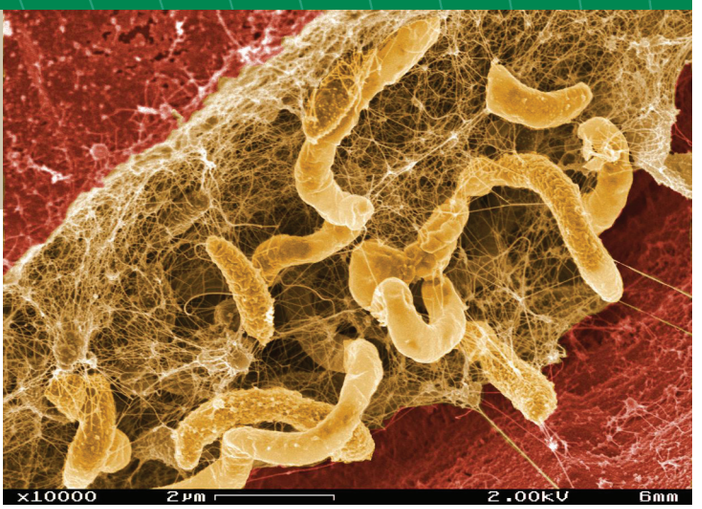
OAK RIDGE National Laboratory
Reporter
Retiree Newsletter
May 2011

SCIENCE

Bacterial genome may hold answers to mercury mystery



A bacterium called Desulfovibrio desulfuricans strain ND132 can transform elemental mercury into methylmercury, a human neurotoxin.

A newly sequenced bacterial genome from a team led by ORNL could contain clues as to how microorganisms produce a highly toxic form of mercury.

Methylmercury, a potent human neurotoxin, appears in the environment when certain naturally occurring bacteria transform inorganic mercury into its more toxic cousin. Few bacterial species are capable of this conversion, and exactly how the transformation takes place has been a matter of debate for decades.

"What is not known are the genes or the proteins that allow these bacteria to mediate the transformation," says ORNL's Steven Brown, who led a research team to sequence the genome of a bacterium in the Desulfovibrio genus that is capable of methylating mercury.

The new genome, sequenced at the California-based DOE Joint Genome Institute (JGI) and published in the Journal of Bacteriology, lays the foundation for future research to examine the little understood mechanisms behind the production of methylmercury.

Desulfovibrio desulfuricans strain ND132 is an organism that thrives in sediments and soils without oxygen — the places in lakes, streams and wetlands where mercury contamination is converted to methylmercury. It is representative of a group of organisms that "breathe" sulfate instead of oxygen and are largely responsible for mercury methylation in nature.

"This is the first Desulfovibrio genome that will methylate mercury that's been published," Brown says. "Now that we have this resource, we can take a comparative approach and look at what is different between the bacteria that can methylate mercury and those that are unable to."

The introduction of mercury into the environment primarily stems from its use in industrial processes and from the burning of fossil fuels. Although industry and regulators have worked to minimize the release of mercury, there is a legacy of mercury pollution in aquatic environments worldwide. Understanding the fundamental science behind the production of methylmercury could eventually help mitigate and reduce the impacts of mercury pollution.

"This is the first Desulfovibrio genome that will methylate mercury that's been published."

"Mercury is a global contaminant of concern," Brown says. "We hope that some of the lessons we learn from these studies will be applicable to many sites. If we can identify the genes involved in mercury methylation, we hope to go to the local environment and understand more about the function and the ecology of the organisms and their gene products that mediate this transformation."

—*Morgan McCorkle*

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Jerrie and Joe Mitchell plan to volkswalk in 18 East Tennessee state parks

Jerrie and Joe Mitchell during a recent walk through Frozen Head State Park in Morgan County.

After working in ORNL's Health Division over 41 years, Jerri Mitchell is a strong believer in maintaining good health. She and her husband Joe stay active by going on long walks with the East Tennessee Wanderers Club.

The club is called a volkswalking club – a German term used to describe 10-kilometer walks from town to town, promoting fun, fitness and friendship among its members. Jerrie and Joe are among more than 40 members of the East Tennessee club who walk as a group twice a month.

The Wanderers are affiliated with the American Volkssport Association, which has more than 300 clubs throughout the 50 states. Volkswalking in the United States was started in 1976 by a group of ex-U.S. military personnel stationed in the former West Germany. They watched countless Germans go in groups for long walks – especially on Sunday afternoons after church.

"Our organization has done many walks of different lengths – usually between three and six miles – throughout East Tennessee," Jerrie said recently while sitting in the living room of the couple's Clinton home. "We have gone to the Blount County Greenway, a number of trails and locations in Knox County, Fort Loudoun and Rogersville to name just a few. Our club members have adopted a six-year goal of taking walks in all 18 state parks in East Tennessee."

Retired since 2008, Jerrie said the Wanderers provide a way to get out of the house on a regular basis and stay healthy.

"Joe saw an ad for this about a year and a half ago and thought it would be fun to try it," Jerrie said. "I went along, and we've been having a lot of fun ever since."

Club members can track the distance of their walks, which is up to them to determine.

"You set your own goals and get credit for what you walk by updating a stamp book you carry along with you," Jerrie said. "In addition to the fun, fitness and fellowship, we usually schedule walks so that somewhere along the route, we can enjoy some food at either a restaurant or with a picnic."

Walks are usually scheduled on weekends with an occasional Friday event on the docket. The group meets at 6 p.m. on the third Tuesday of each month at the Earthfare Restaurant in Turkey Creek.

Most of the East Tennessee club members range in age from 40 to 70, although there is no age limit or requirement.

"We are a growing organization that loves to have new members join us," Jerrie said. "We would welcome ORNL retirees. Joe and I look forward to these walks and plan our schedules accordingly."

The club's most recent walk was to Frozen Head State Park in Morgan County.

"After the walk I was tired, but exhilarated," Jerrie said. "Walking is so good for you and this activity is so much fun."

More information about the East Tennessee Wanderers is available by contacting Jerri at mitchelljj@comcast.net.

Websites are: www.easttennesseewanderers.org and www.ava.org.—*Fred Strohl*

"We are a growing organization that loves to have new members join us."

Reporter is published for retirees of ORNL, which is managed by UT-Battelle for the U.S. Department of Energy.

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Japan earthquake, tsunami spell need for preparedness

Pacific Northwest among regions most vulnerable

Perhaps lost in the recent debates related to the earthquake and tsunami in Japan is that natural disasters and not nuclear energy should be the focus, says the Lab's John Sorensen, an emergency preparedness expert.

Sorensen, who has produced several videos to help people survive manmade and natural disasters, noted that the Pacific Northwest is especially vulnerable to events similar to the March 11 earthquake and subsequent tsunami that devastated cities in northeastern Japan.

"The Oregon coast is definitely at risk, especially to what scientists call a near-term tsunami caused by an earthquake within about 50 miles of the coast," Sorensen says. "Such an earthquake could easily generate 25- to 30-foot waves that would engulf the coast within minutes."

While more work in the area of preparedness remains, since 2004 the nation has made significant progress by improving the ability to detect and forecast tsunamis, according to the National Research Council report "Tsunami Warning and Preparedness." This is in large part because of the Deep-ocean Assessment and Reporting of Tsunamis, a sensor network of buoys, and legislation enacted over the last few years.

"Other federal and state activities to increase tsunami safety include improvement to tsunami hazard and evacuation maps for many coastal communities; vulnerability assessments of some coastal populations in several states; and new efforts to increase public awareness of the hazard and how to respond," the National Research Council report states.

Still, if a near-term tsunami were to occur, people living in Oregon's Cannon Beach and Seaside, for example, would have just 5 to 10 minutes to move to higher ground.

"If the source were so close to shore that only minutes were available before the tsunami reached the coast, the public would need to recognize natural cues - mainly, ground shaking from the tsunami-triggering earthquake - and know to evacuate, even without official warnings," the report states.

The report also noted that organization between the National Oceanic and Atmospheric Administration's West Coast and Alaska Tsunami warning centers has not been optimized. Problems cited include different areas of responsibility, management by different regional offices, the use of different technologies, and separate support and organizational cultures.

> "The Oregon coast is definitely at risk of a near-term tsunami with 25- to 30-foot waves."

"As a result, the public could receive conflicting warning messages from the two centers," according to the report, which also notes that "the content of the warning messages is inconsistent with social science findings on the composition and delivery of effective warning messages."

Despite the many challenges, Sorensen says the events in Japan have increased awareness and he expects that to spur further activities to increase preparedness. For example, within a few years, people could receive text messages on their personal mobile devices, Sorensen says.

The National Research Council report was commissioned in 2006 when Congress requested that the National Academy of Sciences review the nation's ability to detect and forecast tsunamis. The academy expanded the study's scope to include assessment of the nation's ability to reduce losses by educating and preparing the public.—*Ron Walli*

Such scenic rural and urban venues as those above in Oregon are at risk of an earthquake/tsunami combination. Instantaneous response is necessary to preserve lives.

Club ORNL events

Get the details and latest news online via https://info.ornl.gov/sites/clubornl. Request an XCAMS account, which will allow you to participate in these events or contact Lara James at 576-3753 or jamesla@ornl.gov.

June TBD	Charleston Overnight
June 6	Spring Golf Tournament at Willow Creek
June 9	Vintage Car Show
June 18	East Tennessee Wineries
July TBD	Wahoo Ziplining
July TBD	Tubing Day Trip

Earth Day Activities at the Lab

According to Earth Day Network this year's Earth Day theme, "A Billion Acts of Green," was designed to encourage people to commit an act—simple or complicated, small or big—to reduce carbon emissions and promote sustainability. The goal: To register one billion acts before the Earth Summit in 2012.

Earth Day exhibits across the Lab showcased the exciting scientific research ongoing at ORNL and covered such "green" topics as pollution prevention, recycling, energy conservation, and energy management.

Activities included everything from collecting shoes for the Soles for Souls project to a drinking-water taste test. The Earth Day "Green Mile Ride" Bike Tour included riders from across the Lab and was led by Ian Anderson, Associate Lab Director for Neutron Sciences, and a victorious Debbie Stairs, Director of Human Resources and Communications, pictured above. The recyclable collections initiative collected aluminum pop tabs to support the Ronald McDonald House and used athletic shoes to support Nike's "Reuse a shoe" program, which supplies materials for playground and track surfaces.

Congratulations to Mike Ryon, winner of the 2011 Community Sustainability Award "...for exceptional leadership in promoting and implementing the principles of sustainability through creating and maintaining riparian buffers in Farragut, Tennessee."

Here comes the sun

Joan Lawson makes a living being active. Other than a small scar on the left side of her face, most people would never guess she is a cancer survivor. Melanoma-free for over a year, Lawson manages the ORNL Wellness Program and proudly shares her experience dealing with the disease at an ORNL health series seminar on the topic of skin cancer. She and guest speaker Dr. James Lewis warned the audience about the dangers of sun exposure, tanning beds, and the risks they pose for skin cancer.

According to Lewis, a University of Tennessee Assistant Professor and member of the surgical oncology staff at the University of Tennessee Graduate School of Medicine, skin cancer is the fastest increasing cancer in the United States. It's estimated that one out of five Americans born this year will develop skin cancer during his or her lifetime. As May is the month when ultraviolet (UV) indexes begin to increase, prevention and treatment of the disease is a timely topic.

Skin cancer, the abnormal growth of skin cells, most often develops on skin in areas frequently exposed to the sun. Mutations cause cells to grow out of control and form a mass of cells in the skin's top layer, the epidermis. There are three major types of skin cancer, named based on the three types of cells that make up the epidermis — basal cell carcinoma, squamous cell carcinoma and melanoma.

According to Lewis, basal cell carcinoma is the most common form of skin cancer. It grows slowly in the deepest layer of the epidermis and rarely spreads. However, if left untreated, it can cause bone damage, particularly in seniors.

Squamous cell carcinoma occurs on sun-exposed areas of the body, such as the face, lips, ears and hands. Considered more aggressive than basal cell, squamous cell carcinoma can spread quickly to other areas of the body. Because early detection likely means an early cure, performing self-exams to detect signs of this form of skin cancer is encouraged. When performing self-exams, look for a firm, red nodule or a flat lesion with a scaly, crusted surface.

The most serious form of skin cancer is melanoma, which typically metastasizes and invades the lymph nodes. However, if caught early enough, several treatment options are available, and much higher survival rates can be realized. Melanoma can develop anywhere on the body, but it most often affects men on areas of the head and neck and women on the lower leg. Note, however, that in both men and women, melanoma can also occur on skin that has not been exposed to the sun. Signs of the disease include large brownish spots with darker speckles; a mole that changes in color, size or feel; or a small lesion with an irregular border and portions that appear red, white, blue or blue-black. And contrary to popular belief, melanoma can affect people of any skin tone. In people with darker skin tones, melanoma tends to occur on the palms or soles or under the fingernails or toenails.

The good news is that skin cancer can have a better outcome than most other types of cancer and is generally curable. However, people who have been treated for one type of skin cancer have a higher-than-average risk of developing a different type. Therefore, detection and prevention are critical.

Dr. Lewis suggests frequent self-exams, particularly for those who work mostly outdoors, such as farmers, or those who enjoy lots of outdoor hobbies, such as gardeners. He offers these helpful tips:

- With the help of mirrors to view your back and neck, look for new skin growths or changes in existing moles, freckles, bumps and birthmarks.
- Avoid mid-day sun (10 a.m. to 4 p.m.) as much as possible. Wear protective clothing and avoid tanning salons.
- Using sunscreen helps, too, and can decrease your skin cancer risk by as much as 50 percent. Read labels carefully, as most sunscreens don't filter out all harmful UV radiation, especially the radiation that can lead to melanoma. Choose a sunscreen with a sun protection factor (SPF) of 15 or higher. Apply generously to all exposed skin, and don't forget your lips, the tips of your ears, and the backs of your hands and neck.

Lawson summed up her experience this way: "This cancer thing really set me back. If you don't have your health, you don't have anything." Luckily, she's regained her health and is eager to help the rest of us retain ours.—*Stephanie Ritchie*

Know Your Spots!

Keep a close eye on areas of concern. Look for the following abnormalities:

Asymmetry
Border
Color
Diameter
Evolving

If you suspect an abnormality but have difficulty remembering in between exams, grab your camera and take pictures to show your doctor.

ORNL Wellness Program

THE NEWS
OAK RIDGE NATIONAL LABORATORY

A Publication by and for the ORNL Employees of Carbide and Carbon Chemicals Company, Union Carbide and Carbon Corporation

Vol. 3—No. 42 OAK RIDGE, TENNESSEE Friday, May 4, 1951

ORNL Operates World's Largest Fixed Frequency Cyclotron

Carbide Fellowship Director At Mellon Institute To Speak

D. C. Lewis, administrator of the organic synthesis felowship of Carbide and Carbon Chemicals Company at the Mellon Institute of Industrial Research, Pittsburgh, Pa., will speak at a meeting of the Knoxville-Oak Ridge Section of the American Institute of Chemical Engineers next Monday night, May 7. The meeting will start at 8 o'clock and will be held in the Knights of Columbus Hall, Jefferson Circle.

D. C. Lewis

The speaker will discuss early developments in industrial research that have contributed to the growth of the aliphatic chemical industry in his talk entitled "Some Consequences of Industrial Research."

Mr. Lewis has been administrator of the Carbide Fellowship at Mellon Institute since 1945. He has been connected with the commercial life of Carbide and Carbon Chemicals Company during its existence.

All chemical engineers, chemists and others interested are invited to attend the meeting and hear Mr. Lewis, it has been announced by A. C. Jealous, of ORNL, Chairman of the Knoxville-Oak Ridge Section of AIChE.

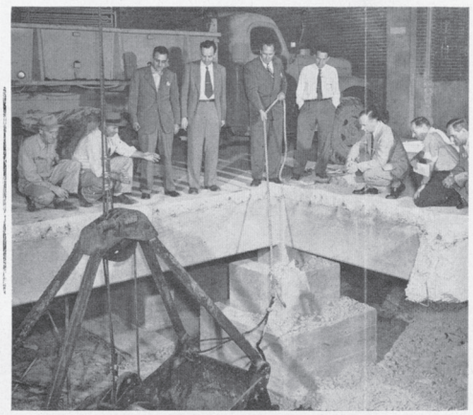
Harrington Awarded Manuscript Prize

Mrs. Nyra J. Harrington of the ORNL Biology Division is now holder of the annual prize awarded by the Association of Southeastern Biologists for the best manuscript submitted for presentation at the annual meeting.

Authored by Mrs. Harrington and R. W. Koza, former Biology Division member who left in January to join the Aero Physics Laboratory, North America Aviation, in Downey, Calif., the title was "Effect of X Radiation on the Desoxyribonucleic Acid and on the Size of Grasshopper Embryonic Nuclei."

Mrs. Harrington

The $100 prize was donated by The Carolina Biological Supply Company of Elon College, N. C. Mrs. Harrington presented the paper at the recent meeting of the association in Tuscaloosa, Ala.



GROUND-BREAKING FOR THE ORNL CYCLOTRON AT Y-12—Within a year after that event in September 1949 installation of the 86-inch cyclotron was being completed. The cyclotron was installed in a pit excavated through the floor of an Alpha Building. Viewing the scene as the huge shovel takes its first bite of earth are, left to right, George Howard, Assistant Crafts General Foreman; C. B. Hopkins, Superintendent of Buildings and Grounds Department, Y-12; Dr. H. M. Roth, Chief of Research Division, AEC; Dr. R. S. Livingston, Director of Electromagnetic Research Division; Dr. C. E. Larson, Director of Oak Ridge National Laboratory; W. D. Lavers, Y-12 Area Superintendent; A. L. Boch, Engineer in charge of cyclotron; E. Zurcher, Superintendent of the Research Engineering Department, Y-12; and E. Vincens, Engineer, Y-12. Pictured at the lower right is a model of the 86-inch cyclotron showing its arrangement within the structure of the building. A photograph of this model appeared on the cover of Physics Today for June 1950.

86" Atom Smashing Machine Designed, Fabricated At Y-12 In Less Than Year

The largest fixed frequency proton cyclotron in the world is now in operation at the Oak Ridge National Laboratory. The 86-inch machine was first successfully operated on November 11, 1950, and shortly afterward was operated at over 20 Mev. Utilization of equipment already available in the Electromagnetic Plant made it possible to have the cyclotron ready for test operation within a year from the time ground was broken.

Approval for building the cyclotron was received from the Atomic Energy Commission August 8, 1949. Ground breaking ceremonies occurred on September 21, 1949. By the following September the machine was ready for test operation. The first actual operation was obtained November 11, 1950.

The new "atom smasher" is an important addition to the research facilities of ORNL. With the cyclotron it will be possible to produce radioisotopes not obtainable from the pile and to extend studies of the effects of radiation. There are many nuclear reactions that cannot be obtained by the action of neutrons in the uranium pile. Stable isotopes being produced at the Laboratory can now be used as targets in the cyclotron to produce specified radioisotopes more efficiently.

This is the first cyclotron to be completed in the Southeastern part of the United States. The nearest machines are at St. Louis, Mo., and at Columbus, O. The Brookhaven National Laboratory has a 60-inch cyclotron for the acceleration of deuterons, the nuclei of heavy hydrogen atoms, to about 20 Mev. Argonne National Laboratory is constructing a similar machine. A 42-inch cyclotron at Los Alamos accelerates deuterons to 11 Mev.

Cyclotrons are usually identified by the diameter of the pole pieces of the large magnets required. The pole pieces of the new ORNL magnet are 86 inches across.

The first cyclotron was built in 1931 by Dr. E. O. Lawrence, director of the University of California Radiation Laboratory. A recent tabulation of high voltage particle accelerators lists 21 cyclotrons built or under construction in this country, and 12 in other countries. In addition, a total of 13 synchrocyclotrons was listed and also two very powerful proton synchrotrons are being built at Brookhaven and at Berkeley.

The design, fabrication [illegible] assembly of this ORNL research tool was done at Y-12. Th[illegible]

Issuing Of New Decals Begun Yesterd[illegible] By Guard Departmen[illegible]

The Atomic Energy Commissi[illegible] Department of the Laboratory P[illegible] windshield decals, which are used [illegible] into the Controlled Area. The old [illegible] 15, AEC spokesman advises.

Issuing at ORNL of the new decals began yesterday and will continue until the deadline date. Time and place of issuing them has been announced as follows: in the lobby of Building 1000 between the hours of 8:30 a. m. and 3:30 p. m.; and at Guard Headquarters, Building 2500, after 5 p. m. for shift workers. Issue of decals over the weekends also will be at Building 2500.

Requirements for obtaining new decal include giving information of present address, old decal number, year and make of vehicle and 1951 state license number. Should the same decal be issued, it will not be necessary to renew family pass. ORNL employees assigned to the Y-12 location will obtain their new decals through the Security Office at Y-12.

Tunes From 'Miss Liberty'

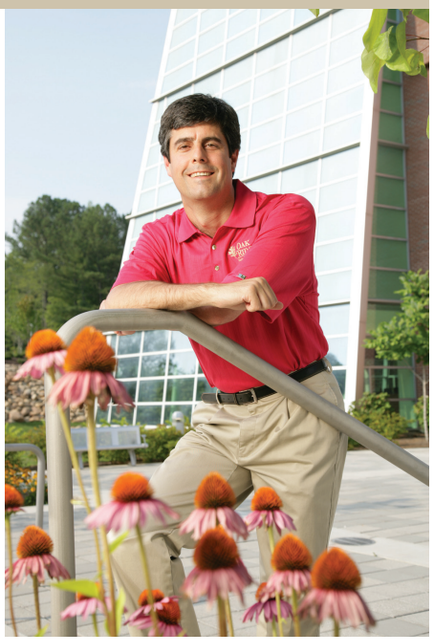
Musical highlights from Irving Berlin's "Miss Liberty" will be featured on Sunday's half-hour Curtain Call broadcast, the musical program now being sponsored by Carbide over Oak Ridge Station WATO at 8:30 p. m. every Sunday.

Sixty years ago this month
Taken from *The ORNL News* for May 1951

- The world's largest atom smasher was completed at Y-12, to be operated by ORNL. Measuring 86 in., the new fix frequency proton cyclotron was fabricated in less than a year by personnel at Y-12 and ORNL. The new system operates at a staggering quarter million volts and accelerates protons to 20 MeV.
- In another world's first, a 5-million volt Van de Graaff generator went into operation. Located at Y-12 and operated by ORNL, this high powered instrument is slated to aid researchers in the study of pure physics and shielding.
- This month in the news, Dr. Alvin Weinberg receives his six-year Service Anniversary Award having arrived in Oak Ridge in May 1945 from Chicago.
- The Laboratory's new state-of-the-art facilities receive building numbers. The 4-wing, two-story research laboratory will bear the number 4500 and its neighbor, the Isotope and Semi-Works building, will be designated 4501.

—prepared by ORNL History Room volunteers

From the Lab Director



Lab staff members have been very generous in helping the Second Harvest Food Bank recover from a recent flood that destroyed food items stored in the charity's warehouse. We were able to present Second Harvest's Executive Director Elaine Streno a check for nearly $9,500.

Donations are still being collected for Oak Ridge's sister city, Naka, Japan, which sustained damage in the March 11 earthquake. We have set up a special account at the ORNL Federal Credit Union where employees can give.

The resolution of the FY11 budget was welcome news. An extended shutdown had the potential to disrupt our mission; finalizing FY11 appropriations removes a big uncertainty in our plans for the balance of the year. Fortunately the final numbers in the budget agreement are much better than the worst-case scenarios we had feared as a sign of the importance of our research on many major programs at the Lab will experience relatively modest cuts in a time of significant budget pressures. As the budget debates continue in Washington, we continue working to provide representatives and policymakers with information on our research activities and their importance in meeting the nation's ongoing energy challenges.

"As the budget debates continue in Washington, we continue working to provide representatives and policymakers with information on our research activities and their importance in meeting the nation's ongoing energy challenges."

ORNL hosted a couple of notable conferences recently: The Partnerships Directorate's Tom Ballard and Tom Rogers, working with the Center for Entrepreneurial Growth, drew a number of entrepreneurs and investors to the Lab for Bridging the Gap, a showcase of promising ORNL technologies. The Sustainable Campus Initiative and Facilities and Operations Directorate organized a very successful Sustainability Summit that included representatives from DOE, the state of Tennessee, ECOtality, Nissan, the Tennessee Valley Authority, and the Electric Power Research Institute. During the summit I participated in the unveiling of the Solar Assisted Electric Vehicle Charging Stations, located on the new North Hill Parking Lot. State Energy Policy Director Ryan Gooch, TVA's James Ellis, ECOtality's Stephanie Cox, and Nissan's Nancy Mansfield all joined me in celebrating the unveiling. I also got my own Blink EV charger installed at home!

Second Harvest Director Elaine Streno accepts a check from ORNL's Leigha Edwards.

In an inspiring show of dedication to science education, Martin Keller, Craig Blue, Lonnie Love, and Tommy Phelps devoted three months of evenings and Saturdays to coaching a team of students competing in the FIRST Robotics Competition. Martin's son Phillip started a robotics club at Hardin Valley Academy, which assembled 23 students and mentors to design and build a set of robots to compete in the regional tournament. They didn't win, but the Hardin Valley Academy team no doubt came away a step ahead in the latest next-generation manufacturing techniques.

Our Earth Day Committee assembled a tremendous program of activities in the days before April 22 that included the Lab's Sustainability Initiative and energy and environment efforts. April 20 was also the birthday of our late Director Emeritus, Alvin Weinberg, a coincidence that was nevertheless symbolic of Alvin's dedication to improving the world through science and technology.

Thomas Mason

Thom Mason

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Noontime checker wrangling in pipefitters' shop

Henry Mink of the Sheet Metal Shop, checker champion of all Claiborne County and probably of ORNL, takes on two opponents at one standing. His opponent with the 24-inch Stillson in hand is Harry Siegel and the other (with hat on) is H. M. Burdette. Purpose of the upraised Stillson, Harry said, was to slow Mink down and keep him from moving checkers with his elbow. Seated and looking on is Charlie Poe who said that these were merely consolation games and not the contest of champions as he was not in them. Getting a big kick out of the checkered fracas is A. G. Spurgeon, standing in the right background. The writer is unable to enlighten the readers on the outcome of the game as he (the writer), being allergic to bloodshed, left hurriedly when the players began to exchange pointed comments.—*From the May 4, 1951 issue of* ORNL News