OSU
Oregon State
UNIVERSITY

Radiation Center
Oregon State University, 100 Radiation Center, Corvallis, Oregon 97331-5903
T 541-737-2341 | **F** 541-737-0480 | http://ne.oregonstate.edu/facilities/radiation_center

October 26, 2007

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Reference: Oregon State University TRIGA Reactor (OSTR)
Docket No. 50-243, License No. R-106

In accordance with section 6.7.e of the OSTR Technical Specifications we are hereby submitting the Oregon State University Radiation Center and OSTR Annual Report for the period July 1, 2006 through June 30, 2007.

The Annual Report continues the pattern established over the past few years by including information about the entire Radiation Center rather than concentrating primarily on the reactor. Because this report addresses a number of different interests, it is rather lengthy, but we have incorporated a short executive summary which highlights the Center's activities and accomplishments over the past year.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on: 10/26/07

Sincerely,

Steven R. Reese
Director

Cc: Alexander Adams, USNRC
Craig Bassett, USNRC
Ken Niles, ODOE
John Cassady, OSU
Rich Holdren, OSU
Todd Palmer, OSU

A020
NRR

July 1 — June 30

06-07

Radiation Center and TRIGA Reactor Annual Report

Submitted by:

Steve R. Reese, Director

Radiation Center
Oregon State University
Corvallis, Oregon 97331-5903
Telephone: (541) 737-2341
Fax: (541) 737-0480

To satisy the requirements of :

A. U.S. Nuclear Regulatory Commission, License No. R-106 (Docket No. 50-243), Technical Specification 6.7(e).

B. Task Order No. 3, under Subcontract No. C84-110499 (DE-AC07-76ER01953) for University Reactor Fuel Assistance-AR-67-88, issued by EG&G Idaho, Inc.

C. Oregon Department of Energy, OOE Rule No. 345-030-010.

Contents

List of Tables

List of Figures

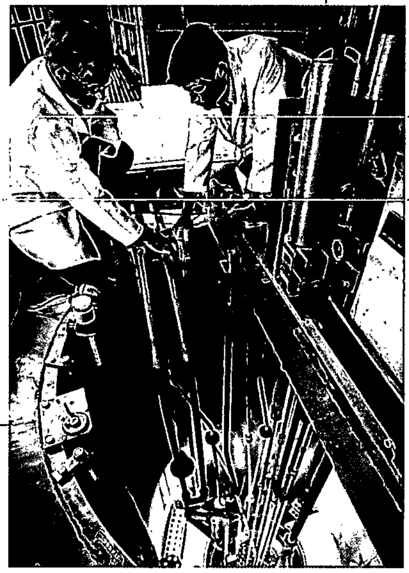
Acknowledgements

We have experienced yet another exciting and successful year. There are many people to thank for this but most of the credit goes to the staff: Steve, Dina, Erin, Shirley, Todd, Gary, Jim, Beth, Alena, Leah, and Scott. Without their efforts none of this would be possible. The camaraderie and cooperation of this group has created a sense of accomplishment and fulfillment rarely seen in organizations of this size.

nuclear engineering students can learn how the reactor works in the classroom, then apply the knowledge in the la

We had two individuals who departed the Radiation Center this year and we wish both of them the best. After some thirty years, Mike Conrady retired to be closer to family. While Mike leaves a legacy of NAA analysis, computers, and networks, it was his outreach and activities involving students for which he had his greatest impact. Mike Hartman who, although he was with us for only a short time, contributed more to the Radiation Center both personally and professionally than we have seen from any individual in many years. There are many things we simply could not have done without him. They both will be missed.

Part I—Overview



Executive Summary

The data from this reporting year shows that the use of the Radiation Center and the Oregon State TRIGA reactor (OSTR) has continued to grow in many areas.

The Radiation Center supported 48 different courses this year, mostly in the Department of Nuclear Engineering and Radiation Health Physics. About 31% of these courses involved the OSTR. The number of OSTR hours used for academic courses and training was 56, while 2,851 hours were used for research projects. Seventy-eight percent of the OSTR research hours were in support of off-campus research projects, reflecting the use of the OSTR nationally and internationally. Radiation Center users published or submitted 86 articles this year, completed 6 theses/dissertations, and made 53 presentations on work that involved the OSTR or Radiation Center. The number of samples irradiated in the reactor during this reporting period was 2018. Funded OSTR use hours comprised 96% of the research use.

Personnel at the Radiation Center conducted 148 tours of the facility, accommodating 2,189 visitors. The visitors included elementary, middle school, high school, and college students; relatives and friends; faculty; current and prospective clients; national laboratory and industrial scientists and engineers; and state, federal and international officials. The Radiation Center is a significant positive attraction on campus because visitors leave with a good impression of the facility and of Oregon State University.

The Radiation Center projects database continues to provide a useful way of tracking the many different aspects of work at the facility. The number of projects supported this year was 220. Reactor related projects comprised 73% of all projects. The total research supported by the Radiation Center, as reported by our researchers, was $5,769,460. The actual total is likely considerably higher. This year the Radiation Center provided service to 69 different organizations/ institutions, 38% of which were from other states and 16% of which were from outside the U. S. and Canada. So while the Center's primary mission is local, it is also a facility with a national and international clientele.

The Radiation Center web site provides an easy way for potential users to evaluate the Center's facilities and capabilities as well as to apply for a project and check use charges. The address is: http://radiationcenter.oregonstate.edu.

Introduction

The current annual report of the Oregon State University Radiation Center and TRIGA Reactor follows the usual format by including information relating to the entire Radiation Center rather than just the reactor. However, the information is still presented in such a manner that data on the reactor may be examined separately, if desired. It should be noted that all annual data given in this report covers the period from July 1, 2006 through June 30, 2007. Cumulative reactor operating data in this report relate only to the FLIP-fueled core. This covers the period from August 1, 1976 through June 30, 2007. For a summary of data on the reactor's original 20% enriched core, the reader is referred to Table IV.A.2 in Part IV of this report or to the 1976-77 Annual Report if a more comprehensive review is needed.

In addition to providing general information about the activities of the Radiation Center, this report is designed to meet the reporting requirements of the U. S. Nuclear Regulatory Commission, the U. S. Department of Energy, and the Oregon Department of Energy. Because of this, the report is divided into several distinct parts so that the reader may easily find the sections of interest.

Overview of the Radiation Center

The Radiation Center is a unique facility which serves the entire OSU campus, all other institutions within the Oregon University System, and many other universities and organizations throughout the nation and the world. The Center also regularly provides special services to state and federal agencies, particularly agencies dealing with law enforcement, energy, health, and environmental quality, and renders assistance to Oregon industry. In addition, the Radiation Center provides permanent office and laboratory space for the OSU Department of Nuclear Engineering and Radiation Health Physics, the OSU Institute of Nuclear Science and Engineering, and for the OSU nuclear chemistry, radiation chemistry, geochemistry and radiochemistry programs. There is no other university facility with the combined capabilities of the OSU Radiation Center in the western half of the United States.

Located in the Radiation Center are many items of specialized equipment and unique teaching and research facilities. They include a TRIGA Mark II research nuclear reactor; a 60Co gamma irradiator; a large number of state-of-the art computer-based gamma radiation spectrometers and associated germanium detectors; and a variety of instruments for radiation measurements and monitoring. Specialized facilities for radiation work include teaching and research laboratories with instrumentation and related equipment for performing neutron activation analysis and radiotracer studies; laboratories for plant experiments involving radioactivity; a facility for repair and calibration of radiation protection instrumentation; and facilities for packaging radioactive materials for shipment to national and international destinations.

A major non-nuclear facility housed in the Radiation Center is the one-quarter scale thermal hydraulic advanced plant experimental (APEX) test facility for the Westinghouse AP600 and AP1000 reactor designs. The AP600 and AP1000 are next-generation nuclear reactor designs which incorporate many passive safety features as well as considerably simplified plant systems and equipment. APEX operates at pressures up to 400 psia and temperatures up to 450°F using electrical heaters instead of nuclear fuel. All major components of the AP600 and AP1000 are included in APEX and all systems are appropriately scaled to enable the experimental measurements to be used for safety evaluations and licensing of the full scale plant. This world-class facility meets exacting quality assurance criteria to provide assurance of safety as well as validity of the test results.

Also housed in the Radiation Center are the Advanced Thermal Hydraulics Research Laboratory (ATHRL), which is used for state-of-the-art two-phase flow experiments, and the Nuclear Engineering Scientific Computing Laboratory.

The Radiation Center staff regularly provides direct support and assistance to OSU teaching and research programs. Areas of expertise commonly involved in such efforts include nuclear engineering, nuclear and radiation chemistry, neutron activation analysis, radiation effects on biological systems, radiation dosimetry, environmental radioactivity, production of short-lived radioisotopes, radiation shielding, nuclear instrumentation, emergency response, transportation of radioactive materials, instrument calibration, radiation health physics, radioactive waste disposal, and other related areas.

In addition to formal academic and research support, the Center's staff provides a wide variety of other services including public tours and instructional programs, and professional consultation associated with the feasibility, design, safety, and execution of experiments using radiation and radioactive materials.

Part II—People

Radiation Center Staff

This section contains a listing of all people who were residents of the Radiation Center or who worked a significant amount of time at the Center during this reporting period.

It should be noted that not all of the faculty and students who used the Radiation Center for their teaching and research are listed. Summary information on the number of people involved is given in Table VI.C.1, while individual names and projects are listed in Tables VI.C.2 and VI.C.3.

Steve Reese, Director

Dina Pope, Office Manager

Shirley Campbell, Business Manager

Beth Lucason, Receptionist

Mike Hartman, Reactor Administrator

S. Todd Keller, Senior Reactor Operator

Gary Wachs, Reactor Supervisor, Senior Reactor Operator

Scott Menn, Senior Health Physicist

Jim Darrough, Health Physicist

Leah Minc, Neutron Activation Analysis Manager

Alena Paulenova, Radiochemistry Research Manager

Steve Smith, Scientific Instrument Technician, Senior Reactor Operator

Erin Cimbri, Custodian

Lindsey Arnold, Health Physics Monitor (Student)

Marcus Arnold, Health Physics Monitor (Student)

David Horn, Health Physics Monitor (Student)

Joel Moreno, Health Physics Monitor (Student)

Mike Kennedy, Laborer (Student)

Nara Shin, Student Lab Assistant

Liecong Zhen, Student Lab Assistant

the Radiation Center has greater combined capabilities than any other university facility in the western half of the United States

Professional and Research Faculty

Binney, Stephen E.

Director Emeritus, Radiation Center, Professor Emeritus, Nuclear Engineering and Radiation Health Physics

****Conrady, Michael R.***

Faculty Research Assistant, Analytical Support Manager, Radiation Center

Craig, A. Morrie

Professor, College of Veterinary Medicine

Daniels, Malcolm

Professor Emeritus, Chemistry

Duringer, Jennifer

Research Associate, College of Veterinary Medicine

Groome, John T.

Faculty Research Assistant, ATHRL Facility Operations Manager, Nuclear Engineering and Radiation Health Physics

****Hamby, David***

Professor, Nuclear Engineering and Radiation Health Physics

Hart, Lucas P.

Faculty Research Associate, Chemistry

****Higginbotham, Jack F.***

Director, Oregon Space Grant, Professor, Nuclear Engineering and Radiation Health Physics

****Higley, Kathryn A.***

Professor, Nuclear Engineering and Radiation Health Physics

Johnson, Arthur G.

Director Emeritus, Radiation Center, Professor Emeritus, Nuclear Engineering and Radiation Health Physics

Keller, S. Todd

Interim Reactor Administrator/Reactor Operator, Radiation Center

Klein, Andrew C.

Professor, Nuclear Engineering and Radiation Health Physics

****Krane, Kenneth S.***

Professor Emeritus, Physics

****Loveland, Walter D.***

Professor, Chemistry

****Menn, Scott A.***

Senior Health Physicist, Radiation Center

****Minc, Leah***

Assistant Professor Senior Research, Radiation Center

****Palmer, Todd S.***

Associate Professor, Nuclear Engineering and Radiation Health Physics

****Paulenova, Alena***

Assistant Professor, Senior Research, Radiation Center

Popovich, Milosh

Vice President Emeritus, Oregon State University

****Reese, Steven R.***

Director, Radiation Center

Reyes, Jr., José N.

Department Head, Nuclear Engineering and Radiation Health Physics, ATHRL Principal Investigator

Ringle, John C.
Professor Emeritus, Nuclear Engineering and Radiation Health Physics
Robinson, Alan H.
Department Head, Emeritus, Nuclear Engineering and Radiation Health Physics
****Schmitt, Roman A.***
Professor Emeritus, Chemistry
****Wachs, Gary***
Reactor Supervisor, Radiation Center
Wang, Chih H.
Director Emeritus, Radiation Center, Professor Emeritus, Nuclear Engineering and Radiation Health Physics
Walker, Karen
Research Assistant, College of Veterinary Medicine
Woods, Brian
Assistant Professor, Nuclear Engineering and Radiation Health Physics
Wu, Qiao
Associate Professor, Nuclear Engineer and Radiation Health Physics
Young, Roy A.
Professor Emeritus, Botany and Plant Pathology

Reactor Operations Committee

Todd Palmer, Chair	Nuclear Engineering and Radiation Health Physics
Rainier Farmer	Radiation Safety
David Hamby	Nuclear Engineering and Radiation Health Physics
Michael Hartman	Radiation Center/Nuclear Engineering and Radiation Health Physics
Mario Magana	Electrical Engineering
Scott Menn	Radiation Center
Wade Richards	NIST
Steve Reese	Radiation Center
Gary Wachs	Radiation Center
Bill Warnes	Mechanical Engineering

Graduate Students

Name	Degree	Program	Advisor
Barnett, Nathan A.	MS	Nuclear Engineering	T. S. Palmer
Belay, Deneke	MS	Radiation Health Physics	K. A. Higley
Bentley, Blair	MA	Radiation Health Physics	K. A. Higley
Benz, Jacob	MS	Nuclear Engineering	T. S. Palmer
Berg, Regina	MS	Radiation Health Physics	K. A. Higley
Bergman, Joshua	PhD	Radiation Health Physics	T. S. Palmer
Berkley, Jonathan M.	MS	Radiation Health Physics	K. A. Higley
Bland, Jason	MHP	Radiation Health Physics	K. A. Higley
Broughton, Phillip	MS	Radiation Health Physics	K. A. Higley
Brumley, Willis	MS	Radiation Health Physics	K. A. Higley
Bruso, Jason	MS	Nuclear Engineering	A. Paulenova
Bytwerk, David	MS	Radiation Health Physics	K. A. Higley
Castro, Miguel	MS	Radiation Health Physics	K. A. Higley
Collins, Brian Allen	MS	Nuclear Engineering	B. Woods
Courville, Alicia	PhD	Radiation Health Physics	D. M. Hamby
Craig, Bridget M	MS	Radiation Health Physics	K. A. Higley
Darrett, Jeannine	MS	Radiation Health Physics	K. A. Higley
Elliott, Anthony James	MS	Nuclear Engineering	T. S. Palmer
Frey, Wesley	PhD	Radiation Health Physics	D. M. Hamby
Galvin, Mark R	PhD	Nuclear Engineering	J. N. Reyes
Garcia, Richard M	MHP	Radiation Health Physics	K. A. Higley
Gerber, Ryan L	MS	Radiation Health Physics	K. A. Higley
Hall, Gary	MS	Radiation Health Physics	K. A. Higley
Hay, Tristan	MS	Radiation Health Physics	K. A. Higley
Hooda, Benny	MS	Radiation Health Physics	K. A. Higley
Hout, Jason	MS	Radiation Health Physics	K. A. Higley
Huang, Zhongliang	PhD	Radiation Health Physics	W. Loveland
Jackson, Brian	MS	Nuclear Engineering	J. N. Reyes
Jones, Sean Edgar	MS	Radiation Health Physics	B. Woods
Keller, Todd	MS	Nuclear Engineering	T. S. Palmer
Kim, Dong W.	PhD	Nuclear Engineering	Q. Wu
Konoff, Daniel	MS	Radiation Health Physics	K. A. Higley
Lally, Mary T	MS	Radiation Health Physics	K. A. Higley
Lambert, Erin	MS	Radiation Health Physics	K. A. Higley

Graduate Students

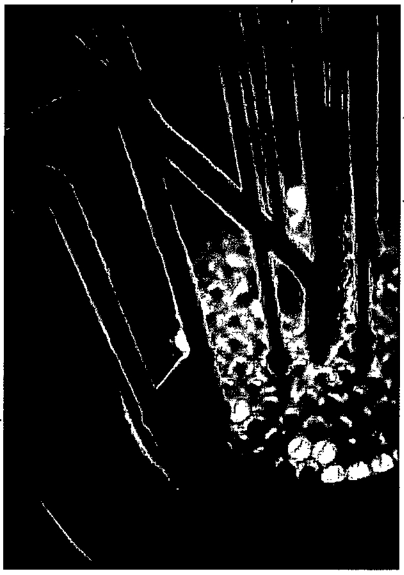
Name	Degree	Program	Advisor
Mangini, Colby D	MS	Radiation Health Physics	K. A. Higley
Marcum, Wade R	MS	Nuclear Engineering	B. Woods
Mathew, Mary (Betsey)	MS	Radiation Health Physics	D. M. Hamby
Misner, Alex	PhD	Nuclear Engineering	T. S. Palmer
Morda, Anthony	MS	Radiation Health Physics	K. A. Higley
Munger, Eric	MS	Radiation Health Physics	K. A. Higley
Myers, Margaret	MS	Radiation Health Physics	K. A. Higley
Naik, Radhika	PhD	Nuclear Chemistry	W. Loveland
Napier, Bruce	PhD	Radiation Health Physics	D. M. Hamby
Nassehzadeh-Tabriz, Mike	PhD	Radiation Health Physics	K. A. Higley/ A. Paulenova
Nelson, Roy K.	MS	Nuclear Engineering	J. N. Reyes
Nes, Razvan	PhD	Nuclear Engineering	T. S. Palmer
Newman, Errol	MS	Radiation Health Physics	D. M. Hamby
Palmer, Patricia L	MS	Radiation Health Physics	K. A. Higley
Patel, Aarti	MS	Radiation Health Physics	K. A. Higley
Ropon, Kimberly	PhD	Radiation Health Physics	D. M. Hamby
Rising, Michael Evan	MS	Nuclear Engineering	T. S. Palmer
Robinson, Adam	MS	Nuclear Engineering	B. Woods
Robinson, Bethany R	MS	Nuclear Engineering	T. S. Palmer
Robinson, Joshua A.	MS	Nuclear Engineering	M. Hartman
Rogers, John W	MHP	Radiation Health Physics	K. A. Higley
Rogers, Kevin	MS	Radiation Health Physics	K. A. Higley
Sarsah, Dominic K	MS	Radiation Health Physics	K. A. Higley
Schaeffer, Barry	MS	Radiation Health Physics	K. A. Higley
Schaub, Candi L	MS	Radiation Health Physics	K. A. Higley
Schilling, Raymond	MS	Radiation Health Physics	K. A. Higley
Shaw, Christopher Glenn	MS	Radiation Health Physics	K. A. Higley
Skinner, Jessie	MS	Nuclear Engineering	Q. Wu
Smith, Angela	MS	Radiation Health Physics	K. A. Higley
Soldatov, Alexei	PhD	Nuclear Engineering	Q. Wu
Sprunger, Peter	PhD	Physics	W. Loveland
Staples, Christopher	MS	Physics	K. Krane

Graduate Students

Name	Degree	Program	Advisor
Straiff, Walt	Non Degree		K. A. Higley
Tavakoli, Fasoni	PhD	Radiation Health Physics	D. M. Hamby
Van Horne-Sealy, Jama	MS	Radiation Health Physics	K. A. Higley
Wagner, Russ	MS	Radiation Health Physics	K. A. Higley
Walker, James R	MHP	Radiation Health Physics	K. A. Higley
Webb, Lindsey S	MS	Radiation Health Physics	K. A. Higley
Wilmot, Aaron	MHP	Radiation Health Physics	J. F. Higginbotham
Wang, Jiani	MS	Nuclear Engineering	Q. Wu
Woodson, Eva M	MS	Radiation Health Physics	D. M. Hamby
Yao, You	PhD	Nuclear Engineering	Q. Wu
Young, Eric	MS	Nuclear Engineering	J. N. Reyes

OSU
Oregon State
UNIVERSITY

Part III—Facilities



Research Reactor

The Oregon State University TRIGA Reactor (OSTR) is a water-cooled, swimming pool type research reactor which uses uranium/zirconium hydride fuel elements in a circular grid array. The reactor core is surrounded by a ring of graphite which serves to reflect neutrons back into the core. The core is situated near the bottom of a 22-foot deep water-filled tank, and the tank is surrounded by a concrete bioshield which acts as a radiation shield and structural support.
The reactor is licensed by the U.S. Nuclear Regulatory Commission to operate at a maximum steady state power of 1.1 MW and can also be pulsed up to a peak power of about 2500 MW.

The OSTR has a number of different irradiation facilities including a pneumatic transfer tube, a rotating rack, a thermal column, four beam ports, five sample holding (dummy) fuel elements for special in-core irradiations, an in-core irradiation tube, and a cadmium-lined in-core irradiation tube for experiments requiring a high energy neutron flux. The OSTR also has an Argon Production Facility for the production of 41Ar.

The **pneumatic transfer facility** enables samples to be inserted and removed from the core in four to five seconds. Consequently this facility is normally used for neutron activation analysis involving short-lived radionuclides. On the other hand, the **rotating rack** is used for much longer irradiation of samples (e.g., hours). The rack consists of a circular array of 40 tubular positions, each of which can hold two sample tubes. Rotation of the rack ensures that each sample will receive an identical irradiation.

The reactor's **thermal column** consists of a large stack of graphite blocks which slows down neutrons from the reactor core in order to increase thermal neutron activation of samples. Over 99% of the neutrons in the thermal column are thermal neutrons. Graphite blocks are removed from the thermal column to enable samples to be positioned inside for irradiation.

The **beam ports** are tubular penetrations in the reactor's main concrete shield which enable neutron and gamma radiation to stream from the core when a beam port's shield plugs are removed. One of the beam ports contains the **argon production facility** for production of curie levels of 41Ar. The neutron radiography facility utilized the tangential beam port (beam port #3) to produce ASTM E545 category I radiography capability. The other beam ports are available for a variety of experiments.

If samples to be irradiated require a large neutron fluence, especially from higher energy neutrons, they may be inserted into a dummy fuel element. This device will then be placed into one of the core's inner grid positions which would normally be occupied by a fuel element. Similarly samples can be placed in the **in-core irradiation tube** (ICIT) which can be inserted in the same core location.

The **cadmium-lined in-core irradiation tube** (CLICIT) enables samples to be irradiated in a high flux region near the center of the core. The cadmium lining in the facility eliminates thermal neutrons and thus permits sample exposure to higher energy neutrons only. The cadmium-lined end of this air-filled aluminum irradiation tube is inserted into an inner grid position of the reactor core which would normally be occupied by a fuel element. It is the same as the ICIT except for the presence of the cadmium lining.

The two main uses of the OSTR are instruction and research.

Instruction

Instructional use of the reactor is twofold. First, it is used significantly for classes in Nuclear Engineering, Radiation Health Physics, and Chemistry at both the graduate and undergraduate levels to demonstrate numerous principles which have been presented in the classroom. Basic neutron behavior is the same in small reactors as it is in large power reactors, and many demonstrations and instructional experiments can be performed using the OSTR which cannot be carried out with a commercial power reactor. Shorter-term demonstration experiments are also performed for many undergraduate students in Physics, Chemistry, and Biology classes, as well as for visitors from other universities and colleges, from high schools, and from public groups.

The second instructional application of the OSTR involves educating reactor operators, operations managers, and health physicists. The OSTR is in a unique position to provide such education since curricula must include hands-on experience at an operating reactor and in associated laboratories. The many types of educational programs that the Radiation Center provides are more fully described in Part VI of this report.

During this reporting period the OSTR accommodated a number of different OSU academic classes and other academic programs. In addition, portions of classes from other Oregon universities were also supported by the OSTR. Table III.D.1, provides detailed information on the use of the OSTR for instruction and training.

Research

The OSTR is a unique and valuable tool for a wide variety of research applications and serves as an excellent source of neutrons and/or gamma radiation. The most commonly used experimental technique requiring reactor use is instrumental neutron activation analysis (INAA). This is a particularly sensitive method of elemental analysis which is described in more detail in Part VI.

The OSTR's irradiation facilities provide a wide range of neutron flux levels and neutron flux qualities which are sufficient to meet the needs of most researchers. This is true not only for INAA, but also for other experimental purposes such as the 39Ar/40Ar ratio and fission track methods of age dating samples.

Analytical Equipment

The Radiation Center has a large variety of radiation detection instrumentation. This equipment is upgraded as necessary, especially the gamma ray spectrometers with their associated computers and germanium detectors. Additional equipment for classroom use and an extensive inventory of portable radiation detection instrumentation are also available.

Radiation Center nuclear instrumentation receives intensive use in both teaching and research applications. In addition, service projects also use these systems and the combined use often results in 24-hour per day schedules for many of the analytical instruments. Use of Radiation Center equipment extends beyond that located at the Center and instrumentation may be made available on a loan basis to OSU researchers in other departments.

Radioisotope Irradiation Sources

The Radiation Center is equipped with a 1,644 curie (as of 7/27/01) Gammacell 220 60Co irradiator which is capable of delivering high doses of gamma radiation over a range of dose rates to a variety of materials.

Typically, the irradiator is used by researchers wishing to perform mutation and other biological effects studies; studies in the area of radiation chemistry; dosimeter testing; sterilization of food materials, soils, sediments, biological specimen, and other media; gamma radiation damage studies; and other such applications. In addition to the 60Co irradiator, the Center is also equipped with a variety of smaller 60Co, 137Cs, 226Ra, plutonium-beryllium, and other isotopic sealed sources of various radioactivity levels which are available for use as irradiation sources.

During this reporting period there was a diverse group of projects using the 60Co irradiator. These projects included the irradiation of a variety of biological materials including different types of seeds.

In addition, the irradiator was used for sterilization of several media and the evaluation of the radiation effects on different materials. Table III.C.1 provides use data for the Gammacell 220 irradiator.

Laboratories and Classrooms

The Radiation Center is equipped with a number of different radioactive material laboratories designed to accommodate research projects and classes offered by various OSU academic departments or off-campus groups.

Instructional facilities available at the Center include a laboratory especially equipped for teaching radiochemistry and a nuclear instrumentation teaching laboratory equipped with modular sets of counting equipment which can be configured to accommodate a variety of experiments involving the measurement of many types of radiation. The Center also has two student computer rooms equipped with a large number of personal computers and UNIX workstations.

In addition to these dedicated instructional facilities, many other research laboratories and pieces of specialized equipment are regularly used for teaching. In particular, classes are routinely given access to gamma spectrometry equipment located in Center laboratories. A number of classes also regularly use the OSTR and the Reactor Bay as an integral part of their instructional coursework.

There are two classrooms in the Radiation Center which are capable of holding about 35 and 18 students, respectively. In addition, there are two smaller conference rooms and a library suitable for graduate classes and thesis examinations. As a service to the student body, the Radiation Center also provides an office area for the student chapters of the American Nuclear Society and the Health Physics Society.

This reporting period saw continued high utilization of the Radiation Center's thermal hydraulics laboratory. This laboratory is being used by Nuclear Engineering faculty members to accommodate a one-quarter scale model of the Palisades Nuclear Power reactor. The multi-million dollar advanced plant experimental (APEX) facility was fully utilized by the U. S. Nuclear Regulatory Commission to provide licensing data and to test safety systems in "beyond design basis" accidents. The fully scaled, integral model APEX facility uses electrical heating elements to simulate the fuel elements, operates at 450°F and 400 psia, and responds at twice real time. It is the only facility of its type in the world and is owned by the U. S. Department of Energy and operated by OSU. In addition, a new building, the Air-water Test Loop for Advanced Thermal-hydraulics Studies (ATLATS), was constructed next to the Reactor Building in 1998. Two-phase flow experiments are conducted in the ATLATS. Together APEX and ATLATS comprise the Advanced Thermal Hydraulics Research Laboratory (ATHRL).

All of the laboratories and classrooms are used extensively during the academic year. A listing of courses accommodated at the Radiation Center during this reporting period along with their enrollments is given in Table III.D.1.

Instrument Repair and Calibration Facility

The Radiation Center has a facility for the repair and calibration of essentially all types of radiation monitoring instrumentation. This includes instruments for the detection and measurement of alpha, beta, gamma, and neutron radiation. It encompasses both high range instruments for measuring intense radiation fields and low range instruments used to measure environmental levels of radioactivity.

The Center's instrument repair and calibration facility is used regularly throughout the year and is absolutely essential to the continued operation of the many different programs carried out at the Center. In addition, the absence of any comparable facility in the state has led to a greatly expanded instrument calibration program for the Center, including calibration of essentially all radiation detection instruments used by state and federal agencies in the state of Oregon. This includes instruments used on the OSU campus and all other institutions in the Oregon University System, plus instruments from the Oregon Health Division's Radiation Protection Services, the Oregon Department of Energy, the Oregon Public Utilities Commission, the Oregon Health Sciences University, the Army Corps of Engineers, and the U. S. Environmental Protection Agency.

In addition to its educational and research functions, the center provides outreach, offering tours to schools and groups

Library

The Radiation Center has a library containing a significant collections of texts, research reports, and videotapes relating to nuclear science, nuclear engineering, and radiation protection.

The Radiation Center is also a regular recipient of a great variety of publications from commercial publishers in the nuclear field, from many of the professional nuclear societies, from the U. S. Department of Energy, the U. S. Nuclear Regulatory Commission, and other federal agencies. Therefore, the Center library maintains a current collection of leading nuclear research and regulatory documentation. In addition, the Center has a collection of a number of nuclear power reactor Safety Analysis Reports and Environmental Reports specifically prepared by utilities for their facilities.

The Center maintains an up-to-date set of reports from such organizations as the International Commission on Radiological Protection, the National Council on Radiation Protection and Measurements, and the International Commission on Radiological Units. Sets of the current U.S. Code of Federal Regulations for the U.S. Nuclear Regulatory Commission, the U.S. Department of Transportation, and other appropriate federal agencies, plus regulations of various state regulatory agencies are also available at the Center.

The Radiation Center videotape library has over one hundred tapes on nuclear engineering, radiation protection, and radiological emergency response topics. In addition, the Radiation Center uses videotapes for most of the technical orientations which are required for personnel working with radiation and radioactive materials. These tapes reproduced, recorded, and edited by Radiation Center staff, using the Center's videotape equipment and the facilities of the OSU Communication Media Center.

The Radiation Center library is used mainly to provide reference material on an as-needed basis. It receives extensive use during the academic year. In addition, the orientation videotapes are used intensively during the beginning of each term and periodically thereafter.

Table III.C.1

Gammacell 220 ^{60}Co Irradiator Use

Purpose of Irradiation	Samples	Dose Range (rads)	Number of Irradiations	Use Time (hours)
Sterilization	wood, wheat germ, seeds, sea water, medical devices	1.5E+04 to 2.5E+06	33	1662
Biological Studies	prostrate cells	1.0E+01 to 5.0E+02	62	0.2
Botanical Studies	seeds, plant material, pollen,	2.5E+03 to 1.0E+05	48	20
Totals			143	1682.39

Table III.D.1

Student Enrollment in Courses Which are Taught or Partially Taught at the Radiation Center

Course #	CREDIT	COURSE TITLE	Number of Students Summer 2006	Fall 2006	Winter 2007	Spring 2007
NE/ RHP 114*	2	Introduction to Nuclear Engineering and Radiation Health Physics		23		
NE/ RHP 115	2	Introduction to Nuclear Engineering and Radiation Health Physics			39	
NE/ RHP 116*	2	Introduction to Nuclear Engineering and Radiation Health Physics				35
NE/ RHP 234	4	Nuclear and Radiation Physics I		25		
NE/ RHP 235	4	Nuclear and Radiation Physics II			23	
NE/ RHP 236*	4	Nuclear Radiation Detection & Instrumentation				23
NE 319	3	Societal Aspects of Nuclear technology			96	
NE 405H	1-16	R&C/Used Nuclear Fuel: Garbage or Gold			11	
RHP 401/501/601	1-16	Research	4	9	7	12
NE/RHP 405/505/605	1-16	Reading and Conference	1	7	3	3
NE/RHP 406/506/606	1-16	Projects	1	1	4	3
NE/RHP 407/507/607	1	Nuclear Engineering Seminar		55	45	44
NE/ RHP 410/510/610	1-12	Internship	3	2	6	13
NE/ RHP 415/515	2	Nuclear Rules and Regulations		47		
NE/ RHP 516*	4	Radiochemistry				7
NE 451/551**	4	Neutronic Analysis and Lab I		19		
NE 452/552**	4	Neutronic Analysis and Lab II			19	
NE 553*	3	Neutronic Analysis and Lab III				8
NE 467/567/667	4	Nuclear Reactor Thermal Hydraulics		25		
NE 474/574	4	Nuclear System Design I			25	
NE 475/575	4	Nuclear System Design II				22
NE/RHP 479	1-4	Individual Design Project				
NE/RHP 481	4	Radiation Protection		20		
NE/RHP 482/582*	4	Applied Radiation Safety			17	
RHP 483/583	4	Radiation Biology			38	
RHP 488/588*	3	Radioecology		29		
NE/RHP 490/590	4	Radiation Dosimetry				34
RHP 493	3	Non Reactor Radiation Protection				

Table III.D.1 (continued)

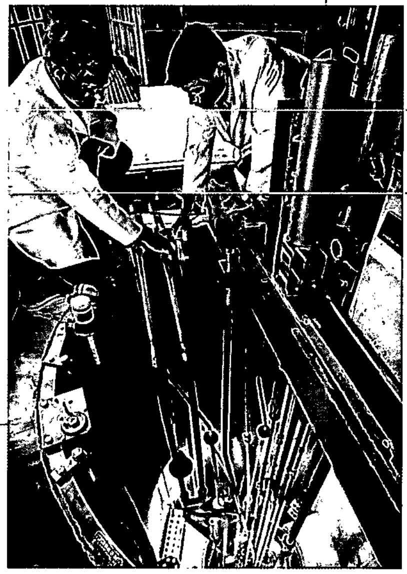
Student Enrollment in Courses Which are Taught or Partially Taught at the Radiation Center

Course #	CREDIT	COURSE TITLE	Number of Students Summer 2006	Fall 2006	Winter 2007	Spring 2007
NE/RHP 499	1-16	St/Environmental Aspects Nuclear Systems				
NE/RHP 503/603	1	Thesis	11	23	21	24
NE 526	3	Computational Methods for Nuclear Reactors				
NE/RHP 535	3	Nuclear Radiation Shielding		34		
NE/RHP 531	3	Nuclear Physics for Engineers and Scientists		27		
NE 550	3	Nuclear Medicine				
NE 559	1	ST/Nuclear Reactor Analysis: Criticality Safety				
NE 568	3	Nuclear Reactor Safety				
NE 569	1-3	ST/Thermal Hydraulic Instrumentation				
NE/RHP 586	3	Advanced Radiation Dosimetry				
RHP 589	1-3	ST/Radiation Protection and Risk Assessment				
RHP 593	3	Non-Reactor Radiation Protection				
NE 599	1	ST/Principals of Nuclear Medicine				
NE 654	3	Neutron Transport Theory				
Course From Other OSU Departments						
CH 123*		General Chemistry				165
CH 222*	5	General Chemistry (Science Majors)			232	
CH 225H*	5	Honors General Chemistry			34	
CH 462*	3	Experimental Chemistry II Laboratory			18	
ENGR 331	4	Momentum, Energy and Mass Transport			135	43
GEO 330*	3	Environmental Conservation		118		
PH 202	5	General Physics			174	
Courses from Other Institutions						
GS 105*	LBCC				15	

ST *Special Topics*
* *OSTR used occasionally for demonstration and/or experiments*
** *OSTR used heavily*

The reactor is a source of neutrons for local and international researchers. But it also has an educational role. Each year 70 to 75 classes are taught at the Radiation Center, and many of them use the reactor.

Part IV—Reactor



Operating Status

Reactor power generation for the operating period between July 1, 2006 and June 30, 2007 totaled 1328 MWH of thermal power. This is equal to 55 MWD of generation, and results in a cumulative thermal output by the OSTR FLIP core of 1211 MWD from August 1976 through June 30, 2007.

Table IV.A.1 provides information related to the OSTR annual energy production, fuel usage and use requests. Table IV.A.2 summarizes statistics for the original 20% enriched fuel loading.

The productivity of the reactor irradiation facilities is based on reactor operation in relation to use categories. Greater productivity is achieved by utilizing a greater number of irradiation facilities at the same time. Tables IV.A.3 through 5 provide this years detail on reactor use and other tracked data.

A normal nine-hour, five-day per week schedule sets the total available reactor operating hours. Critical reactor operation averaged 60% of each day. Of the 2259 total available annual operating hours, 1121 hours were at full power, 484 hours were spent conducting facility startup and shutdown operation, 362 hours were expended for maintenance and sample decay delays and 101 hours the reactor was not operating for reasons other than listed above.

Experiments Performed

During the current reporting period there were eight approved reactor experiments available for use in reactor-related programs. They are:

A-1 Normal TRIGA Operation (No Sample Irradiation).

B-3 Irradiation of Materials in the Standard OSTR Irradiation Facilities.

B-11 Irradiation of Materials Involving Specific Quantities of Uranium and Thorium in the Standard OSTR Irradiation Facilities.

B-12 Exploratory Experiments.

B-23 Studies Using TRIGA Thermal Column.

B-29 Reactivity Worth of Fuel.

B-31 TRIGA Flux Mapping.

B-33 Irradiation of Combustible Liquids in Rotating Rack.

Of these available experiments, two were used during the reporting period. Table IV.B.1 provides information related to the frequency of use and the general purpose of their use.

Inactive Experiments

Presently 33 experiments are in the inactive file. This consists of experiments which have been performed in the past and may be reactivated. Many of these experiments are now performed under the more general experiments listed in the previous section. The following list identifies these inactive experiments.

A-2	Measurement of Reactor Power Level via Mn Activation.
A-3	Measurement of Cd Ratios for Mn, In, and Au in Rotating Rack.
A-4	Neutron Flux Measurements in TRIGA.
A-5	Copper Wire Irradiation.
A-6	In-core Irradiation of LiF Crystals.
A-7	Investigation of TRIGA's Reactor Bath Water Temperature Coefficient and High Power Level Power Fluctuation.
B-1	Activation Analysis of Stone Meteorites, Other Meteorites, and Terrestrial Rocks.
B-2	Measurements of Cd Ratios of Mn, In, and Au in Thermal Column.
B-4	Flux Mapping.
B-5	In-core Irradiation of Foils for Neutron Spectral Measurements.
B-6	Measurements of Neutron Spectra in External Irradiation Facilities.
B-7	Measurements of Gamma Doses in External Irradiation Facilities.
B-8	Isotope Production.
B-9	Neutron Radiography.
B-10	Neutron Diffraction.
B-13	This experiment number was changed to A-7.
B-14	Detection of Chemically Bound Neutrons.
B-15	This experiment number was changed to C-1.
B-16	Production and Preparation of 18F.
B-17	Fission Fragment Gamma Ray Angular Correlations.
B-18	A Study of Delayed Status (n, () Produced Nuclei.
B-19	Instrument Timing via Light Triggering.
B-20	Sinusoidal Pile Oscillator.
B-21	Beam Port #3 Neutron Radiography Facility.
B-22	Water Flow Measurements Through TRIGA Core.
B-24	General Neutron Radiography.
B-25	Neutron Flux Monitors.
B-26	Fast Neutron Spectrum Generator.
B-27	Neutron Flux Determination Adjacent to the OSTR Core.
B-28	Gamma Scan of Sodium (TED) Capsule.
B-30	NAA of Jet, Diesel, and Furnace Fuels.
B-32	Argon Production Facility
C-1	PuO2 Transient Experiment.

This page left blank intentionally

Unplanned Shutdowns

There were seven unplanned reactor shutdowns during the current reporting period as detailed in Table IV.C.1.

Changes Pursuant to 10 CFR 50-59

There were no changes performed during the reporting period under the provisions of 10 CFR 50.59.

Surveillance and Maintenance

Non-Routine Maintenance

July 2006

- **Replaced original reactor tank underwater camera with an updated version.**

August 2006

- **Conducted first high activity Antimony transfer using the new lead transfer cask and its associated shielded storage facility.**

September 2006

- **Received and installed our used CNC milling machine and replacement lathe.**

February 2007

- **Completed removal of the Argon Production Facility's external components.**

April 2007

- **Removed swollen and stuck wooden plug from beam port #4.**
- **All old equipment using the original PanAlarm annuciator panel removed form the control room.**

May 2007

- **Inspected all fuel elements for possible swelling using the upper core plate holes as a standard. One element removed form core due to inspection and replace with racked spare.**

June 2007

- **Replaced demineralizer pump due to cracked pump casing.**

Table IV.A.1

OSTR Operating Statistics (Using the FLIP Fuel Core)

Operational Data for FLIP Core	August 1, 1976 through June 30,1977	July 1, 1977 through June 30, 1978	July 1, 1978 through June 30, 1979	July 1, 1979 through June 30, 1980	July 1, 1980 through June 30, 1981	July 1, 1981 through June 30, 1982	July 1, 1982 through June 30, 1983	July 1, 1983 through June 30, 1984
Operating Hours (critical)	875	819	458	875	1255	1192	1095	1205
Megawatt Hours	451	496	255	571	1005	999	931	943
Megawatt Days	19.0	20.6	10.6	23.8	41.9	41.6	38.8	39.3
Grams ^{235}U Used	24.0	25.9	13.4	29.8	52.5	52.4	48.6	49.3
Hours at Full Power	401	481	218	552	998	973	890	929
Number of Fuel Elements Added(+) or Removed(-)	85	0	+2	0	0	+1	0	0
Number of Irradiation Requests	44	375	329	372	348	408	396	469

Table IV.A.1 *(continued)*
OSTR Operating Statistics (Using the FLIP Fuel Core)

Operational Data for FLIP Core	July 1, 1984 through June 30,1985	July 1, 1985 through June 30, 1986	July 1, 1986 through June 30, 1987	July 1, 1987 through June 30, 1988	July 1, 1988 through June 30, 1989	July 1, 1989 through June 30, 1990	July 1,1990 through June 30, 1991	July 1, 1991 through June 30, 1992
Operating Hours (critical)	1205	1208	1172	1352	1170	1136	1094	1158
Megawatt Hours	946	1042	993	1001	1025	1013	928	1002
Megawatt Days	39.4	43.4	41.4	41.7	42.7	42.2	38.6	41.8
Grams ^{235}U Used	49.5	54.4	51.9	52.3	53.6	53.0	48.5	52.4
Hours at Full Power	904	1024	980	987	1021	1009	909	992
Number of Fuel Elements Added(+) or Removed(-)	0	0	0	-2	0	-1, +1	-1	0
Number of Irradiation Requests	407	403	387	373	290	301	286	297

Table IV.A.1 *(continued)*

OSTR Operating Statistics (Using the FLIP Fuel Core)

Operational Data for FLIP Core	July 1, 1992 through June 30, 1993	July 1, 1993 through June 30, 1994	July 1, 1994 through June 30, 1995	July 1, 1995 through June 30, 1996	July 1, 1996 through June 30, 1997	July 1, 1997 through June 30, 1998	July 1, 1998 through June 30, 1999	July 1, 1999 through June 30, 2000
Operating Hours (critical)	1180	1248	1262	1226	1124	1029	1241	949
Megawatt Hours	1026	1122	1117	1105	985	927	1115	852
Megawatt Days	42.7	46.7	46.6	46.0	41.0	38.6	46.5	35.5
Grams ^{235}U Used	53.6	58.6	58.4	57.8	51.5	48.5	58.3	44.6
Hours at Full Power	1000	1109	1110	1101	980	921	1109	843
Number of Fuel Elements Added(+) or Removed(-)	0	0	0	-1	-1, +1	0	-1	0
Number of Irradiation Requests	329	303	324	268	282	249	231	234

Table IV.A.1 *(continued)*
OSTR Operating Statistics (Using the FLIP Fuel Core)

Operational Data for FLIP Core	July 1, 2000 through June 30, 2001	July 1, 2001 through June 30, 2002	July 1, 2002 through June 30, 2003	July 1, 2003 through June 30, 2004	July 1, 2004 through June 30, 2005	July 1, 2005 through June 30, 2006	July 1, 2006 through June 30, 2007	July 1, 2007 through June 30, 2008
Operating Hours (critical)	983	1029	1100	977	1084	1348	1368	
Megawatt Hours	896	917	1025	966	973	1152	1328	
Megawatt Days	37.3	38.	42.7	40.2	40.1	48	55	
Grams ^{235}U Used	46.8	47.7	50.5	48.0	55.7	65.9	76	
Hours at Full Power	890	912912	1023	965	972	1156	1211	
Number of Fuel Elements Added(+) or Removed(-)	0	-1	0	-1	0	-1	0	
Number of Irradiation Requests	210	239	215	207	279	201	252	

Table IV.A.2

OSTR Operating Statistics with the Original (20%) Enriched Standard TRIGA Fuel Core

Operational Data for 20% Enriched Core	Mar 8, 67 through Jun 30, 68	Jul 1, 68 through Jun 30, 69	Jul 1, 69 through Mar 31, 70	Apr 1, 70 through Mar 31, 71	Apr 1, 71 through Mar 31, 72	Apr 1, 72 through Mar 31, 73	Apr 1, 73 through Mar 31, 74	Apr 1, 74 through Mar 31, 75	Apr 1, 75 through Mar 31, 76	Apr 1, 76 through Jul 26, 76	Total: March 67 through July 76
Operating Hours (Critical)	904	610	567	855	598	954	705	563	794	353	6903
Megawatt Hours	117.2	102.5	138.1	223.8	195.1	497.8	335.9	321.5	408.0	213.0	2,553.0
Megawatt Days	4.9	4.3	5.8	9.3	8.1	20.7	14.1	13.4	17.0	9.0	106.4
Grams ^{235}U Used	6.1	5.4	7.2	11.7	10.2	26.0	17.6	16.8	21.4	10.7	133.0
Hours at Full Power (250kW)	429	369	58	--	---	--	--	--	--	--	856
Hours at Full Power (1MW)	--	--	20	23	100	401	200	291	460	205	1,700
Number of Fuel Elements Added to the Core	70 (Initial)	2	13	1	1	1	2	2	2	0	94
Number of Irradiation Requests	429	433	391	528	347	550	452	396	357	217	4,100
Number of Pulses	202	236	299	102	98	249	109	183	43	39	1,560

Table IV.A.3
Present OSTR Operating Statistics

Operational Data For FLIP Core	Annual Values (2006/2007)	Cumulative Values for FLIP Core
MWH of energy produced	1,328	29,105
MWD of energy produced	55	1211.3
Grams 235U used	76	1526
Number of fuel elements added to (+) or removed(-) from the core	0	77+3 FFCR(1)
Number of pulses	20	1,446
Hours reactor critical	1,368	29,120
Hours at full power (1 MW)	1,211	28,569
Number of startup and shutdown checks	251	8,401
Number of irradiation requests processed	252	9,707
Number of samples irradiated	2,018	118,075

(1) *Fuel Follower Control Rod. These numbers represent the core loading at the end of this reporting period.*

Table IV.A.4

OSTR Use Time in Terms of Specific Use Categories

OSTR Use Category	Annual Values (hours)	Cumulative Values for FLIP Core (hours)
Teaching (departmental and others)(1)	56	13,355
OSU Research	605	11,124
Off Campus research	2,246	25,065
Forensic Services	0	234(2)
Reactor preclude time	845	25,332
Facility time(3)	0	7,191
Total Reactor Use Time	**3,752**	**82,301**

(1) See Tables III.A.1 and III.D.1 for teaching statistics (reactor tours are not logged as use).

(2) Prior to the 1981-1982 reporting period, forensic services were grouped under anther use category and cumulative hours have been compiled beginning with the 1981-1982 report.

(3) The time OSTR spent operating to meet NRC facility license requirements.

The Center is a facility that allows multiple applications of radiation and radioactive materials in teaching and research

Table IV.A.5

OSTR Multiple Use Time

Number of Users	Annual Values (hours)	Cumulative Values for FLIP Core (hours)
Two	352	6,594
Three	263	2,227
Four	195	847
Five	36	187.5
Six	1	60
Seven	0	12
Total Multiple Use Time	**847**	**9927.5**

Table IV.B.1

Use of OSTR Reactor Experiments

Experiment Number	Research	Teaching	Forensic	NRC License Requirement	Other	Total
A-1	10	9	0	1	0	20
B-3	163	46	0	3	20	232
Total	**173**	**55**	**0**	**4**	**20**	**252**

Table IV.C.1

Unplanned Reactor Shutdowns and Scrams

Type of Event	Number of Occurrences	Cause of Event Other Total
Safe Channel Scram	3	Failure to maintain power level during steady state operation and rising outside air temperature.
Manual Scram	1	Anomalous indication of "Beam Port #4 Shield Plug Removed," determined to be moisture related.
Manual Scram	1	Actuation of transient rod manual scram button vs. withdrawal button during rod calibrations.
Safety Channel Scram	1	Power transient caused by withdrawal of cadmium covered sample following short exposure.
"Silent Scram"	1	Failure of K16 relay removed all power from console rod controls and alarm inputs. Position indicators and annunciators failed "as is." All rods inserted upon loss of magnet power, manual verified.

Figure IV.E.1

Monthly Surveillance and Maintenance (Sample Form)

OSTROP 13 Rev. 11 SURVEILLANCE & MAINTENANCE FOR THE MONTH OF ______________________________

	SURVEILLANCE & MAINTENANCE [SHADE INDICATES LICENSE REQUIREMENT]	LIMITS	AS FOUND	TARGET DATE	DATE NOT TO BE EXCEEDED *	DATE COMPLETED	REMARKS and INITIALS
1	REACTOR TANK HIGH AND LOW WATER LEVEL ALARMS	MAXIMUM MOVEMENT "3 INCHES	UP ________ INCHES DN ________ INCHES ANN ________				
2	BULK WATER TEMPERATURE ALARM CHECK	FUNCTIONAL					
3	NOT CURRENTLY USED	©	©	©	©	©	©
4	PRIMARY WATER Ph MEASUREMENT	MIN: 5 MAX: 8.5					
5	BULK SHIELD TANK WATER Ph MEASURE-MENT	MIN: 5 MAX: 8.5					
6	CHANGE LAZY SUSAN FILTER	FILTER CHANGED					
7	REACTOR TOP CAM OIL LEVEL CHECK	OSTROP 13.10	NEED OIL? ______				
8	PROPANE TANK LIQUID LEVEL CHECK	> 50%					
9	PRIMARY PUMP BEARINGS OIL LEVEL CHECK	OSTROP 13.13	NEED OIL? ______				
10	WATER MONITOR CHECK						

*Date not be exceeded is only applicable to shaded items. It is equal to the time completed last month plus six weeks.

Figure IV.E.2

Quarterly Surveillance and Maintenance (Sample Form)

OSTROP 14 Rev. 9 **SURVEILLANCE & MAINTENANCE FOR THE 1st / 2nd / 3rd / 4th QUARTER OF 20__**

	SURVEILLANCE & MAINTENANCE [SHADE INDICATES LICENSE REQUIREMENT]	LIMITS	AS FOUND	TARGET DATE	DATE NOT TO BE EXCEEDED*	DATE COMPLETED	REMARKS & INITIALS
1	REACTOR OPERATION COMMITTEE (ROC) AUDIT	QUARTERLY					
2	QUARTERLY ROC MEETING	QUARTERLY					
3	NOT CURRENTLY USED	N/A					N/A
4	ERP INSPECTIONS	QUARTERLY					
5	KEY INVENTORY	QUARTERLY					
6	ROTATING RACK CHECK FOR UNKNOWN SAMPLES	EMPTY					
7	WATER MONITOR ALARM CHECK	FUNCTIONAL					
8	STACK MONITOR CHECKS (OIL DRIVE MOTORS, H.V. READINGS)	MOTORS OILED					
		PART: 1150 V "50	____V				
		GAS: 900 V "50	____V				
9	CHECK FILTER TAPE SPEED ON STACK MONITOR	1"/HR " 0.2					
10	INCORPORATE 50.59 & ROCAS INTO DOCUMENTATION	QUARTERLY					
11	STACK MONITOR ALARM CIRCUIT CHECKS	ALARM ON CONTACT					
12	ARM SYSTEM ALARM CHECKS	FUNCTIONAL					

CHAN	1	2	3S	3E	4	5	7	8	9	10	11	12	13	14
AUD														
LIGHT														

Figure IV.E.2 *(continued)*

Quarterly Surveillance and Maintenance (Sample Form)

OSTROP 14 Rev. 9 *(continued)*		SURVEILLANCE & MAINTENANCE FOR THE 1st / 2nd / 3rd / 4th QUARTER OF 20___					
	SURVEILLANCE & MAINTENANCE [SHADE INDICATES LICENSE REQUIREMENT]	LIMITS	AS FOUND	TARGET DATE	DATE NOT TO BE EXCEEDED*	DATE COMPLETED	REMARKS & INITIALS
13	OPERATOR LOG	a) $4 hours: at console (RO) or as Rx Sup (SRO) b) Complete Operating Exercise	a) TIME		b) OPERATING EXERCISE		

*Date not be exceeded only applies to shaded items. It is equal to the date completed last quarter plus four months.

Figure IV.E.3

Semi-Annual Surveillance and Maintenance (Sample Form)

OSTROP 15 Rev. 14 SEMI-ANNUAL SURVEILLANCE AND MAINTENANCE FOR 1st /2nd HALF 20____

	SURVEILLANCE & MAINTENANCE [SHADE INDICATES LICENSE REQUIREMENT]		LIMITS	AS FOUND	TARGET DATE	DATE NOT TO BE EX-CEEDED*	DATE COMPLETED	REMARKS & INITIALS
1	FUNCTIONAL CHECKS OF REACTOR INTERLOCKS	NEUTRON SOURCE COUNT RATE INTERLOCK	NO WITHDRAW					
			≥5 cps					
		TRANSIENT ROD AIR INTERLOCK	NO PULSE					
		PULSE PROHIBIT ABOVE 1 KW	≥1 kW					
		TWO ROD WITHDRAWAL PROHIBIT	1 only					
		PULSE MODE ROD MOVEMENT INTERLOCK	NO MOVEMENT					
		MAXIMUM PULSE REACTIVITY INSERTION LIMIT	≤ $2.50					
		PULSE INTERLOCK ON RANGE SWITCH	NO PULSE					
2	SAFETY CIRCUIT TEST	PERIOD SCRAM	≥3 sec					
3	CONTROL ROD WITHDRAWAL, INSERTION & SCRAM TIMES	TRANS / SAFE / SHIM / REG						
		SCRAM	≤2 sec					
		WITH-DRAWAL	≤50 sec					
		INSERTION	≤50 sec					
4	TEST PULSE	PULSE #______ $______ ______MW ______°C	≤20% CHANGE	PULSE #______ $______ ______MW ______°C				
5	REACTOR BAY VENTILATION SYSTEM SHUTDOWN TEST		DAMPERS CLOSE IN ≤5 SECONDS	1st FLOOR 4th FLOOR				
6	CALIBRATION OF THE FUEL ELEMENT TEMPERATURE CHANNEL		Per Checksheet					
7	NOT CURRENTLY USED		---	---	---	---	---	---

*Date not to be exceeded is only applicable to shaded items. It is equal to the date last time plus 7 1/2 months.

Figure IV.E.3 *(continued)*

Semi-Annual Surveillance and Maintenance (Sample Form)

OSTROP 15 REV.14 *(continued)* **SEMI-ANNUAL SURVEILLANCE AND MAINTENANCE FOR 1st /2nd HALF 20____**

SURVEILLANCE & MAINTENANCE [SHADE INDICATES LICENSE REQUIREMENT]			LIMITS	AS FOUND	TARGET DATE	DATE NOT TO BE EXCEEDED*	DATE COMPLETED	REMARKS & INITIALS
8	CLEANING & LUBRICATION OF TRANSIENT ROD CARRIER INTERNAL BARREL							
9	LUBRICATION OF BALL-NUT DRIVE ON TRANSIENT ROD CARRIER							
10	LUBRICATION OF THE ROTATING RACK BEARINGS		10W OIL					
11	CONSOLE CHECK LIST		OSTROP 15.XI					
12	INVERTER MAINTENANCE		See User Manual					
13	STANDARD CONTROL ROD MOTOR CHECKS		LO-17 Bodine Oil					
14	ION CHAMBER RESISTANCE MEASUREMENTS WITH MEGGAR INDUCED VOLTAGE	SAFETY CHANNEL	NONE (Info Only)					
		%POWER CHANNEL	NONE (Info Only)					
15	FISSION CHAMBER RESISTANCE CALCULATION $R=\frac{800V}{\Delta I}$	@ 100 V. I = AMPS @ 900 V. I = AMPS ΔI = AMPS R = ________ Ω	NONE (Info Only)					
16	FUNCTIONAL CHECK OF HOLDUP TANK WATER LEVEL ALARMS		OSTROP 15.XVIII	HIGH______ FULL______				
17	INSPECTION OF THE PNEUMATIC TRANSFER SYSTEM	BRUSH INSPECTION						
		SOLENOID VALVE INSPECTION	FUNCTIONAL					
		SAMPLE INSERTION TIME CHECK.	≤6 SECONDS					

Figure IV.E.4

Annual Surveillance and Maintenance (Sample Form)

OSTROP 16 REV.12 — **ANNUAL SURVEILLANCE AND MAINTENANCE FOR 20___**

	SURVEILLANCE AND MAINTENANCE [SHADE INDICATES LICENSE REQUIREMENT]		LIMITS	AS FOUND	TARGET DATE	DATE NOT TO BE EXCEEDED*	DATE COMPLETED	REMARKS & INITIALS
1	BIENNIAL INSPECTION OF CONTROL RODS:	FFCRS	OSTROP 12.0					
		TRANS						
2	ANNUAL REPORT		NOV 1		OCT 1	NOV 1		
3	CONTROL ROD CALIBRATION	NORMAL	OSTROP 9.0					
		CLICIT						
		ICIT/DUMMY						
4	REACTOR POWER CALIBRATION							
5	CALIBRATION OF REACTOR TANK WATER TEMP TEMPERATURE METERS		OSTROP 16.5					
6	CONTINUOUS AIR MONITOR CALIBRATION	Particulate Monitor	RCHPP 18					
		Gas Monitor						
7	STACK MONITOR CALIBRATION	Particulate Monitor	RCHPP 18 & 26					
		Gas Monitor						
8	AREA RADIATION MONITOR CALIBRATION		RCHPP 18.0					
9	DECOMMISSIONING COST UPDATE		N/A	N/A		AUG 1		

Figure IV.E.4 *(continued)*

Annual Surveillance and Maintenance (Sample Form)

OSTROP 16 REV.12 *(continued)* **ANNUAL SURVEILLANCE AND MAINTENANCE FOR 20____**

SURVEILLANCE AND MAINTENANCE [SHADE INDICATES LICENSE REQUIREMENT]			LIMITS	AS FOUND	TARGET DATE	DATE NOT TO BE EXCEEDED*	DATE COMPLETED	REMARKS & INITIALS
10	SNM PHYSICAL INVENTORY		N/A	N/A		OCT 1		
11	MATERIAL BALANCE REPORTS		N/A	N/A		NOV 1		
12	STANDARD CONTROL ROD DRIVE INSPECTION		OSTROP 16.13					
13	HEU TO LEU CONVERSION REPORT		10 CFR 50.64		MAR 10	MAR 27		
14	EMERGENCY RESPONSE PLAN	CFD TRAINING						
		GOOD SAM TRAINING						
		ERP REVIEW						
		ERP DRILL						
		FIRST AID FOR:						
		FIRST AID FOR:						
		EVACUATION DRILL						
		AUTO EVAC ANNOUNCEMENT TEST						
		ERP EQUIPMENT INVENTORY						
		BIENNIAL SUPPORT AGREEMENTS						
15	PHYSICAL SECURITY PLAN	OSP/DPS TRAINING						
		PSP REVIEW						
		PSP DRILL						
		LOCK/SAFE COMBO CHANGES						
		AUTHORIZATION LIST UPDATE						
		SPOOF MEASUREMENTS						

Figure IV.E.4 *(continued)*

Annual Surveillance and Maintenance (Sample Form)

OSTROP 16 REV. 12 *(continued)* **ANNUAL SURVEILLANCE AND MAINTENANCE FOR 20___**

	SURVEILLANCE AND MAINTENANCE [SHADE INDICATES LICENSE REQUIREMENT]	LIMITS	AS FOUND	TARGET DATE	DATE NOT TO BE EXCEEDED*	DATE COMPLETED	REMARKS & INITIALS
16	REACTOR TANK AND CORE COMPONENT INSPECTION	NO WHITE SPOTS					
17	EMERGENCY LIGHT LOAD TEST	RCHPP 18.0					
18	FUEL ELEMENT INSPECTION FOR SELECTED ELEMENTS (B1, B2, B3, B5, B6, C3, C5, D5, D6)	PASS GO/NO GO		Pulse #______ Date_________			
19	NOT CURRENTLY USED						

	REACTOR OPERATOR LICENSE CONDITIONS	ANNUAL REQUALIFICATION				BIENNIAL MEDICAL		EVERY 6 YEARS LICENSE		
		WRITTEN EXAM		OPERATING TEST				APPLICATION		EXPIRATION DATE
	OPERATOR NAME	DATE DUE	DATE PASSED	DATE DUE	DATE PASSED	Date Due	Date Completed	Date Due	Date Passed	
20										

21	NEUTRON RADIOGRAPHY FACILITY INTERLOCKS						

* Date not be exceeded is only applicable to shaded items. It is equal to the date completed last year plus 15 months. For biennial license requirements, it is equal to the date completed last time plus 2 1/2 years.

Part V—Radiation Protection

Introduction

The purpose of the radiation protection program is to ensure the safe use of radiation and radioactive material in the Center's teaching, research, and service activities, and in a similar manner to ensure the fulfillment of all regulatory requirements of the State of Oregon, the U.S. Nuclear Regulatory Commission, and other regulatory agencies. The comprehensive nature of the program is shown in Table V.A.1, which lists the program's major radiation protection requirements and the performance frequency for each item.

The radiation protection program is implemented by a staff consisting of a Senior Health Physicist, a Health Physicist, and several part-time Health Physics Monitors (see Part II.F). Assistance is also provided by the reactor operations group, the neutron activation analysis group, the Scientific Instrument Technician, and the Radiation Center Director.

The data contained in the following sections have been prepared to comply with the current requirements of Nuclear Regulatory Commission (NRC) Facility License No. R-106 (Docket No. 50-243) and the Technical Specifications contained in that license. The material has also been prepared in compliance with Oregon Department of Energy Rule No. 345-30-010, which requires an annual report of environmental effects due to research reactor operations.

Within the scope of Oregon State University's radiation protection program, it is standard operating policy to maintain all releases of radioactivity to the unrestricted environment and all exposures to radiation and radioactive materials at levels which are consistently "as low as reasonably achievable" (ALARA).

Environmental Releases

The annual reporting requirements in the OSTR Technical Specifications state that the licensee (OSU) shall include "a summary of the nature and amount of radioactive effluents released or discharged to the environs beyond the effective control of the licensee, as measured at, or prior to, the point of such release or discharge." The liquid and gaseous effluents released, and the solid waste generated and transferred are discussed briefly below. Data regarding these effluents are also summarized in detail in the designated tables.

Liquid Effluents Released

Liquid Effluents

Oregon State University has implemented a policy to reduce the volume of radioactive liquid effluents to an absolute minimum. For example, water used during the ion exchanger resin change is now recycled as reactor makeup water. Waste water from Radiation Center laboratories and the OSTR is collected at a holdup tank prior to release to the sanitary sewer. Whenever possible, liquid effluent is analyzed for radioactivity content at the time it is released to the collection point. However, liquids are always analyzed for radioactivity before the holdup tank is discharged into the unrestricted area (the sanitary sewer system). For this reporting period, the Radiation Center and reactor made two liquid effluent releases to the sanitary sewer. All Radiation Center and reactor facility liquid effluent data pertaining to this release are contained in Table V.B.1.A.

Liquid Waste Generated and Transferred
Liquid waste generated from glassware and laboratory experiments is transferred by the campus Radiation Safety Office to its waste processing facility. The annual summary of liquid waste generated and transferred is contained in Table V.B.1.b.

Airborne Effluents Released

Airborne effluents are discussed in terms of the gaseous component and the particulate component.

Gaseous Effluents
Gaseous effluents from the reactor facility are monitored by the reactor stack effluent monitor. Monitoring is continuous, i.e., prior to, during, and after reactor operations. It is normal for the reactor facility stack effluent monitor to begin operation as one of the first systems in the morning and to cease operation as one of the last systems at the end of the day. All gaseous effluent data for this reporting period are summarized in Table V.B.2.

Particulate effluents from the reactor facility are also monitored by the reactor facility stack effluent monitor.

Particulate Effluents
Evaluation of the detectable particulate radioactivity in the stack effluent confirmed its origin as naturally-occurring radon daughter products, within a range of approximately 3 x 10-11 μCi/ml to 1 x 10-9 μCi/ml. This particulate radioactivity is predominantly 214Pb and 214Bi, which is not associated with reactor operations.

There was no release of particulate effluents with a half life greater than eight days and therefore the reporting of the average concentration of radioactive particulates with half lives greater than eight days is not applicable.

Solid Waste Released

Data for the radioactive material in the solid waste generated and transferred during this reporting period are summarized in Table V.B.3 for both the reactor facility and the Radiation Center. Solid radioactive waste is routinely transferred to OSU Radiation Safety. Until this waste is disposed of by the Radiation Safety Office, it is held along with other campus radioactive waste on the University's State of Oregon radioactive materials license.

Solid radioactive waste is disposed of by OSU Radiation Safety by transfer to the University's radioactive waste disposal vendor, Thomas Gray Associates, Inc., for burial at its installation located near Richland, Washington.

Personnel Dose

The OSTR annual reporting requirements specify that the licensee shall present a summary of the radiation exposure received by facility personnel Doses and visitors. For the purposes of this report, the summary includes all Radiation Center personnel who may have received exposure to radiation. These personnel have been categorized into six groups: facility operating personnel, key facility research personnel, facilities services maintenance personnel, students in laboratory classes, police and security personnel, and visitors.

Facility operating personnel include the reactor operations and health physics staff. The dosimeters used to monitor these individuals include quarterly TLD badges, quarterly track-etch/albedo neutron dosimeters, monthly TLD (finger) extremity dosimeters, and pocket ion chambers.

Key facility research personnel consist of Radiation Center staff, faculty, and graduate students who perform research using the reactor, reactor-activated materials, or using other research facilities present at the Center. The individual dosimetry requirements for these personnel will vary with the type of research being conducted, but will generally include a quarterly TLD film badge and TLD (finger) extremity dosimeters. If the possibility of neutron exposure exists, researchers are also monitored with a track-etch/ albedo neutron dosimeter.

Facilities Services maintenance personnel are normally issued a gamma sensitive electronic dosimeter as their basic monitoring device. A few Facilities Services personnel who routinely perform maintenance on mechanical or refrigeration equipment are issued a quarterly Xß(γ) TLD badge and other dosimeters as appropriate for the work being performed.

Students attending laboratory classes are issued quarterly Xß(G) TLD badges, TLD (finger) extremity dosimeters, and track-etch/albedo or other neutron dosimeters, as appropriate.

Students or small groups of students who attend a one-time laboratory demonstration and do not handle radioactive materials are usually issued a gamma sensitive electronic dosimeter. These results are not included with the laboratory class students.

OSU police and security personnel are issued a quarterly Xß(γ) TLD badge to be used during their patrols of the Radiation Center and reactor facility.

Visitors, depending on the locations visited, may be issued a gamma sensitive electronic dosimeters. OSU Radiation Center policy does not normally allow people in the visitor category to become actively involved in the use or handling of radioactive materials.

An annual summary of the radiation doses received by each of the above six groups is shown in Table V.C.1. There were no personnel radiation exposures in excess of the limits in 10 CFR 20 or State of Oregon regulations during the reporting period.

Facility Survey Data

The OSTR Technical Specifications require an annual summary of the radiation levels and levels of contamination observed during routine surveys performed at the facility. The Center's comprehensive area radiation monitoring program encompasses the Radiation Center as well as the OSTR, and therefore monitoring results for both facilities are reported.

Area Radiation Dosimeters

Area monitoring dosimeters capable of integrating the radiation dose are located at strategic positions throughout the reactor facility and Radiation Center. All of these dosimeters contain at least a standard personnel-type beta-gamma film or TLD pack. In addition, for key locations in the reactor facility and for certain Radiation Center laboratories a CR-39 plastic track-etch neutron detector has also been included in the monitoring package.

The total dose equivalent recorded on the various reactor facility dosimeters is listed in Table V.D.1 and the total dose equivalent recorded on the Radiation Center area dosimeters is listed in Table V.D.2. Generally, the characters following the Monitor Radiation Center (MRC) designator show the room number or location.

Routine Radiation and Contamination Surveys

The Center's program for routine radiation and contamination surveys consists of daily, weekly, and monthly measurements throughout the TRIGA reactor facility and Radiation Center. The frequency of these surveys is based on the nature of the radiation work being carried out at a particular location or on other factors which indicate that surveillance over a specific area at a defined frequency is desirable.

The primary purpose of the routine radiation and contamination survey program is to assure regularly scheduled surveillance over selected work areas in the reactor facility and in the Radiation Center, in order to provide current and characteristic data on the status of radiological conditions. A second objective of the program is to assure frequent on-the-spot personal observations (along with recorded data), which will provide advance warning of needed corrections and thereby help to ensure the safe use and handling of radiation sources and radioactive materials. A third objective, which is really derived from successful execution of the first two objectives, is to gather and document information which will help to ensure that all phases of the operational and radiation protection programs are meeting the goal of keeping radiation doses to personnel and releases of radioactivity to the environment "as low as reasonably achievable" (ALARA).

The annual summary of radiation and contamination levels measured during routine facility surveys for the applicable reporting period is given in Table V.D.3.

Environmental Survey Data

The annual reporting requirements of the OSTR Technical Specifications include "an annual summary of environmental surveys performed outside the facility."

Gamma Radiation Monitoring

On-site Monitoring

Monitors used in the on-site gamma environmental radiation monitoring program at the Radiation Center consist of the reactor facility stack effluent monitor described in Section V.B.2 and nine environmental monitoring stations.

During this reporting period, each fence environmental station utilized an LiF TLD monitoring packet supplied and processed by Global Dosimetry Solutions, Inc. (GDS), Irvine, California. Each GDS packet contained three LiF TLDs and was exchanged quarterly for a total of 108 samples during the reporting period (9 stations x 3 TLDs per station x 4 quarters). The total number of GDS TLD samples for the reporting period was 108. A summary of the GDS TLD data is also shown in Table V.E.1.

From Table V.E.1 it is concluded that the doses recorded by the dosimeters on the TRIGA facility fence can be attributed to natural back-ground radiation, which is about 110 mrem per year for Oregon (Refs. 1, 2).

Off-site Monitoring

The off-site gamma environmental radiation monitoring program consists of twenty monitoring stations surrounding the Radiation Center (see Figure V.E.2) and six stations located within a 5 mile radius of the Radiation Center.

Each monitoring station is located about four feet above the ground (MRCTE 21 and MRCTE 22 are mounted on the roof of the EPA Laboratory and National Forage Seed Laboratory, respectively). These monitors are exchanged and processed quarterly, and the total number of TLD samples during the current one-year reporting period was 240 (20 stations x 3 chips per station per quarter x 4 quarters per year). The total number of GDS TLD samples for the reporting period was 204. A summary of GDS TLD data for the off-site monitoring stations is given in Table V.E.2.

After a review of the data in Table V.E.2, it is concluded that, like the dosimeters on the TRIGA facility fence, all of the doses recorded by the off-site dosimeters can be attributed to natural background radiation, which is about 110 mrem per year for Oregon (Refs. 1, 2).

Soil, Water, and Vegetation Surveys

The soil, water, and vegetation monitoring program consists of the collection and analysis of a limited number of samples in each category on a annual basis. The program monitors highly unlikely radioactive material releases from either the TRIGA reactor facility or the OSU Radiation Center, and also helps indicate the general trend of the radioactivity concentration in each of the various substances sampled. See Figure V.E.1 for the locations of the sampling stations for grass (G), soil (S), water (W) and rainwater (RW) samples. Most locations are within a 1000 foot radius of the reactor facility and the Radiation Center. In general, samples are collected over a local area having a radius of about ten feet at the positions indicated in Figure V.E.1.

There are a total of 22 sampling locations: four soil locations, four water locations (when water is available), and fourteen vegetation locations.

The annual concentration of total net beta radioactivity (minus tritium) for samples collected at each environmental soil, water, and vegetation sampling location (sampling station) is listed in Table V.E.3. Calculation of the total net beta disintegration rate incorporates subtraction of only the counting system back-ground from the gross beta counting rate, followed by application of an appropriate counting system efficiency.

The annual concentrations were calculated using sample results which exceeded the lower limit of detection (LLD), except that sample results which were less than or equal to the LLD were averaged in at the corresponding LLD concentration. Table V.E.4 gives the concentration and the range of values for each sample category for the current reporting period.

As used in this report, the LLD has been defined as the amount or concentration of radioactive material (in terms of μCi per unit volume or unit mass) in a representative sample, which has a 95% probability of being detected.

Identification of specific radionuclides is not routinely carried out as part of this monitoring program, but would be conducted if unusual radioactivity levels above natural background were detected. However, from Table V.E.3 it can be seen that the levels of radioactivity detected were consistent with naturally occurring radioactivity and comparable to values reported in previous years.

Radioactive Materials Shipments

A summary of the radioactive material shipments originating from the TRIGA reactor facility, NRC license R-106, is shown in Table V.F.1. A similar summary for shipments originating from the Radiation Center's State of Oregon radioactive materials license ORE 90005 is shown in Table V.F.2. A summary of radioactive material shipments exported under Nuclear Regulatory Commission general license 10 CFR 110.23 is shown in Table V.F.3.

References

1. U. S. Environmental Protection Agency, "Estimates of Ionizing Radiation Doses in the United States, 1960-2000," ORP/CSD 72-1, Office of Radiation Programs, Rockville, Maryland (1972).

2. U. S. Environmental Protection Agency, "Radiological Quality of the Environment in the United States, 1977," EPA 520/1-77-009, Office of Radiation Programs; Washington, D.C. 20460 (1977).

Table V.A.1

Radiation Protection Program Requirements and Frequencies

Frequency	Radiation Protection Requirement
Daily/Weekly/Monthly	**Perform Routing area radiation/contamination monitoring**
Monthly	Collect and analyze TRIGA primary, secondary, and make-up water. Exchange personnel dosimeters and inside area monitoring dosimeters, and review exposure reports. Inspect laboratories. Calculate previous month's gaseous effluent discharge.
As Required	Process and record solid waste and liquid effluent discharges. Prepare and record radioactive material shipments. Survey and record incoming radioactive materials receipts. Perform and record special radiation surveys. Perform thyroid and urinalysis bioassays. Conduct orientations and training. Issue radiation work permits and provide health physics coverage for maintenance operations.
Quarterly	Prepare, exchange and process environmental TLD packs. Conduct orientations for classes using radioactive materials. Collect and analyze samples from reactor stack effluent line. Exchange personnel dosimeters and inside area monitoring dosimeters, and review exposure reports.
Semi-Annual	Leak test and inventory sealed sources. Conduct floor survey of corridors and reactor bay.
Annual	Calibrate portable radiation monitoring instruments and personnel pocket ion chambers. Calibrate reactor stack effluent monitor, continuous air monitors, remote area radiation monitors, water monitor, and air samplers. Measure face air velocity in laboratory hoods and exchange dust-stop filters and HEPA filters as necessary. Inventory and inspect Radiation Center emergency equipment. Conduct facility radiation survey of the 60Co irradiators. Conduct personnel dosimeter training. Update decommissioning logbook. Collect and process environmental soil, water, and vegetation samples.

Table V.B.1.a

Monthly Summary of Liquid Effluent Release to the Sanitary Sewer[1, 2] (OSTR Contribution Shown in () and Bold Print)

Date of Discharge (Month and Year)	Total Quantity of Radioactivity Released (Curies)	Detectable Radio-Nuclides in the Waste	Specific Activity For Each Detectable Radionuclide in the Waste, Where The Release Concentration Was>1 x 10^{-7} ($\mu Ci\ ml^{-1}$)	Total Quantity of Each Detectable Radionuclide Released in the Waste (Curies)	Average Concentration Of Released Radioactive Material at the Point of Release ($\mu Ci\ ml^{-1}$)	**Percent of Applicable Monthly Average Concentration for Released Radioactive Material (%)[3]**	**Total Volume of Liquid Effluent Released Including Diluent [4] (gal)**
January 2007	0	N/A	0	0	0	**0**	**1628**
August 2006	0	N/A	0	0	0	**0**	**1574**
Annual Total for Radiation Center	0	N/A	0	0	0	**0**	**3202**
OSTR Contribution to Above	N/A	N/A	N/A	N/A	N/A	**N/A**	**N/A**

(1) OSU has implemented a policy to reduce the absolute minimum radioactive wastes disposed to the sanitary sewer. There were no liquid effluent released during months not listed.
(2) The OSU operational policy is to subtract only detector background from the water analysis data and not background radioactivity in the Corvallis city water.
(3) Based on values listed in 10 CFR 20, Appendix B to 20.1001 – 10.2401, Table 3, which are applicable to sewer disposal.
(4) The total volume of liquid effluent plus diluent does not take into consideration the additional mixing with the over 250,000 gallons per year of liquids. And sewage normally discharged by the Radiation Center complex into the same sanitary sewer system.

Table V.B.1.b

Annual Summary of Liquid Waste Generated and Transferred

Origin of Liquid Waste	Volume of Liquid Waste Packaged(1) (gallons)	Detectable Radionuclides in the Waste	Total Quantity of Radioactivity in the Waste (Curies)	Dates of Waste Pickup for Transfer to the Waste Processing Facility
TRIGA Reactor Facility	N/A	---	---	---
Radiation Center Laboratories	1.26	Th-232, U-238	7.34×10^{-6}	11/13/06
TOTAL	**1.26**		**7.34×10^{-6}**	

(1) TRIGA and Radiation Center liquid waste is picked up by the Radiation Safety Office for transfer to its waste processing facility for final packaging.

Table V.B.2

Monthly TRIGA Reactor Gaseous Waste Discharges and Analysis[1]

Month	Total Estimated Activity Released (Curies)	Total Estimated Quantity of Argon-41 Released(2) (Curies)	Estimated Atmospheric Diluted Concentration of Argon-41 at Point of Release (μCi/cc)	Fraction of the Technical Specification Annual Average Argon-41 Concentration Limit (%)
July	0.18	0.18	1.53×10^{-8}	0.38
August	0.08	0.08	7.06×10^{-9}	0.18
September	0.13	0.13	1.10×10^{-8}	0.28
October	0.10	0.10	8.53×10^{-9}	0.21
November	0.14	0.14	1.23×10^{-8}	0.31
December	0.12	0.12	9.76×10^{-9}	0.24
January	0.13	0.13	1.06×10^{-8}	0.27
February	0.16	0.16	1.45×10^{-8}	0.36
March	0.17	0.17	1.48×10^{-8}	0.37
April	0.28	0.28	2.41×10^{-8}	0.60
May	0.15	0.15	1.27×10^{-8}	0.32
June	0.13	0.13	1.14×10^{-8}	0.28
TOTAL ('06-'07)	**1.76**	**1.76**	**1.27×10^{-8}(3)**	**0.32(3)**

(1) Airborne effluents from, the OSTR contained no detectable particulate radioactivity resulting fro, reactor operations, and there were no releases of any radioisotopes in airborne effluents in concentrations greater than 20% of the applicable effluent concentration. (20% is a value taken from the OSTR Technical Specifications.

(2) Routine gamma spectroscopy analysis of the gaseous radioactivity in the OSTR stack discharge indicated the only detectable radionuclide was argon-41.

(3) Annual Average.

Table V.B.3

Annual Summary of Solid Waste Generated and Transferred

Origin of Solid Waste	Volume of Solid Waste Packaged(1) (Cubic Feet)	Detectable Radionuclides in the Waste	Total Quantity of Radioactivity in Solid Waste (Curies)	Dates of Waste Pickup for Transfer to the OSU Waste Processing Facility
TRIGA Reactor Facility	35.5	Sc-46, Cr-51, Mn-54, Fe-59, Co-58, Co-60, Zn-65, As-74, Hf-181, Sb-124, Se-75, Eu-152, Na-24, Ce-144, Ta-182, Ga-72, Cs-134, Eu-154	2.8x10-3	8/8/06, 11/13/06, 5/3/07
Radiation Center Laboratories	23.3	U-238, Th-232, Sr-90, Co-60, Eu-152, H-3, Rb-89, Eu-154, Ra-226, C-14	7.9x10-5	11/13/06 5/3/07
TOTAL	58.8	See Above	2.9x10-3	---

(1) TRIGA and Radiation Center laboratory waste is picked up by OSU Radiation Safety for transfer to its waste processing facility for final packaging.

Table V.C.1

Annual Summary of Personnel Radiation Doses Received

Personnel Group	Average Annual Dose(1)		Greatest Individual Dose(1)		Total Person-mrem For the Group(1)	
	Whole Body (mrem)	Extremities (mrem)	Whole Body (mrem)	Extremities (mrem)	Whole Body (mrem)	Extremities (mrem)
Facility Operating Personnel	93	198.57	170	409	651	1390
Key Facility Research Personnel	0	12.42	0	117	0	149
Facilities Services Maintenance Personnel	0	N/A	0	N/A	0	N/A
Laboratory Class Students	2.66	3.14	101	65	332	392
Campus Police and Security Personnel	<1	N/A	13	N/A	13	N/A
Visitors	<1	N/A	7	N/A	62.3	N/A

(1) "N/A" indicates that there was no extremity monitoring conducted or required for the group.

Table V.D.1

Total Dose Equivalent Recorded on Area Dosimeters Located Within the TRIGA Reactor Facility

Monitor I.D.	TRIGA Reactor Facility Location (See Figure V.D.1)	Total Recorded	Dose Equivalent(1)(2)
		xβ (γ) (mrem)	Neutron (mrem)
MRCTNE	D104: North Badge East Wall	190	ND
MRCTSE	D104: South Badge East Wall	172	ND
MRCTSW	D104: South Badge West Wall	484	ND
MRCTNW	D104: North Badge West Wall	140	ND
MRCTWN	D104: West Badge North Wall	259	ND
MRCTEN	D104: East Badge North Wall	271	ND
MRCTES	D104: East Badge South Wall	1272	ND
MRCTWS	D104: West Badge South Wall	442	ND
MRCTTOP	D104: Reactor Top Badge	511	ND
MRCTHXS	D104A: South Badge HX Room	617	ND
MRCTHXW	D104A: West Badge HX Room	206	ND
MRCD-302	D302: Reactor Control Room	315	ND
MRCD-302A	D302A: Reactor Supervisor's Office	99	N/A
MRCBP1	D104: Beam Port Number 1	172	ND
MRCBP2	D104: Beam Port Number 2	194	ND
MRCBP3	D104: Beam Port Number 3	1260	ND
MRCBP4	D104: Beam Port Number 4	752	ND

(1) The total recorded dose equivalent values do not include natural background contribution and, reflect the summation of the results of four quarterly beta-gamma dosimeters or four quarterly fast neutron dosimeters for each location. A total dose equivalent of "ND" indicates that each of the dosimeters during the reporting period was less than the vendor's gamma dose reporting threshold of 10 mrem or that each of the fast neutron dosimeters was less than the vendor's threshold of 10 mrem. "N/A" indicates that there was no neutron monitor at that location.

(2) These dose equivalent values do not represent radiation exposure through an exterior wall directly into an unrestricted area.

Table V.D.2

Total Dose Equivalent Recorded on Area Dosimeters Located Within the Radiation Center

Monitor I.D.	Radiation Center Facility Location (See Figure V.D.1)	Total Recorded Dose Equivalent(1)	
		x $\beta(\gamma)$ (mrem)	Neutron (mrem)
MRCA100	A100: Receptionist's Office	0	N/A
MRCBRF	A102H: Front Personnel Dosimetry Storage Rack	60	N/A
MRCA120	A120: Stock Room	64	N/A
MRCA120A	A120A: NAA Temporary Storage	28	N/A
MRCA126	A126: Radioisotope Research Lab	123	N/A
MRCCO-60	A128: 60Co Irradiator Room	397	N/A
MRCA130	A130: Shielded Exposure Room	49	N/A
MRCA132	A132: TLD Equipment Room	251	N/A
MRCA138	A138: Health Physics Laboratory	63	N/A
MRCA146	A146: Gamma Analyzer Room (Storage Cave)	211	N/A
MRCB100	B100: Gamma Analyzer Room (Storage Cave)	0	N/A
MRCB114	B114: Lab (226Ra Storage Facility)	1,643	ND
MRCB119-1	B119: Source Storage Room	308	N/A
MRCB119-2	B119: Source Storage Room	397	N/A
MRCB119A	B119A: Sealed Source Storage Room	5,601	3,205
MRCB120	B120: Instrument Calibration Facility	74	N/A
MRCB122-2	B122: Radioisotope Storage Hood	49	N/A
MRCB122-3	B122: Radioisotope Research Laboratory	46	N/A
MRCB124-1	B124: Radioisotope Research Lab (Hood)	49	N/A
MRCB124-2	B124: Radioisotope Research Laboratory	83	N/A
MRCB124-6	B124: Radioisotope Research Laboratory	51	N/A
MRCB128	B128: Instrument Repair Shop	49	N/A
MRCC100	C100: Radiation Center Director's Office	24	N/A

(1) The total recorded dose equivalent values do not include natural background contribution and, reflect the summation of the results of four quarterly beta-gamma dosimeters or four quarterly fast neutron dosimeters for each location. A total dose equivalent of "ND" indicates that each of the dosimeters during the reporting period was less than the vendor's gamma dose reporting threshold of 10 mrem or that each of the fast neutron dosimeters was less than the vendor's threshold of 10 mrem. "N/A" indicates that there was no neutron monitor at that location.

Table V.D.2 (continued)

Total Dose Equivalent Recorded on Area Dosimeters Located Within the Radiation Center

Monitor I.D.	Radiation Center Facility Location (See Figure V.D.1)	Total Recorded Dose Equivalent(1)	
		x $\beta(\gamma)$ (mrem)	Neutron (mrem)
MRCC106A	C106A: Staff Lunch Room	24	N/A
MRCC106B	C106: Custodian Supply Storage	72	N/A
MRCC106-H	C106H:East Loading Dock	52	N/A
MRCC118	C118: Radiochemistry Laboratory	23	N/A
MRCC120	C120: Student Counting Laboratory	31	N/A
MRCF100	F100: APEX Facility	12	N/A
MRCF102	F102: APEX Control Room	22	N/A
MRCB125N	B125: Gamma Analyzer Room (Storage Cave)	12	N/A
MRCN125S	B125: Gamma Analyzer Room	26	N/A
MRCC124	C124: Classroom	54	N/A
MRCC130	C130: Radioisotope Laboratory (Hood)	14	N/A
MRCD100	D100: Reactor Support Laboratory	55	N/A
MRCD102	D102: Pneumatic Transfer Terminal Lab`	368	N/A
MRCD102-H	D102H: 1st Floor Corridor at D102	104	N/A
MRCD106-H	D106H: 1st Floor Corridor at D106	212	N/A
MRCD200	D200: Reactor Administrator's Office	206	N/A
MRCD202	D202: Senior Health Physicist's Office	238	N/A
MRCBRR	D200H: Rear Personnel Dosimetry Storage Rack	62	N/A
MRCD204	D204: Health Physicist Office	216	N/A
MRCATHRL	F104: ATHRL	35	N/A
MRCD300	D300: 3rd Floor Conference Room	172	N/A

(1) The total recorded dose equivalent values do not include natural background contribution and, reflect the summation of the results of four quarterly beta-gamma dosimeters or four quarterly fast neutron dosimeters for each location. A total dose equivalent of "ND" indicates that each of the dosimeters during the reporting period was less than the vendor's gamma dose reporting threshold of 10 mrem or that each of the fast neutron dosimeters was less than the vendor's threshold of 10 mrem. "N/A" indicates that there was no neutron monitor at that location.

Table V.D.3

Annual Summary of Radiation and Contamination Levels Observed Within the Reactor Facility and Radiation Center During Routine Radiation Surveys

Accessible Location (See Figure V.D.1)	Whole Body Radiation Levels (mrem/hr)		Contamination Levels[1] (dpm/cm^2)	
	Average	Maximum	Average	Maximum
TRIGA Reactor Facility:				
Reactor Top (D104)	<1	85	<500	21,153
Reactor 2nd Deck Area (D104)	3.48	31	<500	4,423
Reactor Bay SW (D104)	<1	4	<500	2,115
Reactor Bay NW (D104)	<1	70	<500	9,423
Reactor Bay NE (D104)	<1	9	<500	15,192
Reactor Bay SE (D104)	<1	17	<500	3,653
Class Experiments (D104, D302)	<1	<1	<500	<500
Demineralizer Tank & Make Up Water System (D104A)	<1	6	<500	<500
Particulate Filter--Outside Shielding (D104A)	<1	2	<500	576
Radiation Center:				
NAA Counting Rooms (A146, B100)	<1	3	<500	<500
Health Physics Laboratory (A138)	<1	<1	<500	<500
Co60 Irradiator Room and Calibration Rooms (A128, B120, A130)	<1	50	<500	<500
Radiation Research Labs (A126, A136) (B108, B114, B122, B124, C126, C130, C132A)	<1	9	<500	<500
Radioactive Source Storage (B119, B119A, A120A, A132A)	<1	50	<500	<500
Student Chemistry Laboratory (C118)	<1	<1	<500	<500
Student Counting Laboratory (C120)	<1	<1	<500	<500
Operations Counting Room (B136, C125)	<1	<1	<500	<500
Pneumatic Transfer Laboratory (D102)	<1	8	<500	9,423
RX support Room (D100)	<1	<1	<500	<500

(1) <500 dpm/100 cm2 = Less than the lower limit of detection for the portable survey instrument used.

Table V.E.1

Total Dose Equivalent at the TRIGA Reactor Facility Fence

Fence Environmental Monitoring Station (See Figure V.E.1)	Total Recorded Dose Equivalent (Including Background) Based on GSD TLDs[1, 2] (mrem)
MRCFE-1	90 ± 2
MRCFE-2	85 ± 1
MRCFE-3	79 ± 2
MRCFE-4	83 ± 1
MRCFE-5	84 ± 2
MRCFE-6	85 ± 1
MRCFE-7	81 ± 1
MRCFE-8	82 ± 1
MRCFE-9	79 ± 1

(1) Average Corvallis area natural background using GDS TLDs totals 71 ± 8 mrem for the same period.

(2) ± values represent the standard deviation of the total value at the 95% confidence level.

Table V.E.2

Total Dose Equivalent at the Off-Site Gamma Radiation Monitoring Stations

Off-Site Radiation Monitoring Station (See Figure V.E.2)	Total Recorded Dose Equivalent (Including Background) Based on GDS TLDs[1,2] (mrem)
MRCTE-2[3]	60 ± 0
MRCTE-3	89 ± 4
MRCTE-4	80 ± 2
MRCTE-5	87 ± 1
MRCTE-6	77 ± 1
MRCTE-7	82 ± 2
MRCTE-8	93 ± 3
MRCTE-9	90 ± 1
MRCTE-10	75 ± 3
MRCTE-12	91 ± 2
MRCTE-13	90 ± 3
MRCTE-14	75 ± 2
MRCTE-15	75 ± 1
MRCTE-16	86 ± 1
MRCTE-17	82 ± 1
MRCTE-18	80 ± 2
MRCTE-19	82 ± 3
MRCTE-20	86 ± 3
MRCTE-21	72 ± 2
MRCTE-22	75 ± 2

(1) Average Corvallis area natural background using GDS TLDs totals 71 ± 8 mrem for the same period.
(2) ± values represent the standard deviation of the total value at the 95% confidence level.
(3) Only three quarters are reported.

Table V.E.3

Annual Average Concentration of the Total Net Beta Radioactivity (minus 3H) for Environmental Soil, Water, and Vegetation Samples

Sample Location (See Figure V.E.2)	Sample Type	Annual Average Concentration Of the Total Net Beta (Minus 3H) Radioactivity(1)	Reporting Units
1-W	Water	$4.85 \times 10^{-8} \pm 1.83 \times 10^{-8}$(2)	$\mu Ci\ ml^{-1}$
4-W	Water	$4.85 \times 10^{-8} \pm 1.83 \times 10^{-8}$(2)	$\mu Ci\ ml^{-1}$
11-W	Water	$4.85 \times 10^{-8} \pm 1.83 \times 10^{-8}$(2)	$\mu Ci\ ml^{-1}$
19-RW	Water	$4.85 \times 10^{-8} \pm 1.83 \times 10^{-8}$(2)	$\mu Ci\ ml^{-1}$
3-S	Soil	$6.13 \times 10^{-5} \pm 9.14 \times 10^{-6}$	$\mu Ci\ g^{-1}$ of dry soil
5-S	Soil	$1.56 \times 10^{-5} \pm 6.06 \times 10^{-6}$	$\mu Ci\ g^{-1}$ of dry soil
20-S	Soil	$2.12 \times 10^{-5} \pm 5.82 \times 10^{-6}$	$\mu Ci\ g^{-1}$ of dry soil
21-S	Soil	$2.40 \times 10^{-5} \pm 6.40 \times 10^{-6}$	$\mu Ci\ g^{-1}$ of dry soil
2-G	Grass	$3.34 \times 10^{-4} \pm 2.75 \times 10^{-5}$	$\mu Ci\ g^{-1}$ of dry ash
6-G	Grass	$2.31 \times 10^{-4} \pm 3.16 \times 10^{-5}$	$\mu Ci\ g^{-1}$ of dry ash
7-G	Grass	$3.78 \times 10^{-4} \pm 3.31 \times 10^{-5}$	$\mu Ci\ g^{-1}$ of dry ash
8-G	Grass	$2.95 \times 10^{-4} \pm 2.94 \times 10^{-5}$	$\mu Ci\ g^{-1}$ of dry ash
9-G	Grass	$2.91 \times 10^{-4} \pm 3.61 \times 10^{-5}$	$\mu Ci\ g^{-1}$ of dry ash
10-G	Grass	$2.22 \times 10^{-4} \pm 2.86 \times 10^{-5}$	$\mu Ci\ g^{-1}$ of dry ash
12-G	Grass	$1.30 \times 10^{-4} \pm 1.89 \times 10^{-5}$	$\mu Ci\ g^{-1}$ of dry ash
13-G	Grass	$1.71 \times 10^{-4} \pm 2.17 \times 10^{-5}$	$\mu Ci\ g^{-1}$ of dry ash
14-G	Grass	$1.99 \times 10^{-4} \pm 3.20 \times 10^{-5}$	$\mu Ci\ g^{-1}$ of dry ash
15-G	Grass	$3.55 \times 10^{-4} \pm 3.74 \times 10^{-5}$	$\mu Ci\ g^{-1}$ of dry ash
16-G	Grass	$2.91 \times 10^{-4} \pm 4.01 \times 10^{-5}$	$\mu Ci\ g^{-1}$ of dry ash
17-G	Grass	$3.87 \times 10^{-4} \pm 3.49 \times 10^{-5}$	$\mu Ci\ g^{-1}$ of dry ash
18-G	Grass	$1.49 \times 10^{-4} \pm 3.94 \times 10^{-5}$	$\mu Ci\ g^{-1}$ of dry ash
22-G	Grass	$3.53 \times 10^{-4} \pm 2.99 \times 10^{-5}$	$\mu Ci\ g^{-1}$ of dry ash

(1) ± values represent the standard deviation of the value at the 95% confidence level.
(2) Less than lower limit of detection value shown.

Table V.E.4

Beta-Gamma Concentration and Range of LLD Values for Soil, Water, and Vegetation Samples

Sample Type	Average Value	Range of Values	Reporting Units
Soil	$3.05x10^{-5}$	$1.56x10^{-5}$ to $6.13x10^{-5}$	μCi g^{1} of dry soil
Water	$4.85x10^{-8}$ (1)	$4.85x10^{-8}$ (1)	μCi ml^{-1}
Vegetation	$2.70x10^{-4}$	$1.30x10^{-4}$ to $3.87x10^{-4}$	μCi g^{-1} of dry ash

(1) Less than lower limit of detection value shown.

Table V.F.1

Annual Summary of Radioactive Material Shipments originating From the TRIGA Reactor Facility's NRC Licence R-106

Shipped To	Total Activity (TBq)	Number of Shipments				
		Exempt	Limited Quantity	Yellow II	Yellow III	Total
Berkeley Geochronology Center Berkeley, CA USA	4.44×10^{-7}	7	0	0	0	7
Brush Resources Inc. Delta, UT USA	3.44×10^{-2}	0	0	0	7	7
Brush Wellman Inc. Elmore, OH USA	2.28×10^{-2}	0	0	0	2	2
Cal State Fullerton Fullerton, CA USA	6.78×10^{-9}	1	0	0	0	1
Columbia University Palisades, NY USA	8.33×10^{-7}	4	0	0	0	4
Idaho State University Pocatello, ID USA	3.31×10^{-5}	1	0	7	0	8
Lawrence Berkeley National Laboratory Berkeley, CA USA	7.76×10^{-6}	0	0	1	0	1
New Mexico Geochronology Research Lab. Socorro, NM	8.27×10^{-6}	0	0	1	0	1
Oregon Health and Science University Portland, OR USA	4.33×10^{-6}	0	0	1	0	1
Oregon State University Corvallis, OR USA	1.02×10^{-5}	0	0	3	0	3
Plattsburgh State University Plattsburgh, NY USA	3.30×10^{-9}	1	0	0	0	1
Rutgers Piscataway, NJ USA	9.90×10^{-7}	8	0	0	0	8
Stanford University Stanford, CA USA	7.98×10^{-8}	4	0	0	0	4
Syracuse University Syracuse, NY USA	5.56×10^{-6}	1	0	1	0	2
Union College Schenectady, NY USA	7.17×10^{-8}	5	0	0	0	5
University of California at Berkeley Berkeley, CA USA	1.70×10^{-6}	0	0	2	0	2
University of Florida Gainesville, FL USA	2.44×10^{-7}	1	1	0	0	2
University of Nevada Las Vegas Las Vegas, NV USA	5.49×10^{-7}	1	1	1	0	3
University of Southern California Los Angeles, CA USA	1.61×10^{-8}	2	0	0	0	2
University of Wisconsin-Madison Madison, WI USA	6.63×10^{-6}	2	2	1	0	5
Totals	**5.73×10^{-2}**	**38**	**4**	**18**	**9**	**69**

Table V.F.2

Annual Survey of Radioactive Material Shipments Originating From the Radiation Center's State of Oregon License ORE 90005

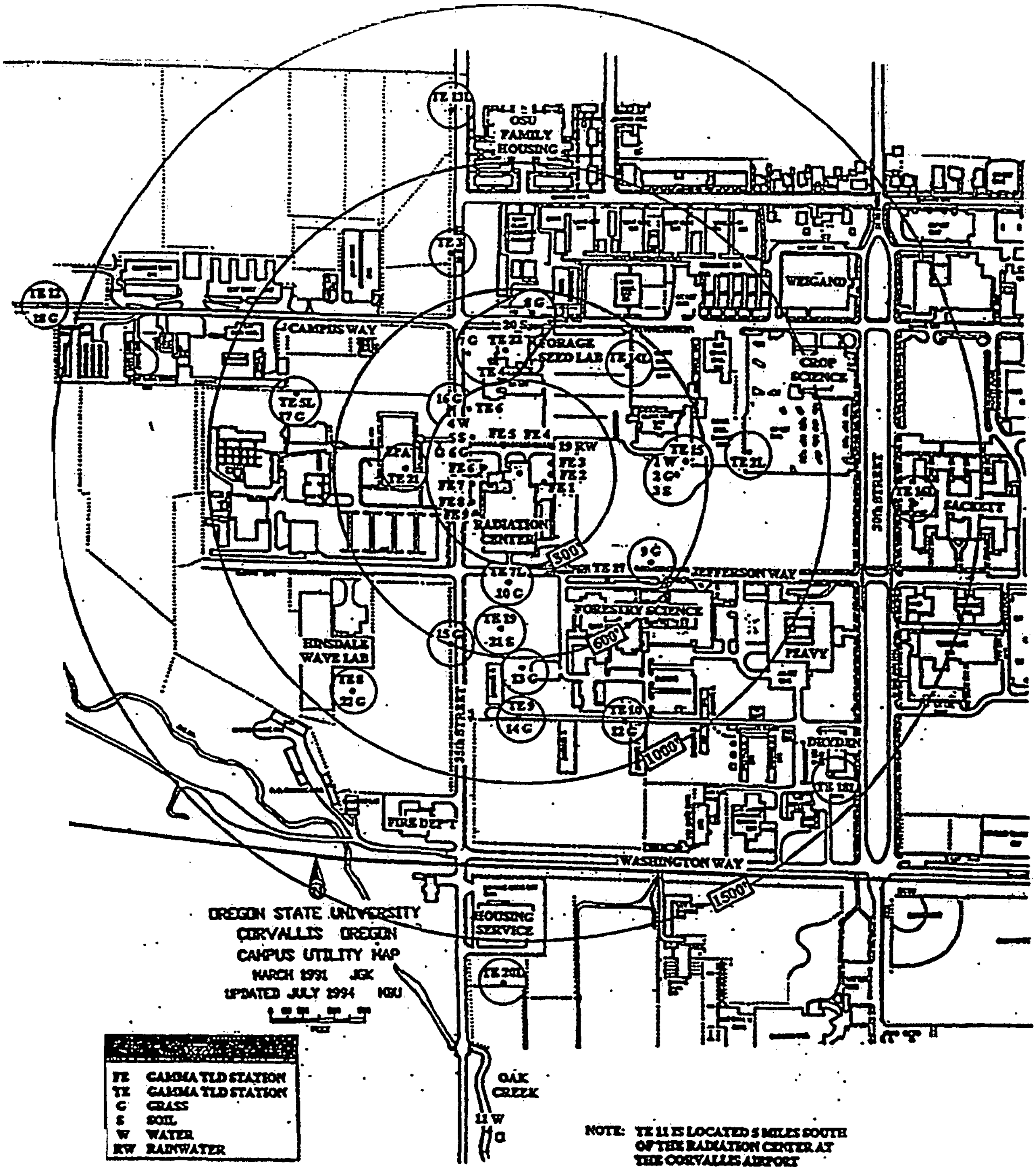
Shipped To	Total Activity (TBq)	Number of Shipments		
		Limited Quantity	Exempt	Total
Argonne National Laboratory Argonne, IL USA	2.37×10^{-9}	1	0	1
University of Notre Dame Notre Dame, IN USA	9.50×10^{-8}	1	0	1
Totals	**9.74×10^{-8}**	**2**	**0**	**2**

Table V.F.3

Annual Survey of Radioactive Material Shipments Exported Under NRC General License 10 CFR 110.23

Shipped To	Total Activity (TBq)	Number of Shipments			
		Exempt	Limited Quantity	Yellow II	Total
Geological Survey of Norway Trondheim, Norway	$3.74x10^{-9}$	1	0	0	1
Institute of Geology, Academy of Sciences Prague, Czech Republic	$3.54x10^{-9}$	2	0	0	2
QUAD-Lab, Roskilde University Roskilde, Denmark	$3.72x10^{-9}$	1	0	0	1
TRIUMF Vancouver, British Columbia Canada	$9.63x10^{-8}$	0	1	0	1
Universita' Degli Studi di Bologna Bologna, Italy	$1.97x10^{-8}$	4	0	0	4
Universitat Gottingen Gottingen, Germany	$8.33x10^{-10}$	1	0	0	1
Universitat Potsdam Postdam, Germany	$6.83x10^{-8}$	2	0	0	2
Universitat Tubingen Tubingen, Germany	$4.67x10^{-9}$	2	0	0	2
University of Geneva Geneva, Switzerland	$2.22x10^{-6}$	2	0	1	3
University of Lausanne Lausanne, Switzerland	$2.70x10^{-7}$	1	1	0	2
University of Manchester Manchester, United Kingdom	$7.81x10^{-9}$	1	0	0	1
University of Queensland Brisbane, Queensland Australia	$1.70x10^{-6}$	1	1	1	3
Vrije Universiteit Amsterdam, The Netherlands	$1.22x10^{-7}$	2	0	0	2
Totals	**$4.53x10^{-6}$**	**20**	**3**	**2**	**25**

Figure V.D.1
Monitoring Stations for the OSU TRIGA Reactor



Part VI—Work

Summary

The Radiation Center offers a wide variety of resources for teaching, research, and service related to radiation and radioactive materials. Some of these are discussed in detail in other parts of this report. The purpose of this part is to summarize the teaching, research, and service efforts carried out during the current reporting period.

Teaching

An important responsibility of the Radiation Center and the reactor is to support OSU's academic programs. Implementation of this support occurs through direct involvement of the Center's staff and facilities in the teaching programs of various departments and through participation in University research programs. Tables III.A.1 and III.D.1 plus Section VI.C.5 provide more detailed information on the use of the Radiation Center and reactor for instruction and training.

Research and Service

Almost all Radiation Center research and service work is tracked by means of a project database. When a request for facility use is received, a project number is assigned and the project is added to the database. The database includes such information as the project number, data about the person and institution requesting the work, information about students involved, a description of the project, Radiation Center resources needed, the Radiation Center project manager, status of individual runs, billing information, and the funding source.

Table VI.C.1 provides a summary of institutions which used the Radiation Center during this reporting period. This table also includes additional information about the number of academic personnel involved, the number of students involved, and the number of uses logged for each organization. Details on graduate student research which used the Radiation Center are given in Table VI.C.2.

The major table in this section is Table VI.C.3. This table provides a listing of the research and service projects carried out during this reporting period and lists information relating to the personnel and institution involved, the type of project, and the funding agency. Projects which used the reactor are indicated by an asterisk. In addition to identifying specific projects carried out during the current reporting period, Part VI also highlights major Radiation Center capabilities in research and service. These unique Center functions are described in Sections VI.C.1 through VI.C.8.

Neutron Activation Analysis

Neutron activation analysis (NAA) stands at the forefront of techniques for the quantitative multi-element analysis of major, minor, trace, and rare elements. The principle involved in NAA consists of first irradiating a sample with neutrons in a nuclear reactor such as the OSTR to produce specific radionuclides. After the irradiation, the characteristic gamma rays emitted by the decaying radionuclides are quantitatively measured by suitable semiconductor radiation detectors, and the gamma rays detected at a particular energy are usually indicative of a specific radionuclide's presence. Computerized data reduction of the gamma ray spectra then yields the concentrations of the various elements in samples being studied. With sequential instrumental NAA it is possible to measure quantitatively about 35 elements in small samples (5 to 100 mg), and for activable elements the lower limit of detection is on the order of parts per million or parts per billion, depending on the element.

The Radiation Center's NAA laboratory has analyzed the major, minor, and trace element content of tens of thousands of samples covering essentially the complete spectrum of material types and involving virtually every scientific and technical field.

While some researchers perform their own sample counting on their own or on Radiation Center equipment, the Radiation Center provides a complete NAA service for researchers and others who may require it. This includes sample preparation, sequential irradiation and counting, and data reduction and analysis.

Data on NAA research and service performed during this reporting period are included in Table VI.C.3.

Forensic Studies

Neutron activation analysis can also be advantageously used in criminal investigations. The principle underlying such application usually involves matching trace element profiles in objects or substances by NAA. This in turn can help identify materials or products (e.g., identify the manufacturer of a given object), and in some cases can match bullets and other materials recovered from a victim to similar materials obtained from suspects. Materials which have been analyzed by the Radiation Center for forensic purposes include bullets, metals, paint, fuses, coats, glass, meat, and salts.

Forensic studies performed in this reporting period are included in the listings in Tables VI.C.1 and VI.C.3.

Irradiations

As described throughout this report, a major capability of the Radiation Center involves the irradiation of a large variety of substances with gamma rays and neutrons. Detailed data on these irradiations and their use during this reporting period are included in Part III as well as in Section C of this part.

Radiological Emergency Response Services

The Radiation Center has an emergency response team capable of responding to all types of radiological accidents. This team directly supports the City of Corvallis and Benton County emergency response organizations and medical facilities. The team can also provide assistance at the scene of any radiological incident anywhere in the state of Oregon on behalf of the Oregon Radiation Protection Services and the Oregon Department of Energy.

The Radiation Center maintains dedicated stocks of radiological emergency response equipment and instrumentation. These items are located at the Radiation Center and at the Good Samaritan Hospital in Corvallis.

During the current reporting period, the Radiation Center emergency response team conducted several training sessions and exercises, but was not required to respond to any actual incidents.

Training and Instruction

In addition to the academic laboratory classes and courses discussed in Parts III.A.2, III.D, and VI.B, and in addition to the routine training needed to meet the requirements of the OSTR Emergency Response Plan, Physical Security Plan, and operator requalification program, the Radiation Center is also used for special training programs. Radiation Center staff are well experienced in conducting these special programs and regularly offer training in areas such as research reactor operations, research reactor management, research reactor radiation protection, radiological emergency response, reactor behavior (for nuclear power plant operators), neutron activation analysis, nuclear chemistry, and nuclear safety analysis.

Special training programs generally fall into one of several categories: visiting faculty and research scientists; International Atomic Energy Agency fellows; special short-term courses; or individual reactor operator or health physics training programs. During this reporting period there were a large number of such people as shown in Part II.B.

As has been the practice since 1985, Radiation Center personnel annually present a HAZMAT Response Team Radiological Course. This year the course was held at the Oregon State University Radiation Center.

Radiation Protection Services

The primary purpose of the radiation protection program at the Radiation Center is to support the instruction and research conducted at the Center. However, due to the high quality of the program and the level of expertise and equipment available, the Radiation Center is also able to provide health physics services in support of OSU Radiation Safety and to assist other state and federal agencies. The Radiation Center does not compete with private industry, but supplies health physics services which are not readily available elsewhere. In the case of support provided to state agencies, this definitely helps to optimize the utilization of state resources.

The Radiation Center is capable of providing health physics services in any of the areas which are discussed in Part V. These include personnel monitoring, radiation surveys, sealed source leak testing, packaging and shipment of radioactive materials, calibration and repair of radiation monitoring instruments (discussed in detail in Section VI.C.7), radioactive waste disposal, radioactive material hood flow surveys, and radiation safety analysis and audits.

The Radiation Center also provides services and technical support as a radiation laboratory to the State of Oregon Radiation Protection Services (RPS) in the event of a radiological emergency within the state of Oregon. In this role, the Radiation Center will provide gamma ray spectrometric analysis of water, soil, milk, food products, vegetation, and air samples collected by RPS radiological response field teams. As part of the ongoing preparation for this emergency support, the Radiation Center participates in inter-institution drills.

Radiological Instrument Repair and Calibration

While repair of nuclear instrumentation is a practical necessity, routine calibration of these instruments is a licensing and regulatory requirement which must be met. As a result, the Radiation Center operates a radiation instrument repair and calibration facility which can accommodate a wide variety of equipment.

The Center's scientific instrument repair facility performs maintenance and repair on all types of radiation detectors and other nuclear instrumentation. Since the Radiation Center's own programs regularly utilize a wide range of nuclear instruments, components for most common repairs are often on hand and repair time is therefore minimized.

In addition to the instrument repair capability, the Radiation Center has a facility for calibrating essentially all types of radiation monitoring instruments. This includes typical portable monitoring instrumentation for the detection and measurement of alpha, beta, gamma, and neutron radiation, as well as instruments designed for low-level environmental monitoring. Higher range instruments for use in radiation accident situations can also be calibrated in most cases. Instrument calibrations are performed using radiation sources certified by the National Institute of Standards and Technology (NIST) or traceable to NIST.

Table VI.C.4 is a summary of the instruments which were calibrated in support of the Radiation Center's instructional and research programs and the OSTR Emergency Plan, while Table VI.C.5 shows instruments calibrated for other OSU departments and non-OSU agencies.

Consultation

Radiation Center staff are available to provide consultation services in any of the areas discussed in this Annual Report, but in particular on the subjects of research reactor operations and use, radiation protection, neutron activation analysis, radiation shielding, radiological emergency response, and radiotracer methods.

Records are not normally kept of such consultations, as they often take the form of telephone conversations with researchers encountering problems or planning the design of experiments. Many faculty members housed in the Radiation Center have ongoing professional consulting functions with various organizations, in addition to sitting on numerous committees in advisory capacities.

Public Relations

The continued interest of the general public in the OSTR is evident by the number of people who have toured the facility. See Table VI.F.1 for statistics on scheduled visitors.

Table VI.C.1
Institutions, Agencies, and Groups Which Utilized the Radiation Center

Institution, Agency and Groups	Number of Projects	Number of Time of Faculty Involvement	Number of Students Involved	Number of Uses of Center Facilities
*Oregon State University[1] Corvallis, OR USA	25	41	13	224[2]
*Crescent Valley High School Corvallis, OR USA	1	0	0	1
*Linn Benton Community College Albany, OR USA	1	0	0	4
*Marist High School Eugene, OR USA	1	0	0	1
Oregon Department of Energy Salem, OR USA	1	1	0	4
Oregon State Fire Marshal Salem, OR USA	1	0	0	7
*Oregon State University - Educational Tours Corvallis, OR USA	5	18	0	43
USDOE Albany Research Center Albany, OR USA	1	0	0	3
*West Albany High School Albany, OR USA	1	0	0	1
Amrhein Associates, Inc Ashland, OR USA	1	0	0	1
City of Gresham Gresham, OR USA	1	0	0	6
ESCO Corporation Portland, OR USA	1	0	0	5
Federal Aviation Administration Portland, OR USA	1	0	0	6
Lebanon Community Hospital Lebanon, OR USA	1	0	0	1
*Lincoln High School Portland, OR USA	1	0	0	1
Marquess & Associates Inc. Medford, OR USA	1	0	0	1
Nunhems USA, Inc. Brooks, OR USA	1	1	0	23
Oregon Department of Environmental Quality Portland, OR USA	1	0	0	3

Table V1.C.1
Institutions, Agencies, and Groups Which Utilized the Radiation Center

Institution, Agency and Groups	Number of Projects	Number of Time of Faculty Involvement	Number of Students Involved	Number of Uses of Center Facilities
*Oregon Health Sciences University Portland, OR USA	2	1	0	12
Radiation Protection Services Portland, OR USA	1	0	0	37
*Reed College Portland, OR USA	1	1	0	1
Rogue Community College Grants Pass, OR USA	1	0	0	1
*Stayton High School Stayton, OR USA	1	0	0	1
Tangent Construction Tangent, OR USA	1	0	0	1
Terra Nova Nurseries, Inc Canby, OR USA.	1	0	0	23
*Thurston High School Springfield, OR USA	1	1	0	1
US National Parks Service Crater Lake, OR USA	1	0	0	4
Veterinary Diagnostic Imaging & Cytopathology Clackamas, OR USA	1	0	0	1
Weyerhaeuser Sweet Home, OR USA	1	0	0	1
*Idaho State University Pocatello, ID USA	2	2	0	6
*Berkeley Geochronology Center Berkeley, CA USA	1	0	5	13
*Occidental College Los Angeles, CA USA	1	1	0	1
*Stanford University Stanford, CA USA	2	2	0	4
*University of California at Berkeley Berkeley, CA USA	1	2	1	2
*University of Nevada Las Vegas Las Vegas, NV USA	1	1	0	5

Table VI.C.1
Institutions, Agencies, and Groups Which Utilized the Radiation Center

Institution, Agency and Groups	Number of Projects	Number of Time of Faculty Involvement	Number of Students Involved	Number of Uses of Center Facilities
*Valero Refining Company Benicia, CA USA	1	0	0	1
*Brush Wellman Utah USA	1	0	0	8
*University of New Mexico Albuquerque, NM USA	1	1	0	1
*EaglePicher Technologies Quapaw, OK USA	1	0	0	2
*University of Chicago Chicago, IL USA	1	2	0	1
*University of Wisconsin Madison, WI USA	1	2	5	7
*Flink Ink Ann Arbor, MI USA	1	0	0	1
*Tulane University New Orleans, LA USA	1	1	1	1
*University of Michigan Ann Arbor, MI USA	1	0	1	2
*Wayne State University Detroit, MI USA	1	0	0	4
*Brush-Wellman Ohio USA	1	0	0	2
*Columbia University Palisades, NY USA	1	2	3	4
*George Washington University Washington, DC USA	1	2	0	2
*North Carolina State University Raleigh, NC USA	1	1	1	1
*Plattsburgh State University Plattsburgh, NY USA	1	2	0	2
*Roswell Park Cancer Institute Buffalo, NY USA	1	1	0	10
*Syracuse University Syracuse, NY USA	1	2	2	2
*Union College Schenectady, NY USA	2	3	8	6

Table V1.C.1
Institutions, Agencies, and Groups Which Utilized the Radiation Center

Institution, Agency and Groups	Number of Projects	Number of Time of Faculty Involvement	Number of Students Involved	Number of Uses of Center Facilities
*Rutgers Piscataway, NY USA	2	3	5	9
Arch Chemicals Inc. Cheshire, CT USA	1	1	0	4
*Brown University Providence, RI USA	2	2	0	8
*University of Florida Gainesville, FL USA	1	1	4	2
*Quaternary Dating Laboratory Roskilde Demark	1	0	0	4
*Universite Montpellier II Montpellier France	1	1	0	2
*Universite Paris-Sud Paris FRANCE	1	1	0	1
*Geologisches Institut Zuirch SWITZERLAND	1	1	0	2
*Geologisch-Palaontologisches Institut BASEL SWITZERLAND	1	1	0	2
*Universita' di Bologna Bologna ITALY	1	1	0	3
*Universitat Potsdam Postdam GERMANY	1	0	0	2
*Universite de Lausanne Lausanne SWITZERLAND	1	0	0	1
*University of Geneva Geneva SWITZERLAND	1	1	4	3
*University of Goettingen Gottingen GERMANY	1	1	3	1
*University of Queensland Brisbane, Queensland AUSTRALIA	1	1	0	5
Totals	102	106	56	555

* Project which involves the OSTR.
(1) Use by Oregon State University does not include any teaching activities or classes accommodated by the Radiation Center.
(2) This number does not include on going projects being performed by residents of the Radiation Center such as the APEX project, others in the Department of Nuclear Engineering and Radiation Health Physics or Department of Chemistry or projects conducted by Dr. Walt Loveland, which involve daily use of Radiation Center facilities.

Table V1.C.2
Graduate Students' Research Which Utilized the Radiation Center

Student's Name	Degree	Academic Department	Advisor	Project	Thesis Topic
Berkeley Geochronology Center					
Brownlee, Sarah	PhD	Geology	Renne	920	Application of 39Ar/40Ar Geochronology Thermochronology and Paleomagnetism of the Ecstall and related plutons in British Columbia
Chang, Su-Chin	PhD	Geology	Renne	920	Application of 39Ar/40Ar Geochronology Permo- Triassic Boundry
Hagan, Jeanette	PhD		Renne	920	Neogene Tectonics of Sierra Nevada, California
Jarboe, Nick	PhD		Renne	920	Geochronology and Paleomagnetism of Columbia River Basalts
Letcher, Alice	MS		Renne	920	Deformation History of Puna Plateau, NW Argentina
Morgan, Leah	PhD	Geology	Renne	920	Application of 39Ar/40Ar Geochronology Geochronology of the Middle Stone Age in Ethiopia
Paine, Jeffery	MS	Geology	Renne	920	Experimental Studies of 39Ar Recoil and Isotope Fractionation Relevant to 40Ar/39Ar Geochronology
Verdel, Charlie	PhD		Renne	920	Core complexes of Saghand region, Iran
Columbia University					
Downing, Greg	PhD		Hemming	1705	Application of 39Ar/40Ar Geochronology
Walker, Chris	PhD		Anders	1705	Application of 39Ar/40Ar Geochronology
North Carolina State University					
Haynes, Elizabeth	PhD	Marine, Earth, and Atmospheric Sciences	Fodor	1684	Intrusion-related gold systems: petrological and fluid geochemical characteristics of gold-hosted granite plutons.
Oregon State University					
Ashbaker, Eric	MS	Nuclear Engineering and Radiation Health Physics	Reese	1702	Determination of neutron flux and spectrum in various OSTR irradiation facilities

Table V1.C.2

Graduate Students' Research Which Utilized the Radiation Center

Student's Name	Degree	Academic Department	Advisor	Project	Thesis Topic
Dorsett, Skye	MS	Physics	Krane	1564	
Funatake, Castle	PhD	Environmental and Molecular Toxicology	Kerkvliet	1725	The Effects of 2, 3, 7, 8-Tetrachlorodibenzo-p-dioxin on the Fate of Antigen-Specific T Cells
Marshall, Nikki	MS		Kerkvliet	1725	Ex-vivo Suppressive Mechanisms Used by CD4+ T Cells exposed to TCDD during Graft-vs-Host disease
Matteson, Brent	PhD	Chemistry	Paulenova	1751	Actinide Chemistry
Mitushashi, June	MS	Wood Science & Engineering	Morell	815	The effect of additives on copper losses from alkaline copper treated wood
Naik, Radhika	PhD	Chemistry	Loveland	1751	Nuclear Chemistry
Sinton, Christopher	PhD	Oceanography	Duncan	444	Age and Composition of Two Large Igneous Provinces: The North Atlantic Volcanic Rifted Margin and the Caribbean Plateau
Sprunger, Peter	PhD	Chemistry	Loveland	1751	Nuclear Chemistry
Yan, Michelle	MS	Nutrition and Exercise Science	Ho	1757	Prostate Cell Zinc Deficiency Study.
Rutgers					
Braun, Dave	PhD	Geological Sciences	Turrin	1707	Dating of Plio-Pleistiocene Homid Sites, Kanjera, Kenya
Mollel, Godwin	PhD	Geological Sciences	Turrin	1707	Statigraphy and Chronolgy of the Plio-Plaeistocene Ngorongoro Volcanic Highland
Price, Rachel	MS	Geological Sciences	Turrin	1708	Age of metamorphism in the New Jersey Highland
Quinn, Rhonda	PhD	Geological Sciences	Turin	1707	Dating of Plio-Pleistiocene Homid Sites, Koobi Fora, Kenya

Table VI.C.2

Graduate Students' Research Which Utilized the Radiation Center

Student's Name	Degree	Academic Department	Advisor	Project	Thesis Topic
Syracuse University					
Monteleone, Brian	PhD	Noble Gas Isotopic Research Laboratory	Baldwin	1555	Timing and Conditions of the Formation of the D'Entrecasteaux Islands, SE Papua New Guniea,
Taylor, Josh	MS		Fitzgerald	1555	Low Temperature Thermochronologic Studies in the Adirondack Highlands Thermochronology and Tectonics of intraplate deformation in SE Mongolia
Terrien, Jessica	PhD	Noble Gas Isotopic Research Laborator	Baldwin	1555	Integration of Thermochronology, Gravity and Aeromagnetic Data from the Catalina Metamorphic Core Complex, AZ: Insight in to the Role of Magmatism and the Timing of Deformation,
Wagner, Alec	MS	Noble Gas Isotopic Research Laborator	Baldwin	1555	
Universitat Potsdam					
Deeken, Anke	PhD		Strecker	1514	Age of initiation and growth pattern of the Puna Plateau, NW-Argentina, constrained by AFT thermochronology.
Mora, Andrés	PhD			1514	Late Cenozoic uplift and deformation of the eastern flank of the Columbian Eastern Cordillera.
Parra, Mauricio	PhD		Strecker	1514	Cenozoic tectonic evolution of the northeastern Andean foreland basin, Colombia
University of California at Berkeley					
Herbison, Sarah	PhD	Department of Chemistry	Nitsche	1468	Applications of NAA
University of Cincinnati					
Davidson, Michelle	PhD	Geology	Killinc	1738	Decompressional Melting as a Mechanism for Differentiation in Columbia River Basalts
Solpuker, Utku	PhD	Geology	Killinc	1738	Petrology and Geochemistry of the Kula Volcanic Province, Western Turkey

Table V1.C.2
Graduate Students' Research Which Utilized the Radiation Center

Student's Name	Degree	Academic Department	Advisor	Project	Thesis Topic
University of Florida					
Coyner, Samuel	PhD		Foster	1621	Pb-Pb Geochronology and Thermochronology of Titanite Using MC-ICP-MS
Gifford, Jennifer	MS		Foster	1621	Quantifying Eocene and Miocene Extension in the Sevier Hinterland, NE Nevada
Grice, Warren	MS	Geology	Foster	1621	Style and Timing of Mylonitization, Detachment, Ductile Attenuation and Metamorphism in the Anaconda Metamorphic core Complex, West-Central Montana
Newman, Virginia	MA	Geology	Foster	1621	Exhumation of the Ruby Mountains Metamorphic Core Complex
Restrepo, Sergio	PhD	Geology	Foster	1621	Long-Term vs. Short-Term Erosion Rates in Columbian Tropical Andean Ecosystems: Measuring the Dimension of the Human Impact
Stroud, Misty	PhD		Foster	1621	Significance of 2.4-2.0 Ga Orogeny in SW Laurentia
University of Geneva					
Baumgartner, Regine	PhD	Geological Sciences	Fontbote	1617	Pulsed High Sulfidation Hydrothermal Activity in the Cerro de Pasco-Colquijirca "super district," Peru
Luzieux, Leonard	PhD	Geological Sciences	Spikings	1617	The Origin and Accretionary History of Basement Forearc Unites in Western Ecuador
Vallejo, Cristian	PhD	Geological Sciences	Spikings	1617	The Syn- and Post-Accretionary History of the Western Cordillera of Ecuador
Villagomez, Diego	PhD	Geological Sciences	Spikings	1617	The Late-Cretaceous to Recent Accretionary History of Western Colombia
University of Goettingen					
Angelmaier, Petra	PhD	Institut fur Geologie und Palaotologie	Dunkl	1519	Exhumation path of different tectonic blocks along the central part of the Transalp-Traverse (Eastern Alps).

Table V1.C.2
Graduate Students' Research Which Utilized the Radiation Center

Student's Name	Degree	Academic Department	Advisor	Project	Thesis Topic
Hoffmann, Veit	PhD		von Ey-natten	1519	Inversion tectonics in the Central European Basin and on its southern border: An approach integrating structural geology, sedimentology, and thermochronology
Most, Thomas	PhD	Institut fur Geologie und Palaontologie	Dunkl	1519	Mesozoic and Tertiary Tectonometamorphic Evolution of Pelagonian Massif
Schwab, Martina	PhD	Institut fur Geologie und Palaontologie	Dunkl	1519	Thermochronology and Structural Evolution of Pamir Mts.
University of Michigan					
Stancin, Andrea	PhD	Geological Sciences	Gleason	1788	
University of Wisconsin					
Escobar-Wulf, Rudiger	PhD		Rose	1612	
Greene, Sarah	MS		Singer	1612	
Gross, Adam	PhD		Kay	1612	
Hora, John	PhD		Singer	1612	
Salisbury, Morgan	PhD		De Silva	1612	
University of Wyoming					
Beland, Peter	MS	Geology and Geophysics	Murphy	321	Applications of Fission Track Analysis
McMillan, Beth	PhD	Geology and Geophysics	Murphy	321	Applications of Fission Track Analysis

Table VI.C.2
Graduate Students' Research Which Utilized the Radiation Center

Student's Name	Degree	Academic Department	Advisor	Project	Thesis Topic
Vrije Universiteit					
Beintema, Kike	PhD	Department of Structural Geology	White/ Wijbrans	1074	The Kinematics and Evolution Major Structural Units of the Archean Pilbara Craton, Western Australia
Carrapa, Barbara	MA	Isotope Geochemistry	Wijbrans/ Bertotti	1074	The tectonic record of detrital minerals on sun-orogenics clastic sediments
Kuiper, Klaudia	PhD	Isotope Geochemistry	Hilgen/ Wijbrans	1074	Intercalibration of astronomical and radioisotopic timescales

Table VI.C.3
List of Major Research and Service Projects Preformed or in Progress at the Radiation Center and Their Funding Agencies

Project	Users	Organization Name	Project Title	Description	Funding
321	Murphy	University of Wyoming	Fission Track Dating	Thermal column irradiations of apatite and zircon samples for fission track production to determine rock age.	University of Wyoming
335	Kowallis	Brigham Young University	Fission Track Dating	Dating of natural rocks and minerals via fission track methodology.	National Science Foundation
444	Duncan	Oregon State University	Ar-40/Ar-39 Dating of Oceanographic Samples	Production of Ar-39 from K-39 to measure radiometric ages on basaltic rocks from ocean basins.	OSU Oceanography Department
481	Le	Oregon Health Sciences University	Instrument Calibration	Instrument calibration.	Oregon Health Sciences University
488	Farmer	Oregon State University	Instrument Calibration	Instrument calibration.	OSU - various departments
519	Martin	US Environmental Protection Agency	Instrument Calibration	Instrument calibration.	USEPA-Corvallis
547	Boese	US Environmental Protection Agency	Survey Instrument Calibration	Instrument calibration.	USEPA, Cincinnati, OH
664	Reese	Oregon State University	Good Samaritan Hospital Instrument Calibration	Instrument calibration.	OSU Radiation Center
815	Morrell	Oregon State University	Sterilization of Wood Samples	Sterilization of wood samples to 2.5 Mrads in Co-60 irradiator for fungal evaluations.	OSU Forest Products
920	Becker	Berkeley Geochronology Center	Ar-39/Ar-40 Age Dating	Production of Ar-39 from K-39 to determine ages in various anthropologic and geologic materials.	Berkeley Geochronology Center
930	McWilliams	Stanford University	Ar-40/Ar-39 Dating of Geological Samples	Irradiation of mineral grain samples for specified times to allow Ar-40/Ar-39 dating.	Stanford University Geological & Environmental Sci
932	Dumitru	Stanford University	Fission Track Dating	Thermal column irradiation of geological samples for fission track age-dating.	Stanford University Geology Department
1018	Gashwiler	Occupational Health Lab	Calibration of Nuclear Instruments	Instrument calibration.	Occupational Health Laboratory
1072	Markos	Army Corps of Engineers	Instrument Calibration	Instrument calibration.	U.S. Army Engineer District, Portland.
1074	Wijbrans	Vrije Universiteit	40Ar-39 Ar Dating of Rocks and Minerals	40Ar-39Ar dating of rocks and minerals.	Vrije Universiteit, Amsterdam

Table VI.C.3
List of Major Research and Service Projects Preformed or in Progress at the Radiation Center and Their Funding Agencies

Project	Users	Organization Name	Project Title	Description	Funding
1075	Teaching and Tours	University of California at Berkeley	Activation Analysis Experiment for NE Class	Activation Analysis Experiment for NE Class. Irradiation of small, stainless steel discs for use in a nuclear engineering radiation measurements laboratory.	University of California at Berkeley
1177	Garver	Union College	Fission Track Analysis of Rock Ages	Use of thermal column irradiations to perform fission track analysis to determine rock ages.	Union College, NY
1188	Salinas	Rogue Community College	Photoplankton Growth in Southern Oregon Lakes	C-14 liquid scintillation counting of radiotracers produced in a photoplankton study of southern Oregon lakes: Miller Lake, Lake of the Woods, Diamond Lake, and Waldo Lake.	Rogue Community College
1191	Vasconcelos	University of Queensland	Ar-39/Ar-40 Age Dating	Production of Ar-39 from K-39 to determine ages in various anthropologic and geologic materials.	Earth Sciences, University of Queensland
1267	Hemming	Columbia University	Geochronology by Ar/Ar Methods	Snake River plain sanidine phenocrysts to evaluate volcanic stratigraphy; sandine and biotite phenocrysts from a late Miocene ash, Mallorca to more accurately constrain stratigraphic horizon; hornblends and feldspar from the Amazon to assess climatic cha	Columbia University
1354	Wright	Radiation Protection Services	Radiological Instrument Calibration	Instrument calibration.	State of Oregon Radiation Protection Services
1366	Quidelleur	Universite Paris-Sud	Ar-Ar Geochronology	Determination of geological samples via Ar-Ar radiometric dating.	Universite Paris-Sud
1397	Teach	Providence St. Vincent Hospital	Sterilization of various biological materials	Sterilization of various biological materials for St. Vincents Hospital, Portland	Oregon Medical Laser Institute
1404	Riera-Lizarau	Oregon State University	Evaluation of wheat DNA	Gamma irradiation of wheat seeds	OSU Crop and Soil Science
1415	McGinness	ESCO Corporation	Calibration of Instruments	Instrument calibration	ESCO Corporation
1423	Turrin	Rutgers	40Ar/39Ar Analysis	Petrology and geochemical evolution of the Damavand trachyandesite volcano in Northern Iran.	Department of Geological Sciences
1431	Patterson	AVI Bio Pharma	Instrument Calibrations	Instrument calibration	AVI Bio Pharma

Table VI.C.3
List of Major Research and Service Projects Preformed or in Progress at the Radiation Center and Their Funding Agencies

Project	Users	Organization Name	Project Title	Description	Funding
1464	Slavens	USDOE Albany Research Center	Instrument Calibration	Instrument calibration.	USDOE Albany Research Center
1465	Singer	University of Wisconsin	Ar-40/Ar-39 Dating of Young Geologic Materials	Irradiation of geological materials such as volcanic rocks from sea floor, etc. for Ar-40/Ar-39 dating.	University of Wisconsin
1467	Kirner	Kirner Consulting, Inc	Instrument Calibration	Instrument calibration.	Kirner Consulting
1468	Nitsche	University of California at Berkeley	Chemistry 146 Experiment	NAA Laboratory experiment.	University of California at Berkeley
1470	Bolken	SIGA Technologies, Inc.	Instrument Calibration	Instrument calibration.	Siga Pharmaceuticals
1489	Roden-Tice	Plattsburgh State University	Thermochronologic evidence linking Adirondack and New England regions Connecticut Valley Regions	The integration of apatite fission-track ages and track length based model thermal histories, zircon fission-track ages, and U-Th/He analyses to better define the pattern of regional post-Early Cretaceous differential unroofing in northeastern New York's	Plattsburgh State University
1492	Stiger	Federal Aviation Administration	Instrument Calibration	Instrument calibration	Federal Aviation Administration
1502	Teaching and Tours	Portland Community College	Portland Community College Tours/Experiments	OSTR tour and half-life experiment.	USDOE Reactor Sharing
1503	Teaching and Tours	Non-Educational Tours	Non-Educational Tours	Tours for guests, university functions, student recruitment.	OSU Radiation Center
1504	Teaching and Tours	Oregon State University - Educational Tours	OSU Nuclear Engineering & Radiation Health Physics Department	OSTR tour and reactor lab.	USDOE Reactor Sharing
1505	Teaching and Tours	Oregon State University - Educational Tours	OSU Chemistry Department	OSTR tour, teaching labs, and/or half-life experiment.	USDOE Reactor Sharing
1506	Teaching and Tours	Oregon State University - Educational Tours	OSU Geosciences Department	OSTR tour.	USDOE Reactor Sharing
1507	Teaching and Tours	Oregon State University - Educational Tours	OSU Physics Department	OSTR tour.	USDOE Reactor Sharing

Table VI.C.3
List of Major Research and Service Projects Preformed or in Progress at the Radiation Center and Their Funding Agencies

Project	Users	Organization Name	Project Title	Description	Funding
1508	Teaching and Tours	Oregon State University - Educational Tours	Adventures in Learning Class	Half Life Demonstration; Eric Miller, Forensic Science Instructor.	USDOE Reactor Sharing
1509	Teaching and Tours	Oregon State University - Educational Tours	HAZMAT course tours	First responder training tours.	Oregon Office of Energy
1510	Teaching and Tours	Oregon State University - Educational Tours	Science and Mathematics Investigative Learning Experience	OSTR tour and half-life experiment.	USDOE Reactor Sharing
1511	Teaching and Tours	Oregon State University - Educational Tours	Reactor Staff Use	Reactor operation required for conduct of operations testing, operator training, calibration runs, encapsulation tests and other.	OSU Radiation Center
1512	Teaching and Tours	Linn Benton Community College	Linn Benton Community College Tours/Experiments	OSTR tour and half-life experiment.	USDOE Reactor Sharing
1514	Sobel	Universitat Potsdam	Apatite Fission Track Analysis	Age determination of apatites by fission track analysis.	Universitat Potsdam
1519	Dunkl	University of Goettingen	Fission Track Analysis of Apatites	Fission track dating method on apatites: use of fission tracks from decay of U-238 and U-235 to determine the cooling age of apatites.	University of Tuebingen
1520	Teaching and Tours	Western Oregon University	Western Oregon University	OSTR tour and half-life experiment.	USDOE Reactor Sharing
1522	Wachs	Oregon State University	General Reactor Operation	Reactor operation when no other project is involved.	OSU Radiation Center
1525	Teaching and Tours	Life Gate High School	Life Gate High School	OSTR tour and half-life experiment.	USDOE Reactor Sharing
1526	Crawford	Hot Cell Services	Instrument calibration	Instrument calibration.	Hot Cell Services
1527	Teaching and Tours	Oregon State University - Educational Tours	Odyssey Orientation Class	OSTR tour.	USDOE Reactor Sharing
1528	Teaching and Tours	Oregon State University - Educational Tours	Upward Bound	OSTR tour.	USDOE Reactor Sharing

Table VI.C.3
List of Major Research and Service Projects Preformed or in Progress at the Radiation Center and Their Funding Agencies

Project	Users	Organization Name	Project Title	Description	Funding
1529	Teaching and Tours	Oregon State University - Educational Tours	OSU Connect	OSTR tour.	USDOE Reactor Sharing
1530	Teaching and Tours	Newport School District	Newport School District	OSTR tour.	USDOE Reactor Sharing
1531	Teaching and Tours	Central Oregon Community College	Central Oregon Community College Engineering	OSTR tour for Engineering	USDOE Reactor Sharing
1535	Teaching and Tours	Corvallis School District	Corvallis School District	OSTR tour.	USDOE Reactor Sharing
1536	Nuclear Engineering Faculty	Oregon State University	Gamma Irradiations for NE/RHP 114/115/116	Irradiation of samples for Introduction to Nuclear Engineering and Radiation Health Physics courses NE/RHP 114/115/116.	OSU Radiation Center
1537	Teaching and Tours	Oregon State University - Educational Tours	Naval Science Department	OSTR tour.	USDOE Reactor Sharing
1538	Teaching and Tours	Oregon State University - Educational Tours	OSU Speech Department	OSTR tour.	USDOE Reactor Sharing
1540	Teaching and Tours	McKay High School	McKay High School	OSTR tour and half-life experiment.	USDOE Reactor Sharing
1542	Teaching and Tours	Oregon State University - Educational Tours	Engineering Sciences Classes	OSTR tour.	USDOE Reactor Sharing
1543	Bailey	Veterinary Diagnostic Imaging & Cytopathology	Instrument Calibration	Instrument calibration.	Veterinary Diagnostic Imaging & Cytopathology
1544	Teaching and Tours	West Albany High School	West Albany High School	OSTR tour and half-life experiment.	USDOE Reactor Sharing
1545	Teaching and Tours	Oregon State University - Educational Tours	OSU Educational Tours	OSTR tour.	USDOE Reactor Sharing
1548	Teaching and Tours	Willamette Valley Community School	Willamette Valley Community School	OSTR tour.	USDOE Reactor Sharing

Table VI.C.3
List of Major Research and Service Projects Preformed or in Progress at the Radiation Center and Their Funding Agencies

Project	Users	Organization Name	Project Title	Description	Funding
1555	Fitzgerald	Syracuse University	Fission track thermochro-nology	Irradiation to induce U-235 fission for fission track thermal history dating, especially for hydrocarbon exploration. The main thrust is towards tectonics, in particular the uplift and formation of mountain ranges.	Syracuse University
1564	Krane	Oregon State University	Measurement of neutron capture cross sections	Measurement of neutron capture cross sections.	USDOE Reactor Sharing
1568	Spell	University of Nevada Las Vegas	Ar/Ar dating of rocks and minerals	Irradiation of rocks and minerals for Ar/Ar dating to determine eruption ages, emplacement histories, and provenances studies.	University of Nevada Las Vegas
1583	Teaching and Tours	Neahkahnie High School	Neahkahnie High School	OSTR tour.	USDOE Reactor Sharing
1584	Teaching and Tours	Reed College	Reed College Staff & Trainees	OSTR tour for Reed College Staff & Trainees	USDOE Reactor Sharing
1592	Burgess	University of Manchester	Ar-Ar dating of Icelandic rhyolites	Nuclear irradiation of rock chips in cadmium-lined irradiation facility for Ar-Ar dating studies of Icelandic rhyolites.	University of Manchester
1594	Teaching and Tours	Jefferson High School	Jefferson High School	OSTR tour and half-life experiment.	USDOE Reactor Sharing
1601	Crutchley	Josephine County	Instrument Calibrations	Instrument calibration.	Josephine County Public Works
1603	Teaching and Tours	Thurston High School	Thurston High School Chemistry	OSTR tour and half-life experiment for Chemistry Class	USDOE Reactor Sharing
1611	Teaching and Tours	Grants Pass High School	Grants Pass High School	OSTR tour.	USDOE Reactor Sharing
1612	Singer	University of Wisconsin	Determination of age of Eocene and Quaternary volcanic rocks	Determination of age of Eocene and Quaternary volca-nic rocks by production of Ar-39 from K-39.	USDOE Reactor Sharing
1613	Teaching and Tours	Silver Falls School District	Silver Falls School District	OSTR tour.	USDOE Reactor Sharing
1614	Teaching and Tours	Marist High School	Marist High School	OSTR tour and half-life experiment.	USDOE Reactor Sharing

Table VI.C.3
List of Major Research and Service Projects Preformed or in Progress at the Radiation Center and Their Funding Agencies

Project	Users	Organization Name	Project Title	Description	Funding
1615	Teaching and Tours	Liberty Christian High School	Liberty Christian High School	OSTR tour and half-life experiment.	USDOE Reactor Sharing
1616	Doyle	Evanite Fiber Corporation	Instrument Calibration	Instrument calibration.	Evanite Fiber Corporation
1617	Spikings	University of Geneva	Ar-Ar geochronology	Argon dating of Chilean granites.	University of Geneva
1618	Teaching and Tours	Falls City High School	Fall City High School	OSTR tour and half-life experiment.	USDOE Reactor Sharing
1619	Teaching and Tours	Sheridan High School	Sheridan High School	OSTR tour and half-life experiment.	USDOE Reactor Sharing
1620	Teaching and Tours	Eddyville High School	Eddyville High School	OSTR tour.	USDOE Reactor Sharing
1621	Foster	University of Florida	Irradiation for Ar/Ar Analysis	Ar/Ar analysis of geological samples.	University of Florida
1622	Reese	Oregon State University	Flux Measurements of OSTR	Measurement of neutron flux in various irradiation facilities.	OSU Radiation Center
1623	Blythe	Occidental College	Fission Track Analysis	Fission track Thermochronology of Tibetian Geology	University of Southern California
1625	Armstrong	California State University at Fullerton	Fission Track Irradiations	Measurement of fission track ages to determine erosion amounts and timing.	USDOE Reactor Sharing
1627	Fleischer	Union College	Fission Track Irradiations	The primary project is the use of tracks to study the leaching out of imbedded radionuclides from alpha-activity in materials. The radionuclide could be a decay product of U-238 or Th-232 in studying the geochemistry of natural materials, or of Rn-222 in	USDOE Reactor Sharing
1628	Garver	Union College	Fission Track Irradiations	Use of fission track to determine age dating of apatites.	USDOE Reactor Sharing
1634	Tollo	George Washington University	REE Geochemistry of Meta-Igneous Rocks using INAA (TBC)	NAA of apatite samples to determine metal composition in ingneous rocks.	USDOE Reactor Sharing
1640	Gans	University of California at Santa Barbara	Age dating of Neogene volcanism	Age dating of rock samples from Sierra Nevada, Sonora, Mexico, and Chilean Andes	USDOE Reactor Sharing

Table VI.C.3
List of Major Research and Service Projects Preformed or in Progress at the Radiation Center and Their Funding Agencies

Project	Users	Organization Name	Project Title	Description	Funding
1641	Hughes	Idaho State University	Independent Study of NAA	Development of NAA for Thesis Research	USDOE Reactor Sharing
1648	Stewart	University of Washington	Fission-track Dating of Zircon	Fission-track Dating of Zircon from the Exhumation of Avaloatz Mountians in California	University of Washington
1653	Teaching and Tours	Madison High School	Madison High School Senior Science Class	OSTR tour for Senior Science Class	USDOE Reactor Sharing
1655	Teaching and Tours	Future Farmers of America	OSTR Tour	OSTR tour	USDOE Reactor Sharing
1657	Teaching and Tours	Richland High School	Richland High School	OSTR tour.	USDOE Reactor Sharing
1660	Reese	Oregon State University	Isotope and Container Testing	Testing of containers and source material	OSU Radiation Center
1666	Teaching and Tours	Douglas High School	Douglas High School AP Physics Class	OSTR tour and half-life experiment.	USDOE Reactor Sharing
1670	Teaching and Tours	Toledo High School	Toledo High School	OSTR tour and half-life experiment.	USDOE Reactor Sharing
1671	Roden-Tice	Plattsburgh State University	Fission Track Dating	Use of fission tracks to determine location of U-235 and Th232 in natural rocks and minerals	USDOE Reactor Sharing
1673	Teaching and Tours	Heal College	Heal College Physics Department	OSTR tour.	USDOE Reactor Sharing
1674	Niles	Oregon Department of Energy	Radiological Emergency Support	Radiological emergency support ot OOE related to instrument calibration, radiological and RAM transport consulting, and maintenance of radiological analysis laboratory at the Radiation Center.	Oregon Department of Energy
1676	Minc	Oregon State University	NAA of labelled antibodies	Au labelled antibodies are used use in cancer studies. NAA tracks the presence of the antibodies in various organs.	University of Michigan
1677	Zuffa	Universita' di Bologna	Fission Track Dating	Use of fission track from U-235 to determine uranium content in rock	Universita' di Bologna
1680	Danisik	Unversity of Tubingen	Fission Track Dating	Low-temperature geochronology using He and fission track dating.	University of Tuebingen

Table VI.C.3
List of Major Research and Service Projects Preformed or in Progress at the Radiation Center and Their Funding Agencies

Project	Users	Organization Name	Project Title	Description	Funding
1683	Teaching and Tours	Idaho State University	Nuclear Engineering Pulsing Lab	Reactor Pulsing laboratory for ISU NE students.	USDOE Reactor Sharing
1684	Fodor	North Carolina State University	Geochemical Investigation	NAA to determine rare earth composition.	USDOE Reactor Sharing
1686	Miller	Nunhems USA, Inc.	Production of haploid and dihaploid melon plants induced with irradiated pollen	Irradiated melon pollen will be used to polliate female melon plants to induce parthenogenetic embryos. These embryos will be rescued and cultured for plant production.	Sunseeds
1687	Teaching and Tours	Inavale Grade School	Reactor Tour	General reactor tour	USDOE Reactor Sharing
1688	Moore	Northwest Construction Surveying & Testing	Instrument Calibration	Instrument calibration	Northwest Construction Surveying & Testing
1690	Teaching and Tours	Wilson High School	Reactor Tour	D300 Reactor Tour	USDOE Reactor Sharing
1691	Teaching and Tours	Lost River High School	Reactor Tour	D300 Reactor Tour	USDOE Reactor Sharing
1692	Choi	Arch Chemicals Inc.	Screening Tests of Wood Decay	This is to build up basic knowledge on the efficacy of a copper based preservative in preventing decay of wood inhabiting basidiomycetes.	Arch Chemical Inc.
1695	Teaching and Tours	Transitional Learning	Reactor Tour	Reactor Tour in D300 only	USDOE Reactor Sharing
1696	Sayer	Marquess & Associates Inc.	Instrument Calibration	Instrument calibration	Marquess & Associates Inc.
1697	Teaching and Tours	Crescent Valley High School	Crescent Valley High School AP Physics Class	This project supports the advanced placement physics class at Cresent Valley High School. It will utilize the reactor in ongoing research projects sponsored by Radiation Center staff.	USDOE Reactor Sharing
1699	Teaching and Tours	Philomath High School	Reactor Tour	Tour of NAA and gas chromatograph capabilities in the Radiation Center	USDOE Reactor Sharing
1700	Frantz	Reed College	Instrument calibration	Instrument calibration	Reed College
1705	Hemming	Columbia University	Geochronology by Ar/Ar Methods	Geochronology by Ar/Ar methods	USDOE Reactor Sharing

Table VI.C.3
List of Major Research and Service Projects Preformed or in Progress at the Radiation Center and Their Funding Agencies

Project	Users	Organization Name	Project Title	Description	Funding
1707	Turrin	Rutgers	Ar/Ar Chronology Analysis	Statigraphy and Chronology of the Plio-Pleistocene Ngoronogoro volcanic highland	USDOE Reactor Sharing
1708	Turrin	Rutgers	Ar/Ar Chronology Analysis	Preliminary analysis on refining the age of the Monon Lake and Laschamp geomagnetic polarity events.	USDOE Reactor Sharing
1714		Lebanon Community Hospital	Instrument Calibration		Lebanon Community Hospital
1715	Teach	Providence St. Vincent Hospital	Stent Project	Irradiate elastin coated cardio stent devices to reduce thrombic reaction.	Providence NW Hospital
1717	Webb	Syracuse University	Ar/Ar Dating	Ar/Ar Dating	Syracuse University
1719	Teaching and Tours	Portland Community College	Upward Bound	OSTR Tour for Upward Bound	USDOE Reactor Sharing
1720	Teaching and Tours	Saturday Academy	OSTR Tour	OSTR Tour	USDOE Reactor Sharing
1722	Tollo	George Washington University	Petrologic Evolution of Mesoproterozoic Basement Rocks, Blue Ridge Province, Virginia	The petrologic relationships between granitoids and gneisses of the Mesoproterozoic Basement in the Blue Ridge Province, Virginia are contrained through trace element geochemistry, petrology and detailed field studies.	USDOE Reactor Sharing
1724	Stebbins-Boaz	Willamette University	Instrument Calibration	Instrument calibration	Willamette University
1725	Kerkvliet	Oregon State University	Consequences of AhR-mediated signaling in T lymphocytes.	The basic goal of this project is to understand the cellulr and molecular basis for the immune suppression induced by Ah receptor (AhR) ligands.	OSU Environmental and Molecular Toxicology
1726	Teaching and Tours	Oregon State University - Educational Tours	Academic Learning Services	Cohort Class 199	USDOE Reactor Sharing
1729	Hendriks	Geological Survey of Norway	Recycling of an Orogen	Study of interactions of the onshore and offshore parts of the Norwegian continental margin near Lofoten and Vesteralen Islands	Geological Survey of Norway
1730	Reese	Oregon State University	Neutron Radiography	Neutron Radiography using the real-time and film imaging methods	OSU Radiation Center

Table VI.C.3
List of Major Research and Service Projects Preformed or in Progress at the Radiation Center and Their Funding Agencies

Project	Users	Organization Name	Project Title	Description	Funding
1735	Minc	Oregon State University	INAA of SRMs	INAA to determine inter-lab calibration based on New Ohio Red Clay and NIST SRMs.	OSU Radiation Center
1736	Rauch	Nu-Trek, Inc	GaAs Damage Studies	Determination of the effect of radiation damage on GaAs for use in X-ray detectors	Nu-Trek, Inc.
1737	Roullet	Oregon Health Sciences University	Silver Activation for Radio-label	Production of Ag-110m for Radiolabeled Molecules	Oregon Health Sciences University
1738	Kilinc	University of Cincinnati	INAA of geological samples.	Geochemical analysis of rock and mineral samples for graduate student projects.	USDOE Reactor Sharing
1739	Teaching and Tours	Daly Middle School	Reactor Tour	Reactor Tour	USDOE Reactor Sharing
1741	Higley	Oregon State University	SIRAD Evaluation	Determination of neutron response for SIRAD dosimeter.	OSU NERHP
1742	Armitage	Eastern Michigan University	INAA of Bricks and Clays from St. Marys City	INAA of bricks and clays from historic St. Marys City, MD.	USDOE Reactor Sharing
1743	Teaching and Tours	West Salem High School	Reactor Tour	Reactor Tour	USDOE Reactor Sharing
1744	Niles	Oregon Department of Energy	Gamma Spectroscopy of Columbia River Sediments	Use of gamma spectroscopy to determine radioactive contaminants in the sediments in the Columbia River downstream from Hanford	Oregon Department of Energy
1745	Girdner	US National Parks Service	C14 Measurements	LSC analysis of samples for C14 measurements.	US National Parks Service
1746	Loveland	Oregon State University	Tantalum Tracer	Produce tantalum tracer for LBNL	USDOE Reactor Sharing
1747	Teaching and Tours	East Linn Christian Academy	Reactor Tour	Reactor Tour for Chemistry Class	USDOE Reactor Sharing
1748	Hamby	Oregon State University	Black Bean Nutritional Study	Activation of black bean powder for nutritional study. The chief isotopes are zinc, iron, and sodium.	OSU Radiation Center
1749	Bottomley	Oregon State University	Hot Spots of Nitrogen Cycling in Soil	Grant is focused upon nitrogen cycling in soil at the small scale. We are trying to understand how physical and biological parameters control the fate of ammonium and nitrate in soil.	OSU Crop and Soil Science

Table VI.C.3
List of Major Research and Service Projects Preformed or in Progress at the Radiation Center and Their Funding Agencies

Project	Users	Organization Name	Project Title	Description	Funding
1750	Robbins	Great Lakes Environmental Research Lab	INAA of Great Lakes Sediments	The Environmental Radiotracers (ERT) Project employs natural and artificial radionuclides to identify and model important particle transport processes in diverse systems including the Laurentian and other Great Lakes, smaller freshwater bodies, wetlands a	NOAA-GLERL
1751	Loveland	Oregon State University	Tracer Preparation	Tracer preparation for chemistry.	OSU Chemistry / Loveland DOE
1753	Rosencrans	Flink Ink	INAA of pigment samples	INAA of organic-based pigment samples for halogen (Cl, Br, I) content.	Flint Ink
1757	Ho	Oregon State University	Prostate Cell Zinc Deficiency Study	The goal of this study is to determine how zinc deficiency modulates the ability of normal healthy cells to respond to DNA damage.	OSU HHS
1758	Teaching and Tours	Oregon State University - Educational Tours	Kids Spirit	OSTR tour	USDOE Reactor Sharing
1760	Helmhotz	NWT Corp.	Na Production	Production of Na-24 for use as an tracer.	NWT Corp
1761	Ho	Oregon State University	Suppression of Prostate Cancer in Xenograft Model by Histone Deacetylase Inhibitors	One new area in both prevention and treatment involves the use of histone deacetylate inhibitors to turn on tumor suppressor genes. Tumor suppression genes can supress and reverse cancer cell growth.	OSU HHS
1762	Day	CH2M Hill Inc	Sr-90 Column Studies	Column studies to look at Sr-90 sorption in Hanford soils.	CH2M Hill
1763	Svojtka	Academy of Sciences of the Czech Republic	Fission Track	Fission Track	Academy of Sciences of the Czech Republic
1764	Kelly	Oregon State University	Nanoparticle delivery of therapeutic tumor radiation	The goal of this project is the development of radioavtive nanoparticles with surfacefuctionalization that will result in localization at tumor sites.	OSU Radiation Center
1765	Beaver	Weyerhaeuser	Instrument Calibration	Calibration of radiological instruments.	Weyerhaeuser Foster

Table VI.C.3
List of Major Research and Service Projects Preformed or in Progress at the Radiation Center and Their Funding Agencies

Project	Users	Organization Name	Project Title	Description	Funding
1766	Cosca	Universite de Lausanne	Ar/Ar Geochronology		Universite de Lausanne, Humense
1767	Korlipara	Terra Nova Nurseries, Inc.	Genera Modifications using gamma Irradiation	Use of gamma and fast neutron irradiations for genetic studies in genera.	Terra Nova Nurseries, Inc.
1768	Bringman	Brush-Wellman	Antimony Source Production	Production of Sb-124 sources	Brush-Wellman
1769	Paulenova	Oregon State University	Cerium Study	Production of Ce-141/143.	OSU Radiation Center, Paulenova
1770	Iverson	AVI Bio Pharma, Inc.	Lab Swipes	Analyze lab swipes for contamination using liquid scintillation counter.	AVI Bio Pharma
1771	Otjen	Oregon State Fire Marshal	Instrument calibration	Calibration of radiological response kits	Oregon State Fire Marshall
1773	Utley	EaglePicher Technologies	Impurities of Boro-Silicate Matrix	INAA to determine trace impurities of Boro-silicate matrix	Eagle Picher Technologies
1774	Cohen	University of New Mexico		Age dating of meteorites using the Ar/Ar dating method	University of New Mexico
1775	Carson	Advanced Cochlear Systems	Presbycusis Implant	Working under a grant proposing to correct old-age hearing loss from Strial Presbycusis with an implant.	Advanced Cochlear Systems
1776	Hruby	SIGA Technologies, Inc.	Development of S. gordonii as a vaccine vector	SIGA Technologies is attempting to develop a safe, effective subunit vaccine delivery system using the bacterial commensal vector Streptococcus gordonii. The proposed studies will examine the immune response after vaccination of mice with the bacterial v	SIGA Technologies, Inc.
1777	Storey	Quaternary Dating Laboratory	Quaternary Dating	Production of Ar-39 from K-39 to determine radiometric ages of geological materials.	Quaternary Dating Laboratory
1778	Campbell	Genis, Inc.	Gamma Exposure of Chitosan polymer	This project subjects chitosan polymer in 40 and 70% DDA formulations to 9 and 18 Kgy, boundary doses for commerical sterilization for the purpose of determine changes in the molecular weight and product formulation properites.	Genis, Inc.

Table VI.C.3
List of Major Research and Service Projects Preformed or in Progress at the Radiation Center and Their Funding Agencies

Project	Users	Organization Name	Project Title	Description	Funding
1779	Teaching and Tours	Lebanon High School	Teaching and tours	OSTR tour.	USDOE Reactor Sharing
1780	Bray	Wayne State University	INAA of Archaeological Ceramics	INAA of Inca-period archaeological ceramics from South America.	USDOE Reactor Sharing
1781	Balogh	Roswell Park Cancer Institute	INAA of Au nanocomposites.	INAA to determine biodistribution Au nanocomposites in mouse tissue samples.	Department of Defense, Roswell Park Cancer Institu
1782	Rajagopal	Oregon State University	Effects of gamma radiation on the germination and growth of radish seeds	Determine the effects of different doses of gamma radiation on radish seeds.	OSU Radiation Center
1783	Amrhein	Amrhein Associates, Inc	Instrument Calibration	Instrument calibration	Amrhein Associates, Inc.
1784	Reese	Oregon State University	DOE Instrumentation Grant	Refurbishment of Cornell and OSTR ion chambers	DOE Instrumentation
1786	Teaching and Tours	Oregon State University - Educational Tours	Anthropology Department	Anth 430/530 NAA class with Minc	USDOE Reactor Sharing
1788	Gleason	University of Michigan	INAA of hydrothermal sediments.	Trace-element analysis of marine core samples from the South Pacific.	University of Michigan
1789	Was	University of Michigan	Irradiation of pressure vessel steels.	Fast neutron CLICIT irradiation of steel samples and sample analysis	DOE University Reactor Share
1790	Teaching and Tours	Oregon State University - Educational Tours		OSTR Tour	
1791	Teaching and Tours	Oregon State University - Educational Tours		RX Tour	
1792	Dragila	Oregon State University	Neutron Radiography of Fluid Flow in Sand	Determination of neutron radiography imaging capability on saturated and unsaturated fluid flow in various sands using sodium as a tracer	USDOE Reactor Sharing
1793	Wiclow	Valero Refining Company	INAA of Crude Oil		Valero Refining Co.
1794	O'Kain	Tangent Construction	Instrument Calibration	Instrument calibration	Tangent Construction

Table VI.C.3
List of Major Research and Service Projects Preformed or in Progress at the Radiation Center and Their Funding Agencies

Project	Users	Organization Name	Project Title	Description	Funding
1795	Zubek	Eugene Sand & Gravel, Inc	Instrument Calibration	Instrument calibration	
1796	Hardy	CH2M Hill Inc	Instrument Calibration	Instrument calibration	
1797	Teaching and Tours	Oregon State University - Educational Tours		RX Tour	
1798	Muszyński	Oregon State University	Neutron Radiography of Wood Products	Use of neutron radiography to look at joints in composite wood samples.	USDOE Reactor Sharing
1799	Haigh	Oregon Department of Environmental Quality	Instrument Calibration	Instrument calibration	Oregon Department of Enviromental Quality
1800	Montante	Wayne State University	Sediment Characteristics and Aquatic Macrophyte Distribution	Characterization of soil chemistry using INAA to determine how sediment characteristics affect the distribution of aquatic macrophytes.	US DOE University Reactor Share
1801	Giovannoni	Oregon State University	Seawater Sterilization	Sterilize seawater for use as a culturing media. Inactivate bacteria and viruses without cooking dissolved organic carbon.	OSU Microbiology Department
1802	Settaluri	Oregon State University	Characterization of Irradiated High-Electron Mobility Transistor (HEMT) based microwave circuits	To characterize for the purposes of modelling irradiated microwave circuits consisting of HEMT elements. Substrates are placed in a reactor for neutron bombarment. Post irradiated measurements are compared to preirradiated performance to changes.	USDOE Reactor Sharing
1803	Valdos	Tulane University	INAA of Aztec Pottery	Determination of Aztec pottery provenance using trace-element data generated by INAA.	USDOE Reactor Sharing
1804	Hale	Oregon State University	INAA of 19th century European ceramics.	Trace-element analysis of 19th century European ceramics using INAA.	USDOE Reactor Sharing
1805	Cherry	Brown University	INAA of Armenian obsidian	INAA to characterize obsidian sources in Armenia and determine provenance of Early Bronze age obsidian artifacts.	Brown University
1807	Minc	Oregon State University	INAA of Oaxacan Ceramics	Trace-element analysis of archaeological ceramics from the Valley of Oaxaca, Mexico to determine provenance.	OSU Radiation Center, Minc

Table VI.C.3
List of Major Research and Service Projects Preformed or in Progress at the Radiation Center and Their Funding Agencies

Project	Users	Organization Name	Project Title	Description	Funding
1808	Cherry	Brown University	INAA of Armenian obsidian	INAA to characterize obsidian sources in Armenia and determine provenance of Early Bronze age obsidian artifacts.	US DOE Reactor Share
1809	Harper	Oregon State University	Evaluation of gold nanoparticle uptake	INAA of gold concentration in zebrafish embryos to evaluate nanoparticle uptake.	US DOE Reactor Share
1810	Smith	University of Chicago	INAA of Bronze Age Ceramics from Armenia	INAA of archaeological ceramics to determine provenance.	University of Chicago
1811	Smith	University of Chicago	INAA of Bronze Age Obsidian from Armenia	INAA of archaeological obsidian to determine provenance.	University of Chicago
1812	Bird	Oregon State University	Entron Material Development	This project involves development of medical device material. To that end, placement of the material into living tissue is the goal, which necessitates having a sterile material. The literature indicates that other forms of sterilization are likeley to	Entek Manufacturing
1813	Turrin	Rutgers	Ar/Ar Cretaceus Tektite	Pre-proposal irradiations of cretaceus tektite, geochronology studies student research	US DOE Reactor Share
1814	Minc	Oregon State University	INAA of Aztec Pottery	Trace-element analysis of Aztec pottery to determine provenance.	US DOE Reactor Share
1815	Hamby	Oregon State University	Proof of Concept for Beta/Gamma Coincindent Counting	Cobalt source for simultaneous beta/gamma spectroscopy	OSU NERHP, Hamby
1816	Kounov	Geologisch-Palaontologisches Institut	Fission Track Analysis	Geochronology analysis using fission track dating	Geologisch-Palaontologisches Institut
1817	Costigan	City of Gresham	Instrument Calibration	Calibration of instruments	City of Gresham
1818	Sabey	Brush Wellman	Antimony source production (Utah)		Brush-Wellman
1819	Vetter	University of California at Berkeley	NE-104A INAA source	Stainless Steel disk source for INAA lab.	University of California at Berkeley

Table VI.C.3
List of Major Research and Service Projects Preformed or in Progress at the Radiation Center and Their Funding Agencies

Project	Users	Organization Name	Project Title	Description	Funding
1820	Jolivet	Universite Montpellier II	Fission Track Analysis	Use of fission track analysis for geochronology.	University of Montpellier II
1821	Reese	Oregon State University	Two Phase Flow Imaging	Utilization of neutron radiography to analyze two-phase flow characteristics	Oregon State University - WNSA
1822	Hartman	Oregon State University	Reactor Measurement	Measurement of reactor parameters in support of conversion from HEU to LEU fuel	Oregon State University - HEU to LEU Conversion
1823	Harper	Oregon State University	Evaluation of Au nanoparticle uptake	INAA of gold concentrations in zebrafish embryos to evaluate nanoparticle uptake	OSU Environmental Health Sciences Center
1824	Seward	Geologisches Institut	Fission Track Analysis	Low temperature thermochronology is being used to answer questions relating in general to tectonics and basin analysis. The current project covers studies in Madagascar, southern India, Sri Lanka where they are trying to understand what happened to the	Geologisches Institut, ETH Zentrum
1825	Peterson	Oregon State University	INAA of Oregon pottery	Trace-element analysis to determine provenance of historic Oregon pottery.	
1826	Teaching and Tours	North Eugene High School		OSTR Tour and half-life experiment	USDOE Reactor Sharing
1827	Teaching and Tours	Stayton High School		OSTR Tour and half-life experiment	USDOE Reactor Sharing
1828	Teaching and Tours	Lincoln High School		OSTR Tour and half-life experiment	USDOE Reactor Sharing
1829	Rauch	Nu-Trek, Inc	RADFET dosimeter calibration and testing	RADFET dosimeter calibration and testing using gamma and neutron sources.	Nu-Trek, Inc.
1830	Jander	Oregon State University	Radiation Hardness Testing	Radiation hardness testing of transisters	Electrical Engineering and Computer Science

Figure VI.C.1

Summary of the Types of Radiological Instrumentation Calibrated to Support the OSU TRIGA Reactor and Radiation Center

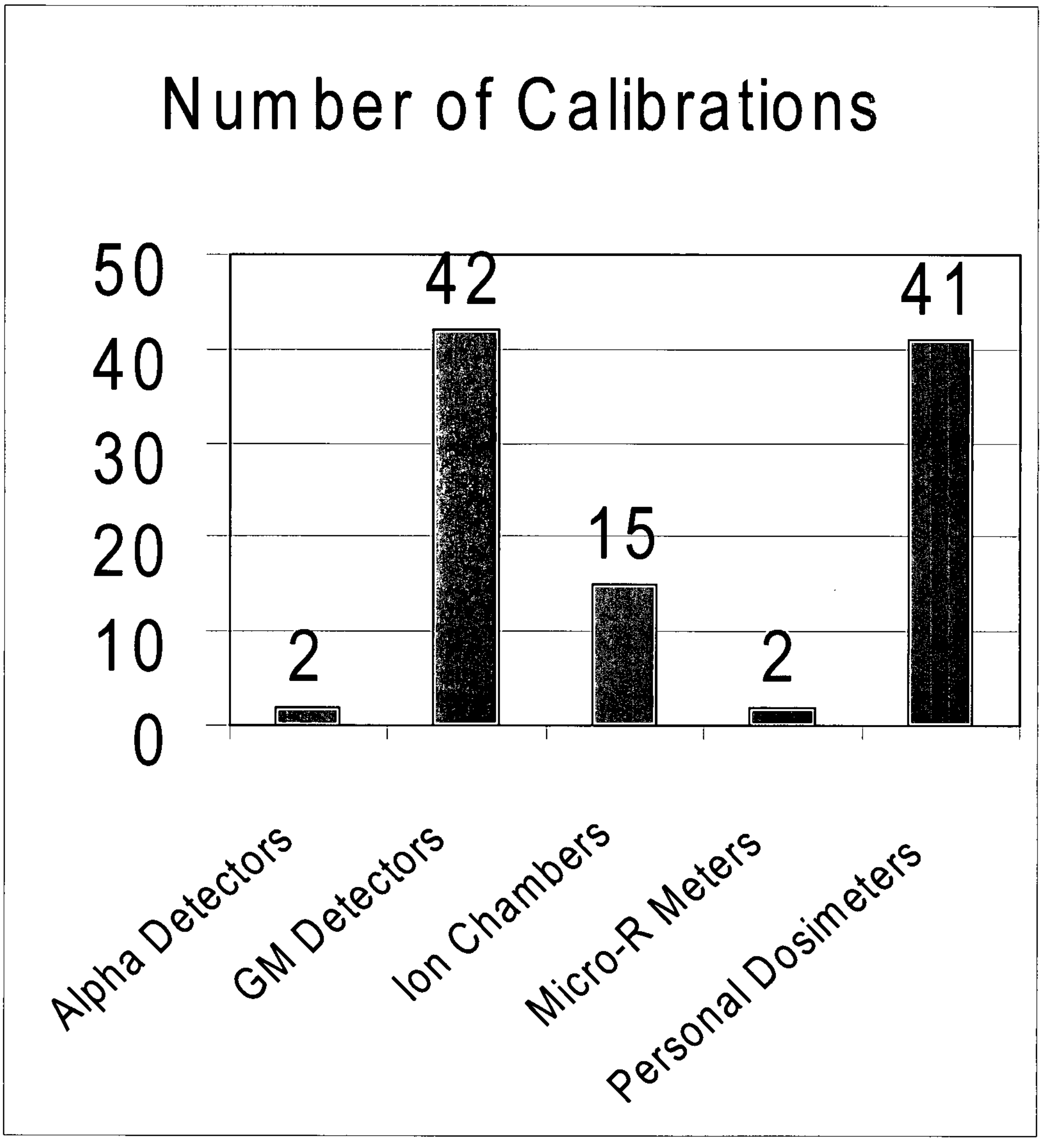


Table V1.C.4
Summary of Radiological Instrumentation Calibrated to Support OSU Departments

OSU Department	Number of Calibrations
Animal Science	2
Biochemistry/Biophysics	4
Botany and Plant Pathology	7
Center for Gene Research	1
Chemistry	2
Civil, Construction and Environmental Engineering	2
COAS	1
Crop Science	2
E.M.T.	6
Environmental Engineering	1
Environmental Health and Safety	2
Fisheries and Wildlife	1
Food Sciences	1
Forest Engineering	1
Forest Science	3
Horticulture	2
LPI	3
Mechanical Engineering	1
Microbiology	6
Nutrition and Food Management	3
Oceanic and Atmospheric Sciences (COAS)	3
Pharmacy	3
Physics	5
Radiation Safety	29
Veterinary Medicine	10
Zoology	2
Total	**103**

Table V1.C.5
Summary of Radiological Instrumentation Calibrated to Support Other Agencies

Agency	Number of Calibrations
Amrheim Associates	1
CH2M Hill	1
DOE Albany Research Center	3
ESCO Corporation	6
Eugene Sand and Gravel	1
FAA (TSA)	7
Good Samaritin Hospital	9
Gresham Fire Department	3
Knife River	2
Lebanon Community Hospital	3
Marquess and Associates, Inc.	1
Occ. Health Lab	1
Oregon Department of Energy/Hazmat	6
Oregon Department of Transportation	5
Oregon Health Sciences University	24
Oregon Public Utilities Commission	5
Oregon State Health Division	57
Rogue Community College	1
State Fire Marshall	8
Veterinary Diagnostic Imaging Cytopathology	2
Weyerhaeuser	1
Total	**147**

Table VI.F.1
Summary of Visitors to the Radiation Center

Date	Number of Visitors	Group
7/6/2006	2	Bhatia, Peter
7/11/2006	18	Talented and Gifted Middle School Students
7/11/2006	5	Radiation Health Physics 536
7/13/2006	15	Adventures in Learning- Forensic Science Class
7/18/2006	4	START group
7/18/2006	20	Talented and Gifted Middle School Students
7/24/2006	7	General Science 152
7/28/2006	25	Middle School Engineering Camp
7/31/2006	29	Chemistry 222
8/1/2006	29	Chemistry 222
8/4/2006	3	Pommier, Regis
8/8/2006	2	Toler, Mary & Stiles, Dennis
8/9/2006	2	AREVA
8/9/2006	1	Bretthaeur, Todd - Department of Defense
8/15/2006	12	School Teachers
8/17/2006	7	International Council Radiation Protection
8/24/2006	1	Christian Science Monitor
8/29/2006	4	Family - Student and Family
8/31/2006	16	Boy Scouts - Ralph Stellar
9/1/2006	2	Alumni – Karamanos, Heather & Duffy, William
9/6/2006	25	Chemistry 123
9/6/2006	25	Chemistry 123
9/8/2006	10	OSU Student Affairs
10/9/2006	1	Jill Watts
10/12/2006	4	Anthropology 430/530
10/13/2006	1	OSU Undergrads -Natalie Strom
10/13/2006	9	Confederated Tribes of the Umatilla
10/23/2006	15	Odyssey Class
10/24/2006	20	Odyssey Class
10/25/2006	22	NE/RHP 114
10/26/2006	9	Linn Benton Community College
10/28/2006	131	Dad's Weekend
11/3/2006	3	Ann Winters
11/7/2006	22	Engineering 111 - Sec10
11/7/2006	21	Engineering 111 - Sec11
11/7/2006	20	Engineering 111 - Sec12

Table V1.F.1
Summary of Visitors to the Radiation Center

Date	Number of Visitors	Group
11/9/2006	32	Linn Benton Community Colleage
11/9/2006	1	Prospective Student - Matt Bensen
11/9/2006	23	Engineering 111 - Sec15
11/9/2006	23	Engineering 111 - Sec 16
11/9/2006	21	Engineering 111 - Sec17
11/16/2006	16	Odyssey Class
11/21/2006	1	Hewlett Packard
11/22/2006	1	General Electric
11/22/2006	1	Visitor
11/27/2006	1	Prospective Students
12/1/2006	1	Prospective Students
12/5/2006	7	Good Samaritan Hospital Emergency Room Nursing Staff
12/18/2006	10	Boy Scouts of America Troop 8
1/10/2007	12	OSU-OHSU
1/11/2007	21	Chemistry 462
1/12/2007	2	McMurry, David
1/12/2007	25	North Eugene High School
1/16/2007	0	Reed College
1/16/2007	7	Chemistry 462
1/18/2007	6	Chemistry 462
1/22/2007	4	Kathy Parks
1/23/2007	6	Chemistry 462
1/30/2007	19	Lebanon High School
2/7/2007	12	Geosciences 430/530
2/8/2007	9	Philomath Middle School
2/13/2007	20	Chemistry 225 H
2/13/2007	1	Seminar Speaker
2/14/2007	9	Odyssey Class
2/15/2007	15	Chemistry 225 H
2/19/2007	2	Prospective Students
2/20/2007	24	Chemistry 222 - Sec 14
2/20/2007	24	Chemistry 222 - Sec 66
2/20/2007	24	Chemistry 222 - Sec 13
2/20/2007	23	Chemistry 222 - Sec 12
2/21/2007	24	Chemistry 222 - Sec 37
2/21/2007	23	Chemistry 222 - Sec 33
2/22/2007	1	Prospective Students
2/22/2007	23	Chemistry 222 - Sec 42
2/22/2007	23	Chemistry 222 - Sec 78

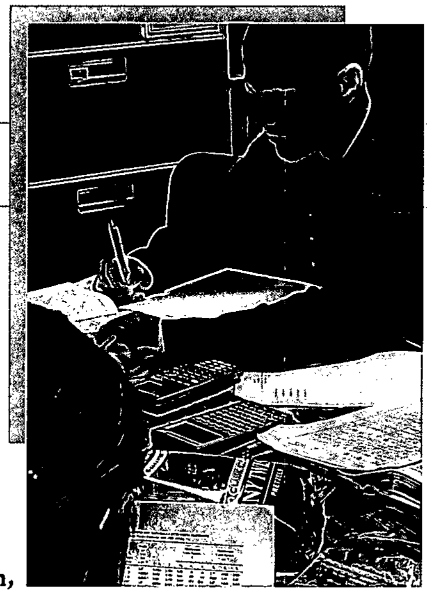
Table V1.F.1
Summary of Visitors to the Radiation Center

Date	Number of Visitors	Group
2/22/2007	24	Chemistry 222 - Sec 62
2/22/2007	24	Chemistry 222 - Sec 43
2/23/2007	3	Prospective Students
2/23/2007	15	Alumni
2/24/2007	11	Lake Oswego High School
2/27/2007	25	Chemistry 222 - Sec 15
2/27/2007	24	Chemistry 222 - Sec 26
2/27/2007	24	Chemistry 222 - Sec 17
2/27/2007	24	Chemistry 222 - Sec 16
2/28/2007	23	Chemistry 205 - sec 32
2/28/2007	24	Chemistry 222 - Sec 36
2/28/2007	24	Chemistry 222 - sec 32
3/1/2007	24	Chemistry 222 - Sec 46
3/1/2007	24	Chemistry 222 - Sec 110
3/1/2007	24	Chemistry 222 - Sec 63
3/1/2007	23	Chemistry 222 - Sec 79
3/2/2007	9	Prospective Students
3/5/2007	23	Chemistry 205 - sec 22
3/6/2007	23	Chemistry 222 - Sec 48
3/6/2007	24	Chemistry 205 - Sec 12
3/6/2007	24	Chemistry 222 - Sec 252
3/7/2007	24	Chemistry 205 - Sec 18
3/7/2007	24	Chemistry 205 - Sec 36
3/8/2007	24	Chemistry 205 - Sec 54
3/8/2007	24	Chemistry 222 - Sec 52
3/8/2007	23	Chemistry 222 - Sec 38
3/9/2007	3	Bennion, John
3/12/2007	24	Chemistry 205 - sec 26
3/12/2007	8	OSU Retirement Association
3/13/2007	5	Parks, Kathy
3/13/2007	23	Chemistry 205 - Sec 16
3/13/2007	23	Chemistry 205 - sec 14
3/14/2007	23	Chemistry 205 - Sec 42
3/14/2007	5	Reed College
3/15/2007	23	Chemistry 222 - Sec 53
3/21/2007	31	Marist High School

Table V1.F.1
Summary of Visitors to the Radiation Center

Date	Number of Visitors	Group
3/27/2007	5	Prospective Students
3/27/2007	2	Idaho National Laboratory
3/28/2007	3	American Nuclear Society
3/29/2007	34	American Nuclear Society
3/30/2007	4	AREVA
3/30/2007	2	Nuclear Regulatory Commission
3/30/2007	6	American Nuclear Society
3/30/2007	7	American Nuclear Society
3/30/2007	4	American Nuclear Society
4/5/2007	1	Prospective Students
4/5/2007	15	Material Science
4/6/2007	1	Visitor
4/10/2007	24	Linn Benton Community Colleage
4/11/2007	0	Thurston High School Students
4/11/2007	1	Prospective Students
4/12/2007	2	MJM
4/13/2007	1	Prospective Students
4/20/2007	16	Linn Benton Community Colleage
5/4/2007	76	Mom's Weekend
5/11/2007	2	Prospective Students
5/11/2007	15	Linn Benton Community Colleage
5/11/2007	52	West Salem High School
5/18/2007	1	Seminar Speaker
5/22/2007	26	Lincoln High School
5/23/2007	27	West Albany High School
5/23/2007	27	West Albany High School
5/31/2007	24	Stayton High School
5/31/2007	24	Stayton High School
6/1/2007	3	Prospective Students
6/5/2007	1	Visitor
6/13/2007	2	Visitor
6/14/2007	1	Seminar Speaker
6/15/2007	1	Seminar Speaker
6/18/2007	2	Family - Student and Family
6/18/2007	2	Family
6/22/2007	2	Family
6/29/2007	4	START group
Total	**2189**	

Part VII—Words



Publications

Alonso, R.N., Carrapa, B., Coutand, I., Haschke, M., Hilley, G.E., Schoenbohm, L., Sobel, E. R., Strecker, M.R., Trauth, M.H., 2006, Tectonics, climate, and landscape evolution of the southern Central Andes: The Argentine Puna Plateau and adjacent Regions between 22 and 28° S lat: in Oncken, O., Chong, G., Franz, G., Giese, P., Götze, H.-J., Ramos, V., Strecker, M., and Wigger, P., editors, The Andes - Active Subduction Orogeny: Frontiers in Earth Sciences, v. 1, Springer Verlag, p. 265-283.

Ambrose S.H., Bell, C.J., Bernor, R.L., Boisserie, J.R., Darwent, C.M., DeGusta, D., Deino, A., Garcia, N., Haile-Selassie, Y., Head, J.J., Howell, F.C., Kyule, M.D., Manthi, F.K., Mathu, E.M., Nyamai, C.M., Pickford, M., Saegusa, H., Stidham, T.A., Williams, M.A.J., Hlusko, L.J., 2007, The paleoecology and paleogeographic context of Lemudong'o Locality 1, a late Miocene terrestrial fossil site in southern Kenya: Kirtlandia 56: in press.

Beardsley, A.G., Sisson, V.B., Ave Lallemant, H.G., and Roden-Tice, M.K. Shallow Level Exhumation History of the Leeward Antilles, Offshore Venezuela. Submitted to The Geological Society of America Bulletin, 4/07.

Blisniuk, P.M., Stern, L.A., Chamberlain, C.P., Zeitler, P.Z., Ramos, V.A., Haschke, M., Sobel, E.R., Strecker, M.R. and Warkus, F., 2006, Links between mountain uplift, climate, and surface processes in the southern Patagonian Andes,, in Oncken, O., Chong, G., Franz, G., Giese, P., Götze, H.-J., Ramos, V., Strecker, M., and Wigger, P., editors, The Andes - Active Subduction Orogeny: Frontiers in Earth Sciences, v. 1, Springer Verlag, p. 429-440.

Blondes, M.S., Reiners, P.W., Ducea, M.N., Singer, B., Chesley, J.. Temporal-compositonal trends over short and long time-scales in basalts of the Big Pine Volcanic Field, CA. Earth and Planetary Science Letters (in press).

Burbank , D.W., Brewer, I.D., Sobel, E.R., and Bullen, M.E., in press, Single-crystal dating and the detrital record of orogenesis: International Association of Sedimentologists Special Publication.

Carmichael, I.S.E., Lange, R.A., Hall, C.M., Renne, P.R.. Faulted and tilted Pliocene Olivine-Tholeiite Lavas near Alturas, NE California, and their bearing on the uplift of the Warner Range: Geological Society of America Bulletin 118 (9/10): 1196-1211; doi: 10.1130/B25918.1.

Carrapa, B., Strecker, M.R., and Sobel, E.R., 2006, Cenozoic orogenic growth in the Central Andes: Evidence from sediment provenance and apatite fission track thermochronology along the southernmost Puna Plateau margin (NW Argentina): Earth and Planetary Science Letters, v. 247, p. 82-100.

Casperson, R., Krane, K. S,. and. Norman, E. B.. Neutron Capture Cross Sections of 148Gd and the Decay of 149Gd, Rios, M. G., Phys. Rev. C 74, 044302 (2006).

Colgan J.P., Dumitru, T.A., Miller, E.L., and Reiners, P.W.. Cenozoic tectonic evolution of the Basin and Range Province in northwestern Nevada, American Journal of Science, v. 306, p. 616-654.

Coutand, I., Carrapa, B., Deeken, A., Schmitt, A.K., Sobel, E.R., and Strecker, M.R., 2006, Propagation of orographic barriers along an active range front: insights from sandstone petrography and detrital apatite fission-track thermochronology in the intramontane Angastaco basin, NW Argentina: Basin Research, v. 18, p. 1-26, doi: 10.1111/j.1365-2117.2006.00283.x.

Craddock, J.P., Anziano, J., Wirth, K., Vervoort, J.D., Singer, B., Zhang, X. (2007) Structure, geochemistry and geochronology of a Penokean lamprophyre dike swarm, Archean Wawa terrane, Little Presque Isle, Michigan, USA, Precambrian Research, v. 157, p. 50-70.

Crouzet, C., Dunkl, I., Paudel, L., Árkai, P., Rainer, T. M., Balogh, K. and Appel, E. (2007): Temperature and age constraints on the metamorphism of the Tethyan Himalaya in Central Nepal: A multidisciplinary approach. Journal of Asian Earth Sciences, 30, 113-130.

D'Addezio, G., Karner, D.B., Burrato, P., Insinga, D., Maschio, L., Ferranti, L., and Renne, P.R., Tephrochronology in faulted Middle Pleistocene tephra layer in the Val 'Agri area (Southern Italy): Annals of Geophysics 49: 1029-1040.

Danišík, M., Kohút, M., Dunkl, I. and Frisch, W. (2008 - in press): Cooling evolution of the Žiar Mts. (Inner Western Carpathians, Slovakia) constrained by fission track data. Geol. Carp. 59/1.

Danišík, M., Kuhlemann, J., Dunkl, I., Székely, B., and Frisch, W. (2007): Burial and exhumation of Corsica (France) in the light of fission track data. Tectonics, 26, TC1001.

Deeken, A., Sobel, E.R., Coutand, I., Haschke, M., Riller, U. and Strecker, M.R., 2006, Construction of the southern Eastern Cordillera, NW-Argentina: from early Cretaceous extension to middle Miocene shortening, constrained by AFT-thermochronometry, Tectonics, v. 25, TC6003, doi:10.1029/2005TC001894

Deino, A. L., Kingston, J., Glen, J. M., Edgar, R. K., Hill, A.. Precessional forcing of lacustrine sedimentation in the late Cenozoic Chemeron Basin, Central Kenya Rift, and calibration of the Gauss/Matuyama boundary: Earth and Planetary Science Letters 247:41–60.

Deino, A.L. Ambrose, S.H., 2007, 40Ar/39Ar dating of the Lemudong'o late Miocene fossil assemblages, southern Kenya Rift: Kirtlandia 56: in press.

Doughty, P.T., K.R. Chamberlain, D.A. Foster, and G. Sha, 2007, Structural, metamorphic and geochronological constraints on the origin of the Clearwater core complex, northern Idaho: In, J. Sears, T. Harms, and C. Evenchick, eds., Orogenic Systems Geological Society of America Special Paper, Geological Society of America, Boulder, in press.

Dunkl, I., Kuhlemann, J., Reinecker, J. and Frisch, W. (2005): Cenozoic relief evolution of the Eastern Alps constraints from apatite fission track age-provenance of Neogene intramontane sediments. Austrian Journal of Earth Sciences, 98, 92-105.

Eastman, M. C., Krane, K. S.. Neutron Capture Cross Sections of Even-Mass Tellurium Isotopes, Phys. Rev. C (submitted).

Ege, H., Sobel, E.R., Scheuber, E., and Jacobshagen, V., 2007, Exhumation history of the southern Altiplano plateau (southern Bolivia) constrained by apatite fission-track thermochronology: Tectonics, v. 26, p. TC1004, 10.1029/2005TC001869.

Fitzgerald, P.G. and Baldwin, S.L.."Thermochronologic constraints on Jurassic rift flank denudation in the Thiel Mountains, Antarctica", (2007). Editor(s): A. K. Cooper and C. R. Raymond et al., Antarctica: A keystone in a Changing World - Online Proceedings of the 10th ISAES, USGS Open-File Report 2007-1047, Short Research Paper 044, 4 p.; doi10.3133/of2007-1047.srp044.

Fleischer, R. L., Chang, S., Farrell, J., Herrmann, R. C., MacDonald, J., Zalesky, M.,. Doremus, R.H. "Etched Tracks and Serendipitous Dosimetry," Radiation Protection Dosimetry, 120, 450-456 (2006).

Florindo, F., Karner, D.B., Marra, F., Renne, P.R., Roberts, A.P. Weaver, R., Radioisotopic age constraints for Glacial terminations IX and VII from aggradational sections of the Tiber River delta in Rome, Italy: Earth and Planetary Science Letters 256: 61-80. doi: 10.1016/j.epsl.2007.01.014.

Foster, D.A., and D.R Gray, 2007, Strain rate in a Paleozoic accretionary orogen: the western Lachlan Orogen, Australia: In, J. Sears, T. Harms, and C. Evenchick, eds., Orogenic Systems Geological Society of America Special Paper, Geological Society of America, Boulder, in press.

Foster, D.A., P.T. Doughty, T.J. Kalakay, C.M Fanning, S. Coyner, W.C. Grice, and J.J. Vogl, 2007, Kinematics and timing of exhumation of Eocene metamorphic core complexes along the Lewis and Clark fault zone, northern Rocky Mountains, USA, in Till, A., Roeske, S., Sample, J., and Foster, D.A., eds., Exhumation along major continental strike-slip systems: Geological Society of America Special Paper 434, p. 205-229, doi: 10.1130/2007.2343(10).

Foster, D.A., T.J. Kalakay, P.A. Mueller, and A. Heatherington, 2007, Late Cretaceous granitic plutons in southwestern Montana: Northwest Geology, v. 36, p. 73-90.

Freitag, C., Freitag, M., Morrell. J.. 2007. Detecting fungal DNA in treated and non-treated wood International Research Group on Wood Protection Document No IRG/WP/07-10621.

Giorgis, S., McClelland, W., Fayon, A., Singer, B., and Tikoff, B., Timing of defomation and exhumation in the western Idaho shear zone, McCall, Idaho. Geological Society of America Bulletin (in review).

Harper, S.L., Lee, S., Hutchison, J.E.,. Miller, J., Tanguay. R.L. 200X. Biosafety considerations for nanomaterial design: effects of size, surface functionalization and purity on in vivo biological response to gold nanoparticle exposure. Nature Nanotechnology In preparation.

Harper, S.L.,. Dahl, J.A, Maddux, B.L.S., Tanguay, R.L., and Hutchison, J.E.. 2007. Proactively designing nanomaterials to enhance performance and minimize hazard. International Journal of Nanotechnology, In press.

Haschke, M, Sobel, E.R., Blisniuk, P., Strecker, M.R., Warkus, F., 2006, Continental response to active ridge subduction, Geophysical Research Letters, v. 33, oi:10.1029/2006GL025972.

Herrero-Bervera, E., Browne, E.J., Valet, J.P., Singer, B.S., Jicha, B.R., (2007) Cryptochron C2r.2r-1 recorded 2.51 Ma in the Koolau Volcano at Halawa, Oahu, Hawaii, USA: Paleomagnetic and 40Ar/39Ar evidence, Earth & Planetary Science Letters, v. 254, p. 256-271.

Hoffman, K.A., Singer, B.S., Camps, P., Hansen, L.N., Johnson, K., Clipperton, S., and Carvallo, C.. Stability of mantle control over dynamo flux since the mid-Cenozoic. Physics of the Earth and Planetary Interiors (Invited submission to special issue on the Geodynamo, 9/07).

Hora, J.M., Singer, B.S., Wörner, G. (2007) Volcano evolution and eruptive flux on the thick crust of the Andean central volcanic zone: 40Ar/39Ar constraints from Volcán Parinacota, Chile, GSA Bulletin, v. 119, p. 343-362.

Jicha, B.R., Singer, B.S., Beard, B.L., Johnson, C.M., Moreno Roa, H., Naranjo, J.A. (2007) Rapid magma ascent and the generation of 230Th excesses in the lower crust at Puyehue-Cordón Caulle, Southern volcanic zone, Chile, Earth & Planetary Science Letters, v. 255, p. 229-242.

Jordan, B.R.,. Sigurdsson, H., Carey, S., Lundin, S., Rogers, R.,. Singer, B., Barquero-Molina, M.. (2007) Petrogenesis of Central American Tertiary ignimbrites and associated Caribbean Sea tephra. in: Paul Mann (ed.), Geological Society of America Special Paper 428: Geologic and Tectonic Development of the Caribbean Plate in Northern Central America, GSA, Boulder CO. (in press).

Jourdan, F. Renne, P.R.. Age calibration of the Fish Canyon sanidine 40Ar/39Ar dating standard using primary K-Ar standards: Geochimica et Cosmochimica Acta 71: 387-402, doi:10.1016/j.gca.2006.09.002

Jourdan, F., Matzel, J.P., Renne, P.R., 2007, 39Ar and 37Ar recoil ejection during neutron irradiation of sanidine and plagioclase: Geochimica et Cosmochimica Acta 71: 2791-2808. doi:10.1016/j.gca.2006.06.606.

Jourdan, F., Renne, P.R., Reimold, W.U.. The problem of inherited 40Ar* in dating impact glass by the 40Ar/39Ar method: Evidence from the Tswaing impact crater (South Africa): Geochimica et Cosmochimica Acta 71: 1214-1231. doi:10.1016/j.gca.2006.11.013

Kingston, J.D., Deino, A., Hill, A., Edgar, R., in press, Astronomically forced climate change in the Kenyan Rift Valley 2.7–2.55 Ma: Implications for the evolution of early hominin ecosystems: J. hum. Evol.

Kulp, W. D., Wood, J. L., Allmond, J. M., Eimer, J.,. Furse, D., Krane, K. S., Loats, J., Schmelzenbach, P., Stapels, C. J., Larimer, R.-M., Norman, E. B., Piechaczek, A., 90 Region: The Decays of 152Eum,g to 152Sm., Phys. Rev, C (accepted).

Leloup, P.H., Arnaud, N., Lacassin, R., and Sobel, E.R., 2007, Reply to comment by Y. Rolland et al. on "Alpine thermal and structural evolution of the highest external crystalline massif: The Mont Blanc": Tectonics, v. 26, p. TC2016, 10.1029/2006TC002022.

Levine, J., Renne, P.R., Muller, R.A., 2007, Solar and Cosmogenic Argon in Dated Lunar Impact Spherules: Geochimica et Cosmochimica Acta 71: 1624-1635.

Little, T.A., Baldwin, S.L., Fitzgerald P.G. and Monteleone, B.. "A young metamorphic core complex on Normanby Island, D'Entrecasteaux Islands, Papua New Guinea: Continental rifting processes near the Woodlark spreading ridge.", Tectonics, p. TC1002, vol. 26, (2007). 10.1029/2005TC001911.

Lo,D.,. Fleischer, R. L.,. Albert, E. A., and. Arnason, J.G , Environ. J.. "Size and Location of Depleted Uranium Grains in Reservoir Sediments", Radioactivity. 89, 240-248 (2006).

Love, C.S. and Morrell, J J.. 2007. Effect of barriers on moisture content of treated and non-treated utility poles. International Research Group on Wood Protection Document No IRG/WP/07-40369.

Maoz, M., Weitz, I, Blumenfeld, M, Freitag, C and Morrell, J J 2007. Antifungal activity of plant derived extracts against G. trabeum. International Research Group on Wood Protection Document No IRG/WP/07-30433.

Medaris, L.G. Jr., Van Schmus W.R., Loofboroc, J., Zhang, X., Holm, D.K., Singer, B.S., and Dott, R.H. Jr. (2007) Two Paleoproterozoic (Statherian) Siliciclastic Metasedimentary Sequences in Central Wisconsin: The End of the Penokean Orogeny and Cratonic Stabilization of the Southern Lake Superior Region. Precambrian Research, v. 157, p. 188-202.

Mertz, D.F., Renne, P.R., Wuttke, M., Modden, C., 2007, A numerically calibrated reference level (MP28) for the terrestrial mammal-based biozonation of the European Upper Oligocene: International Journal of Earth Sciences 96: 353-361.

Mitsuhashi, J., Morrell, J J, Jin, L, and Preston., A F 2007. The effect of additives on copper losses from alkaline copper treated wood. International Research Group on Wood Protection Document No IRG/WP/07-50246.

Mora, A., Parra, M., Strecker, M., Sobel, E., Hooghiemstra, H., Torres, V., Vallejo, J., in review. Climate forcing of asymmetric orogenic evolution in the Eastern Cordillera of Colombia. GSA Bulletin.

Mora. A. Gaona, T. Kley, J. Montoya, D. Parra, M. Quiroz, L.I: Reyes, G. Strecker, M., in review. Reconstruction of Lower Cretaceous inverted rift basins in the Eastern Cordillera of Colombia. Influences of extensional fault segmentation and linkage in contractional orogenesis. Basin Research.

Morrell, J.J. and. Manning, M.J.. 2007. Durability of wood plastic composites: where we've been and how we can get better. Proceedings, 3rd Wood Fibre Polymer Composites International Symposium, Cite Mondiale, Bordeaux France (March 26-27, 2007). Pages 1-13.

Mortimer, E., Carrapa, B., Coutand, I., Schoenbohm, L., Sobel, E.R., Sosa Gomez, J., and Strecker, M.R., 2007, Fragmentation of a foreland basin in response to out-of-sequence basement uplifts and structural reactivation: El Cajón–Campo del Arenal basin, NW Argentina: Geological Society of America Bulletin, v. 119, p. 637–65.

Mueller, P.A., Foster, D.A., Mogk, D.W. , Wooden, J.L., Kamanov, G.D., Vogl, J.J.. Detrital mineral chronology of the Unita Mountain Group: Implications for the origin of Mesoproterozoic detritus in southwestern Laurentia: Geology, v. 35, p. 431-434; doi:10.1130/G23148A.1.

Mulcahy, S.R., Roeske, S.M., McClelland, W.C., Nomade, S., and Renne, P.R., 2007, Cambrian initiation of the Las Pirquitas thrust of the western Sierras Pampeanas, Argentina: Implications for the tectonic evolution of the proto-Andean margin of South America: Geology 35: 443-446.

Murrell, G.R., Sobel, E.R., Carrapa, B., and Andriessen, P., in rereview, Calibration and comparison of etching and thermal modeling techniques for apatite fission track thermochronology: Special Publication Geological Society of London.

Nomade, S., Knight, K.B., Beutel, E., Renne, P.R., Vérati, C., Féraud, G., Marzoli, A., Youbi, N., and Bertrand, H., 2007, Chronology of the Central Atlantic Magmatic Province: Implications for the Central Atlantic rifting processes and the Triassic-Jurassic biotic crisis: Palaeogeography, Palaeoclimatology, Palaeoecology 244: 326-344.

Palfy, J., Mundil, R., Renne, P.R., Bernor, R.L., Kordos, L., and Gasparik, M., 2007, U-Pb and 40Ar/39Ar dating of the Miocene fossil track site at Ipolytarnóc (Hungary) and its implications: Earth and Planetary Science Letters 258: 160-174. doi:10.1016/j.epsl.2007.03.029

Parra, M., Mora, A., Jaramillo, C., Strecker, M.R., Sobel, E.R., Quiroz, L.I., Rueda, M., and Torres, V., in review, Orogenic lateral growth in the northern Andes: evidence from the Oligo-Miocene sedimentary record of the Medina Basin, Eastern Cordillera, Colombia: Geological Society of America Bulletin.

Renne, P.R., 2006, Progress and Challenges in K-Ar and 40Ar/39Ar Geochronology, in Geochronology: Emerging Opportunities (T.D. Olszewski, Ed.), Paleontology Society Papers 12: 47-66

Ritts, B.D., Yue, Y.J., Graham, S.A., Sobel., E.R.. Abbinjk, O., and Stockli, D., in review, From sea level to high elevation in 15 Million Years: Uplift history of the northern Tibetan Plateau margin in the Altun Shan, submitted to American Journal of Science.

Rosset, A., De Min, A., Marques, L.S., Macambira, M.J.B., Ernesto, M., Renne, P.R., and Piccirillo, E.M., 2007, Genesis and geodynamic significance of Mesoproterozoic and Early Cretaceous tholeiitic dike swarms from the São Francisco craton (Brazil): Journal of South American Earth Sciences, in press.

Silva, A., Gartner, B.L., and Morrell, J.J. 2007. Towards the development of accelerated methods for assessing the durability of wood plastic composites. Journal of Testing and Evaluation 35(3):203-210.

Simon, J.I., Renne, P.R., Mundil, R., Implications of pre-eruptive magmatic histories of zircons for U-Pb geochronology of silicic extrusions: Earth and Planetary Science Letters, in review.

Singer, B.S., Hoffman, K.A., Schnepp, E., Guillou, H., Brunhes Chron Excursions in the West Eifel Volcanic Field: Mantle Control on the Non-Axial Dipole Field. Physics of the Earth and Planetary Interiors (Invited submission to special issue on the Geodynamo, 9/07).

Singer, B.S., Jicha, B.R., Narranjo, Lara, L.E., Moreno-Roa, H., Harper, M.A. (2007) Eruptive history, geochronology, and magmatic evolution of the Puyehue-Cordon Caulle volcanic complex, Chile, GSA Bulletin, in press.

Smith, M.E., Singer, B.S., Carroll, A.R., Fournelle, J.H., Biotite 40Ar/39Ar geochronology: Empirical evidence for alteration effects. American Mineralogist (in press).

Sobel, E. R., Oskin, M., Burbank, D., and Mikolaichuk, A., 2006, Exhumation of basement-cored uplifts: Example of the Kyrgyz Range quantified with apatite fission-track thermochronology: Tectonics, v. 25, TC2008, doi:10.1029/2005TC001809.

Sobel, E.R., Chen, J., and Heermance, R.V., 2006, Late Oligocene - Early Miocene initiation of shortening in the Southwestern Chinese Tian Shan: Implications for Neogene shortening rate variations: Earth and Planetary Science Letters, v. 247, p. 70-81.

Strecker, M.R., Alonso, R.N., Bookhagen, B., Carrapa, B., Hilley, G.E., Sobel, E.R., and Trauth, M.H., 2007, Tectonics and Climate of the Southern Central Andes: Annu. Rev. Earth Planet. Sci, v. 35, p. 747–87.

Taylor, A.M., Mason, L.J., and Morrell, J.J.. 2007. Effect of ozone treatment on survival of termites and wood decay fungi. International Research Group on Wood Protection Document No IRG/WP/07-40365.

Vidrine, C., Freitag, C., Nicholson, J., and Morrell, J. J.. 2007. Effects of heat treatments on decay resistance and material properties of ponderosa pine and yellow poplar. International Research Group on Wood Protection Document No IRG/WP/07-40374.

Thiede, R.C., Arrowsmith, J.R., Bookhagen, B., McWilliams, M., Sobel, E.R., Strecker, M.R., 2006, Dome formation and extension in the Tethyan Himalaya, Leo Pargil, Northwest India: GSA Bulletin, v. 118, no. 5/6, p. 635-650, doi: 10.1130/B25872.1.

Thouret, J.-C., Wörner, G., Gunnell, Y., Singer, B., Zhang, X., Souriot, T. (2007) Geochronologic and stratigraphic constraints on canyon incision and Miocene uplift of the Central Andes in Peru, Earth & Planetary Science Letters, in press.

Trauth, M.H., Maslin, M., Deino, A., Strecker, M.R., Bergner, A.G.N., and Dühnforth, M., in press, Three million years history of the East African Lakes: Journal of Human Evolution.

Unruh, J., Dumitru, T.A., and Sawyer, T.. Coupling of early Tertiary extension in the Great Valley forearc basin with blueschist exhumation in the underlying Franciscan accretionary wedge at Mt. Diablo, California, Geological Society of America Bulletin, accepted, in press.

Valli, F., Arnaud, N., Leloup, P.H., Sobel, E.R., Maheo, G., Lacassin, R., Guillot, S., Li, H., and Tapponnier, P., 2007, 2007, Twenty million years of continuous deformation along the Karakorum fault, western Tibet: A thermochronological analysis: Tectonics, v. 26, p. doi:10.1029/2005TC001913.

Verdel, C., Wernicke, B.P., Ramezani, J., Hassanzadeh, J., Renne, P.R., and Spell, T.L., 2007, Geology and thermochronology of Tertiary Cordilleran-style metamorphic core complexes in the Saghand region of central Iran: Geological Society of America Bulletin 119: 961-977. doi: 10.1130/B26102.1

Vogel, N., Nomade, S., Negash, A., and Renne, P.R., 2006, Forensic 40Ar/39Ar dating: A provenance study of Middle Stone Age obsidian tools from Ethiopia: Journal of Archeological Science 33: 1749-1765.

Vogel, N., Renne, P.R., 40Ar-39Ar dating of plagioclase grain size separates from silicate inclusions in IAB iron meteorites and implications for the thermochronological evolution of the IAB parent body: Geochimica et Cosmochimica Acta, in review.

Wakabayashi, J. and Dumitru, T.A.. 40Ar/39Ar ages from coherent, high-pressure metamorphic rocks of the Franciscan Complex, California: Revisiting the timing of metamorphism of the world's type subduction complex, International Geological Review, accepted, in press.

West, D. P., Jr., Roden-Tice, M.K., Potter, J.K., and Barnard N. Accessing the Role of Orogen-Parallel Faulting in Post-Orogenic Exhumation: Low-Temperature Thermochronology across the Norumbega Fault System, Maine. Submitted to the Canadian Journal of Earth Sciences, 7/07.

Presentaions

Altamira, A., Burke, K.,. Copeland, P., Foster, D.A. 2006, New 40Ar/39Ar ages support the dominant right-lateral transform motion within the CARIP-SOAM PBZ since Middle Eocene: American Geophysical Union Fall Meeting, 11-15 December, San Francisco T43D-1673.

Baldwin S.L. and P.G. Fitzgerald, "Using thermochronology to determine the timing and rates of tectonic processes", 16th Annual V.M. Goldschmidt Conference, (2006).

Baldwin S.L., L.E. Webb, T.A. Little, P.G. Fitzgerald and B. Monteleone, "Bridging the scales to investigate mechanisms of HP/UHP exhumation in the active Woodlark rift, Papua New Guinea" Conference on Subduction zone dynamics -- bridging the scales. Germany. (2007).

Baldwin S.L., Webb, L.E., Monteleone, B., Little, T.A., Fitzgerald, P.G., Peters, K. and J.L. Chappell, "Continental Crust Subduction and Exhumation: insights from eastern Papua New Guinea.", Geochimica et Cosmochimica Acta Supplement, p. 31, vol. 70(1, (2006).

Baldwin, S.L., Monteleone, B.D., Little, T.A., Webb, L.E., and Fitzgerald, P.G., "Subduction to rifting evolution of the Australian–Woodlark plate boundary zone of eastern Papua New Guinea: insights into the 4-D nature of continental subduction and exhumation processes", Geological Society of America Abstracts with Programs, p. 274, vol. 38(7), (2006).

Beardsley, A.G., Ave Lallemant, H.G., and Roden-Tice, M.K. (2006). Shallow Level Exhumation History of the Leeward Antilles, Offshore Venezuela: Evidence from Fluid Inclusion Analysis. Geological Society of America Abstracts with Programs, v. 38, p. 209. National Meeting of the Geological Society of America, October 22-25, 2006, Philadelphia, PA.

Brownlee, S.J., Renne, P.R., and Hollister, L.S., 2006, Comparison of Paleomagnetic and 40Ar/39Ar results from two plutons near Prince Rupert, British Columbia: Eos Transactions American Geophysical Union, 87(52), Fall Meeting Supplement, Abstract V21A-0563.

Chang, S., Mundil, R., and Renne, P.R., 2006, U/Pb and Ar/Ar Dating of Latest Permian Magnetic Polarity Reversals in the Ochoan of western Texas: Eos Transactions American Geophysical Union, 87(52), Fall Meeting Supplement, Abstract V21A-0565.

Deeken, A., Sobel, E.R., Coutand, I., Haschke, M., Riller, U., and Strecker, M.R., 2006, Construction of the southern Eastern Cordillera, NW-Argentina: from early Cretaceous extension to middle Miocene shortening, constrained by apatite fission track thermochronometry, in Ventura, B., and Lisker, F., eds., European Conference on thermochronology, Volume 49: Schriftenreihe der Deutschen Gesellschaft fuer Geowissenschaften: Bremen, p. 31.

Deino, A., Luque, L., and Domínguez-Rodrigo, M., 2006, 40Ar/39Ar dating of the Pleistocene Peninj Group, Lake Natron, Tanzania, AGU Fall Meeting.

Dumitru, T. A., Wright, J. E., Wakabayashi, J., and Wooden, J. L., 2006, Geochronology of the Franciscan Eastern Belt in the Yolla Bolly area, northern California, and the nature of the South Fork Mountain Schist [abs.]: EOS (Transactions, American Geophysical Union), v. 87, no. 52 (fall meeting supplement), abstract no. T11D-0469.

Escobar Wolf, R.P., Singer, B.S., Diehl, J.F., Rose, W.I., Zhang, X. (2006) Long-term evolution of Volcán de Santa María, Guatemala from 40Ar/39Ar geochronology, paleomagentic stratigraphy, and geochemistry, Eos Trans. AGU, 86(52), Fall meet. Suppl., abstract V11A-0554.

Feraud, G., Jourdan, F., Bertrand, H., Watkeys, M., and Renne, P.R., 2006, Distinct brief major events in the Karoo large igneous province clarified by new 40Ar/39Ar ages on the Lesotho basalts: Eos Transactions American Geophysical Union, 87(52), Fall Meeting Supplement, Abstract V21A-0561.

Foster, D., Gray, D., and Bierlein, F., 2007, Paleozoic continental growth, recycling, crustal structure, and metallogeny in the Lachlan Orogen, Eastern Australia: Ores and Orogenesis Symposium, Arizona Geological Society, September 24-30, Program with Abstracts, p. 100.

Foster, D.A., and Gray D.R., 2006, Strain rate in a turbidite fold-thrust belt in the southwestern Lachlan Orogen, Australia: Geological Society of America Annual Meeting, Philadelphia, 22-25 October. Geological Society of America Abstracts with Programs, v. 38, p. 131.

Harper, S.L., B.L.S. Maddux, J.E. Hutchison and R.L. Tanguay. 2007. Biodistribution and toxicity of nanomaterials in vivo: effects of composition, size, surface functionalization and route of exposure. NSTI Nanotech 2007.

Harper, S.L., R.L. Tanguay and J.E. Hutchison. 2007. In vivo toxicity evaluations of gold nanoparticles: proactively designing safer nanomaterials. Society of Toxicology.

Jarboe, N.A., Coe, R.S., Renne, P.R., and Glen, J.M., 2006, 40Ar/39Ar Ages of the Early Columbia River Basalt Group: Determining the Steens Mountain Geomagnetic Polarity Reversal (R0-N0) as the top of the C5Cr Chron and the Imnaha Normal (N0) as the C5Cn.3n Chron: Eos Transactions American Geophysical Union, 87(52), Fall Meeting Supplement, Abstract V51D-1702.

Jicha, B.R., Singer, B.S., Beard, B.L., Johnson, C.M. (2006) Rapid magma ascent and the generation of 230Th excesses in the lower crust at Puyehue-Cordón Caulle, Southern volcanic zone, Chile, Eos Trans. AGU, 86(52), Fall meet. Suppl., abstract V51D-1514.

Jicha, B.R., Singer, B.S., Beard, B.L., Johnson, C.M., Moreno Roa, H., Naranjo, J.A. (2007) U-Th isotopes, rapid magma ascent, and MASH processes at Puyehue-Cordón Caulle, Southern Volcanic Zone, Chile, State of the Arc (SOTA) 2007 meeting, Jan. 28-Feb. 2, Termas Puyehue, Chile.

Jicha, B.R., Singer, B.S., Johnson, C.M., Beard, B.L., Hora, J.M. (2007) Shallow crystallization and deep magma storage: insights from U-Th and 40Ar/39Ar geochronology, 17th annual Goldschmidt meeting, Cologne, Germany.

Jourdan, F. and Renne, P.R., 2006, Age Calibration of the Fish Canyon Sanidine 40Ar/39Ar Dating Standard Using Primary K- Ar Standards: Eos Transactions American Geophysical Union, 87(52), Fall Meeting Supplement, Abstract V21A-0560.

Jourdan, F., Matzel, J.P., and Renne, P.R., 2006, Ar-39 and Ar-37 recoil ejection during and plagioclase crystals: Geochimica et Cosmochimica Acta 70 (18): A299-A299 Suppl. S.

Krane, K. S. Physics Colloquium, North Carolina State University, Nov. 2006. "Neutron Capture Cross Sections of Stable and Radioactive Nuclei,"

Levine, J., Renne, P.R., and Muller, R.A., 2006, Solar Argon Recorded in Dated Lunar Impact Spherules: Eos Transactions American Geophysical Union, 87(52), Fall Meeting Supplement, Abstract SM43A-1471.

Little, T.A., Monteleone, B. D., Baldwin, S.L., Fitzgerald, P.G., "Rapid Slip-Rate and Low Shear Strength of a High Finite-Slip Low-Angle Normal Fault: Normanby Island, Woodlark Rift, Papua New Guinea,", EOS, Transactions of the American Geophysical Union, p. T53A-1572, vol. 87(52), (2006).

Matzel, J., Mundil, R., Renne, P.R., and Paterson, S., 2006, Using 40Ar/39Ar Thermochronology to Track the Thermal Evolution of the Tuolumne Batholith, Sierra Nevada, CA: Eos Transactions American Geophysical Union, 87(52), Fall Meeting Supplement, Abstract V51E-1715.

Monteleone, B., S.L. Baldwin, L.E. Webb, P.G. Fitzgerald and T.A, Little, "Metamorphic core complex formation in the D'Entrecasteaux Islands, SE Papua New Guinea", Circum-Pacific Tectonics, Geologic Evolution, and Ore Deposits, (2007).

Mora, A. Parra, M., Strecker, M., QUIROZ. L.(2006) Inverted structures in an active contractional orogen: insights from facies, provenance, and structural analysis in the Eastern Cordillera of Colombia. Sediment-2006. Conference SEPM, June 2006.

Mora, A. Parra, M., Strecker, M. (2006) The role of penetrative deformation in orogenic processes. An example from the Eastern Cordillera of Colombia. 11 Symposium "Tektonik, Struktur- und Kristallingeologie". Göttingen, Germany. March 22-24 del 2006.

Mora, A., Parra, M., Strecker, M.R., and Sobel, E.R., 2006, Erosion and the structural geometry of inversion orogens: insights from the Eastern Cordillera of Colombia, 96th Annual Meeting Geologische Vereinigung, Volume 2006/3: Terra Nostra: Potsdam, p. 75.

Mora, A; Parra, M; Strecker, M; Sobel, E.R. Cenozoic Tectonic Evolution of the Colombian Eastern Cordillera and adjacent Foreland Basins (2007). Laboratoire des Mecanismes et Transferts en Geologie. Toulouse.

Mora, A; Parra, M; Strecker, M; Sobel, E.R. Late Cenozoic climatic forcing of geologic processes in the Eastern Cordillera of Colombia (2007). Smithsonian Tropical Research Institute. Panama

Mora, A. Parra, M., Strecker, M., Sobel, E. (2006). Erosion and the structural geometry of inversion orogens. Insights from the Eastern Cordillera of Colombia. Geologische Vereinigung International Conference, Septiembre 2006

Mortimer, E., Carrapa, B., Coutand, I., Schoenbohm, L., Sobel, E.R., Gomez, J.S., and Strecker, M.R., 2006, Fragmentation of a foreland basin in response to out-of-sequence basement uplifts and structural reactivation: El Cajon-Campo del Arenal basin, NW Argentina, 96th Annual Meeting Geologische Vereinigung, Volume 2006/3: Terra Nostra: Potsdam, p. 76.

Mundil, R., Metcalfe, I., Chang, S., and Renne, P.R., 2006, The Permian-Triassic boundary in Australia: New radio-isotopic ages: Geochimica et Cosmochimica Acta 70 (18): A436-A436 Suppl. S.

Mundil, R., Renne, P.R., Min, K.K., and Ludwig, K.R., 2006, Resolvable miscalibration of the 40Ar/39Ar geochronometer: Eos Transactions American Geophysical Union, 87(52), Fall Meeting Supplement, Abstract V21A-0543.

Parra, M., A. Mora, C. Jaramillo E.R Sobel and M. Strecker (2006). Late Oligocene to Miocene foreland-basin evolution in the Medina Basin, Colombia: tracking the record of the uplift and growth of the Eastern Cordillera in the northern Andes. 4th Latin American Congress on Sedimentology, November 20-24, San Carlos de Bariloche, Argentina.

Parra, M., A. Mora, C. Jaramillo E.R Sobel and M. Strecker (2006). Palaeogene mountain building in the northeastern Andes reflected by syntectonic sediments in the Medina Basin, Eastern Cordillera (4-5°Lat N) Colombia. Geologische Vereinigung Conference, September 2006, Potsdam, Germany, p56.

Parra, M., Mora, A., Jaramillo, C., Sobel, E.,Strecker., M (2006) Foreland basin evolution as reflected from syntectonic sediments in the Medina Basin, Eastern Cordillera, Colombia. Geologische Vereinigung International Conference, September 2006.

Parra, M., Mora, A., Sobel. E.R., Jaramillo, C. and Strecker, M.R., Cenozoic exhumation history in the northeastern Andes: new data based on low-T thermochronology and basin analysis in the Eastern Cordillera of Colombia. European Geosciences Union General Assembly 2007, April 15-20, Vienna, Austria

Renne, P.R., 2006, Progress and Challenges in K-Ar and 40Ar/39Ar Geochronology: Paleontological Society Short Course

Roden-Tice, M.K. and Wintsch, R.P. (2007). Late Jurassic to Early Cretaceous Exhumation in Eastern Massachusetts and Connecticut based on Apatite Fission-Track Age Gradients and Discontinuities. Geological Society of America Abstracts with Programs, v. 39, p.94. Northeastern Section Meeting of the Geological Society of America, March 12-14, 2007, Durham, NH.

Semerad, J.N., Roden-Tice, M.K., and Lupulescu, M.V. (2007). Comparison of Apatite Fission-Track Ages and Trace Element Concentrations in Apatites from Iron Ore Deposits in the Adirondack Mountains of New York State and Carbonatites in Southern Ontario. Geological Society of America Abstracts with Programs, v. 39, p.41. Northeastern Section Meeting of the Geological Society of America, March 12-14, 2007, Durham, NH.

Shape Coexistence in Transitional Nuclei, W. D. Kulp, P. Schmelzenbach, J. L. Wood, J. M. Allmond, K. S. Krane, J. Loats, C. J. Stapels, and E. B. Norman, American Physical Society Division of Nuclear Physics Meeting, Newport News VA, October 2007.

Simon, J.I., Renne, P.R., and Vazquez, J., 2006, High Precision Ar/Ar Ages of Coso Volcanic Field Rhyolites: A Requirement for Constraining Eruption and Subvolcanic Time Scales: Eos Transactions American Geophysical Union, 87(52), Fall Meeting Supplement, Abstract V21A-0562.

Simon, J.I., Renne, P.R., Mundil, R., and Ludwig, K.R., 2006, Implications of Pre-eruptive Zircon Saturation in Silicic Magmas for High-Precision U/Pb Geochronology: Eos Transactions American Geophysical Union, 87(52), Fall Meeting Supplement, Abstract V21A-0564.

Singer, B.S., Guillou, H., Zhang, X., Schnepp, E., Hoffman, K.A. (2006) Multiple Brunhes chron excursions recorded in the Eifel volcanic field, Eos Trans. AGU, 86(52), Fall meet. Suppl., abstract GP21A-1301.

Sobel, E., Coutand, I., Deeken, A., and Hilley, G., 2006, Links Between Rock Erodability, Topographic Growth and Flexural Subsidence, AGU Fall meeting: Eos, Trans. AGU: San Francisco.

Sobel, E.R., and Seward, D., 2006, Influence of etching conditions on apatite fission track etch pit diameter, in Ventura, B., and Lisker, F., eds., European Conference on thermochronology, Volume 49: Schriftenreihe der Deutschen Gesellschaft fuer Geowissenschaften: Bremen, p. 128-130.

Sobel, E.R., Coutand, I., and Deeken, A., 2006, Links between rock erodability, topographic growth and flexural subsidence, 96th Annual Meeting Geologische Vereinigung, Volume 2006/3: Terra Nostra: Potsdam, p. 94.

Terrien, J.J., Baldwin, S.L., and G. Gehrels, "Correlation between structural level and age of the Wilderness sills: Implications for a complex cooling history", Circum-Pacific Tectonics, Geologic Evolution, and Ore Deposits, (2007).

Thiede, R.C., Arrowsmith, J.R., Bookhagen, B., McWilliams, M., Sobel, E.R., and Strecker, M.R., 2006, Timing of dome formation in the Tethyan Himalaya, Leo Pargil (NW India), in Ventura, B., and Lisker, F., eds., European Conference on thermochronology, Volume 49: Schriftenreihe der Deutschen Gesellschaft fuer Geowissenschaften: Bremen, p. 144.

Oregon State University Radiation Center, 100 Radiation Center, Corvallis, OR 96331

www.radiationcenter@oregonstate.edu