DOE/ER/10733-11

PARTICIPATION IN THE UNITED STATES DEPARTMENT OF ENERGY REACTOR SHARING PROGRAM

An Annual Report

August 31, 1991 - August 29, 1992

Submitted to:

Department of Energy
Contracts Division
Chicago Operations Office
9800 South Cass Avenue
Argonne, IL 60439

Attention:

Renee L. Irwin
Contract Specialist

Submitted by:
R. U. Mulder
Assistant Professor and
Director of Reactor Facility

P. E. Benneche
Reactor Services Supervisor

B. Hosticka
Research Scientist

SEAS Report No. UVA/527277/NEEP92/111
May 1992

PREPARED FOR THE U.S. DEPARTMENT OF ENERGY
UNDER GRANT NUMBER DE-FG07-80ER10733

DEPARTMENT OF NUCLEAR ENGINEERING
AND ENGINEERING PHYSICS

SCHOOL OF
ENGINEERING
& APPLIED SCIENCE

University of Virginia
Thornton Hall
Charlottesville, VA 22903

UNIVERSITY OF VIRGINIA
School of Engineering and Applied Science

The University of Virginia's School of Engineering and Applied Science has an undergraduate enrollment of approximately 1,500 students with a graduate enrollment of approximately 600. There are 160 faculty members, a majority of whom conduct research in addition to teaching.

Research is a vital part of the educational program and interests parallel academic specialties. These range from the classical engineering disciplines of Chemical, Civil, Electrical, and Mechanical and Aerospace to newer, more specialized fields of Applied Mechanics, Biomedical Engineering, Systems Engineering, Materials Science, Nuclear Engineering and Engineering Physics, Applied Mathematics and Computer Science. Within these disciplines there are well equipped laboratories for conducting highly specialized research. All departments offer the doctorate; Biomedical and Materials Science grant only graduate degrees. In addition, courses in the humanities are offered within the School.

The University of Virginia (which includes approximately 2,000 faculty and a total of full-time student enrollment of about 17,000), also offers professional degrees under the schools of Architecture, Law, Medicine, Nursing, Commerce, Business Administration, and Education. In addition, the College of Arts and Sciences houses departments of Mathematics, Physics, Chemistry and others relevant to the engineering research program. The School of Engineering and Applied Science is an integral part of this University community which provides opportunities for interdisciplinary work in pursuit of the basic goals of education, research, and public service.

DOE/ER/10733--11

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Department of Nuclear Engineering and Engineering Physics
SCHOOL OF ENGINEERING AND APPLIED SCIENCE
UNIVERSITY OF VIRGINIA
CHARLOTTESVILLE, VIRGINIA

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Copy No. 2

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SECTION I

PARTICIPATION IN THE U.S. REACTOR SHARING PROGRAM

1991 - 1992

A. INTRODUCTION

The University of Virginia Reactor Facility is an integral part of the Department of Nuclear Engineering and Engineering Physics (to become the Department of Mechanical, Aerospace and Nuclear Engineering on July 1, 1992). As such, it is effectively used to support educational programs in engineering and science at the University of Virginia as well as those at other area colleges and universities. The expansion of support to educational programs in the mid-east region is a major objective.

To assist in meeting this objective, the University of Virginia has been supported under the U.S. Department of Energy (DOE) Reactor Sharing Program since 1978. Due to the success of the program, this proposal requests continued DOE support through August 1993. Specifically, $XX,XXX in new funds is requested.

B. SUMMARY OF OBJECTIVES AND UVA'S PARTICIPATION IN DOE'S REACTOR SHARING PROGRAM

The objective of the DOE supported Reactor Sharing Program is to increase the availability of university nuclear reactor facilities to non-reactor owning educational institutions. The educational and research programs of these user institutions is enhanced by the use of the nuclear facilities.

Two specific methods have been used by the University of Virginia Reactor Facility to achieve this objective. First, advanced undergraduate and graduate

classes from area colleges and universities visit the facility to perform experiments in nuclear engineering and physics which would not be possible at the user institution. Second, irradiation services are made available for unsupported research by faculty and students from user institutions. These two areas are discussed below.

B.1. Student Participation in Experiments and Reactor Facility Tours

A major portion of the Reactor Sharing Program involves groups of students visiting the Nuclear Reactor Facility as part of a tour or to perform experiments involving the use of radioisotopes. Over 1000 students have participated in these activities. A summary of the colleges and universities participating in this portion of the program is provided in Table 1.

The most common experiments fall into three general areas. These are: Radiation and Radioactive Decay, Radioisotope Applications in Science and Industry, and Reactor Operation. A brief description of several of the available experiments is provided in Table II. In addition, special experiments can be arranged to meet the needs of classes in biology, chemistry and physics.

The use of neutron activation analysis for identification of the elemental composition of materials continues to be the most popular experiment. This is a result of the wide application of neutron activation analysis for research in many areas of science. In addition to learning how to use neutron activation analysis, the students also increase their understanding of radioactive decay and interaction of radiation with matter.

The second most requested experiment involves measurements of the decay of radioactive isotopes. The half-life of various short-lived reactor produced isotopes,

such as aluminum-28 and magnesium-27, are determined. Also, the decay of one isotope into another radioactive isotope is measured to demonstrate the concept of decay chains.

The University of Virginia supplies background information to the course instructors who use the material to prepare the students for a visit to the Reactor Facility. Once at the Reactor Facility, the students perform experiments under the direction of a reactor staff member or a faculty member.

Most faculty members and students participating in these experiments have stated that they were an important addition to their classes. The positive impact of these experiments is also indicated by the number of classes making repeat visits.

TABLE 1

Summary of Participation in Laboratories, Training Sessions and Tours Under the Auspices of the Reactor Sharing Program (September 1978 - April 1992)

University or College	This year	Discipline	Number of Visits	Faculty Contact
Bridgewater College		Chemistry	1	J. Martin
		Physics	2	D. Neher
	*	Physics	1	P. Spickler
		Physics	4	J. Ulrich
Emory & Henry College		Physics	1	C. Nelson
Hampton University		Physics	1	K. Han
James Madison University	*	Physics	9	J. Gordon
		Physics	1	R. Serway
		Chemistry	5	D. Downey
		Biology	3	M. Gordon
J.S. Reynolds Comm. College		Chemistry	1	J. Martin
Longwood College		Physics	2	L. Fawcett
Lynchburg College	*	Chemistry	16	N. Summerlin
Mary Washington College	*	Physics	7	R. Atalay
		Physics	1	G. King
Piedmont Va. Comm. College	*	Physics	6	R. Bratton
		Physics	1	J. Walpole
		Physics	4	T. Lowe
Randolph Macon College		Physics	1	W. Temple
Randolph Macon Women's College		Physics	2	B. Mattson
Roanoke College		Physics	1	W. Baldridge
		Physics	1	J. Adams
Shepherd College		Chemistry	1	W. Crum
S.W. Va. Community College		Chemistry	2	R. Epling
Sweetbriar College		Chemistry	8	H. Gager
University of Richmond		Physics	1	W. Major
		Physics	1	M. Vineyard
Virginia Commonwealth Univ.	*	Physics	2	S. Herr
Virginia Military Institute		Chemistry	2	R. Minnix
		Chemistry	5	H. Schreiber
		Physics	2	P. Peters
		Psychology	1	D. Foster
Virginia Tech.	*	Physics	14	T. Parkinson
		Env.&Haz.Mat.	1	D. Orvos
College of William & Mary		Marine Science	3	J. Warinner

* These institutions and faculty members participated in the Reactor Sharing Program during the current and/or previous contract year.

Additionally, numerous high school groups have toured the facility and some of these have also participated in simple laboratory exercises. In the 1990-91 contract year, 474 primary and secondary school students and their teachers visited the reactor.

TABLE II
EXPERIMENTS PERFORMED FOR THE UNIVERSITY OF VIRGINIA
REACTOR SHARING PROGRAM

A. RADIATION AND RADIOACTIVE DECAY OF ISOTOPES

1. Radiation Counting Statistics

Demonstration of the random nature of radioactive disintegrations at both low and high disintegration rates. Using a multi-scaler, series of counts are taken which, respectively, approach a Poisson distribution and a Gaussian distribution.

2. Radioisotope Decay and Half-Life Determination

Demonstration of radioactive decay and determination of reactor produced, short-lived isotope half-life using a multi-scaler. More complex decay chains may also be demonstrated, such as decay of two isotopes with differing half-lives or decay of two isotopes, one of which decays to the other.

3. Types of Radiation

Characterization of different types of radiation including determination of alpha and beta energy spectra using silicon surface barrier devices and gamma spectra using either a sodium-iodide scintillator or a germanium detector. Effectiveness of shielding materials for the various radiation types may also be demonstrated.

4. Radiation Intensity and Shielding

Demonstration of the decrease in radiation intensity as a function of the inverse square of distance from the radiation source. Determination of source activity from measured dose rates and radiation energy. Effectiveness of radiation shields may also be included.

5. Gamma-Gamma Coincidence Techniques

Demonstration of angular correlation of gamma rays from cobalt-60 and of annihilation radiation from sodium-22. The absolute activity of sodium-22 may also be determined.

6. Binding Energy of Last Neutron in Deuterium and Mass of Neutron

Measurement of the energy of the hydrogen neutron capture gamma ray yields the binding energy of the neutron and allows the calculation of the mass of a neutron.

TABLE II (continued)

B. RADIOISOTOPE APPLICATIONS IN SCIENCE AND INDUSTRY

1. Neutron Activation Analysis

Demonstration of trace element analysis using neutron activation analysis. A sample is activated in the UVAR and its constituents determined from the nature of its radioactive decay. Activation analysis of a coin, lipstick, hair, environmental samples, or other samples may be performed.

2. X-Ray Fluorescence Analysis

Demonstration of the chemical analysis of thin samples using an Am-241 x-ray exciter source and a germaniurn-lithium low-energy photon spectrometer. The x-ray spectrum measured from the material is used to determine the chemical composition of the surface.

3. Industrial Applications of Radioisotopes

Demonstration of the use of radioisotopes in industrial applications, such as thickness gauging, liquid level sensing and flow detection. Beta, gamma and neutron sources are used.

C. REACTOR EXPERIMENTS

1. Approach to Critical

Demonstration of the subcritical multiplication of neutrons until a self-sustaining fission reaction is obtained.

2. Reactor Dynamics and Safety Systems

Demonstration of changes in reactor power resulting from control rod position changes. Calibration of control rods and demonstration of reactor safety systems.

3. Decay Heat Following Reactor Shutdown

Measurement of heat generation from fission and fission product decay following a reactor shutdown. Measurements are read from nuclear instrumentation and calculated from primary system heat balance.

B.2. Research Projects for the Reactor Sharing Program

A second objective of the Reactor Sharing Program is to offer the UVAR nuclear reactor and counting facilities for general use in research projects. For example, some experiments are been performed to determine the effects of radiation on materials. However, the major is in the area of neutron activation analysis (NAA).

Neutron activation analysis is a method of determining the elemental composition of a sample by placing it in the neutron flux of a nuclear research reactor. The neutrons interact with elements in the sample, transforming a small fraction of these into radioactive isotopes. The quantity of isotopes produced is established by the amount of each element present in the sample, the level of the neutron flux, and the irradiation time.

Once produced, each radioisotope emits characteristic gamma- rays by which the elements in the sample can be identified. When the sample is counted on sensitive solid state radiation detectors, the precise amount of each element can be determined.

At the University of Virginia we are currently able to analyze samples for over 50 different elements. This analysis is expedited by the use of dedicated computers which calculate the elemental composition directly from the gamma-ray spectra, sample mass and irradiation conditions.

Over the last eleven years, many professors and students from various universities have carried out research projects utilizing the Reactor Facility. In most cases, the experimenters are not familiar with activation analysis techniques and depend on the reactor staff for advice on sample preparation,

NAA procedures, data reduction and analysis. In a number of instances samples are supplied to the staff by the experimenters in bulk form. Starting from this, the entire analysis procedure is done by one or more staff members. The results returned to the experimenters state the elemental concentrations found in the supplied samples.

In the current contract year several universities indicated their intention to begin projects utilizing Reactor Sharing funds, and two have done so as of this time. Scheduled but not yet completed projects for this year include additional work for Virginia Tech and James Madison University and a new project with Longwood College. Additional projects may be started if we are approached and asked for assistance. It is important to note that the sole funding received for these outreach services by the University of Virginia comes from the DOE Reactor Sharing Program. Thus, the continuation of these projects would be affected if Reactor Sharing funds were not available to cover the cost of the support.

A final report entitled, "Participation in the United State Department of Energy Reactor Sharing Program," which covers the program from 1990-1991 was issued in December 1991. A report for the 1991-1992 year will be issued late in 1992.

C. AVAILABILITY OF REACTOR

The University of Virginia Reactor (UVAR) is used extensively for research and training to support the educational programs at the University of Virginia, including the Reactor Sharing Program. Potential users have always been able to perform experiments due to the availability of the reactor. Given the high priority placed on this program, the UVAR and related facilities will continue to be available for use by user institutions as projected in this proposal.

D. POTENTIAL USER INSTITUTIONS

There are over 50 colleges and universities located within a one day's trip radius from the University of Virginia which may benefit from the Reactor Sharing Program support. Institutions with programs in engineering, biology, physics, chemistry or other related sciences are listed in Table III. Users from universities located outside of this area are also encouraged to participate in this program. Those which have are listed in Table III.

Several methods will continue to be used to inform potential users of the Reactor Sharing Program. First, letters describing the program are sent to department chairman in Anthropology, Biology, Chemistry, Environmental Science, General Science, Geology, Marine Science, Medical Technology and Physics at each of the colleges and universities listed in Table III. Former participants indicate that they learn of the program existence as a result of such letters. The next mailing is planned for the Spring of 1991.

Additionally, our staff or faculty publicize the program at professional meetings. Members of tour groups from colleges and high schools are encouraged to return singly to the facility at a later date to initiate independent research projects of their own design. Also, professors with whom periodic contact is maintained are invited to use our facilities for their unsupported research. The support of unfunded research through the Reactor Sharing Program often enables researchers to later apply for and obtain grant money from other sources.

TABLE III

A. Institutions Which Have Participated in the Reactor Sharing Program at UVA (through March 1992)

Bridgewater College	Bridgewater, VA
College of William and Mary	Williamsburg, VA
Emory and Henry College	Emory, VA
Hampton Institute	Hampton, VA
Hampton-Sydney College	Hampton-Sydney, VA
Indiana University	Bloomington, IN
James Madison University	Harrisonburg, VA
Longwood College	Farmville, VA
Luther College	Decorah, IA
Lynchburg College	Lynchburg, VA
Mary Washington College	Fredericksburg, VA
Norfolk State University	Norfolk, VA
Old Dominion University	Norfolk, VA
Randolph-Macon College	Lynchburg, VA
Randolph-Macon Women's College	Lynchburg, VA
Roanoke College	Salem, VA
Sweet Briar College	Sweet Briar, VA
University of Richmond	Richmond, VA
University of South Carolina	Columbia, SC
Virginia Military Institute	Lexington, VA
Virginia Polytechnic Institute	Blacksburg, VA
Virginia State University	Petersburg, VA
Washington and Lee University	Lexington, VA

B. Other Institutions Located Near UVA

Avertt College	Danville, VA
Bluefield College	Bluefield, VA
Christopher Newport College	Newport News, VA
Clinch Valley College	Wise, VA
Eastern Menonite College	Harrisonburg, VA
Ferrum College	Ferrum, VA
George Mason University	Fairfax, VA
Hollins College	Hollins, VA
Liberty Baptist College	Lynchburg, VA
Mary Baldwin College	Staunton, VA
Radford University	Radford, VA
Randolph-Macon College	Ashland, VA
Virginia Commonwealth University	Richmond, VA
Virginia Intermount College	Bristol, VA
Virginia Union University	Richmond, VA
Virginia Wesleyan College	Norfolk, VA

E. ASSESSMENT OF USER INSTITUTION INTEREST

The success of the Reactor Sharing Program in previous years, as discussed in section B, is the best indicator of user institution interest in the continuation of the program. Current interest is indicated requests for information or letters of appreciation for work performed which have been received by us, fourteen of which are included as Attachments A through N. For a complete listing of past participants, please see the final report on participation in the program for the period September 1990 - August 1991.

F. PERSONNEL

The project director is Dr. R.U. Mulder, Director of the Reactor Facility (50% time dedication) and Assistant Professor of Nuclear Engineering (50% time). In his functions, Mulder is responsible for increasing reactor utilization in support of educational and research programs, upgrading of the Reactor Facility, teaching undergraduate and graduate nuclear engineering courses and conducting research programs.

Paul Benneche is the Reactor Services Supervisor at the University of Virginia. Previous positions held at UVA over the last 14 years include: Reactor Operations Supervisor, Research Engineer and Senior Reactor Operator. Benneche earned both BS('75) and MS('82) degrees at UVA in nuclear engineering. Areas of interest include neutron activation analysis, environmental monitoring and reactor utilization.

Bouvard Hosticka is a Research Scientist at the Nuclear Reactor Facility at the University of Virginia. He received his B.S. degree (nuclear engineering) from the University of Virginia in May 1986. Previously, he has also been employed by the Reactor Facility as a reactor operator and senior reactor operator. Prior work experience includes eight years in various capacities aboard nuclear submarines. Current research interests include neutron fluoroscopy, neutron shielding, neutron activation analysis and neutron-induced lattice defects.

G. ESTIMATED BUDGET

This proposal requests approval of $9,010 or the program in 1992-93. The requested contract period is from September 1, 1992 to August 31, 1993.

The basis for the estimated budget is:

Personnel cost for technical assistance:			
Bouvard Hosticka, 10% of effort for 12 months			$5,310
Reactor use:			3,500
(a)	Activations for research projects 20 hours of irradiation at $50.00 per hour (1/2 normal rate, reactor time shared with other projects)	1,000	
(b)	Experiments for class experiments 5 hours of irradiation at $50.00 per hour (1/2 normal rate, reactor time shared with other projects)	250	
(c)	Gamma ray spectrographic analysis of samples (equipment use only, personnel cost already covered). 100 samples at $22.50 average per sample ($5 for irradiation equipment use, $10 for use of analysis equipment, $7.50 per hour for detector use.)	2,250	
Clerical assistance:			200
(a)	Report generation and mailing	100	
(b)	Production and mailing of information to potential user institutions	100	
New funds requested for 1991-92			$9,010

The personnel costs covers the direct effort necessary to prepare for and conduct experiments for classes and to assist in neutron activation analysis for research projects, as discussed in section B.

The reactor use charges are based on the presently established rate for reactor operation and covers all expenses associated with sample preparation, irradiation and use of equipment for subsequent counting for class experiments.

ATTACHMENTS

Appendix A

COLLEGE OF ENGINEERING

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Blacksburg, Virginia 24061-0211

DEPARTMENT OF CHEMICAL ENGINEERING (703) 231-6631

April 24, 1990

Mr. Paul E. Benneche
Dept. of Nuclear Eng.
University of Virginia
Reactor Facility
Charlottesville, VA 22903-2442

Dear Paul,

In compliance with the first provision of the Memorandum of Understanding regarding participation in the Reactor Sharing Program, this letter describes my research project and the services desired from the UVA Reactor Facility. The goal of this research is to perform a numerical simulation of cooking extrusion in a single screw extruder using a wheat flour dough. Cooking extrusion is a process which is used in the manufacture of a variety of food products such as texturized vegetable protein, breakfast cereals, snack foods, and quick-cooking pasta products.

A key element in the experimental verification of the numerical computations is the measurement of residence time distribution (RTD) in the extruder. An effective method for measuring the RTD in a food extrusion process is to inject MnO_2 as a tracer at the feed end of the extruder and then to collect samples of extrudate from the discharge end over an appropriate time period. Neutron activation analysis of these samples provides a measure of the manganese content, and the RTD can be derived from this information.

The services desired for this project include neutron irradiation and gamma ray spectrographic analysis. I anticipate that approximately 250 samples will require analysis. The personnel who will be involved are Donald G. Baird, Professor of Chemical Engineering at VPI&SU and principal investigator on the project, and myself.

Sincerely,

Carleton M. Reed

Carleton M. Reed
Graduate Student

cc: D. G. Baird

THE STATE UNIVERSITY OF NEW JERSEY
RUTGERS

Department of Environmental Sciences • Cook College
P.O. Box 231 • New Brunswick • New Jersey 08903-0231 • 908/932-9185 • FAX: 908/932-8644

Appendix B

January 9, 1991

Paul Bennecha
University of Virginia
Dept. of Nuclear Engineering and Engineering Physics
Nuclear Reactor Facility
School of Engineering and Applied Science
Charlottesville, Va 22903

Dear Mr. Bennecha:

This letter is to inform you that I will be sending a small quantity of soil, roughly 10 Kg, to be sterilized at your facility as per our conversation, 1/4/91. It is my understanding that a minimum of 2 MegaRads is necessary to achieve complete sterilization. If you have any questions please feel free to contact me at (908) 932-9082.

Thank you,

Bradley C. Williams
Research Scientist

Appendix C

BRIDGEWATER COLLEGE

BRIDGEWATER, VIRGINIA 22812
Telephone (703) 828-2501
FAX (703) 828-2160

April 10, 1991

Dr. Paul Benneche
University of Virginia
Dept. of Nuclear Engineering and Engineering Physics
Reactor Facility
Charlottesville, VA 22901

Dr. Benneche:

Thank you for accommadating the group of 6 physics students from Bridgewater College on April 4, 1991. Although the students had no previous experience in nuclear physics, they expressed to me that they had an enjoyable as well as an informative experience. The neutron activation experiment the students performed while at your facility provided an opportunity to do research that otherwise would not have been available to them. Again thank you for sharing your facility and time with us.

Sincerely,

Philip T. Spickler

Philip T. Spickler
Instructor in Physics

Appendix D

April 30, 1991

Paul Benneche
Dept. of Nuclear Engineering
& Engineering Physics
Reactor Facility
University of Virginia
Charlottesville, VA 22901

Dear Paul:

The enclosed (4) samples are to be given doses as marked (0.2-1.0 MR) at the same rate (.22MR/hr). I think these should be the last samples for this study. Thanks for your cooperation.

Best regards,

Jim D.

Jim Donaghy

LYNCHBURG COLLEGE
IN VIRGINIA

1501 LAKESIDE DRIVE
LYNCHBURG, VIRGINIA 24501-3199

(804) 522-8100

May 8, 1991

Mr. Bouvard Hosticka
Department of Nuclear Engineering
Reactor Facility
University of Virginia
Charlottesville, VA 22901

Dear Bo:

Thanks much for running the neutron activation analysis lab for my nuclear chemistry class last Friday. They enjoyed it, and I got several positive comments on the amount of useful information you provided in a relatively short period of time. Even that limited amount of "hands-on" experience is helpful for students.

On a separate matter, I'm afraid the cost of 30 L of liquid nitrogen per week is just too much for us to pay, especially for an instrument that would get limited use. I very much appreciate the offer, however, and any time you have a 15% efficient intrinsic germanium detector you want to dump, let me know!

Tentative date for bringing anywhere from ten to fifteen high-school students up is Thursday, July 25th. I'll get back with confirming details as the time draws nearer.

Thanks again!

Sincerely,

Neal Sumerlin

Neal Sumerlin, Chairman
Chemistry Department

Sharon Elementary School
Rt. 1
Clifton Forge, VA 24422
5/22/91

Mr. Paul Benneche
Department of Nuclear Engineering
University of Virginia
Reactor Facility
Charlotessville, VA 22901-2442

Dear Paul:

Thank you and the other staff members for taking the time yesterday to show the reactor facility to the sixth grade students of Sharon Elementary School. Nuclear energy is part of the sixth grade science curriculum and you explanation of the facility operation was very helpful. This was also very good career exposure to our students as I am hopeful that some will be sparked by a school experience to pursue a science career.

Sincerely,

Dave

C. David Peters, 6th grade teacher

Appendix G

George Washington High School

Danville, Virginia 24541

OFFICE OF THE PRINCIPAL

May 27, 1991

Dr. Paul Benneche
Reactor Services Supervisor
Reactor Facility
University of Virginia
Charlottesville, VA 22903-2442

Dear Paul:

I just wanted to drop you a note to express my thanks for a thoroughly enjoyable tour of your facility on May 23, 1991 (and 1990). The students really got to see a reactor at work and could compare it to a commercial palnt such as North Anna. The contrast was most educational and enlightening to them.

You did your usual outstanding job on the tour of explaining differences between UVa and North Anna reactors and your work in terms of high school understanding.

My thanks again to you and I look forward to setting up another tour next year about the same time with yet another class.

Sincerely,

John H. Fesperman

John H. Fesperman

WOODBERRY FOREST SCHOOL
WOODBERRY FOREST, VIRGINIA
22989

(703) 672-3900

Lewis Acampora
Science Department
Woodberry Forest School
Woodberry Forest, Va. 22989
29 July 1991

Mr. Paul Benneche
Nuclear Engineering Reaction Facility
University of Virginia
Charlottesville, Va. 22903

Dear Mr. Benneche:

I want to thank you personally and on behalf of the students of our chemistry and physics classes for hosting our visit to the reactor and giving us a very educational tour. The field trip proved to be an excellent break from our daily routine, and the students were fascinated by seeing the "reality" of a nuclear reaction facility--it is certainly much different than many of them would have pictured!

Thank you especially for taking the time to be so accomodating to such a large group. It is wonderful to be able to take advantage of the opportunities afforded by the University, and I am thankful that you made it so easy for us to do so. Good luck with your research, and I hope to see you with future groups.

Sincerely yours,

Lewis Acampora
Science Department
Woodberry Forest School

Appendix I

MAJOR WILLIAM A CHICK, CAP
125 FORESTVUE DRIVE
EARLYSVILLE, VA 22936
(804) 973-8869

CIVIL AIR PATROL
1941-1991
FIFTY YEARS OF SERVICE

GROUP II
CADET PROGRAMS
PUBLIC AFFAIRS

REACTOR ADMINISTRATOR
UNIVERSITY OF VIRGINIA
NUCLEAR REACTOR FACILITY
CHARLOTTESVILLE, VA 22903-2442

AUG 20, 1991

MR J P FARRAR,

We thank you and your staff for given us a tour of your facility for the 35 Civil Air Patrol Cadets who were in the area for their annual training.

They all seem to enjoy the visit. We heard about the GLOW for some time after we departed.

We appreciate you supporting our young people.

Thanks again.

William A Chick, Major, CAP
Project Officer

Virginia Tech
VIRGINIA POLYTECHNIC INSTITUTE
AND STATE UNIVERSITY

Department of Entomology

College of Agriculture and Life Sciences
Blacksburg, Virginia 24061-0319 USA
(703) 231-6341 Fax: (703) 982-6050
Bitnet: ent4@vtvm1

1 December 1991

Dr. Paul Benneche
Department of Nuclear Engineering
Reactor Facility
University of Virginia
Charlottesville, VA 22903

Dear Paul:

I would appreciate it if you could sterilize the four containers that I have sent you in the styrofoam cooler. Each vessel contains 4.0 microcuries of 14C-ring-labelled atrazine, 10 g of peat moss, and approximately 0.5 ug/g atrazine. Two of the vessels are bottles which I imagine will not be difficult to sterilize, however, the other two vessels are specially constructed glassware for the experiment. They are less than 2.5 inches in diameter, and I hope that they fit in the reactor. Please, contact me if there is a problem.

There is no particular urgency to sterilize these vessels and get them back to me. If, however, it is longer than a day after you receive them, could you keep them cold ($< 4^{o}C$) until you get to them? Afterwards, you do not need to keep them refridgerated or need to pack them on ice or dry-ice for the trip back to Virginia Tech. Please send them to me care of:

Doug Smiley, Radiation Safety, Room 104, Health and Safety Bulding #459,
Virginia Tech, Blacksburg, VA, 24061.

I do appreciate the service that you and your Department provide, and in future articles corresponding to research with the sterilized vessels, your services will be mentioned with my pleasure. Please inform me of any instructions that would make future packages for sterilization easier for you.

Sincerely,

David Judge

encl. 4 glass vessels containing 4.0 microcuries of 14C-atrazine in 10 g peat moss with 0.5 ppb unlabelled atrazine.

cc. Doug Smiley
Donald Mullins

LYNCHBURG COLLEGE
IN VIRGINIA

1501 LAKESIDE DRIVE
LYNCHBURG, VIRGINIA 24501-3199

(804) 522-8100

December 14, 1991

Mr. Bouvard Hosticka
Department of Nuclear Engineering
Reactor Facility
University of Virginia
Charlottesville, VA 22901

Dear Bo:

Thank you once again for the opportunity afforded my students by the Reactor Sharing Program at UVa. My nuclear chemistry class very much enjoyed getting to see equipment they had learned about in class. I imagine that we will both be certain that sight is the only sense involved the next time we learn about thin beryllium windows!

Thanks again for your significant contribution to our educational program.

Sincerely,

Neal Sumerlin

Neal Sumerlin, Professor and Chairman
Chemistry Department

Virginia Commonwealth University

Paul Benneche
Reactor Services Supervisor
University of Virginia
Department of Nuclear Engineering & Engineering Physics
Reactor Facility
Charlottesville, Virginia 22093-2442

January 28, 1992

Dear Dr. Benneche,

I wish to thank you and the Reactor Facility staff for the tour and laboratory experiment/demonstration provided for my Modern Physics Laboratory students on November 22, 1992. The students thoroughly enjoyed the entire program and, judging from their enthusiasm and general interest, found it to be a real educational experience.

The faculty in the VCU Physics Department is made up largely of solid state physicists and there is no ongoing research in the area of nuclear physics. The Reactor Sharing Program at UVA provides an excellent opportunity for VCU students to gain a hands on look at nuclear physics and broaden their scope of physics research. I feel that this is an outstanding program and have incorporated a tour of the reactor facility into my Modern Physics Laboratory course syllabus as a required field trip.

Thank you again for your cooperation and hospitality, I hope to see you again next fall.

Sincerely,

Steven L. Herr
Assistant Professor

Department of Physics · College of Humanities and Sciences · 1020 West Main Street · Box 2000
Richmond, Virginia 23284-2000 · (804) 367-1313 · VOICE TDD (804) 367-0100

JMU
James Madison University
Department of Chemistry

March 2, 1992

Bo Hostika
Nuclear Reactor Facility
University of Virginia
Charlottesville, Va

Dear Bo:

I am writing to express my appreciation for your conducting a tour for my nuclear chemistry class on Friday February 28. As always, you did a very good job and I am certain that the class found the tour very informative and educational. The reactor start up was particularly well received and I think the neutron activation analysis of selenium in horse hooves was a good way to demonstrate the value of a reactor in elemental analysis. As part of the course I require the students to conduct a project of their own design. You may recall, a few years ago one student irradiated soil samples for mercury analysis. Another project involved a study of the equilibrium between Zr-95 & 97 and daughters using reactor irradiated zirconium. I don't know if any projects this year will involve reactor irradiations, but if this is the case, I will call you to discuss to see if it is possible for us to have some irradiation done and discuss the details.

Again, thank you for taking the time to give us the very good tour. I am sure that the students benefitted greatly by the opportunity to see a real reactor in operation.

Sincerely,

Dan

Daniel M. Downey, Ph.D.
Associate Professor

Harrisonburg, Virginia 22807
(703) 568-6246

Piedmont Virginia Community College

Route 6, Box 1-A, Charlottesville, Virginia, 22901-8714, Tel. 804/977-3900

April 3, 1992

Bouvard Hosticka
Research Scientist
University of Virginia
Department of Nuclear Engineering
and Engineering Physics
Reactor Facility
Charlottesville, VA 22903-2442

Dear Bo,

On behalf of my Chemistry 111 students, as well as Rick and myself, I want to thank you for the tour of the University of Virginia Reactor Facility last week. We especially appreciate the special efforts that you made for us. Doing the tour in the evening and leaving the reactor operating beyond normal shut-down call for special thanks.

If you have printed information on experiments that could be done with students such as mine, I would appreciate having a copy.

Sincerely,

Ray

Raymond F. Bratton
Professor of Chemistry

mw

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