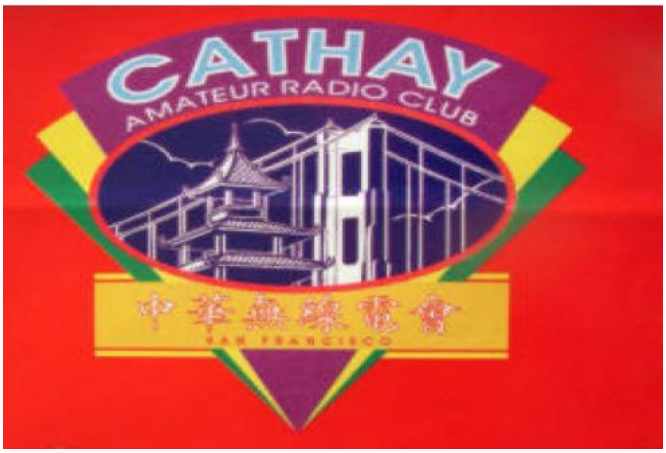

Cathay October 2024

www.cathayradio.org

President North: Leonard Tom, *NX6E* **email:**nx6e@hotmail.com
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Web Master: Edison Fong – *WB6IQN* - **email:**edison_fong@hotmail.com
Mission: The Cathay Amateur Radio Club is basically an active social club of Ham Radio Operators and their spouses. We support local community requests for HAM emergency communications. Several of us are trained in CPR/ First Aid and are involved with community disaster preparedness.

Monday Night Net Time: 9 PM Local Time/PST, As of 8/21/2023 we are switching over from using Repeater: WB6TCS to **Nick Cassarino's Repeater: WA6GEL UHF 444.80000 Mhz, Offset +5Mhz, CTCCS/Tone PL 179.9 Hz on Monument Peak, Milpitas.**

If you cannot reach the fore-mentioned machine, please use WA6GEL UHF 4448.8 Mhz Offset +5Mhz, CTCCS/Tone PL173.8 which is on Mt. San Bruno.

The CARC Monday night net is the best way to find out the latest club news. All check-in are welcome.

Message on Behalf of the President: Leonard Tom, *NX6E*

Hello CARC Members and Friends;

Many thanks to Nick Cassarino for the use of repeater – WA6GEL for our CARC Monday Night Net.

Additional folks are needed to help out with conducting the CARC radio net on Monday nights. Please contact Ed Fong (edison_fong@hotmail.com) if you are interested.

I wish to thank our CARC members that set aside their valuable time to participate in our Monday night's nets.

Introduction Tech Article:

New studies on a little known rare earth radioactive element Promethium (Pm) atomic number 61.

For further information, please go to the Tech Section of this newsletter and check out: Promethium - Wikipedia.

CARC Final News Wrap Up

Chat sub s'em to all you CARC members! - Leonard Tom, *NX6E*

Public Service Announcements

HAM CRAM / HAM Licensing

For upcoming HAM Licensing locations please refer to:
http://www.arrl.org/find-an-amateur-radio-license-exam-session

Auxiliary Communications Service (ACS)

The Auxiliary Communications Service (ACS) is a unit of trained professionals who supply communications support to the agencies of the City and County of San Francisco, particularly during major events/incidents. ACS goals are the support of gathering and distribution of information necessary to respond to and recover from a disaster.

The ACS Net begins at 1930 hours (7:30 p.m. PT) local time each Thursday evening, on the WA6GG repeater at 442.050 MHz, positive offset, tone 127.3 Hz. The purpose of this net is to practice Net Control skills, practice checking in with deployment status in a formal net, and to share information regarding upcoming ACS events. Guests are welcome to check in. ACS members perform Net Control duty on a regular basis. On the second Thursday of each month, the net is conducted in simplex mode on the output frequency of the WA6GG repeater, 442.050 MHz no offset, tone 127.3 Hz.

ACS holds its General Meetings on the third Tuesday of each month from 1900 hours to 2100 hours local time. Currently meetings are exclusively conducted over Zoom during the COVID-19 pandemic, ACS looks forward to meeting in person again as soon as possible.

Upcoming meeting dates in 2024 are:

- Nov 19, 2024
- Jan 21, 2025
- Feb 18, 2025

Location of in person future ACS meetings are yet to be determined as the regular location is under reconstruction. All interested persons are welcome to attend. For further information contact Corey Siegel KJ6LDJ <kj6ldj@gmail.com>.

For more information, please attend an ACS meeting, check in on the ACS radio net, or call 415-558-2717.

Free Disaster Preparedness Classes In San Francisco – NERT Taught by San Francisco Fire Department (SFFD).

https://sf-fire.org/nert/nert-calendar-meetings-trainings-events

Training Classes
TBD

+ Recertifications
TBD

***SFFD DOT** is the Fire Department Division of Training. All participants walking, biking or driving **enter through the driveway gate on 19th St.** between Folsom and Shotwell. Parking is allowed along the back toward the cinderblock wall.

Visit ***www.sfgov.org/sffdnert*** to learn more about the training, other locations, and register on line. Upcoming Special NERT Events.

San Francisco Police Department: Auxiliary Law Enforcement Response Team (ALERT)

The Auxiliary Law Enforcement Response Team (ALERT) is a citizen disaster preparedness program designed. The ALERT program is for volunteers 16 years of age or older, who live, work, or attend high school in San Francisco.

Graduates of the San Francisco Police Activities League (P.A.L) Law Enforcement Cadet Academy are also eligible to join.

ALERT volunteers will no longer need to complete the Fire Department's Neighborhood Emergency Response Team (NERT) (www.sfgov.org/sfnert) training and then graduate into two 8 hour Police Department course specifically designed for ALERT team members.

ALERT members will work closely with full-time and/or Reserve Police Officers in the event they are deployed after a disaster. The Basic ALERT volunteer will have no law enforcement powers other than those available to all citizens.

SFPD ALERT Training (New Members)

The next SFPD ALERT training class has been scheduled for: TBD

*Class date indicated are only for new members

IMPORTANT- All participants must complete the background interview process in order to be eligible to attend the ALERT training class.

Eligible ALERT participants may register fora training class by contacting the ALERT Program Coordinator, marina.chacon@sfgov.org, or by telephone at 415-401-4615.

SFPD ALERT Practice/Training Drill

All active/trained ALERT members are asked to join us for our next training drill, via scheduled for on TBD

For more information on the San Francisco Police Department ALERT Program, email us at sfpdalert@sfgov.org, or call Lt. Marina Chacon (SFPD Ret.), SFPD ALERT Program Coordinator, at (415) 401-4615.

For additional information on the web please refer to:
https://sfgov.org/policecommission/alert

Pictures FARS Dinner on 09/27/2024

Foothills Amateur Radio Society (FARS) Pictures from Show & Tell Meeting / Dinner.

FARS Food Table Spread. In foreground is CARC member wearing orange shorts is Bob Yee – W6VVQ.

FARS Dinner in progress

FARS Desert celebrating FARS member's Birthday, Andy who is 88 years young.

Tech Article

OAK RIDGE National Laboratory

Promethium bound: Rare earth element's secrets exposed

https://www.ornl.gov/news/promethium-bound-rare-earth-elements-secrets-exposed

[Promethium unveiled: Rare earth element's secrets exposed (youtube.com)]

Scientists have uncovered the properties of a rare earth element that was first discovered 80 years ago at the very same laboratory, opening a new pathway for the exploration of elements critical in modern technology, from medicine to space travel.

Promethium was discovered in 1945 at Clinton Laboratories, now the Department of Energy's Oak Ridge National Laboratory, and continues to be produced at ORNL in minute quantities. Some of its properties have remained elusive despite the rare earth element's use in medical studies and long-lived nuclear batteries. It is named after the mythological Titan who delivered fire to humans and whose name symbolizes human striving.

This groundbreaking promethium research was led by, from left, Alex Ivanov, Santa Jansone-Popova and Ilja Popovs, all of ORNL. Credit: Carlos Jones/ORNL, U.S. Dept. of Energy

"The whole idea was to explore this very rare element to gain new knowledge," said Alex Ivanov, an ORNL scientist who co-led the research. "Once we realized it was discovered at this national lab and the place

where we work, we felt an obligation to conduct this research to uphold the ORNL legacy."

The ORNL-led team of scientists prepared a chemical complex of promethium, which enabled its characterization in solution for the first time. Thus, they exposed the secrets of this extremely rare lanthanide, whose atomic number is 61, in a series of meticulous experiments.

> *"The whole idea was to explore this very rare element to gain new knowledge," said Alex Ivanov, an ORNL scientist who co-led the research. "Once we realized it was discovered at this national lab and the place where we work, we felt an obligation to conduct this research to uphold the ORNL legacy."*

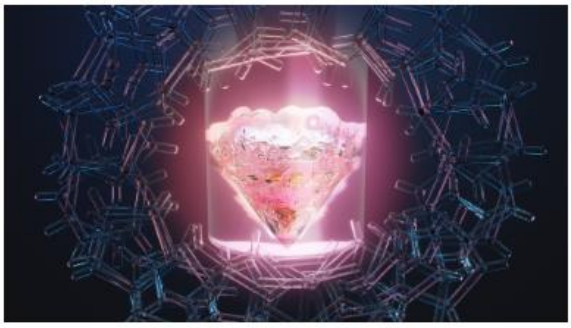
Their landmark study, **published in the journal *Nature***, marks a significant advance in rare earth research and might rewrite chemistry textbooks.

"Because it has no stable isotopes, promethium was the last lanthanide to be discovered and has been the most difficult to study," said ORNL's Ilja Popovs, who co-led the research. Most rare earth elements are lanthanides, elements from 57 — lanthanum — to 71 — lutetium — on the periodic table. They have similar chemical properties but differ in size.

The other 14 lanthanides are well understood. They are metals with useful properties that make them indispensable in many modern technologies. They are workhorses of applications such as lasers, permanent magnets in wind turbines and electric vehicles, X-ray screens and even cancer-fighting medicines.

"There are thousands of publications on lanthanides' chemistry without promethium. That was a glaring gap for all of science," said ORNL's Santa Jansone-Popova, who co-led the study. "Scientists have to assume most of its properties. Now we can actually measure some of them."

The research relied on unique resources and expertise available at DOE national laboratories. Using a research reactor, hot cells and supercomputers, as well as the accumulated knowledge and skills of 18 scientists in different fields, the authors detailed the first observation of a promethium complex in solution.



Conceptual art shows the rare earth element promethium in a vial surrounded by an organic ligand. ORNL scientists have discovered hidden features of promethium, opening a pathway for research into other lanthanide elements. Credit: Jacquelyn DeMink, art; Thomas Dyke, photography/ORNL, U.S. Dept. of Energy

The ORNL scientists bound, or chelated, radioactive promethium with special organic molecules called diglycolamide ligands. Then, using X-ray spectroscopy, they determined the properties of the complex, including the length of the promethium chemical bond with neighboring atoms — a first for science and a longstanding missing piece to the periodic table of elements.

Promethium is very rare; only about a pound occurs naturally in the Earth's crust at any given time. Unlike other rare earth elements, only minute quantities of synthetic promethium are available because it has no stable isotopes.

For this study, the ORNL team produced the isotope promethium-147, with a half-life of 2.62 years, in sufficient quantities and at a high enough purity to study its chemical properties. ORNL is the United States' **only producer of promethium-147**.

Notably, the team provided the first demonstration of a feature of lanthanide contraction in solution for the whole lanthanide series, including promethium, atomic number 61. Lanthanide contraction is a phenomenon in which elements with atomic numbers between 57 and 71 are smaller than expected. As the atomic numbers of these lanthanides increase, the radii of their ions decrease. This contraction creates distinctive chemical and electronic properties because the same charge is limited to a shrinking space. The ORNL scientists got a clear promethium signal, which enabled them to better define the shape of the trend — across the series.

"It's really astonishing from a scientific viewpoint. I was struck once we had all the data," said Ivanov. "The contraction of this chemical bond accelerates along this atomic series, but after promethium, it considerably slows down. This is an important landmark in understanding the chemical bonding properties of these elements and their structural changes along the periodic table."

Many of these elements, such as those in the lanthanide and actinide series, have applications ranging from cancer diagnostics and treatment to renewable energy technologies and long-lived nuclear batteries for deep space exploration.

Team members at ORNL's Radiochemical Engineering Development Center, where the promethium sample was purified, included, from left, Richard Mayes, Frankie White, April Miller, Matt Silveira and Thomas Dyke. Credit: Carlos Jones/ORNL, U.S. Dept. of Energy

The achievement will, among other things, ease the difficult job of separating these valuable elements, according to Jansone-Popova. The team has long worked on separations for the whole series of lanthanides, "but promethium was the last puzzle piece. It was quite challenging," she said. "You cannot utilize all these lanthanides as a mixture in modern advanced technologies, because first you need to separate them. This is where the contraction becomes very important; it basically allows us to separate them, which is still quite a difficult task."

The research team used several premier DOE facilities in the project. At ORNL, promethium was synthesized at the High Flux Isotope Reactor, a DOE Office of Science user facility, and purified at the Radiochemical Engineering Development Center, a multipurpose radiochemical processing and research facility. Then, the team performed X-ray absorption spectroscopy at the National Synchrotron Light Source II, a DOE Office of Science user facility at DOE's Brookhaven National Laboratory, specifically working at the Beamline for Materials Measurement, which is funded and operated by the National Institute of Standards and Technology.

The team also performed quantum chemical calculations and molecular dynamics simulations at the Oak Ridge Leadership Computing Facility, a DOE Office of Science user facility at ORNL, using the lab's Summit supercomputer, the only computational resource capable of providing the necessary calculations at the time. In addition, the researchers used resources of the Compute and Data Environment for Science at ORNL. They expect future calculations to be performed on ORNL's Frontier, the world's most powerful supercomputer and the first exascale system, which is able to perform more than a quintillion calculations each second.

The promethium research team, standing in front of ORNL's Radiochemical Engineering Development Center, included, from left, Santanu Roy, Thomas Dyke, Ilja Popovs, Richard Mayes, Darren Driscoll, Frankie White, Alex Ivanov, April Miller, Subhamay Pramanik, Santa Jansone-Popova, Sandra Davern, Matt Silveira, Shelley VanCleve and Jeffrey Einkauf. Credit: Carlos Jones/ORNL, U.S. Dept. of Energy

Popovs emphasized that the ORNL-led accomplishments can be attributed to teamwork. Each of the *Nature* paper's 18 authors was critical to the project, he said.

The achievement sets the stage for a new era of research, the scientists said. "Anything that we would call a modern marvel of technology would include, in one shape or another, these rare earth elements," Popovs said. "We are adding the missing link." Besides Popovs, Ivanov and Jansone-Popova from ORNL's Chemical Sciences Division, the paper's co-authors include Darren Driscoll, Subhamay Pramanik, Jeffrey Einkauf, Santanu Roy and Thomas Dyke, also of ORNL's Chemical Sciences Division; Frankie White, Richard Mayes, Laetitia Delmau, Samantha Cary, April Miller and Sandra Davern of ORNL's Radioisotope Science and Technology Division; Matt Silveira and Shelley VanCleve of ORNL's Isotope Processing and Manufacturing Division;

Dmytro Bykov of the National Center for Computational Sciences at ORNL; and Bruce Ravel of the National Institute of Standards and Technology.

This work was primarily co-sponsored by DOE's Office of Science for ligand synthesis, lanthanide complexation studies, crystallization processes, spectroscopic analyses and simulation efforts. The production, purification and preparation of the promethium sample were supported by the DOE Isotope Program, managed by the Office of Science for Isotope R&D and Production. The single-crystal X-ray diffraction data collection and refinement were supported by the DOE Office of Science.

UT-Battelle manages ORNL for DOE's Office of Science, the single largest supporter of basic research in the physical sciences in the United States. The Office of Science is working to address some of the most pressing challenges of our time. For more information, please visit **energy.gov/science**. — Lawrence Bernard and Leo Williams

Learn more about the original discovery of promethium at ORNL