiation you got this year by looking at the side table to determine the amount of radiation you have been exposed to. In addition, your body has radiation in it already just from naturally occurring materials in your environment.

The potential radiation that Argonne might release would be from air, water, and direct radiation. The radiation dose from Argonne has always been less than 1 mrem/year, well below the government safety standard of 100 mrem/year. Every year, we all get around 300 mrem from nature. By comparison, Argonne gave a total of 0.063 mrem in 2001, and that is only if you lived within a few hundred feet of Argonne’s border.

Overall, Argonne has minimal radiation emissions compared to the U.S. government standards or to natural radiation. The facility has fully complied with the EPA and DOE regulations.



# Water monitoring

By Courtney Shillington and Garin Jones

Water can be considered the main source of life. There are countless hazardous materials that can be found in stream water. This is due to man's industrial revolution. But Argonne is doing its part to keep us safe by monitoring and treating its wastewater.

## Clean Water Act

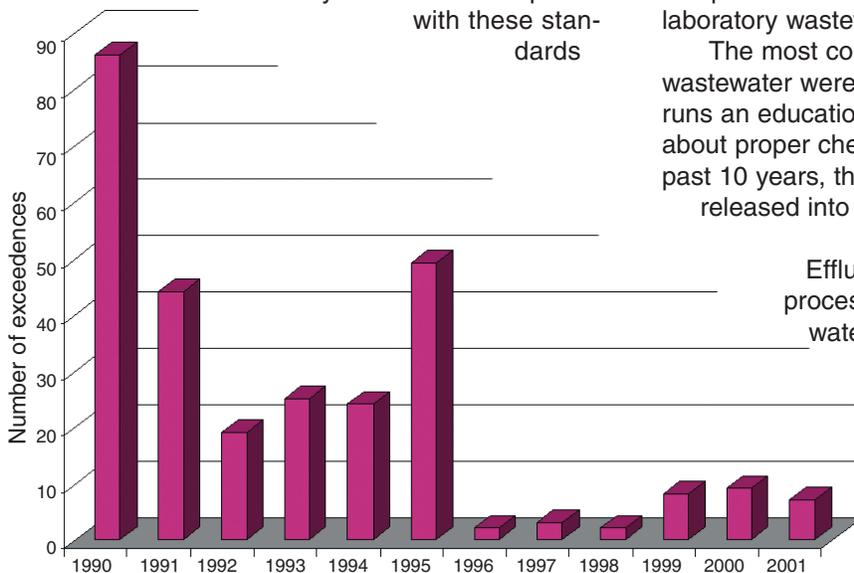
The Clean Water Act was established in 1977 and revised in 1987 by the Water Quality Act to restore and maintain water quality. The main goal of these acts is to provide "swimmable and fishable" water throughout the country.

In support of the Clean Water and Water Quality acts, Argonne monitors its water for excessive radioactivity and chemicals that can harm all of those that rely on water. Argonne monitors water in accordance with the National Pollutant Discharge Elimination System (NPDES) standards. Monitoring also focuses on some volatile organic compounds.

## Water monitoring and collection

Argonne collects water samples from various discharge water outfalls daily and analyzes the samples weekly to make sure everything is kept within NPDES regulations.

The main stream that flows across the Argonne site is Sawmill Creek. Most of the water in Sawmill Creek consists of storm-water runoff. Argonne monitors Sawmill Creek for alpha and beta radiation, toxic runoff from the laboratory, and anything else brought in from storm water. None of the samples collected exceeded the State of Illinois' general use water quality standards. Compliance with these standards



keeps water safe for any type of activity, including natural support of plant and animal life.

## NPDES regulations

The chart shows the number of times since 1990 that Argonne exceeded NPDES regulations for chemicals and other materials found in the water. It shows that the lab has been doing increasingly better over this past decade. The downward pattern is reassuring to local residents as it means their safety is secure in the hands of the Argonne scientists.



## Water outfalls

Argonne monitors 18 separate outfalls of storm water. Despite its natural name, storm water may contain harmful materials. Storm water can move quickly and pull minerals and sediment into its flow. Argonne samples and monitors storm-water runoff as often as laboratory wastewater.

The most commonly found organic compounds in wastewater were acetone and chloroform. Argonne runs an educational program to teach its employees about proper chemical disposal procedures. Over the past 10 years, the amount of chemicals Argonne released into the environment has decreased.

## Effluent monitoring

Effluent monitoring covers outfalls for both process wastewater discharge and for storm water runoff. Samples from both types of outfalls are analyzed for NPDES compliance. In 2001, 99 percent of the samples tested met NPDES compliance.

Over the past 10 years, the number of exceedences decreased.

# Groundwater monitoring

*By Brian Azriel and Scott Mandru*

With the experiments and the materials used at Argonne National Laboratory-East in Illinois you would imagine that some of the materials might get into the groundwater. To see if this is happening and at what levels, the groundwater is tested through the many wells that are located all over the Argonne site and the surrounding area. The major areas monitored are Argonne's former potable water system, its waste management units, sanitary landfill, and the CP-5 reactor.

## Former potable water system

The former potable water system consists of pipes and wells that used to provide water to Argonne before the water from Lake Michigan began to be pumped into the area. Four wells at Argonne previously supplied water and now are used to monitor water in these areas. Water is removed from the wells and tested for radioactive constituents and volatile organic compounds (VOCs). The tests for this year revealed radiological results within the normal range compared with previous years. No VOCs were detected.

As a result of hydrogen-3 being found in two wells in the past, seven wells in the area that surrounds the source are now monitored. It is believed that the hydrogen-3 was taken into the wells through the dolomite aquifer, which received it from the glacial drift. Quarterly tests of these seven wells detected hydrogen-3 in three wells — one in Waterfall Glen Forest Preserve and two inside the Argonne fence — but in all three wells, concentrations were well within safe drinking-water standards.

## Waste management sites

Over the years, various types of waste have been deposited in ditches and landfills at Argonne. Because there is potential for the materials from these waste-management areas to get into groundwater, monitoring wells have been placed around them.

Argonne operates seven separate waste management units. This year's tests of monitoring wells around these sites found no organic or inorganic contaminants that exceeded State of Illinois regulatory standards. A few wells had detectable, but safe levels of pH, chloride, or VOCs. A yearly test for SVOCs (semivolatile organic compounds), PCBs (polychlorinated biphenyl), pesticides, and herbicides found none. The highest radiation levels detected were for hydrogen-3 near Argonne's southern boundary.

## Sanitary landfill

Another waste management area is a 21.8-acre landfill on Argonne's western edge. It was used for general refuse, construction debris, boiler house ash,



and other nonradioactive waste until 1992, when it was closed. The landfill contained a "French drain" which was used for liquid wastes from 1969-1978. A French drain is a gravel-filled pit where liquids are poured and allowed to soak into the soil and the fill material. About 109,000 liters (29,000 gallons) of waste were deposited into the pit.

There are now 26 monitoring wells around the landfill. The most common materials found at levels higher than State of Illinois standards were chloride, iron, manganese, and total dissolved solids. Low concentrations of a few VOCs were detected at safe levels in 14 wells. Hydrogen-3 was detected at safe levels in some of the wells.

## CP-5 reactor

CP-5 is a small, retired nuclear research reactor located inside the Argonne site. When it was running from 1954 to 1979, it occasionally released small amounts of hydrogen-3. As a result, ground water tests near CP-5 find small amounts of hydrogen-3 that exceed State of Illinois standards. Nickel and chloride concentrations also exceed State of Illinois standards.

# Air monitoring

By Doug May and Travis Atkinson

Often when I was a young kid, my friends would have breathing contests to see who could hold their breath the longest. It would go on for a while, and then we would eventually run out of air and have to take short gasps of air to gain back the oxygen that was not in our lungs and blood.

You need air to survive wherever you are, inside a building, under water, out in the prairie, or talking to a friend. Whatever you are doing, you need air to live and survive. But how clean is the air you breathe? You may never know how clean it is, unless you had a professional come and test every gulp of air that you breathed. This is something like what the scientists at Argonne do; they monitor the air and test what is in it.

Air monitoring looks at air scientifically to see what is and is not in the air that we breathe. Many processes are used in testing air. It is vital that the air be clean enough for the plants, animals, and humans to breathe safely.

## Clean Air Act

Governmental officials have made laws that require that certain tests are performed. In addition they have passed laws that help keep the air clean and safe for all living and non-living things.

The Clean Air Act is the federal law that sets emission limits on all the air pollutants. Not only does it set the limits but it also determines what pollutants are more hazardous than others. The law requires every state in the United States to determine how it will prevent pollutants from getting into the air.

In 1990, under the Clean Air Act, Argonne had to submit a Clean Air Act Permit Program application to the Illinois Environmental Protection Agency (IEPA) and to help carry out a site-wide investigation of all of the emissions that take place there. This permit supercedes all of prior state permits.

The National Emission Standards for Hazardous Air Pollutants (NESHAP) program sets federal regulations on emission limits and related activities, such as record keeping and operational and reporting requirements. It also requires monitoring certain hazardous air pollutants, such as asbestos.

## Asbestos emissions

Asbestos is a naturally occurring mineral that was once used as an insulator or fire retardant and is also found in many building materials. Because breathing asbestos can cause health problems, NESHAP sets requirements for the cleanup of asbestos. Many buildings at Argonne contain asbestos in floor tile or cement. Argonne occasionally has to remove asbestos.

## Radionuclide emissions

NESHAP regulations also establish emission limits for the release of all radionuclides except radon. NESHAP requires that radionuclides emissions be monitored and reported. To fulfill NESHAP requirements, Argonne monitors the exhaust from five major research facilities and more than 100 smaller laboratories. All Argonne emissions are well below the NESHAP limit.

## Air sampling

Argonne also conducts an air-monitoring program for radioactive pollutants in the environment. This program assesses the impact of Argonne on the public. Argonne continuously collects air samples for the measurement of airborne particles that may contain radionuclides.

Samples are tested for alpha, beta, or gamma radiation. The samples are also tested for plutonium, thorium, uranium, and strontium. All monitored concentrations are well within safe limits.



# Wildlife management

By Laura Biehl and Liz Kochan

Argonne plays an important role for the wildlife that surrounds the site. It protects endangered and threatened animals covered by the Endangered Species Act, even when they live off the site, and helps monitor animals that live near the site. Argonne manages and monitors the wetlands and restores native prairie on site. Argonne also conducts monitoring and analysis of the area and keeps records on how the laboratory's activities affect the animals' and plants' environment.

## Endangered Species Act

The Endangered Species Act is federal legislation to protect plant and animal resources from the adverse effects of development. In support of this law, Argonne has established programs that ensure conservation of endangered or threatened species on the Argonne site. Argonne evaluates the area for threatened or endangered species and consults the Fish and Wildlife Service when any are found. There are no federal-

listed threatened or endangered species on the Argonne

site, but three inhabit the Waterfall Glen Forest Preserve that surrounds Argonne. Several State-of-Illinois endangered and threatened species inhabit the Argonne site.



Sketch by Caitlyn Daly

## Wetland management

To manage its wetlands, Argonne regulates the discharge of waters into the wetlands and monitors any other pollutants that affect the area. The Argonne site contains 35 individual wetland areas that cover a total of 45 acres. Argonne also has construction permits that outline wetlands management.

## Prairie restoration

To help maintain native prairies on its site, Argonne reintroduces native species with seed plantings and conducts controlled burns to remove noxious weeds. Native plants survive controlled burns better than non-native plants. Argonne also controls the deer population on its site, because too many deer can destroy vegetation and leave too little food for other animals.

## Vegetation

Argonne lies within the Prairie Peninsula of the



The "White Deer" at Argonne are actually fallow deer, native to parts of southern Europe and northern Africa. The coloration is normal for the species. They are descendants of animals collected by the former owner of the Argonne property. There are also native white-tailed deer on site.

oak-hickory forest region. It is a mosaic of forest, oak openings, and a tall grass prairie. Sugar maple, red oak, and basswood trees dominate Argonne. In the poorly drained areas, vegetation consists of silver maples, elms, and cottonwood trees.

## Animals

In addition to endangered and threatened species, many other species inhabit the Argonne site. Examples include seven reptiles, five amphibians, 40 summer-resident birds, and 25 mammals. More than 100 bird species can be found in the area during migration or in winter. The birds typically do not nest on the site. Other large populations are the native white-tailed deer and fallow deer native to southern Europe and northern Africa.

Argonne monitors animal populations by spotlight surveys, which are primarily for deer, but which can also be used for other animals.

The following species live in the area around Argonne but have not been observed on site:

### Endangered

Black-crowned night heron  
Osprey  
Shadbush

### Threatened

Brown creeper  
Kirtland's snake  
Marsh speedwell  
Pied-billed grebe  
Red-shouldered hawk  
River otter  
Slender sandwort  
White lady's slipper

# Compliance summary

*By Jay Sloma and Kate Pruyn*

Many Argonne employees work to ensure that the laboratory complies with regulations to protect human health and the environment. These regulations are established by government agencies, such as the U.S. Environmental Protection Agency (EPA), the Illinois

Environmental Protection Agency (IEPA), the U.S. Department of Energy (DOE), and the U.S. Army Corps of Engineers (COE). Argonne's policy is to conduct research projects with the safety of people and the environment in mind. The following list summarizes Argonne's compliance with regulations during 2001.

■ **Clean Air Act and permit program** — Argonne needs permits from the IEPA for any possible pollutant emissions as regulated by the Clean Air Act. — Status: Argonne collects hundreds of samples to ensure compliance with standards for clean air.

■ **National Emission Standards for Hazardous Air Pollutants (NESHAP)** — Places Argonne under certain emissions limits and requires monitoring and reporting of emissions. The asbestos abatement program ensures that laws regarding the material are followed and that asbestos is removed and disposed of safely.

■ **Clean Fuel Fleet Program** for vehicle acquisitions in model year 2001 (Sept. 1, 2000-Aug. 31, 2001) — All vehicles reported were in compliance in 2001 at Argonne.

■ **Clean Water Act** — Works toward "fishable and swimmable" water by setting treatment and pollutant regulations. Some exceedances took place; violations were reduced in 2001.

■ **Safe Drinking Water Act** — Ensures that no public drinking water may be exposed to harmful materials. While no public drinking water comes from Argonne currently, wells previously used for public water are monitored.

■ **Spill Prevention Control and Countermeasures Plan** — Describes actions to be taken in case of oil or oil product releases to navigable waters of the United States. Argonne had no reported spills in 2001 that needed activation.

■ **Clean Water Action Plan Program** — Constitutes a voluntary commitment by federal agencies to work cooperatively to improve U.S. water quality. Argonne completed all needed steps in 2001.

■ **Resource Conservation and Recovery Act** — Any facilities managing hazardous waste must keep in mind the health of humans and the environment. Argonne disposes of hazardous materials according to permits issued by the IEPA.

■ **Federal Facility Compliance Act** — Clarified the application of certain environmental regulations to federal facilities. Argonne completed treatment for waste streams in 2001 and will continue treatment throughout the years.

■ **National Environmental Policy Act** — Federal-related facilities are required to act with consideration

toward the environment. While no problems with Argonne actions were identified, four ways to improve were found and are being acted upon.

■ **Endangered Species Act** — Development of facilities shall not negatively affect certain plants and animals. No endangered species exist around Argonne. Plans are in action to promote general wildlife health.

■ **National Historic Preservation Act** — Requires federal agencies to assess impact of proposed projects on historic or culturally important sites and artifacts. Some sites at Argonne are eligible for listing on the National Register of Historic Places.

■ **Toxic Substances Control Act** — Requires chemical manufacturers and processors to develop data on the health and environmental effects of substances. Argonne follows the regulations and disposes of toxic materials properly.

■ **Wetland Protection (Executive Order 11990)** — Requires federal agencies to identify potential impacts to wetlands resulting from proposed activities and to minimize impacts. 35 wetland areas identified by Argonne. 3 wetlands were to undergo a mitigation plan to construct a new area and to avoid impacts on 4th wetland during construction. One wetland experienced difficulties and was restored by controlled burning and replanting.

■ **Wildlife Preservation** — Monitors the deer and vegetation on site. The size of the deer herd on site was in compliance with guidelines. Oak trees on site during 2000 and 2001 were not regenerating.

■ **Federal Insecticide, Rodenticide, and Fungicide Act** — Chemicals that control insects, rodents and fungi must be EPA-approved, used properly, and cleaned up after. Commercial contractors were used for pesticide applications; Argonne monitored and assured compliance with the act.

■ **Comprehensive Environmental Response, Compensation, and Liability Act** — Addresses the cleanup of hazardous waste disposal sites and the response to hazardous substance spills. No Argonne sites were included on the national priority list. Argonne will be impacted when the EPA redefines what types of air emissions need to be reported.

■ **Emergency Planning and Community Right to Know Act** — Addresses planning for possible emergencies in which the public may be at risk and may need to be kept informed. All required reports were submitted.

# Current issues at Argonne

**By Chad Meador and Jessica Bridges**

One of the largest concerns involving Argonne is the impact that it has on the surrounding environment, including the people, animals, and land. This section summarizes the most important issues related to environmental protection that Argonne encountered in 2001.

## Clean Water Act-NPDES

In 2001 and earlier years, water discharged from Argonne occasionally exceeded the limits for total dissolved solids (TDS) set by its National Pollutant Discharge Elimination System (NPDES) permit, which supports compliance with the Clean Water Act. Due to boiler house blow down and road salt runoff, TDS concentrations were exceeded seven different times at an outfall where Argonne discharges water into Sawmill Creek. By obtaining a construction permit to re-route the boiler house equalization pond to DuPage County for periodic discharge, the winter concentrations of TDS will be reduced.

At several of the lab's wastewater outfalls, the water was found to contain low concentrations of chlorine. The water is safe for humans to drink, but it could harm fish and other aquatic life forms, which are not as tolerant of chlorine as humans. The primary chlorine source is water from Argonne's cooling towers, which use a chlorine-based biocide to prevent fouling. These cooling-tower discharges are being rerouted to Argonne's waste-water treatment plant, where the chlorine will be removed.

## Landfill closure

In September 1992, Argonne terminated the operation of a landfill in its northwest corner. When in use, the landfill received general refuse, construction debris, boiler house ash, and other nonradioactive solid waste. Tests of groundwater around the landfill consistently exceeded groundwater quality standards for manganese, iron, chloride, nickel, lead, and TDS. Argonne installed additional groundwater monitoring wells around the landfill to track the movement of these pollutants. Currently Argonne needs to assure the Illinois Environmental Protection Agency that the landfill materials are contained, based on the groundwater monitoring information. The Illinois Department of Public Health has concluded that the landfill presents "no apparent public health hazard."

## Waste management

In 2001, there were no major problems with hazardous substances at Argonne. Hazardous substances

are potentially harmful to the environment and to living things. Examples of these are radionuclide emissions, air pollutants, asbestos emissions and mixed wastes.

Radionuclide emissions can be harmful when released into the atmosphere in large proportions. Argonne has been able to keep the amount of radioactive material it releases to minute levels.

Argonne has to comply with regulations and corrective actions for the air pollutants that the lab releases. The air pollutants come mainly from equipment and facilities that use fuel. Examples include a steam plant, two alkali metal reaction booths, bulk chemical tanks, a dust collection system, the engine test facility, and the Argonne Fire Department's training activities.

Every May, an annual compliance certification is submitted to the Illinois Environmental Protection Agency detailing any problems and corrective actions needed. For 2001, two such problems involved the steam plant and an incident that involved the unpermitted mixing of hazardous wastes. On April 8, 2001, the steam plant exceeded emission limits three times, due to unusually warm temperatures. The second example involved combining mixed-waste solvents in violation of the Resource Conservation and Recovery Act (RCRA).

Mixed wastes contain both radioactive and hazardous materials. Acids, solvents, and sludges contaminated with radionuclides are three examples of mixed wastes found at Argonne. RCRA monitors and provides five on-site treatment systems for radioactivity.

Cleaning up the waste management units at Argonne is a continuing effort. The environmental cleanup program at the laboratory will be completed in 2003. Argonne is currently planning for a transition from active remediation to long-term environmental stewardship: ongoing operation, maintenance, and monitoring of the site.

## Summary

Argonne encountered no extreme environmental obstacles that could not be handled. All of the issues have been acknowledged, and the proper steps to solve the current problems are being taken. Argonne will continue its monitoring to make sure that Argonne complies with the requirements of the Illinois Environmental Protection Agency and the U.S. Department of Energy.

*Except for the class photo on page 1, all photos were taken on the Argonne-East site by George Joch, Stanley Niehoff and Dave Jacqué. The text was edited by David Baurac. Design and layout by Dave Jacqué.*

