



Stewart L. Udall

AUI Lecture Stewart Udall On Hiroshima

On August 6, 1945, the U.S. dropped an atomic bomb on Hiroshima, Japan. Nine days later, the Japanese surrendered. Thus, World War II has been over for almost 45 years, but the debate over the morality of using atomic power for destructive purposes persists.

One perspective on this debate will be offered at BNL on Wednesday, February 28, when Stewart L. Udall, former U.S. Secretary of the Interior, delivers an AUI Distinguished Lecture. His talk on "Hiroshima: The American Tragedy" will offer a fresh moral view of the decision to use the bomb — focusing on who was and was not responsible. A reception will follow the lecture, which will begin at 5 p.m. in Berkner Hall.

In addition, on Thursday, March 1, Udall will lead a breakfast discussion (continued on page 2)

Invention of New Radiation Source Offers New PATH for Cancer Therapy

A new radiation source for treating malignant tumors — samarium-145 — has been invented in the Medical Department by BNL researchers Ralph Fairchild, Brenda Laster and Samuel Packer, who is also Chief of Ophthalmology at North Shore University Hospital.

Samarium-145 (¹⁴⁵Sm) is a source of x-rays, or photons. Recently two events — experiments at the National Synchrotron Light Source (NSLS) and clinical tests at Ohio State University — have produced evidence that ¹⁴⁵Sm has a promising future as a source of photons for a new type of cancer therapy called photon activation therapy (PAT). Clinical tests using ¹⁴⁵Sm in PAT are expected to begin within a year.

Double-Component Therapy

PAT is a double-component attack on malignant tumors. One component is iodine incorporated in the DNA of tumor cells. The second is a photon with an energy suitable for activating the iodine. Neither agent is effective alone, but combined, they can destroy tumors.

As a cancer therapy, PAT overcomes many of the limitations of surgery, chemotherapy and conventional radiation therapy. With PAT, it should be possible to leave normal tissue relatively unharmed, while causing far more destruction to the microscopic extensions of the cancer than is possible with conventional therapy.

In PAT, the patient is given non-radioactive iodine in a form known as IdUrd. The molecule is structurally similar to thymidine, a base used by cells to make DNA when they replicate. Because such cell division and multiplication occurs quite rapidly in malignant tumors, IdUrd is efficiently incorporated by the tumor.

IdUrd has two advantages: It

makes the tumor more sensitive to the destructive effects of x-rays; and, when the iodine in IdUrd is activated by photons of a specific energy, it produces tumor-destroying cascades of electrons — called Auger cascades — within the tumor cell nucleus.

In an Auger cascade, at an energy of 33,200 electron volts (33.2 keV), a photon ejects an electron from its position within one of the innermost shells of the iodine atom. In order to stabilize the atom, an electron from an outer shell drops down to fill up the "hole" in the inner shell. As the electron drops down, it gives off an x-ray, which knocks out another electron, and so on. In an IdUrd

molecule, one photon can cause a shower of approximately 11 electrons — an Auger cascade, known to be very effective in killing tumor cells.

Source of Encouragement

Made in BNL's High Flux Beam Reactor (HFBR), the new ¹⁴⁵Sm source has many advantages. First, it has a half-life that is about six times longer than other radiation sources of this type — which means that it can be sent to distant places and stored without difficulty.

Also, Fairchild, Laster and Packer have been able to make ¹⁴⁵Sm in tiny, 4 x 0.8 millimeter, seed-like capsules. (continued on page 2)



Roger Stoutenburgh

At beam line X17B1 at the National Synchrotron Light Source: (from left) Brenda Laster, William Thomlinson and Ralph Fairchild.

DNI Lecture: Seismic Studies of Reactor Components

There was a whole lot of shaking going on in Shikoku, Japan, in the spring of 1988, but most of the inhabitants of that small island were completely unaware that an enormous earthquake had just taken place.

A team of scientists, however, was very much aware, for they had created that earthquake — and several more like it — inside the Tadotsu Engineering Laboratory, on a 15-meter-square shaking table, as part of a joint U.S.-Japanese test of the ability of reactor components to withstand the worst an earthquake can offer.

One member of the U.S. team is Charles Hofmayer, who heads the Structures & Components Evaluation Group in the Structural Analysis Division of BNL's Department of Nuclear Energy (DNE). He will discuss these "Seismic Studies of Reactor Components" when he delivers the 259th Brookhaven Lecture on Tuesday, February 27, at 4 p.m., in Berkner Hall.

DNE Chairman Walter Kato, who was also very much involved with this project, will introduce the speaker. Other members of the BNL team were John Curreri, Young Park, Semyon Shteyngart and Y.K. Wang, all in the Structural Analysis Division.



Roger Stoutenburgh

Charles Hofmayer

To put the U.S.-Japanese tests in perspective and show their uniqueness, Hofmayer will begin by discussing other seismic tests done worldwide. For example, previous tests have placed great stress on small-diameter reactor piping, by the use of sleds moved with a designated motion. And, after Germany's HDR reactor was decommissioned, an eccentric shaker was used to test the building and the components housed

within.

In order to test the capacity of a complete reactor-coolant system with large-diameter piping by simulating actual earthquake motions, the U.S.-Japan team employed the world's largest shaking table. The table, which can be programmed to move both horizontally and vertically, can excite structures weighing up to one-million pounds, with an input acceleration of almost three times gravity.

Hofmayer will describe the scaled test model of a steam generator, reactor-coolant pump and associated reactor-coolant piping, which was manufactured exactly like the components used in a nuclear power plant. He will explain how the test model was modified and subjected to simulated earthquake motions that produced a crack in a 14-inch diameter, stainless steel pipe, which propagated almost completely through the 1½-inch-thick pipe wall.

As Hofmayer will conclude, the U.S.-Japan study demonstrated significant seismic margin in nuclear power plant piping, provided extensive test data to correlate with existing seismic analysis techniques, and furnished unique information to understand fatigue-crack initiation and growth under seismic-loading conditions.

Charles Hofmayer was graduated

from Cooper Union with a bachelor's degree in civil engineering in 1966. He earned both his master's and his Ph.D. in structural engineering from the University of Illinois, in 1967 and 1970 respectively.

In 1970, Hofmayer became a structural engineer with the Bechtel Corporation. He left Bechtel in 1973 to join the U.S. Nuclear Regulatory Commission (NRC) in the same capacity. When he left the NRC in 1981, he was section leader of the Seismic and Dynamic Load Qualification Section.

As a technical specialist with the Impell Corporation from 1981-83, Hofmayer was responsible for the marketing and technical direction of projects related to seismic and structural analysis of structures and equipment for nuclear power plants. He brought this expertise to BNL in 1983, when he joined DNE's Structural Analysis Division as a mechanical engineer. He became the Group Leader of the Structures & Components Evaluation Group in 1986.

After the lecture, those attending are invited to join the speaker for discussion and hors d'oeuvres. In addition, anyone interested in joining the lecturer for dinner at a restaurant off site, should call Grace Searles, Ext. 4464, by noon on Monday, February 26.

Conquering The Waves

Last week, the Bulletin introduced the recently revived and extremely active BNL Amateur Radio Club. Today, meet three retired BNLers who are amateur radio enthusiasts.

Either on the water or on the air waves — that's where retired BNL employees Michael McKeown, Fred Pallas and Vance Sailor now spend much of their time.

Each of the three retirees owns a sailboat, and each has earned a ham radio operator's license. Two have already combined the two interests, and Sailor is planning to do so.

Michael McKeown, a resident of Brookhaven, retired from a 34-year career in BNL's Physics Department in 1983. Two years later, he successfully completed the test to earn an amateur radio license.

Soon afterwards, he was able to use his ham radio expertise to keep in touch with his daughter and son-in-law, Christine and Bill Burry of Fairfax, Virginia, as they took a two-year sail to Europe on their 41-foot, two-masted ketch, and later, sailed to the Caribbean.

"I called them weekly, and when I lost contact with them in Greece, I was able to find a ham in Great Britain who relayed messages to them for me," McKeown said. "Through our Great Britain contact,

Note to Employees:

Attendance at lectures, meetings and other special programs held during normal working hours is subject to supervisory concurrence.

Cancer Therapy (cont'd)

They can be surgically implanted directly into tumors, a technique referred to as brachytherapy. In addition, arrays of these seeds can be attached to the back of the eye for the treatment of ocular cancer. Even more important, ^{145}Sm emits photons of the correct energy to activate Auger cascades.

"The fact that ^{145}Sm can stimulate Auger cascades," said Fairchild, "makes the new information from the NSLS experiments, in combination with the development of methodology for PAT coming from Drs. Reinhard Gahbauer and Joseph Goodman, our collaborators at Ohio State, very encouraging."

Unambiguous Confirmation

The new information from the NSLS experiments, Fairchild explained, is that the concept of PAT has been unambiguously confirmed.

The experiments were done at the X17B1 beam line, which was capable of providing an adequate intensity of photons. William Thomlinson, NSLS, designed a special monochromator to select photon beams of the correct energy to stimulate Auger cascades in the IdUrd — equivalent to the effects of ^{145}Sm . These photons were used to irradiate cell cultures both with and without IdUrd. Ed Popenoe, Chris Gordon and Lynne Warkentien of the Medical Department, along with Nicholas Gmur of the NSLS, completed the interdisciplinary team making this proof possible.

Results showed that malignant cells containing IdUrd are destroyed more efficiently than those without IdUrd.

Also, at the 33.2 keV energy that stimulates Auger cascades, cell destruction is increased significantly in accordance with theoretical predictions.

"Therefore," said Fairchild, "when ^{145}Sm sources are used with IdUrd in a patient, and results are compared to those obtained with conventional sources and IdUrd, we expect the effective dose to be doubled."

Possible Increase in Median Survival

These results from the NSLS are even more promising in view of the preliminary information from results of clinical trials of PAT, done at Ohio State using brachytherapy techniques. Historically, the life expectancy of patients with malignant brain tumors is approximately nine months. The tests of PAT done at Ohio State with 12 patients indicate that the technique may increase median survival (see graph). Follow-ups of these patients will determine if these results are statistically significant.

The Ohio State treatments have two steps. In the first step depicted in the graph, the patients were infused for three weeks with IdUrd. In an effort to change only one parameter at a time, this unique step was followed by a procedure used in conventional therapy: tumor irradiation with a combination of external beams of photons and implanted radiation sources of iridium-192 (^{192}Ir),



Ham radio operators (from left) Michael McKeown, Vance Sailor and Fred Pallas, all retired BNL employees, check out the equipment in the BNL Amateur Radio Club's room at the Recreation Building.

my wife and I were able to make plans to meet with them in Rhodes for a two-week vacation."

McKeown and his wife, Marilyn, who retired from Physics in 1989, sail their own boat — a 26-foot sloop — in local waters. He plans to bring a hand-held ham radio on the boat now that BNL's Amateur Radio Club's repeater is in operation.

McKeown, who joined the Radio Club when it was recently reactivated, said, "The repeater will allow me to call inland from the Great South Bay. Without it, I couldn't even make contact with anyone at the Lab."

Fred Pallas, who worked at BNL from 1947 to 1976, now sails to exotic

locales on his 34-foot Morgan sloop and contacts foreign countries with his ham radio at home in Patchogue, using a 26-foot backyard antenna for transmission.

Pallas has gathered a list of contacts on the sea — amateur radio enthusiasts who have their equipment on their boats — and he often calls them to find out if they are safe in stormy weather. As an experienced captain with a U.S. Coast Guard Master's license for the Atlantic Coast, and a district commander for the U.S. Power Squadron, Pallas is well-equipped to help boaters who have lost their destination.

"I've been interested in ham radio since high school" Pallas said, "but

I never really found time to delve into it until about five years ago. In case I ever become housebound and can't sail anymore, I'll always have contact with the outside world."

With his ham radio, Pallas has made contact with people in scores of foreign lands — the Canary Islands, Berlin, Latvia, Moscow, the Galapagos Islands, Nicaragua and New Zealand.

"When I'm restless at night and I can't sleep, I find people to talk to on my ham radio," Pallas said.

A member of the Suffolk County Radio Club, Pallas remains in contact with fellow hams at BNL. Sponsored by the county-wide club, he teaches the basics of amateur radio to local secondary school students. "Ham radio is a good teaching tool to interest young people in science," Pallas said.

Vance Sailor of East Patchogue, who retired from the Department of Nuclear Energy in 1985 after 36 years (continued on page 4)

AUI Lecture (cont'd)

on "The History of the Environmental Movement and Environmental Law." An avid environmentalist himself, Udall has chosen Brookhaven for this forum because he recognizes that much of the environmental movement started here in the 1960s, with such BNLers as retiree Dennis Puleston, founding chairman of the Environmental Defense Fund in 1967. The breakfast, which is open to all interested participants, will begin at 8:30 a.m. in the Cafeteria.

To look at the effects of ionizing radiation on the environment, BNL began the Ecology Forest project in 1961, and Udall toured that project in November 1969, when he first visited the Lab as an AUI Distinguished Lecturer, to give a talk on his then most recent book, *1976: Agenda for Tomorrow*. On November 20, 1969, the Brookhaven Bulletin reported, "Udall gave his enthusiastic audience a look at the problems and solutions that will face us in the world of tomorrow."

Now it's past the tomorrow of which Udall then spoke — and nuclear weapons continue to be one of the problems that face the world today. Thus, his discussion of the 45-year-old decision to target Hiroshima promises to have important implications for today and tomorrow.

Soon after he was elected to his fourth term as a U.S. Congressman from Arizona, Udall was appointed by President John F. Kennedy to serve as the 37th Secretary of the Interior. He held that position for eight years, during both the Kennedy and Johnson administrations. During that time, he implemented many new programs that helped to protect the nation's natural resources and bring about a new national concern for the environment.

Udall's first book, *The Quiet Crisis* (1963), was updated and reissued in 1988. In this best-seller, he advanced "the proposition that men must grasp completely the relationship between human stewardship and the fullness of the American earth."

King Carlos of Spain conferred a knighthood on Udall for the 1987 book, *To the Inland Empire: Coronado and Our Spanish Legacy*, which celebrates Hispanic contributions to U.S. history. In 1974, he also co-authored *The Energy Balloon*.

In 1965, Associated Universities, Inc., adopted a plan for lectures to be given at BNL on topics of general interest. In January 1966, Ralph Bunche, then United Nations Under-Secretary for Special Political Affairs, delivered the first AUI Distinguished Lecture on "U.N. Peacekeeping: Crisis and Prospects." Of the 33 AUI Distinguished Lecturers to date, Udall is the first to return to BNL to deliver a second talk.

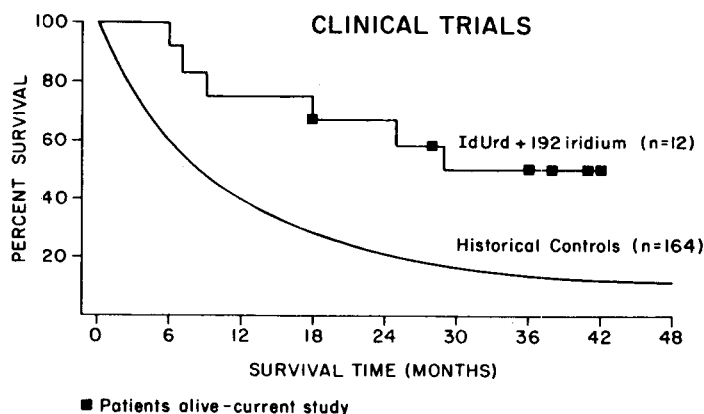
which produce an enhanced dose due to the sensitizing effects of IdUrd, but do not efficiently produce Auger cascades. For the second and final step, which should take place within in a year, the researchers will replace the ^{192}Ir sources with ^{145}Sm sources, which can efficiently produce both sensitized damage and Auger cascades.

"When ^{145}Sm replaces the ^{192}Ir sources, the treatment should be much more effective," said Laster. "This way of treating malignant brain tumors, such as glioblastoma multiforme, is especially important since it does not depend on the availability of a nuclear reactor for therapy, as, for example, in neutron capture therapy. It should be of great use in third world countries and developing nations that do not have convenient access to sophisticated radiation therapy accelerators."

Tech Transfer Possibilities

Great interest in the production of ^{145}Sm as a source for PAT has been demonstrated by the Medical Device Division of the 3M Company in Minnesota. 3M assisted in research and development by encapsulating and sealing the enriched samarium oxide (^{145}Sm) in titanium capsules, which are then activated at the HFBR to become the radioactive sources, ^{145}Sm .

Because of ^{145}Sm 's longer shelf-life — one year rather than 60 days — and its Auger cascade advantage, 3M is interested in the commercial potential of ^{145}Sm as a possible replacement for implantable iodine (^{125}I) brachytherapy sources now being used to treat malignant brain tumors. — Liz Seubert



The lower curve on this graph shows that, historically, for 164 patients with malignant brain tumors, the median survival time was about nine months. The upper line shows the results of clinical trials at Ohio State University, using iodine to sensitize tumors to 192-iridium gamma rays. When the 192-iridium is replaced by the BNL-invented samarium-145, the effective dose to the cancer is expected to be doubled, thus improving the chances of successful treatment.

Next BERA Concert: Shanghai String Quartet

The Shanghai String Quartet, one of today's leading young string ensembles, will give the next performance of the 1989-90 BERA concert series on Monday, February 26, at 8 p.m., in Berkner Hall.

Composed of three musicians from Shanghai — Wei-Gang Li, violin; Hong-Gang Li, violin; Zheng Wang, viola — and one new member from Montana — Kathe Jarka, cello — the group is currently the graduate quartet-in-residence at the Juilliard School.

Formed in 1983, the ensemble gained international recognition in 1985, when they were selected to represent China at the Portsmouth International String Quartet Competition where they captured the second prize. They subsequently left China to study with the Vermeer Quartet in the U.S.

In 1987, the quartet won first prize in the prestigious Chicago Discovery Competition. They gained further distinction by performing with violinist Young Uck Kin and cellist Yo Yo Ma at the Mostly Mozart Festival at Lincoln Center, in 1987 and 1988.



The Shanghai String Quartet

The program for their BNL concert consists of Beethoven's String Quartet in F Major, Op. 18, No. 1; Zhou Long's "Song of the Ch'in" (1982); and Brahms' String Quartet in C

Minor, Op. 51, No. 1.

Tickets for the concert can be purchased at the door for \$9, general admission; \$6, students and those over 65; and \$5, children under 18.

Adults' Swim Lessons

Registrations for swim lessons for adult employees and their dependents 18 years old and older are now being accepted at the pool.

Classes will begin on Wednesday, March 7, at 5:15 p.m., and continue for eight consecutive Wednesday evenings. A \$25 fee is due at the time of registration.

Note to Drivers

BNL has new car rental agreements with Budget, National and Avis. Lab travelers can obtain identification cards from department secretaries or from the Travel Office, Bldg. 179B.

Arrivals & Departures

Arrivals

Philip Rappa III.....Biology
Reyad I.T. Sawafta.....Physics

Departures

This list includes all employees who have terminated from the Lab, including retirees:

Marvin J. Duncan.....Reactor
Sharon B. Edwards.....Fiscal
Iaan O. Fabien.....NLSL
Diane P. Hanna.....Fiscal

TFCU — You Can Bank on It

With the upcoming closing of the Upton branch of Barclays Bank on March 30, the BNL branch of Teachers Federal Credit Union (TFCU) has been inundated with questions about its services and planned move to Bldg. 193 on Technology Street during the first week of April.

To answer some of those questions, the Bulletin interviewed Lisa Goodenough, BNL Branch Manager of TFCU.



Roger Stouenburgh

Lisa Goodenough

What is a credit union?

A credit union is a cooperative financial association in which members first pool their money and then make loans to individual members who are creditworthy. Savings deposited in a credit union are called shares.

TFCU was founded in 1952, when seven Long Island teachers each pooled \$5 and obtained a charter under the Federal Credit Union Act. In 1982, TFCU opened its seventh branch — at BNL.

Today, TFCU has over 70,000 members, over 150 employees, and assets in excess of \$270,000,000. By the size of its assets, TFCU is ranked in the top 100 credit unions nation-

wide by the National Credit Union Administration.

What services does TFCU offer?

As a full-service financial institution, TFCU offers: share (savings) accounts and share-draft (checking) accounts; direct deposit and payroll deduction; automated teller machines and computer-assisted telephone transactions; auto, boat, personal and student loans; mortgages, and regular and mini home-equity loans; certificates of deposit, money-market accounts and individual retirement accounts; vacation and holiday clubs; money orders, travelers' checks and gift checks; and two credit cards — VISA and MasterCard.

Once TFCU moves, it will be able to disburse more cash, and will continue to cash Lab payroll checks for weekly and monthly employees and guests. TFCU will also cash employees' personal checks drawn on banks other than the credit union, as long as the employee is a TFCU member and has sufficient funds on deposit to cover that check.

How do I become a credit-union member?

Those holding valid BNL identification cards are eligible to join TFCU. In addition, family members of a TFCU member may join the credit union.

To join TFCU, a prospective member must pay a \$2 fee and open a share (savings) account. The member must maintain a minimum balance of \$50 to take advantage of TFCU's other services.

If the share-account balance is over \$50 but under \$1,000 for a full calendar quarter of a year, a member will earn the current interest rate of 5 percent. If the share-account balance is over \$1,000, the present interest is 5.75 percent.

What about checking accounts?

TFCU offers checking accounts, but calls them share-draft accounts.

There are no per-check charges, and a service charge of \$5 per month is assessed only when a share-draft account drops below \$300. For each day that members have a balance of \$500 or more, they earn 5 percent interest for that day.

Members can receive basic,

imprinted checks for free by having their full net paycheck deposited directly into any of their TFCU accounts. Each check has a carbon-less copy behind it for easy record-keeping, but a photocopy of a cancelled check can be obtained if necessary.

Overdrafts can be automatically covered by a transfer of funds from a share (savings) account or by a Teachers' Advantage line of credit.

Are savings deposited in a credit union insured?

Yes. The National Credit Union Share Insurance Fund (NCUSIF) is the federal insurance program set up specifically to protect savings in credit unions. Of the three federal insurance programs, the NCUSIF is the best capitalized. TFCU accounts are insured up to \$100,000 by the NCUSIF.

How can I access my money?

The hours of the BNL branch of

TFCU are: Monday through Thursday, 9 a.m. to 4:30 p.m., and Friday, 9 a.m. to 5 p.m. Five TFCU branches — Bohemia, Bay Shore, Elwood, Farmingville and Lake Grove — are open Saturdays, 9 a.m. to noon.

After obtaining an automated teller machine (ATM) card, a TFCU member can use the cash machine on site or any ATM machine in the NYCE, Instabank or \$AM networks.

Who will be handling my transactions at the credit union?

As in the past, Cathy Mahan will continue as a platform assistant, and tellers Julie Freise and Elizabeth LaBalbo will be staffing the windows.

When the BNL branch of TFCU moves, additional teller and platform assistant positions will be filled. As business warrants, more employees will be added.

Anyone with more questions about TFCU can call Lisa Goodenough, Ext. 2790.

An Important Month In Black History

With the release of Nelson Mandela on February 11, after 27 years in prison in South African, black history was again made during Black History Month. Following are some other significant moments in black history that took place in the month of February:

- Feb. 1, 1870 Jonathan Jasper Wright was elected to South Carolina Supreme Court and became the first black to hold a major judicial post in the U.S.
- Feb. 1, 1960 Sit-ins at segregated lunch counters began in Greensboro, North Carolina.
- Feb. 1, 1965 700 people were arrested in Selma, Alabama, demonstrating for black voting rights.
- Feb. 2, 1901 Birth of poet and writer Langston Hughes.
- Feb. 6, 1956 Autherine Lucy became the first black student to enroll at the University of Alabama.
- Feb. 9, 1944 Birth of poet and novelist Alice Walker.
- Feb. 12, 1902 Founding of the NAACP, the National Association for the Advancement of Colored People.
- Feb. 14, 1817 Frederick Douglass was born into slavery. After his escape, he became editor of the Rochester, New York, abolitionist newspaper, The North Star.
- Feb. 19, 1919 First Pan-African Congress was organized by W.E.B. DuBois and others in Paris.
- Feb. 20, 1895 Death of abolitionist Frederick Douglass.
- Feb. 21, 1965 Assassination of civil rights leader Malcolm X.
- Feb. 23, 1896 Educator and writer W.E.B. DuBois was born.
- Feb. 25, 1870 Hiram Revels became the first black U.S. senator.
- Feb. 27, 1987 Death of E.D. Nixon, who cofounded the first successful black union, the Brotherhood of Sleeping Car Porters, and helped organize the Montgomery bus boycott.

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