

1372

UNITED STATES GOVERNMENT

# Memorandum

718447

*9/28/66*

TO : R. G. Humphries, Director  
Contract Division

DATE: September 26, 1966

FROM : David F. Cope, Director  
Reactor Division

SUBJECT: UNIVERSITY OF NORTH CAROLINA CONTRACT AT-(40-1)-2130

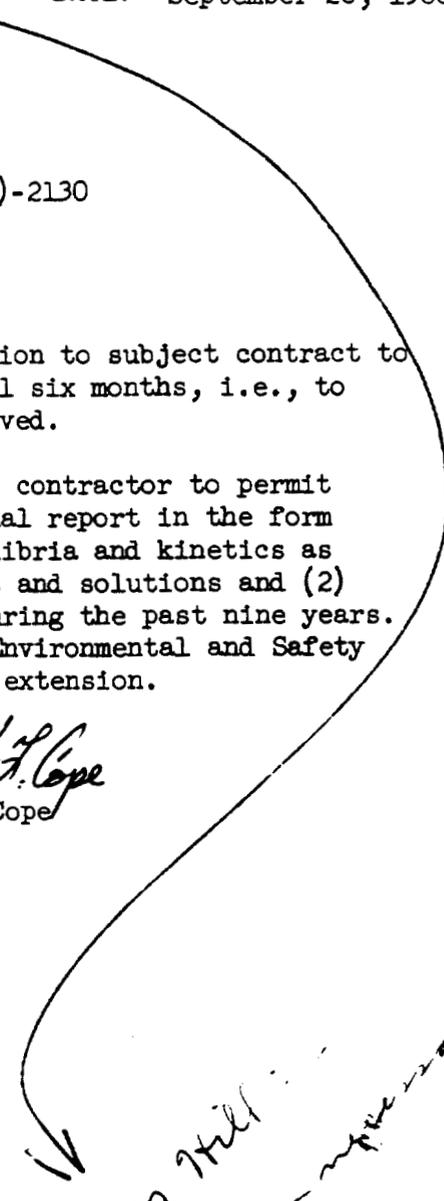
OE:TPC

We would appreciate preparation of a modification to subject contract to extend the period for performance an additional six months, i.e., to March 31, 1967. No increase in funds is involved.

This six months extension was requested by the contractor to permit additional time for proper completion of a final report in the form of a monograph which will (1) emphasize equilibria and kinetics as applicable to the interaction of soil minerals and solutions and (2) summarize work conducted under the contract during the past nine years. The Headquarters technical point of contact (Environmental and Safety Engineering Branch, RDT) is agreeable to this extension.

*David F. Cope*  
David F. Cope

cc: R. C. Armstrong, ORO  
C. W. Hill, ORO  
Harold Bernard, RDT, HQ



*Chas Hill  
for necessary  
action: 9/28/66*

REPOSITORY Oak Ridge Operations  
Records Holding area  
COLLECTION Doc. 1944-94  
BOX No. A-69-5 68-6 Bldg. 2714-H  
Contract AT-(40-1)-2130  
FOLDER Univ. of NC

39148



Buy U.S. Savings Bonds Regularly on the Payroll Savings Plan

1129103

41700

RECORD COPY

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TELETYPE  
BY U.S.T.

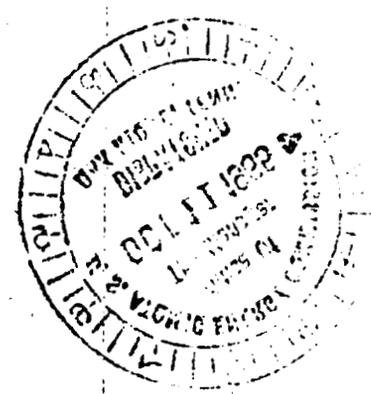
PXA005  
RR RUCBWO  
DE RUEPXG 218 2812122  
ZNR UUUUU  
R 082122Z  
FM USAEC MILTON SHAW WASHDC  
TO USAEC S R SAPIRIE MANAGER OAK RIDGE TENN  
AEC  
BT

3201

SUM. OCT 11 1965

UNCLAS REURWIRE 9-29 CONCERNING CONTRACT AT/40-1/-2130 WITH  
UNIVERSITY OF NORTH CAROLINA /INVESTIGATION OF SORPTION AND ION  
EXCHANGE PHENOMENA IN NATURAL SOILS AND TREATED MATERIALS/ PD PARA  
BASED UPON RECOMMENDATIONS IN YOUR WIRE CMM CONTRACT AUTHORIZATION  
66-008 OF 8-9-65 IS REVISED TO REFLECT DELETION OF STUDIES OF  
SORPTION IN THREE-ION SYSTEMS PD REDUCTION OF COST FROM \$36 476  
TO \$20 221 IS ACCEPTABLE PD END REF RDT CLN D

BT



NNNN

1129104

35800

*H. J. [unclear]*

SEP 28 1965 *Wife*

X

X

USAC  
S. R. SAPIRE, MANAGER  
OAK RIDGE OPERATIONS  
OAK RIDGE, TENNESSEE

USAC  
CUMMINGTON, MD  
FOR: MILTON SHAW, MDT

CONTRACT AUTHORIZATION DATED AUGUST 9, 1965, SERIAL NO. 66-006, AUTHORIZED  
EXTENSION OF CONTRACT AT-(40-1)-2130 WITH THE UNIVERSITY OF NORTH CAROLINA  
FROM OCTOBER 1, 1965, TO SEPTEMBER 30, 1966, WITH ABC CONTRIBUTION OF  
\$36,476. DR. HENRY C. THOMAS ADVISES THAT (1) H. B. BENDISHE HAS  
ACCEPTED OTHER EMPLOYMENT, (2) HIS REPLACEMENT IS VERY UNCERTAIN, (3)  
ANY CONTINGENT REPLACEMENT AT THIS TIME WOULD HAVE LESSER QUALIFICATIONS,  
(4) WITHOUT BENDISHE OR A REPLACEMENT THE ABC CONTRIBUTION WOULD BE ABOUT  
\$20,221, AND (5) EXTENSION OF STUDIES OF THE SORPTION IN THREE-ION SYSTEMS  
AT HIGHER TEMPERATURE RANGE CANNOT BE CONDUCTED. AS DISCUSSED WITH HAROLD  
BERNARD BY PHONE, REQUEST YOUR APPROVAL TO NEGOTIATE THE CONTRACT EXTENSION  
RECOGNIZING THAT OMISSION OF THIS PORTION OF THE WORK AND CORRESPONDING  
REDUCTION IN ABC CONTRIBUTION WILL BE NECESSARY IN THE EVENT ADEQUATE  
STAFFING IS NOT AVAILABLE. GR:EGC

cc: Harold Bernard, MDT, MD  
R. G. Humphries, GRG ✓  
H. A. Sheeran, GRG

35745

Sound;jf  
3:30 p.m.  
Rm 131 3-4495

1129105

Scope

The Contractor will:

1. Complete certain research on the problems of return of radioactive wastes to the environment. This work will specifically include the preparation of a monograph covering the entire scope of research conducted under the contract.
2. Conduct other work related to unsettled matters connected with the work reported in the monograph. This may include investigation of ion exchange for a binary system on well characterized mica surfaces. No new work will be commenced which will not be completed in time for evaluation and inclusion in the monograph.

*Insert*

*of Alice*

I N F O R M A L M E M O R A N D U M

FILES, Reactor Division

9/23/65

E. G. DeLaney, Reactor Technology Branch  
Reactor Division

EVALUATION OF ABILITY TO PERFORM WORK SCOPE PROPOSED FOR PERIOD 10/1/65 to 9/30/66 ON CONTRACT AT-(40-1)-2130 WITH UNIVERSITY OF NORTH CAROLINA

OE:KED

Dr. H. C. Thomas has informally notified AEC Headquarters (H. Bernard) that he has lost a man who was to have performed part of the work proposed for this contract modification covering the period 10/1/65 to 9/30/66. I telephoned Dr. Thomas on September 23 to determine how this would affect his ability to perform the work proposed and the cost of this work.

K. B. Deshpande, who has left, was to have performed the following work as described in Appendix "A" of the contract authorization Serial No. 66-008 (8/9/65): "(1) extension of studies of the sorption in three-ion systems on two siliceous minerals to include an expanded temperature range".

Dr. Thomas said this work would probably not be accomplished unless a suitable replacement was obtained. His plans for obtaining a replacement are either to interest a graduate student in doing the work as a thesis, or hire a laboratory assistant to conduct the work under Thomas' supervision. Thomas does not think he will be able to get a graduate student at this late date, and didn't state what the chances are for getting a competent laboratory assistant. The estimated cost of this work as indicated in his proposal dated June 18, 1965, is approximately as follows:

Direct Cost: K. Deshpande's salary		\$11,200
Indirect Cost		
Overhead at 33.48%	3,750	
FICA & Retirement (my estimate)	<u>1,305</u>	
		<u>5,055</u>
Total Reduction in Cost		\$16,255
Previous Proposed New AEC Funds		<u>36,476</u>
Revised New Funds		\$20,221

I suggested to Dr. Thomas that the contract modification might be prepared with provision for a lower amount in the event he could not arrange a replacement to do the work previously assigned to K. Deshpande. He thought this was reasonable.

I questioned Dr. Thomas on possible need for an extension beyond 9/30/66 which he indicated in his proposal. He said that he expected to have a finished manuscript of his final report (a monograph) by the end of the contract, but that publishing might not be completed. He would like to publish the report as a book and retain copyrights to the book, AEC regulations permitting. I told him we'd let him know whether this was permissible.

E. G. DeLaney

35729

CC: R. G. Humphries ✓  
E. W. Gound

1129107

UNITED STATES GOVERNMENT

*Memorandum*

TO : R. G. Humphries, Director  
Contract Division

FROM : Herman M. Roth, Director  
Research and Development Division

SUBJECT: REQUEST FOR CONTRACT ACTION

DATE: SEP 1 1965

ORS:EMM

It is requested that you take the necessary steps to process the following described contract action:

1. Nature of Action Requested:

- Selection of New Contractor and/or  
Negotiation of Contract  
Number:  
Contractor:
- Modification of Contract  
Number: AT-(40-1)-2130  
Contractor: University of North Carolina  
Chapel Hill, North Carolina

2. Nature of Services to be Covered by Contract: Research

Title: "Investigation of Sorption and Ion Exchange Phenomena  
in Natural Soils and Treated Materials"

3. Type of Contract:  Lump Sum  Cost-Type  Other4. Amount to be Obligated by this Contract Action: \$36,476.005. Description of Other Changes to be Covered by Contract Action:

Modify contract to provide for (1) the performance of additional research to be completed during the period October 1, 1965 through September 30, 1966, with new AEC funds in the amount of \$36,476, (2) revision to Paragraph (h) of Appendix "C" to request 32 copies of final summary report (monograph) for entire contract period rather than 22 copies, and (3) vesting of title to Government-owned property, previously furnished under

6. Authority: contract, in Contractor.

*Herman M. Roth*  
Herman M. Roth

Contract Authorization from Milton Shaw to S. R. Sapirie dated August 9, 1965

Memorandum from Milton Shaw to S. R. Sapirie dated August 24, 1965

## APPENDIX "A"

For the Contract Period October 1, 1965 through September 30, 1966.

A-I RESEARCH TO BE PERFORMED BY CONTRACTOR

*Insert #1*

~~The Contractor will complete certain research on the problems of return of radioactive wastes to the environment. This work may include (1) extension of studies of the sorption in three-ion systems on two siliceous minerals to include an expanded temperature range, (2) investigation of ion exchange for a binary system on well characterized mica surfaces, and (3) preparation of a monograph covering the entire scope of the research conducted under this contract. Special emphasis will be given in the terminal year to completion of kaolin studies so this data and evaluation can be included in the monograph.~~

A-II APPROXIMATE LEVEL OF RESEARCH EFFORT

<u>(a) Contractor Personnel:</u>	<u>Approx. % of time</u>	
Dr. H. C. Thomas	Academic	25%
Principal Investigator	Summer	100%
<i>1 X</i> Research Associate		100%
<u>(b) Premises, Facilities, and Materials to be Furnished by the Contractor:</u>		

Adequate laboratory facilities and equipment are available for the Contractor to conduct an investigation of sorption and ion exchange phenomena in natural soils and treated materials.

A-III ITEMS OF EQUIPMENT TO BE PURCHASED OR FABRICATED BY CONTRACTOR  
COSTING \$500 OR MORE

None

ARTICLE II - THE PERIOD FOR PERFORMANCE

The period for performance under this contract shall expire on September 30, 1966; provided, however, that this period may be extended for additional periods by the mutual written agreement of the parties.

ARTICLE III - CONSIDERATION

(a) In full consideration of the Contractor's performance hereunder for the period commencing on October 1, 1965, and expiring on September 30, 1966, the Commission shall pay the Contractor the sum of \$36,476.00 and shall transfer title to the items of Government property listed in ARTICLE V (b), GOVERNMENT PROPERTY, to the Contractor.

20,221

ARTICLE IV - ADDITIONAL CONTRACT PROVISIONS

Appendix "B", attached hereto and made a part hereof, sets forth additional general provisions of this contract.

ARTICLE V - GOVERNMENT PROPERTY

ARTICLE V - GOVERNMENT PROPERTY is revised to read as follows:

(b) The following items of property heretofore procured or fabricated by the Contractor or heretofore furnished the Contractor are also hereby listed as "Government property": None.

ARTICLE VI - ALTERATIONS AND ADDITIONS

The following alterations in or additions to the provisions of this form of contract were made prior to execution of the contract by the parties:

Paragraph (d) of Appendix C is revised to read as follows:

(d) Final Summary Report for Current Contract Period - Thirty-two (32) copies.

## APPENDIX "A"

For the Contract Period October 1, 1965 through September 30, 1966.

A-I RESEARCH TO BE PERFORMED BY CONTRACTOR

The Contractor will complete certain research on the problems of return of radioactive wastes to the environment. This work may include (1) extension of studies of the sorption in three-ion systems on two siliceous minerals to include an expanded temperature range, (2) investigation of ion exchange for a binary system on well characterized mica surfaces, and (3) preparation of a monograph covering the entire scope of the research conducted under this contract. Special emphasis will be given in the terminal year to completion of kaolin studies so this data and evaluation can be included in the monograph.

A-II APPROXIMATE LEVEL OF RESEARCH EFFORT

<u>(a) Contractor Personnel:</u>		<u>Approx.</u>
		<u>% of time</u>
Dr. H. C. Thomas	Academic	25%
Principal Investigator	Summer	100%
2 Research Associates		100%

(b) Premises, Facilities, and Materials to be Furnished by the Contractor:

Adequate laboratory facilities and equipment are available for the Contractor to conduct an investigation of sorption and ion exchange phenomena in natural soils and treated materials.

A-III ITEMS OF EQUIPMENT TO BE PURCHASED OR FABRICATED BY CONTRACTOR COSTING \$500 OR MORE

None

UNITED STATES GOVERNMENT

# Memorandum

TO : S. R. Sapirie, Manager  
Oak Ridge Operations Office

DATE: AUG 24 1965

FROM : Milton Shaw, Director *M. Shaw*  
Division of Reactor Development & Technology, HQ

2444

58

SUM. AUG 26 1965

SUBJECT: CONTRACT NO. AT(40-1)-2130 WITH THE UNIVERSITY OF NORTH CAROLINA  
(DR. HENRY C. THOMAS)

Reference is made to a memorandum dated August 13, 1965, same subject as above, which requested authority to transfer title to certain Government-owned equipment to the University of North Carolina.

This is to advise that you are authorized to transfer title to the equipment listed as an enclosure to the referenced memorandum, provided that adequate consideration is received.



F 8400

Buy U.S. Savings Bonds Regularly on the Payroll Savings Plan

F 8400  
AUG 26 1965

1129112



UNITED STATES ATOMIC ENERGY COMMISSION CONTRACT AUTHORIZATION	DATE PAGE NO. 2 Serial # 66-008
TO S.R. Sapirie, Manager Oak Ridge Operations Office	CONTRACT NO. AT(40-1)-2130 PROJECT AGREEMENT NO.
CONTRACTOR University of North Carolina	
<p>8 SCOPE OF WORK</p> <p>As indicated in attached proposal and with following stipulation: Only those studies involving kaolin be initiated which can be completed by approximately June 30, 1966, so that the data and evaluation can be included in the monograph.</p>	
<p>9 SPECIAL PROVISIONS AND INSTRUCTIONS</p> <p>IT IS REQUESTED THAT YOU KEEP THE CONTRACTS BRANCH, DRD, ADVISED AS TO ANY PROBLEMS ENCOUNTERED IN YOUR NEGOTIATIONS AND THE DATE OF EXECUTION OF THIS CONTRACT, TOGETHER WITH THE AMOUNT OF FUNDS OBLIGATED. THIS NOTIFICATION SHOULD BE MADE DIRECTLY TO DRD RATHER THAN WAITING FOR THE NORMAL DISTRIBUTION OF THE CONTRACT DOCUMENT OR MONTHLY CONTRACT REPORT.</p> <p>Final report is to be a monograph as described in the proposal and receive UC-70 distribution.</p> <p>Draft of final report is to be reviewed by HQ; five copies required.</p> <p>Patent provisions remain the same.</p>	
<p>10 HEADQUARTERS TECHNICAL POINT OF CONTACT</p> <p>Chief, Environmental &amp; Sanitary Engineering Branch          Division of Reactor Development &amp; Technology</p>	
<p>11 ENCLOSURES</p> <p>1. Proposal dated June 18, 1965</p>	

F 7860

1129114

UNITED STATES GOVERNMENT

# Memorandum

TO : **Milton Shaw, Director** DATE: **June 25, 1948**  
**Division of Reactor Development & Technology, OR**

FROM : **Herman M. Roth, Director**  
**Research and Development Division, OR**

SUBJECT: **RENEWAL OF CONTRACT NO. AT-(40-1)- 2150 WITH UNIVERSITY OF NORTH CAROLINA (DR. HENRY G. THOMAS)**

**CRS:RSM**

We are submitting for your review and appropriate action the following information concerning the contract which will expire on **September 30, 1948**:

1. Renewal Proposal ( 4)
2. Progress Report ( 4)
3. Financial Statement ( 4)
4. 200-Word Summary ( 2)

We shall appreciate your advising us of your decision so that we may proceed with the necessary contract action at the earliest possible date.

*Herman M. Roth*  
Herman M. Roth

Enclosure:  
As Listed Above

cc: **C. S. Sharp, w/anal.**  
**D. S. Eckley, w/progress report**  
**Alice Brown** ✓

To: The United States Atomic Energy Commission  
Research and Development Division  
Post Office Box E  
Oak Ridge, Tennessee

65 5242

From: The University of North Carolina  
Chapel Hill, N. C.

Proposal for the Renewal of Research Contract

No. AT-(40-1)-2130

2181

June 18, 1965

It is proposed that the above designated contract between the United States Atomic Energy Commission and the University of North Carolina be renewed for a final year from October 1, 1965, to September 30, 1966.

Three items are proposed for the final period of the contract.

1. On the expiration of the contract period a year hence, nine years of work will have been brought to a close. To assemble a final report by the expedients of clipping and piecing from interim reports and published papers would produce a disconnected and nearly useless document. It is proposed that the principal investigator attempt something better: write a monograph on equilibria and kinetics as applicable to the interaction of soil minerals and solutions. Most or all of the work accomplished under contract AT-(40-1)-2130 would be contained therein, at least in summary form. Much else would have to be included in order to make a connected story. It is believed that this could be accomplished during the coming year, but possibly, because of his full time teaching duties, it may be necessary for the principal investigator to request an extension of time through the school vacation following the expiration of the contract, to complete finishing touches and to see the work through reproduction.

A highly tentative table of contents for this proposed monograph follows. This is included merely as an indication of what is in mind; any final work might be somewhat differently organized.

1. Soil Minerals as Exchange Sorbents
2. Thermodynamics of Sorption
3. Kinetics of Sorption
4. Flow through Packed Beds
5. Applications and Practical Calculations

On the completion of this final report, the author will request the privilege of submitting the work for publication under his own name.

2. In the course of the preparation of a final report, as we have suggested, it is essential that the established points of varying importance will be identified. These would require long range researches, some of which may require days or weeks of experimentation. In the first category, it should be mentioned the extension to kaolin clays of the ion exchange work now nearly completed for the montmorillonite minerals. This could be a study of some significance to the problem of containment of radioactive wastes in South Carolina. In the second category of relatively short term projects, it is necessary, before any pronouncement of completeness can be made, of extending at least some of the three-ion work to a higher temperature. It is proposed that we do this work. There are no significant experimental problems are expected to arise; it is quite otherwise in the case of the kaolins.

3. The difficulty with kaolin minerals in studies of sorption and ion exchange stems from their very low capacity. The low capacity renders any operational definition of the amount of sorbed material subject to great uncertainty. Furthermore it is apparently true that the exchange capacity of a kaolin depends significantly on its degree of agglomeration. (In this connection see: M. A. Tamers and H. C. Thomas, J. Phys. Chem., 64, 29 (1960)). We thus have here a system so complex as almost to escape definition. Not even the nature of the best type of experiment for such a study is now known. As a first approach to this problem it is suggested that work on a system not subject to varying degrees of agglomeration but otherwise supplying all the experimental difficulties may be the most promising approach. It is therefore proposed that we initiate ion-exchange studies on finely divided mica. Such studies might be expected to be simple in one respect: the exchange capacity of mica is so low that one would perhaps not expect significant ion interaction at a mica surface. We would expect to be able to interpret results more sensibly in terms of a spectrum of site energies.

Although we cannot expect to accomplish in a single year much more than preliminary testing of experimental methods, it is probable that the work can be carried to a reasonable conclusion under another year. We would start the work with a study of the reproducibility of results for sodium-potassium exchange on finely divided muscovite.

The principal investigator receives no other support from the United States government.

} SRO - du Pont  
Consultant ?

Facilities for the work remain as described earlier.

PROPOSED BUDGET

Contract No. AT-(10-1)-2130

For the period Oct. 1, 1965 - Sept. 30, 1966

	<u>AEC</u>		<u>UNC</u>
	FY66	FY67	
<u>I. Personnel</u>			
Henry C. Thomas, Director			
quarter time, 9 months	-0-		\$ 3,500.00
full time, 3 months	\$ 4,665.00	3665	-0-
Research Associates			
K. B. Deshpande, full time	11,200.00	2,800	-0-
Isao Hashimoto, full time	10,200.00	2,600	-0-
Consultation within UNC	-0-		1,200.00
	<u>\$26,065.00</u>	<u>10665</u>	<u>\$ 4,700.00</u>
<u>II. Indirect Costs</u>			
Overhead, 33.48%*			
of salaries	\$ 8,726.56	3360	\$ 2,171.80
FICA and Retirement	3,034.58	1200	406.71
	<u>11,761.14</u>	<u>5560</u>	<u>1,578.51</u>
<u>III. Operating Expenses</u>			
Supplies expendable	\$ 1,800.00		
Service on equipment	200.00		
Secretarial and publication	900.00	900	
Laboratory services	-0-		3,600.00
Glass shop and machine work	-0-		2,100.00
	<u>\$ 2,600.00</u>	<u>          </u>	<u>\$ 4,700.00</u>
Total proposed	\$40,426.14		\$20,978.51
Estimated balance, Sept. 30, '65	<u>3,950.00</u>		
New funds requested from AEC	\$36,476.00		

\* Rate fixed by the Army Audit Agency

*Henry C. Thomas*  
 Henry C. Thomas  
 Principal Investigator

ORIGINAL signed By  
*A. H. Shepard, Jr.*  
 A. H. Shepard, Jr.  
 Business Officer and  
 Treasurer

## EXPENDITURE STATEMENT

2181

Contract No. AT-(40-1)-2130

The following statement shows the contributions of both the Atomic Energy Commission and the University of North Carolina for the period October 1, 1964 - September 30, 1965. Column A gives actual expenditures for the period ending May 31, 1965, the contribution of the University being in part estimated. Column B gives estimates for the period June 1 - September 30, 1965, based for the most part on fixed items for salaries and actual encumbrances.

	Column A		Column B	
	AEC	UNC	AEC	UNC
Salaries and Wages	\$18,344.48	\$875.00	\$10,183.31	\$250.00
Equipment	-0-		-0-	
Supplies and Services	1,108.08		344.61	
Travel	393.46		-0-	
Communications	-0-	80.00	150.00	40.00
Indirect Cost	6,970.90		3,869.66	
FICA & Retirement	1,170.98		749.35	
Laboratory Services		2,650.00		1,350.00
	<u>\$ 27,987.90</u>	<u>3,605.00</u>	<u>15,296.93</u>	<u>1,640.00</u>
Balance on University's books 5/31/65:			\$ 19,252.87	
Estimated expenditures 6/1 - 9/30/65 :			15,296.93	
Estimated balance 9/30/65:			<u>\$ 3,955.94</u>	

Henry C. Thomas

Henry C. Thomas  
Principal Investigator

ORIGINAL SIGNED BY  
A. H. Shepard, Jr.

A. H. Shepard, Jr.  
Business Officer and  
Treasurer

UNITED STATES GOVERNMENT

# Memorandum

TO : R. G. Humphries, Director  
Contract Division

FROM : Herman M. Roth, Director  
Research and Development Division

SUBJECT: REQUEST FOR CONTRACT ACTION

DATE: OCT 6 1964

ORS:LM

It is requested that you take the necessary steps to process the following described contract action:

1. Nature of Action Requested:

Selection of New Contractor and/or  
Negotiation of Contract  
Number:  
Contractor:

Modification of Contract  
Number: AT-(40-1)-2130  
Contractor: University of North Carolina  
Chapel Hill, North Carolina

2. Nature of Services to be Covered by Contract: Research

Title: "Investigation of Sorption and Ion Exchange Phenomena in  
Natural Soils and Treated Materials"

3. Type of Contract:  Lump-Sum  Cost-Type  Other

4. Amount to be Obligated by this Contract Action: \$35,000.00

5. Description of Other Changes to be Covered by Contract Action:

Modify contract to provide for the performance of additional research to be completed during the period October 1, 1964 through September 30, 1965. The AEC will support the project in the amount of \$35,000 in new funds.

The Government will retain title to equipment previously acquired

6. Authority: under the contract.

Contract Authorization from F. K. Pittman to S. R. Sapirie dated August 14, 1964

*Herman M. Roth* 82233  
Herman M. Roth

1129120

## APPENDIX "A"

For the Contract Period October 1, 1964 through September 30, 1965.

A-I RESEARCH TO BE PERFORMED BY CONTRACTOR

The Contractor will continue to conduct research on some of the fundamental problems associated with the disposal of the byproducts of nuclear fission. This work will include such approaches as continuation of the study on (1) the synthesis and properties of potassium cobalt ferrocyanide, and (2) ion-exchange equilibria of ternary system on inorganic exchangers.

A-II APPROXIMATE LEVEL OF RESEARCH EFFORT

(a) <u>Contractor Personnel:</u>		<u>Approx.</u>
		<u>% of time</u>
Dr. H. C. Thomas	Academic	37%
Principal Investigator	Summer	63%
2 Research Associates		70%
Laboratory Assistant		As Needed
(b) <u>Premises, Facilities, and Materials to be</u>		
<u>Furnished by the Contractor:</u>		

Adequate laboratory facilities and equipment are available to conduct the proposed investigation of sorption and ion exchange phenomena in natural soils and treated materials.

A-III ITEMS OF EQUIPMENT TO BE PURCHASED OR FABRICATED BY CONTRACTOR  
COSTING \$500 OR MORE

None

WRD-1 (11-60)	UNITED STATES ATOMIC ENERGY COMMISSION <b>CONTRACT AUTHORIZATION</b>	DATE AUG 14 1964 Serial # 65-008
TO S.R. Sapirie, Manager Oak Ridge Operations Office FROM Frank K. Pittman, Director Division of Reactor Development		<input type="checkbox"/> NEW CONTRACT <input checked="" type="checkbox"/> RENEWAL OF  CONTRACT NO. AT(40-1)-2130 PROJECT AGREEMENT NO.
1 CONTRACTOR University of North Carolina		2 TERM 12 Months 10/1/64 to 9/30/65
3 PROJECT TITLE Investigation of Sorption and Ion Exchange Phenomena in Natural Soils and Treated Materials.		
4 RECOMMENDED TYPE <input checked="" type="checkbox"/> AT OPTION OF YOUR OFFICE <input type="checkbox"/> CFFF <input type="checkbox"/> COST REIMBURSEMENT <input type="checkbox"/> FIXED PRICE <input type="checkbox"/> OTHER		5 FINANCING <input checked="" type="checkbox"/> THE ESTIMATED COST FOR THE TERM IS \$ 35,000 <input type="checkbox"/> COST CEILING IN THE AMOUNT OF \$ HAVE (NOT) BEEN PROVIDED IN THE OPERATIONS OFFICE FINANCIAL PLAN. <input type="checkbox"/> GSO IN THE AMOUNT OF \$ HAS (NOT) BEEN PROVIDED IN YOUR FINANCIAL PLAN. <input type="checkbox"/> YOU SHOULD (NOT) ABSORB GSO REQUIREMENTS WITHIN TOTAL AVAILABILITY. <input checked="" type="checkbox"/> COSTS ARE CHARGEABLE TO BUDGET ACTIVITY 04 60 40 02. <input checked="" type="checkbox"/> IT IS DESIRED THAT THIS CONTRACT BE FUNDED FOR ITS ENTIRE TERM <input checked="" type="checkbox"/> IT SHOULD BE NOTED THAT HEADQUARTERS HAS NOT MADE A DETAILED REVIEW OF OVERHEAD, GENERAL AND ADMINISTRATIVE EXPENSES, EQUIPMENT AND OTHER RELATED COSTS AS IT IS EXPECTED THAT THE OPERATION OFFICE WILL INVESTIGATE THESE ITEMS AS PART OF ANY CONTRACT NEGOTIATIONS. <input type="checkbox"/> FEE CALCULATIONS ARE TO BE MADE BY THE OPERATION OFFICE CONSISTENT WITH AEC FEE POLICY AND STANDARD AEC SCHEDULES. <input checked="" type="checkbox"/> NO PART OF THE FUNDS UNDER THIS CONTRACT MAY BE USED FOR CONFERRING OF A FELLOWSHIP WITHIN THE MEANING OF THE APPROPRIATION RIDER. <input checked="" type="checkbox"/> OTHER. Cost ceiling in the amount of \$35,000 will be provided in the first firm OR financial plan for FY 1965. No GSO involved. This authorization is subject to the availability of FY 1965 funds and the provisions of the continuing resolution. No equipment funds are included.
6 CLASSIFICATION <b>UNCLASSIFIED</b> I WORK TO BE PERFORMED IS UNDER CATEGORY _____ AS DEFINED IN AEC MANUAL SECTION 3403		
7 REPORTING REQUIREMENTS <input checked="" type="checkbox"/> ALL ASPECTS OF THE WORK SHALL BE DESCRIBED IN SUFFICIENT DETAIL SO AS TO ENABLE OTHERS TO USE THIS INFORMATION. <input checked="" type="checkbox"/> PROVISIONS OF AECM 3202 AND 3203 APPLY. <input type="checkbox"/> ONE COPY OF ALL REPORTS IS TO BE SENT TO THE REPORTS AND STATISTICS BRANCH, DRD. <input type="checkbox"/> THE CONTRACTOR WILL SUBMIT INFORMAL MONTHLY LETTER REPORTS TO DRD ( COPIES) AND TO THE OPERATIONS OFFICE ( COPIES). <input checked="" type="checkbox"/> QUARTERLY TECHNICAL REPORTS WILL BE SUBMITTED BY THE CONTRACTOR <del>AS PER THE CONTRACT DOCUMENTS</del> <del>XXXXXXXXXXXXXXXXXXXX</del> <input checked="" type="checkbox"/> A DRAFT FINAL SUMMARY REPORT FOR THE CONTRACT PERIOD IS TO BE SUBMITTED TO THE DIRECTOR, DRD, 15 DAYS BEFORE <del>WORK</del> COMPLETION OF THIS CONTRACT AND BEFORE THE REPORT IS REPRODUCED. <input checked="" type="checkbox"/> IT IS REQUESTED THAT THE Oak Ridge OPERATIONS OFFICE RECEIVE THIS REPORT AND FORWARD IT TO THE HEADQUARTERS TECHNICAL POINT OF CONTACT TOGETHER WITH AN EVALUATION OF THE REPORT AND RECOMMENDATIONS AS TO FUTURE WORK PROPOSED, IF ANY. <input checked="" type="checkbox"/> FINAL REPORT DUE 20 DAYS AFTER APPROVAL OF DRAFT. REPORTING REQUIREMENTS REMAIN THE SAME AS PREVIOUSLY AUTHORIZED, EXCEPT AS NOTED ABOVE. <input checked="" type="checkbox"/> 30 COPIES OF FINAL REPORT REQUIRED.  See item 9 for other reporting requirements		

E 8012

AUG 17 1964

1129122

<p style="text-align: center;">UNITED STATES ATOMIC ENERGY COMMISSION</p> <p style="text-align: center;">CONTRACT AUTHORIZATION</p>	<p>DATE           AUG 14 1964</p> <p>PAGE NO. 2    Serial # 65-008</p>
<p>TOS. R. Sapirie, Manager Oak Ridge Operations Office</p>	<p>CONTRACT NO. AT(40-1)-2130</p> <p>PROJECT AGREEMENT NO.</p>
<p>CONTRACTOR</p> <p style="text-align: center;">University of North Carolina</p>	
<p>8 SCOPE OF WORK</p> <p>As indicated in attached proposal</p>	
<p>9 SPECIAL PROVISIONS AND INSTRUCTIONS</p> <p>IT IS REQUESTED THAT YOU KEEP THE CONTRACTS BRANCH, DRD, ADVISED AS TO ANY PROBLEMS ENCOUNTERED IN YOUR NEGOTIATIONS AND THE DATE OF EXECUTION OF THIS CONTRACT, TOGETHER WITH THE AMOUNT OF FUNDS OBLIGATED. THIS NOTIFICATION SHOULD BE MADE DIRECTLY TO DRD RATHER THAN WAITING FOR THE NORMAL DISTRIBUTION OF THE CONTRACT DOCUMENT OR MONTHLY CONTRACT REPORT.</p> <p>Topical reports to be submitted when applicable</p> <p>Quarterly reports to be distributed to HQ only.</p> <p>Final report to be distributed according to TID-4500 UC-70</p>	
<p>10 HEADQUARTERS TECHNICAL POINT OF CONTACT</p> <p>Chief, Environmental &amp; Sanitary Engineering Branch Division of Reactor Development</p>	
<p>11 ENCLOSURES</p> <p>1. Proposal dated July 24, 1964</p>	

1129123

**TO: The United States Atomic Energy Commission  
Research and Development Division  
Post Office Box E  
Oak Ridge, Tennessee**

**FROM: The University of North Carolina  
Chapel Hill, North Carolina**

**Proposal for the Renewal of Research Contract**

**No. AT-(40-1)-2130**

**July 24, 1964**

**It is proposed that the above designated contract between the United States Atomic Energy Commission and the University of North Carolina be renewed for one year from October 1, 1964, to September 30, 1965**

**Investigations proposed herewith are two in number. Both are continuations of work in progress.**

- 1. It is proposed to continue the investigation of the synthesis and properties of potassium cobalt ferrocyanide essentially according to the procedure outlined in the accompanying progress report. We propose to synthesize the material under carefully controlled conditions from materials marked with isotopic tracers. Used in conjunction with a standardized assessment of its ion-exchange properties as regards cesium this procedure promises to enable a characterization of the material in terms of the synthetic method giving the most desirable product.**
- 2. It is proposed to continue the study of ion-exchange equilibria of ternary system on inorganic exchangers. An approximate procedure has been shown to make possible a prediction of these equilibria from binary cases for singly charged ions. Many complications enter into the more important case of ions of mixed charge type. Little or no theory is available and very precise experimental work will be essential as a basis for a reasonable discussion of these systems.**

**The proposed budget here attached has been drawn up with the above work in mind.**

**"Other Financial Assistance." The principal investigator under this contract is responsible for a research project on diffusion of ions in gels, now supported by a grant for two years in the amount of \$25,300 from the National Science Foundation (NSF GP-1981). These funds are expended for salaries of other personnel and for computation on the Univac-1105. This work is related in general nature to the work under subject contract, and we profit from its proximity. There is otherwise no connection.**

**The facilities for the prosecution of the work proposed are those described in Modification No. 7 of subject contract.**

PROPOSED BUDGET

For the period Oct. 1, 1964 - Sept. 30, 1965

	<u>AEC</u>	<u>UNC</u>
<b>I. <u>Personnel</u></b>		
Henry C. Thomas, Director		
.37 time , 9 months	\$ 4,949.49	\$ 1,148.99
.63 time , 3 months	3,181.82	
<b>Research Associates</b>		
K. B. Deshpande, .70 time	7,919.18	
Isso Hashimoto, .70 time	7,212.11	
Laboratory Assistant (hourly)	707.07	
Consultation within UNC	848.48	848.48
	23,969.67	1,997.47
<b>II. <u>Indirect Costs</u></b>		
Overhead, 38% of salaries*	8,984.03	436.26
FICA and Retirement (State)	2,189.80	87.68
	11,173.83	523.94
<b>III. <u>Operating Expenses</u></b>		
1. Supplies expendable	1,414.14	
2. Mass Spectrometer	1,272.73	
3. Service on electronic equipment	212.12	
4. Travel	530.30	
5. Secretarial & publication	848.48	
6. Communication, etc.	212.12	
7. Laboratory services		2,545.45
8. Glass shop & machine work	777.78	777.78
	4,489.89	3,323.23
<b>Total Proposed</b>	39,633.39	5,844.64
Estimated balance, Sept. 30, 1964	4,633.39	
<b>NEW FUNDS REQUESTED FROM AEC</b>	\$ 35,000.00	

\* Rate fixed by the Army Audit Agency

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Henry C. Thomas  
Principal Investigator

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A. H. Shepard, Jr.  
Business Officer and Treasurer

1129125

**TO: The United States Atomic Energy Commission  
Research and Development Division  
Post Office Box E  
Oak Ridge, Tennessee**

**FROM: The University of North Carolina  
Chapel Hill, North Carolina**

**Proposal for the Renewal of Research Contract**

**No. AT-(40-1)-2130**

**July 24, 1964**

**It is proposed that the above designated contract between the United States Atomic Energy Commission and the University of North Carolina be renewed for one year from October 1, 1964, to September 30, 1965**

**Investigations proposed herewith are two in number. Both are continuations of work in progress.**

- 1. It is proposed to continue the investigation of the synthesis and properties of potassium cobalt ferrocyanide essentially according to the procedure outlined in the accompanying progress report. We propose to synthesize the material under carefully controlled conditions from materials marked with isotopic tracers. Used in conjunction with a standardized assessment of its ion-exchange properties as regards cesium this procedure promises to enable a characterization of the material in terms of the synthetic method giving the most desirable product.**
- 2. It is proposed to continue the study of ion-exchange equilibria of ternary system on inorganic exchangers. An approximate procedure has been shown to make possible a prediction of these equilibria from binary cases for singly charged ions. Many complications enter into the more important case of ions of mixed charge type. Little or no theory is available and very precise experimental work will be essential as a basis for a reasonable discussion of these systems.**

**The proposed budget here attached has been drawn up with the above work in mind.**

**"Other Financial Assistance." The principal investigator under this contract is responsible for a research project on diffusion of ions in gels, now supported by a grant for two years in the amount of \$25,300 from the National Science Foundation (NSF GP-1981). These funds are expended for salaries of other personnel and for computation on the Univac-1105. This work is related in general nature to the work under subject contract, and we profit from its proximity. There is otherwise no connection.**

**The facilities for the prosecution of the work proposed are those described in Modification No. 7 of subject contract.**

**PROPOSED BUDGET**

For the period Oct. 1, 1964 - Sept. 30, 1965

	<u>AEC</u>	<u>UNC</u>
<b>I. <u>Personnel</u></b>		
Henry C. Thomas, Director		
.37 time , 9 months	\$ 4,949.49	\$ 1,148.99
.63 time , 3 months	3,181.82	
 Research Associates		
K. B. Deshpande, .70 time	7,919.18	
Isao Hashimoto, .70 time	7,212.11	
 Laboratory Assistant (hourly)	707.07	
 Consultation within UNC		848.48
	<hr/> 23,969.67	<hr/> 1,997.47
 <b>II. <u>Indirect Costs</u></b>		
Overhead, 38% of salaries*	8,984.03	436.26
FICA and Retirement (State)	2,189.80	87.68
	<hr/> 11,173.83	<hr/> 523.94
 <b>III. <u>Operating Expenses</u></b>		
1. Supplies expendable	1,414.14	
2. Mass Spectrometer	1,272.73	
3. Service on electronic equipment	212.12	
4. Travel	530.30	
5. Secretarial & publication	848.48	
6. Communication, etc.	212.12	
7. Laboratory services		2,545.45
8. Glass shop & machine work		777.78
	<hr/> 4,489.89	<hr/> 3,323.23
 Total Proposed	39,633.39	5,844.64
Estimated balance, Sept. 30, 1964	<u>4,633.39</u>	
 NEW FUNDS REQUESTED FROM AEC	\$ 35,000.00	

\*Rate fixed by the Army Audit Agency

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Henry C. Thomas  
Principal Investigator

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A. H. Shepard, Jr.  
Business Officer and Treasurer

1129127

UNITED STATES GOVERNMENT

# Memorandum

TO : **Frank E. Kistner, Director**  
**Division of Manpower Development, HQ**

DATE: **June 24, 1968**

FROM : **Herman M. Roth, Director**  
**Research and Development Division, ORO**

SUBJECT: **RENEWAL OF CONTRACT NO. AT-(40-1)- 2238 WITH UNIVERSITY OF**  
**SOUTH CAROLINA (DR. HENRY C. THOMAS)**

**000:10**

We are submitting for your review and appropriate action the following information concerning the contract which will expire on **September 30, 1968**:

1. Renewal Proposal (4)
2. Progress Report (4)
3. Financial Statement (4)
4. 200-Word Summary (2)

We shall appreciate your advising us of your decision so that we may proceed with the necessary contract action at the earliest possible date.

  
Herman M. Roth

Enclosure:  
As Listed Above

CC: **G. S. Shoup, w/incl.**  
**D. S. Eckley, w/progress report**  
**Alice Brown**

TO: The United States Atomic Energy Commission  
Research and Development Division  
Post Office Box E  
Oak Ridge, Tennessee

FROM: The University of North Carolina  
Chapel Hill, N. C.

\$35,000 for  
1 A 2  
from DRD  
③ is from D Research.  
Dave Richmond

Proposal for the Renewal of Research Contract

No. AT-(40-1)-2130

June 15, 1964

It is proposed that the above designated contract between the United States Atomic Energy Commission and the University of North Carolina be renewed for one year from October 1, 1964, to September 30, 1965.

Investigations proposed herewith are three in number. The first two are continuations of work in progress. The third is new work of a fundamental nature.

- ① 1. It is proposed to continue the investigation of the synthesis and properties of potassium cobalt ferrocyanide essentially according to the procedure outlined in the accompanying progress report. We propose to synthesize the material under carefully controlled conditions from materials marked with isotopic tracers. Used in conjunction with a standardized assessment of its ion-exchange properties as regards cesium this procedure promises to enable a characterization of the material in terms of the synthetic method giving the most desirable product.
- ② 2. It is proposed to continue the study of ion-exchange equilibria of ternary system on inorganic exchangers. An approximate procedure has been shown to make possible a prediction of these equilibria from binary cases for singly charged ions. Many complications enter into the more important case of ions of mixed charge type. Little or no theory is available and very precise experimental work will be essential as a basis for a reasonable discussion of these systems.
3. It is proposed to start at the earliest opportunity work on the application of the thermodynamic relation developed in the attached report "The Effect of Water Activity on Ion-Exchange Selectivity." The character of the requisite experiments is outlined in this report. In very many cases of practical interest ion-exchangers are used in conjunction with concentrated solutions. Any aid to the understanding of these complex systems should be of value. It is believed that the proposed study will be most useful in this regard.

1129129

The proposed budget here attached has been drawn up with the above work in mind. The use of a mass spectrometer (not available in Chapel Hill) will be essential to the prosecution of item 3 above. It is assumed that we can get the use of an instrument at some other location; the item "Use of Mass Spectrometer" may well be expended in travel to this location.

"Other Financial Assistance." The principal investigator under this contract is responsible for a research project on diffusion of ions in gels, now supported by a grant for two years in the amount of \$25,300 from the National Science Foundation (NSF GP-1981). These funds are expended for salaries of other personnel and for computation on the Univac-1105. This work is related in general nature to the work under subject contract, and we profit from its proximity. There is otherwise no connection.

The facilities for the prosecution of the work proposed are those described in Modification No. 7 of subject contract.

PROPOSED BUDGET

Contract No. AT-(40-1)-2130

For the period Oct. 1, 1964 - Sept. 30, 1965

	<u>AEC</u>	<u>UNC</u>
<b>I. <u>Personnel</u></b>		
Henry C. Thomas, Director		
half time, 9 months	\$7,000.00	\$1,625.00
full time, 3 months	4,500.00	
Research Associates		
K. B. Deshpande, full time	11,200.00	
Isao Hashimoto, full time	10,200.00	
Laboratory Assistant (hourly)	1,000.00	
Consultation within UNC		<u>1,200.00</u>
	<u>\$33,900.00</u>	<u>\$2,825.00</u>
<b>II. <u>Indirect Costs</u></b>		
Overhead, 38% of salaries*	\$12,796.00	\$ 617.00
FICA and Retirement (State)	3,097.00	124.00
	<u>15,893.00</u>	<u>741.00</u>
<b>III. <u>Operating Expenses</u></b>		
1. Supplies expendable	\$2,000.00	
2. Mass Spectrometer	1,800.00	
3. Service on electronic equipment	300.00	
4. Travel	750.00	
5. Secretarial & publication	1,200.00	
6. Communication, etc.	300.00	
7. Laboratory services		3,600.00
8. Glass shop & machine work		<u>1,100.00</u>
	<u>6,350.00</u>	<u>4,700.00</u>
Total Proposed	\$56,050.00	8,266.00
Estimated balance, Sept. 30, 1964	<u>6,500.00</u>	
NEW FUNDS REQUESTED FROM AEC	\$49,550.00	

\*Rate fixed by the Army Audit Agency

*Henry C. Thomas*  
 \_\_\_\_\_  
 Henry C. Thomas  
 Principal Investigator

*A. H. Shepard, Jr.*  
 \_\_\_\_\_  
 A. H. Shepard, Jr.  
 Business Officer and Treasurer

UNITED STATES GOVERNMENT

# Memorandum

TO : R. G. Humphries, Director  
Contract Division

FROM : Herman M. Roth, Director  
Research and Development Division

SUBJECT: REQUEST FOR CONTRACT ACTION

DATE: OCT 4 1963

ORS:LH

It is requested that you take the necessary steps to process the following described contract action:

1. Nature of Action Requested:

Selection of New Contractor and/or  
Negotiation of Contract  
Number:  
Contractor:

Modification of Contract  
Number: AT-(40-1)-2130  
Contractor: University of North Carolina  
Chapel Hill, North Carolina

2. Nature of Services to be Covered by Contract: Research

Title: "Investigation of Sorption and Ion Exchange Phenomena  
in National Soils and Treated Materials"

3. Type of Contract  Lump-Sum  Cost-Type  Other

4. Amount to be Obligated by this Contract Action: \$55,000.00

5. Description of Other Changes to be Covered by Contract Action:

Modify contract to provide for the performance of additional research to be completed during the period October 1, 1963 through September 30, 1964. The AEC will support the project in the amount of \$55,000 in new funds.

The Government will retain title to equipment previously acquired under the contract.

6. Authority:

Contract Authorization from Frank K. Pittman to S. R. Sapirie dated October 1, 1963

*Herman M. Roth*  
Herman M. Roth

28542

1129132

## APPENDIX "A"

For the Contract Period October 1, 1963 through September 30, 1964

A-I RESEARCH TO BE PERFORMED BY CONTRACTOR

The Contractor will continue with studies bearing on the disposal in the ground of radioactive wastes to include (1) further work on the application to performance data from ion-exchange columns of a method of computation which produces a description in terms of a Peclet number. In all but the simplest cases the method is necessarily empirical; its utility is to be assessed, and (2) prosecution of a study of ion sorption in ternary systems, in particular in sodium, cesium, and  $\text{NH}_4$  on the zeolite clinoptilolite. In (3) further studies, work will continue to be directed toward relating the ion-exchange behavior and the structure of inorganic materials.

A-II APPROXIMATE LEVEL OF RESEARCH EFFORT

(a) <u>Contractor Personnel:</u>		Approx. % of time
Dr. H. C. Thomas	Academic	75%
Principal Investigator	Summer	100%
2 Research Associates		100%
2 Research Assistants		50%
Secretarial Assistance		As Needed

(b) Premises, Facilities, and Materials to be  
Furnished by the Contractor:

Adequate laboratory facilities will be furnished to conduct an investigation of sorption and ion exchange phenomena in natural soils and treated materials. Among equipment items available for use on the project are various types of spectrometers, flame photometer, gas chromatographic equipment, and a computer.

A-III ITEMS OF EQUIPMENT TO BE PURCHASED OR FABRICATED  
BY CONTRACTOR COSTING \$500 OR MORE

None

WRD-1 (11-60)	UNITED STATES ATOMIC ENERGY COMMISSION <b>CONTRACT AUTHORIZATION</b>	DATE OCT 1 1963 Serial No. 64-035
TO S. R. Sapirie, Manager Oak Ridge Operations Office FROM <i>y. m. Stables</i> Frank K. Pittman, Director Division of Reactor Development		<input type="checkbox"/> NEW CONTRACT <input checked="" type="checkbox"/> RENEWAL OF  CONTRACT NO. AT(40-1)-2130 PROJECT AGREEMENT NO.
1 CONTRACTOR University of North Carolina		2 TERM 12 months  10/1/63 -- 9/30/64
3 PROJECT TITLE Investigation of Sorption and Ion Exchange Phenomena in National Soils and Treated Materials		
4 RECOMMENDED TYPE <input checked="" type="checkbox"/> AT OPTION OF YOUR OFFICE <input type="checkbox"/> CPFF <input type="checkbox"/> COST REIMBURSEMENT <input type="checkbox"/> FIXED PRICE <input type="checkbox"/> OTHER		5 FINANCING <input checked="" type="checkbox"/> THE ESTIMATED COST FOR THE TERM IS \$ 55,000 <input type="checkbox"/> COST CEILING IN THE AMOUNT OF \$ HAVE (NOT) BEEN PROVIDED IN THE OPERATIONS OFFICE FINANCIAL PLAN. <input type="checkbox"/> GSO IN THE AMOUNT OF \$ HAS (NOT) BEEN PROVIDED IN YOUR FINANCIAL PLAN. <input type="checkbox"/> YOU SHOULD (NOT) ABSORB GSO REQUIREMENTS WITHIN TOTAL AVAILABILITY. <input checked="" type="checkbox"/> COSTS ARE CHARGEABLE TO BUDGET ACTIVITY 04 60 40 02. <input checked="" type="checkbox"/> IT IS DESIRED THAT THIS CONTRACT BE FUNDED FOR ITS ENTIRE TERM <input checked="" type="checkbox"/> IT SHOULD BE NOTED THAT HEADQUARTERS HAS NOT MADE A DETAILED REVIEW OF OVERHEAD, GENERAL AND ADMINISTRATIVE EXPENSES, EQUIPMENT AND OTHER RELATED COSTS AS IT IS EXPECTED THAT THE OPERATION OFFICE WILL INVESTIGATE THESE ITEMS AS PART OF ANY CONTRACT NEGOTIATIONS. <input type="checkbox"/> FEE CALCULATIONS ARE TO BE MADE BY THE OPERATION OFFICE CONSISTENT WITH AEC FEE POLICY AND STANDARD AEC SCHEDULES. <input checked="" type="checkbox"/> NO PART OF THE FUNDS UNDER THIS CONTRACT MAY BE USED FOR CONFERRING OF A FELLOWSHIP WITHIN THE MEANING OF THE APPROPRIATION RIDER. <input checked="" type="checkbox"/> OTHER. Cost ceiling in amount of \$55,000 will be provided in the first firm OR financial plan for FY 1964. This is subject to the availability of FY 1964 funds and the provisions of the continuing resolution. No equipment funds are included.
6 CLASSIFICATION <b>UNCLASSIFIED</b> WORK TO BE PERFORMED IS UNDER CATEGORY <u>I</u> AS DEFINED IN AEC MANUAL SECTION 3403		
7 REPORTING REQUIREMENTS <input checked="" type="checkbox"/> ALL ASPECTS OF THE WORK SHALL BE DESCRIBED IN SUFFICIENT DETAIL SO AS TO ENABLE OTHERS TO USE THIS INFORMATION. <input checked="" type="checkbox"/> PROVISIONS OF AECM 3202 AND 3203 APPLY. <input type="checkbox"/> ONE COPY OF ALL REPORTS IS TO BE SENT TO THE REPORTS AND STATISTICS BRANCH, DRD. <input type="checkbox"/> THE CONTRACTOR WILL SUBMIT INFORMAL MONTHLY LETTER REPORTS TO DRD ( COPIES) AND TO THE OPERATIONS OFFICE ( COPIES). <input type="checkbox"/> QUARTERLY TECHNICAL REPORTS WILL BE SUBMITTED BY THE CONTRACTOR AT WHICH TIME MONTHLY REPORTS WILL STILL BE REQUIRED. <input type="checkbox"/> A DRAFT FINAL SUMMARY REPORT FOR THE CONTRACT PERIOD IS TO BE SUBMITTED TO THE DIRECTOR, DRD, DAYS BEFORE (AFTER) COMPLETION OF THIS CONTRACT AND BEFORE THE REPORT IS REPRODUCED. <input type="checkbox"/> IT IS REQUESTED THAT THE OPERATIONS OFFICE RECEIVE THIS REPORT AND FORWARD IT TO THE HEADQUARTERS TECHNICAL POINT OF CONTACT TOGETHER WITH AN EVALUATION OF THE REPORT AND RECOMMENDATIONS AS TO FUTURE WORK PROPOSED, IF ANY. <input type="checkbox"/> FINAL REPORT DUE DAYS AFTER APPROVAL OF DRAFT. REPORTING REQUIREMENTS REMAIN THE SAME AS PREVIOUSLY AUTHORIZED, EXCEPT AS SHOWN BY THIS <input type="checkbox"/> COPIES OF FINAL REPORT REQUIRED. <i>02 YES</i>		
No change in reporting requirements <i>DCI</i>		

RECEIVED

OCT 3 - 1963

1129134

UNITED STATES ATOMIC ENERGY COMMISSION CONTRACT AUTHORIZATION		DATE <b>OCT 1 1963</b> PAGE NO. 2 Serial No. 64-035
TO <b>S. R. Sapirio, Manager</b> <b>Oak Ridge Operations Office</b>	CONTRACT NO. <b>AT(40-1)-2130</b> PROJECT AGREEMENT NO.	
CONTRACTOR <b>University of North Carolina</b>		
<b>8 SCOPE OF WORK</b> Continue work on sorption of radioactive tracers in natural earth materials, and synthetic exchange materials as indicated in the attached proposal.		
<b>9 SPECIAL PROVISIONS AND INSTRUCTIONS</b> IT IS REQUESTED THAT YOU KEEP THE CONTRACTS BRANCH, DRD, ADVISED AS TO ANY PROBLEMS ENCOUNTERED IN YOUR NEGOTIATIONS AND THE DATE OF EXECUTION OF THIS CONTRACT, TOGETHER WITH THE AMOUNT OF FUNDS OBLIGATED. THIS NOTIFICATION SHOULD BE MADE DIRECTLY TO DRD RATHER THAN WAITING FOR THE NORMAL DISTRIBUTION OF THE CONTRACT DOCUMENT OR MONTHLY CONTRACT REPORT.  Patent provision remain the same.		
<b>10 HEADQUARTERS TECHNICAL POINT OF CONTACT</b> <b>Chief, Environmental &amp; Sanitary Engineering Branch</b> <b>Division of Reactor Development</b>		
<b>11 ENCLOSURES</b> Proposal dated June 1963		

1129135

## Office Memorandum • UNITED STATES GOVERNMENT

TO : **Frank L. Fisher, Director**  
**Division of Research Development, Headquarters**

DATE: **June 21, 1953**

FROM : **Herman M. Roth, Director**  
**Research and Development Division, ORO**

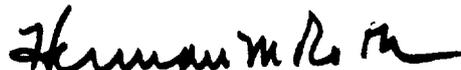
SUBJECT: **RENEWAL OF CONTRACT NO. AT-(40-1)- 2120 • UNIVERSITY OF NORTH CAROLINA**  
**(Dr. HENRY C. THOMAS)**

**OO:OR**

We are submitting for your review and appropriate action the following information concerning the contract which will expire on **September 30, 1954**

1. Renewal Proposal ( 1 )
2. Progress Report ( 1 )
3. Financial Statement ( 1 )
4. 200-Word Summary ( 1 )

We shall appreciate your advising us of your decision so that we may proceed with the necessary contract action at the earliest possible date.

  
Herman M. Roth

Enclosure:  
As Listed Above

CC: **E. L. Hall, Headquarters**  
**w/encs.**

CC: **C. S. Shoup, w/encs.**  
**D. S. Eschey, w/progress report**  
**Alice Brown** ✓

To: The United States Atomic Energy Commission  
Research and Development Division  
Post Office Box E  
Oak Ridge, Tennessee

From: The University of North Carolina  
Chapel Hill, North Carolina

Proposal for the Renewal of Research Contract

No. AT-(40-1)-2130

June 15, 1963

It is proposed that the above designated contract between the United States Atomic Energy Commission and the University of North Carolina be renewed for one year from October 1, 1963 to September 30, 1964.

The investigations proposed herewith amount to continuations of studies currently in progress. These are:

1. It is proposed that we investigate further applications of our method of handling data on column performance, at least to the extent necessary to demonstrate its range of applicability. We will conclude this work by making available a detailed account of the procedure, the necessary computer programs, together with an assessment of its utility. The method having already been demonstrated to be successful in the study of hydraulic dispersion in packed beds, we propose to apply it to a variety of such cases and to attempt to produce a useful survey of the values of dispersion coefficients to be expected with packed beds of types in general use.

2. It is proposed to continue the study of the ternary system Cs, Na, NH<sub>4</sub> - clinoptilolite over a wide range of composition to assess the validity of the description in terms of pseudo-binary equilibrium coefficients. Since exchange sorption of strontium is of particular importance and because it is not at all clear how to handle ternary systems containing divalent ions, it is proposed to extend this work both theoretically and experimentally to such cases. It is probable that exploratory work on systems containing divalent ions will be more profitably carried out on a simpler sorbent, such as a purified montmorillonite clay.

3. It is proposed to continue the work on the ion-exchange behavior of the synthetic lithium zeolite. This clinoptilolite-like material exhibits to an exaggerated degree some of the peculiar characteristics of that mineral. It would be of importance to be able to correlate in more detail the structure of such a material with its ion exchange behavior.

4. As is known, the Savannah River Laboratory of the du Pont Company has developed a form of potassium cobalt ferrocyanide which exhibits important properties as a sorbent for cesium. The high selectivity for cesium, the chemical stability, and the relatively simple nature of this material suggest that it may be a nearly ideal substance with which to investigate relations between molecular structure and the thermodynamic functions descriptive of ion-exchange behavior. A detailed study of this material from this point of view promises results of both theoretical and practical importance. It is proposed that we undertake an investigation aimed at correlating the structure of this material with its sorptive properties. This proposal is made after consultation with officials of the Savannah River Laboratory, where questions of patentability of this material are under consideration with the Savannah River Operations Office of the Atomic Energy Commission. We would undertake this investigation with the understanding that the Savannah River Laboratory has prior rights in any considerations involving patents.

The proposed budget attached has been drawn up with the above work in mind and according to procedures used in our proposal for the current year.

The facilities available for the work are those listed in Modification No. 7 of the subject contract.

---

Henry C. Thomas  
Principal Investigator

PROPOSED BUDGET

Contract No. AT-(40-1)-2130

For the period Oct. 1, 1963 - Sept. 30, 1964

	<u>ABC</u>	<u>UNC</u>
<b>I. Personnel</b>		
Henry C. Thomas, Director		
3/4 time, 9 months	\$7,000.00	\$1,250.00
Full time, 3 months	3,600.00	
Research Associates		
K. B. Deshpande, full time	10,600.00	
Isao Hashimoto, full time	9,600.00	
Research Assistant		
Doris Thompson, half time	2,550.00	
Laboratory Assistant <sup>half time</sup> <del>(hourly)</del>	2,500.00 <del>1,200.00</del>	
Consultation within UNC		<u>1,200.00</u>
	<u>\$34,550.00</u> 35,850.00	\$2,450.00
<b>II. Indirect Costs</b>		
Overhead, 36% of salaries*	\$12,438.00 + 468	\$ 450.00
FICA and Retirement (State)	<u>2,565.34</u> + 97.50	<u>92.81</u>
	\$15,003.34 + 565.50	\$ 542.81
<b>III. Operating Expenses</b>		
1. Supplies expendable	\$2,000.00	
2. Computation	1,800.00	1,800.00
3. Service on electronic equipment	300.00	
4. Travel	750.00	
5. Secretarial	900.00	
6. Communication, etc.	600.00	
7. Laboratory services		3,000.00
8. Glass shop & machine work		<u>1,500.00</u>
	<u>\$6,350.00</u>	<u>\$6,300.00</u>
Total Proposed	\$55,903.34	\$9,292.81
Estimated balance, September 30, 1963	<u>2,303.00</u>	
NEW FUNDS REQUESTED FROM ABC	\$53,600.00 + 1865 = \$55,465	

\* Rate fixed by the Army Audit Agency

Henry C. Thomas  
Henry C. Thomas  
Principal Investigator

A. H. Shepard, Jr.  
A. H. Shepard, Jr.  
Business Officer and Treasurer

1129139

**EXPENDITURE STATEMENT**

Contract No. AT-(40-1)-2130

The following statement shows the contributions of both the Atomic Energy Commission and the University of North Carolina for the period October 1, 1962 - September 30, 1963. Column A gives actual expenditures for the period October 1, 1962 - May 31, 1963, the contribution of the University being in part estimated. Column B gives estimates for the period June 1, 1963 - September 30, 1963. These estimates are in part based on actual encumbrances.

The estimated balance is based on the contribution of the Atomic Energy Commission of \$44,998 as stated in Modification No. 7 of the contract. During the period February - May 1963, a saving of \$2,000 in the matter of salary disbursement from AEC funds was effected through extra teaching on the part of the principal investigator. It will be noted that the estimated balance for September 30 is in large part due to this fact.

	Column A		Column B	
	<u>AEC</u>	<u>UNC</u>	<u>AEC</u>	<u>UNC</u>
Salaries and Wages	\$18,866.61	\$833.00	\$13,116.00	\$417.00
Equipment	588.96			
Supplies and services	2,958.66		1,973.00	
Travel	127.79		700.00	
Communications	134.70		100.00	
Indirect Cost	6,852.98		4,722.00	
Retirement & FICA	925.55		675.00	
Laboratory Services		2,650.00		1,350.00
	<u>\$30,455.27</u>	<u>\$3,483.00</u>	<u>\$21,286.00</u>	<u>\$1,767.00</u>
Total funds available (AEC) (including reimbursement as explained above):			\$54,044.00	
Expenditures through 9/30/63			<u>51,741.00</u>	
Estimated balance 9/30/63			\$ 2,303.00	

*Henry C. Thomas*  
 Henry C. Thomas  
 Principal Investigator

*A. H. Shepard, Jr.*  
 A. H. Shepard, Jr.  
 Business Officer and Treasurer

1129140

1. TO: **R. G. Humphries** Chairman Contract Board. From: **Res. & Dev. Div.**

It is requested that the Contract Board take the necessary action to process the following described contract action in accordance with the provisions of Bulletin OR-O&M-19:

2. Nature of Action Requested

Selection of New Contractor and Negotiation of Contract.

Modification of Contract No. **AT-(40-1)-2130**

Contractor: **University of North Carolina Chapel Hill, North Carolina**

Review and approval of Contract, Sub-contract or Purchase Order.

Other (Explain) \_\_\_\_\_

Number: \_\_\_\_\_  
Name: \_\_\_\_\_

3. Nature of Services to be Covered by Contract

Construction

Architect-Engineer

Other

(Explain) **Research**

4. Funding

Amount to be Obligated by this Contract Action : **44,998.00**

Source of Funds

Approved ORO Financial Plan, \_\_\_\_\_ Quarter, Fiscal Year 19\_\_

Project No. \_\_\_\_\_ or, Activity No. **04 60 40 02**

Funds to be Obligated: Allotment No. **24-31-91** (F.Y. 19**63** Funds)

Procurement Directive No. **62-158** Dated **9-20-62**

Issuing Office **Dir. of Res. & Dev.**

Concurrence in Funding Statement: (signed) \_\_\_\_\_

**Chief, Budget Branch**

5. Project or Activity to be Covered by Contract Action:

Location of Work: \_\_\_\_\_ Construction Directive No. \_\_\_\_\_

Estimated Cost of Work to be Covered by this Contract Action \$ \_\_\_\_\_

Schedule: Date Work to Start \_\_\_\_\_ Estimated Completion Date \_\_\_\_\_

Description of Project or Activity:

(If more space is required use separate sheets and attach hereto)

<p>6. Contract Board Docket No. _____ (To be assigned by Board Secretary)</p>	<p>7. Request Submitted By: (signed) _____  <del>DATE</del> 17 1962 Title: _____ <i>C. Shoup</i>  C. S. SHOUP  CHIEF, BIOLOGY BRANCH  RESEARCH AND DEVELOPMENT DIVISION</p>
<p>8. <u>Complete Description of Services to be Furnished by Contractor:</u>  Headquarters designated research contract   <b>TITLE: "Investigation of Sorption and Ion Exchange Phenomena in Natural Soils and Treated Materials"</b>  (If more space is required use separate sheets and attach hereto:)</p>	
<p>9. <u>Description of other changes to be covered by Modification:</u>   <b>Modify contract to provide for the performance of additional research to be completed during the period October 1, 1962 through September 30, 1963. The AEC will support the project in the amount of \$44,998.</b>  (If more space is required use separate sheets and attach hereto:)</p>	
<p>10. <u>Negotiated Contracts.</u> (Show why it appears desirable to negotiate new contract or to negotiate modification to existing contract)   <b>Form AEC-481 (Contract Authorization) from Frank K. Pittman to S. R. Sapirie dated September 20, 1962</b>   (If more space is required use separate sheets and attach hereto:)</p>	
<p>11. <u>Contracts, Subcontracts, or Purchase Orders Submitted for Review and Approval:</u> (Furnish brief description of action in this space and attach pertinent documents)   <b>None</b></p>	
<p>12. <u>Disputes:</u>  Attach a statement summarizing the dispute together with pertinent documents and Background Material.   <b>None</b></p>	

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## APPENDIX "A"

For the Contract Period October 1, 1962 through September 30, 1963.

A-I RESEARCH TO BE PERFORMED BY CONTRACTOR

The Contractor will continue to conduct research on the disposal of radioactive by-products of nuclear fission through investigation of dispersion of such materials in ion-exchange siliceous systems. This research will include such approaches as (1) fundamental studies of qualitative nature and quantitative description of the effects observed in ionic sorption on siliceous materials and (2) the application of this knowledge to the development of practical means of treating the effects observed when sorption takes place in flowing liquid-stationary solid systems.

A-II APPROXIMATE LEVEL OF RESEARCH EFFORT

<u>(a) Contractor Personnel:</u>	<u>Approx. % of time</u>
Dr. H. C. Thomas	Academic 75%
Principal Investigator	Summer 100%
2 Research Associates	100%
Research Assistant	50%
Secretarial Help	As Needed
 <u>(b) Premises, Facilities, and Materials to be Furnished by the Contractor:</u>	

Adequate laboratory space and facilities are available to conduct research on the disposal of radioactive by-products of nuclear fission. Among equipment items available for use under the contract are:

- (1) X-Ray Spectrometer, camera
- (2) X-Ray Spectrometer, Geiger counter
- (3) Gamma Ray Spectrometer, Single Channel
- (4) Gamma Ray Spectrometer, with special automatic recording equipment, single channel
- (5) Optical Spectrometers, infra-red and U.V.
- (6) Flame Photometer
- (7) Gas Chromatographic Equipment
- (8) Computer

A-III EQUIPMENT TO BE PURCHASED OR FABRICATED BY THE CONTRACTOR

None

A-IV EQUIPMENT TITLE TO WHICH IS TO REMAIN WITH THE GOVERNMENT

Equipment previously acquired under the contract

Analyzer - American Instrument Co.

- 1 Cat. No. 5-445 Roller Particle size Analyzer
- 1 " " 5-451 Sound-resistant cabinet
- 1 " " 5-456 Spec. Brass Sample Tube
- 1 " " 5-452 Low Pressure Air Pump

Centrifuge - Macalaster Bicknell

- 1 Internat'l Size 1 S.B. Serial # Z 6663

Deminerlizer - Penfield Products

- 1 M-8 Cartridge Type

Drop Collector - Technicon Chromatography Corp.

- 1 Drop counting accessories for Time Flow Fraction Collector

Fraction Collector - Technicon Chromatography Corp.

- 1 Time Flow Fraction collector with 150 minute timer

Pumps - Milton Roy Co.

- 1 MM2-B-11.5 "Mini Pump"
- Macalaster Bicknell
- 3 Eastern Model D6 Centrifugal Pump - Bronze Casting
- Macalaster Bicknell
- 1 Eastern, Midget, Low pressure model D-6 Crackle finish  
Bronze #35193

Relays - Central Scientific Co.

- 1 Cat. #99784 Relay
- 1 " #99785-A Electrode Relay, 50/60 cycle 115 V

Shaker - Macalaster Bicknell

- 1 Burrell Shaker, Size C

Spectrophotometer - Will-N.Y. Inc.

- 1 Beckman DU Serial No. 89442
- 1 Powersupply Serial No. 77284

Survey Meter - (Beta Gamma) National Tech. Labs.

- 1 #10800 Beckman Geiger Counter, Model "MX-5"  
Serial No. 21529

Counters - Eagle Signal Corp.

- 1 HZ 50A6 Microflex Counter 115 V 50/60 cycle;  
400 count range, AAR A-212
- 1 HN84 Cabinet

Autoscalers - General Radio  
2 SC-4 Eagle Preset Counters

Pump - Sigmamotor Co.  
1 Model T-6SH, with Graham 28A Variable drive,  
1/6 h.p. motor - all mounted on special  
base Serial No. 129 (S-547)

**A-V SUBSTANTIAL DEVIATIONS**

Substantial deviations from the foregoing shall be discussed with and subject to the written approval of the Commission.

WRD-1 (11-60)	UNITED STATES ATOMIC ENERGY COMMISSION <b>CONTRACT AUTHORIZATION</b>	DATE SEP 20 1962 Serial No. 62-158
TO  FROM	S. R. Sapirie, Manager Oak Ridge Operations Office  <i>Frank K. Pittman, Director</i> Division of Reactor Development	<input type="checkbox"/> NEW CONTRACT <input checked="" type="checkbox"/> RENEWAL OF  CONTRACT NO. AT(40-1)-2130 PROJECT AGREEMENT NO.
1 CONTRACTOR	University of North Carolina	2 TERM 12 Months
3 PROJECT TITLE Investigation of Sorption and Ion Exchange Phenomena in Natural Soils and Treated Materials		
4 RECOMMENDED TYPE	5 FINANCING	
<input checked="" type="checkbox"/> AT OPTION OF YOUR OFFICE <input type="checkbox"/> CFFF <input type="checkbox"/> COST REIMBURSEMENT <input type="checkbox"/> FIXED PRICE <input type="checkbox"/> OTHER	<input checked="" type="checkbox"/> THE ESTIMATED COST FOR THE TERM IS \$ 45,000 <input checked="" type="checkbox"/> COST CEILING IN THE AMOUNT OF \$ 45,000 HAVE (NOT) BEEN PROVIDED IN THE Current OR OPERATIONS OFFICE FINANCIAL PLAN. <input checked="" type="checkbox"/> GSO IN THE AMOUNT OF \$ N/A HAS (NOT) BEEN PROVIDED IN YOUR FINANCIAL PLAN. <input type="checkbox"/> YOU SHOULD (NOT) ABSORB GSO REQUIREMENTS WITHIN TOTAL AVAILABILITY. <input checked="" type="checkbox"/> COSTS ARE CHARGEABLE TO BUDGET ACTIVITY 04 60 40 02. <input checked="" type="checkbox"/> IT IS DESIRED THAT THIS CONTRACT BE FUNDED FOR ITS ENTIRE TERM <input checked="" type="checkbox"/> IT SHOULD BE NOTED THAT HEADQUARTERS HAS NOT MADE A DETAILED REVIEW OF OVERHEAD, GENERAL AND ADMINISTRATIVE EXPENSES, EQUIPMENT AND OTHER RELATED COSTS AS IT IS EXPECTED THAT THE OPERATION OFFICE WILL INVESTIGATE THESE ITEMS AS PART OF ANY CONTRACT NEGOTIATIONS. <input type="checkbox"/> FEE CALCULATIONS ARE TO BE MADE BY THE OPERATION OFFICE CONSISTENT WITH AEC FEE POLICY AND STANDARD AEC SCHEDULES. <input checked="" type="checkbox"/> NO PART OF THE FUNDS UNDER THIS CONTRACT MAY BE USED FOR CONFERRING OF A FELLOWSHIP WITHIN THE MEANING OF THE APPROPRIATION RIDER. <input type="checkbox"/> OTHER.	
6 CLASSIFICATION <u>Unclassified</u> WORK TO BE PERFORMED IS UNDER CATEGORY <u>I</u> AS DEFINED IN AEC MANUAL SECTION 2402	7 REPORTING REQUIREMENTS	
<input checked="" type="checkbox"/> ALL ASPECTS OF THE WORK SHALL BE DESCRIBED IN SUFFICIENT DETAIL SO AS TO ENABLE OTHERS TO USE THIS INFORMATION. <input checked="" type="checkbox"/> PROVISIONS OF AECM 3202 AND 3203 APPLY. <input checked="" type="checkbox"/> ONE COPY OF ALL REPORTS IS TO BE SENT TO THE REPORTS AND STATISTICS BRANCH, DRD. <input checked="" type="checkbox"/> THE CONTRACTOR WILL SUBMIT INFORMAL MONTHLY LETTER REPORTS TO DRD ( 5 COPIES) AND TO THE OPERATIONS OFFICE ( 1 COPIES). OR <input checked="" type="checkbox"/> QUARTERLY TECHNICAL REPORTS WILL BE SUBMITTED BY THE CONTRACTOR AT WHICH TIME MONTHLY REPORTS WILL STILL BE REQUIRED. <input checked="" type="checkbox"/> A DRAFT FINAL SUMMARY REPORT FOR THE CONTRACT PERIOD IS TO BE SUBMITTED TO THE DIRECTOR, DRD, 15 DAYS BEFORE (AFTER) COMPLETION OF THIS CONTRACT AND BEFORE THE REPORT IS REPRODUCED. <input checked="" type="checkbox"/> IT IS REQUESTED THAT THE OPERATIONS OFFICE RECEIVE THIS REPORT AND FORWARD IT TO THE HEADQUARTERS TECHNICAL POINT OF CONTACT TOGETHER WITH AN EVALUATION OF THE REPORT AND RECOMMENDATIONS AS TO FUTURE WORK PROPOSED, IF ANY. <input checked="" type="checkbox"/> FINAL REPORT DUE 30 DAYS AFTER APPROVAL OF DRAFT. REPORTING REQUIREMENTS REMAIN THE SAME AS PREVIOUSLY AUTHORIZED, EXCEPT AS NOTED ABOVE. <input checked="" type="checkbox"/> 20 COPIES OF FINAL REPORT REQUIRED.	CONTRACTS - 2130 (Nrc)	

CONTRACTS - 2130 (Nrc)

8918  
SEP 24 1962

1129146

UNITED STATES ATOMIC ENERGY COMMISSION CONTRACT AUTHORIZATION		DATE PAGE NO. 2 Serial No. 62-158
TO	S. R. Sapirie, Manager Oak Ridge Operations Office	CONTRACT NO. AT(40-1)-2130 PROJECT AGREEMENT NO.
CONTRACTOR	University of North Carolina	
8 SCOPE OF WORK  Continue work on sorption of radioactive tracers in natural earth materials, and treated minerals.		
9 SPECIAL PROVISIONS AND INSTRUCTIONS  IT IS REQUESTED THAT YOU KEEP THE CONTRACTS BRANCH, DRD, ADVISED AS TO ANY PROBLEMS ENCOUNTERED IN YOUR NEGOTIATIONS AND THE DATE OF EXECUTION OF THIS CONTRACT, TOGETHER WITH THE AMOUNT OF FUNDS OBLIGATED. THIS NOTIFICATION SHOULD BE MADE DIRECTLY TO DRD RATHER THAN WAITING FOR THE NORMAL DISTRIBUTION OF THE CONTRACT DOCUMENT OR MONTHLY CONTRACT REPORT.		
10 HEADQUARTERS TECHNICAL POINT OF CONTACT Chief, Environmental & Sanitary Engineering Branch Division of Reactor Development		
11 ENCLOSURES Proposal - Proposal for Renewal of Research Contract, dated June 15, 1962 Letter - Ltr. to Belter from Thomas, dated March 28, 1962		

1129147



To: The United States Atomic Energy Commission  
Research and Development Division  
Post Office Box E  
Oak Ridge, Tennessee

From: The University of North Carolina  
Chapel Hill, North Carolina

Proposal for Renewal of Research Contract

No. AT-(40-1)-2130

June 15, 1962

It is proposed that the above designated contract between the United States Atomic Energy Commission and the University of North Carolina be renewed for one year from October 1, 1962 to September 30, 1963.

The scope and plan of approach of the work will remain much as described in Appendix "A," Title VI, of Modification No. 5 to the subject contract, except insofar as some of the work there mentioned has been completed.

In general we propose to divide our efforts between (1) fundamental studies of the qualitative nature and quantitative description of the effects observed in ionic sorption on siliceous materials and (2) the application of this knowledge to the development of practical means of treating the effects observed when sorption takes place in flowing liquid-stationary solid systems. As an example, we may cite the necessity of taking into account the recently demonstrated irreversibility in strontium sorption on clinoptilolite in any attempt to predict the behavior of this mineral in a waste disposal operation.

Since all waste disposal systems involving sorption are concerned with multi-ion solutions (necessarily containing hydrogen ion) and since sorption from multi-ion solutions is a field very little understood, we

may find it necessary to do some preliminary work in three-ion competition. It is, however, not now clear that either time or man-power will be available for this work.

We propose also to aid in the evaluation of zeolites and other siliceous materials synthesized for possible use by the Atomic Energy Commission.

*Henry C. Thomas*

**PROPOSED BUDGET**  
**Contract No. AT-(40-1)-2130**

<u>I. Personnel</u>	<u>AEC</u>	<u>UNC</u>	
Henry C. Thomas, Director			
Part time, 9 months	7,000.00		3,740.00
Full time, 3 months	3,600.00		
Research Associates, 2	19,000.00		
Research Associates, 1	2,600.00		
Technician	1,400.00		
Secretarial	900.00		
Consultation within UNC	<u>          </u>	<u>1,200.00</u>	
	34,500.00		4,940.00
 <u>II. Overhead</u>			
36% of salaries and wages*	12,420.00	1,844.10	
FICA and Retirement (State)	<u>1,897.50</u>	<u>205.70</u>	
	14,317.50		2,049.80
 <u>III. Operating Expenses</u>			
1. Supplies, expendable	2,400.00		
2. Travel	500.00		
3. Service on electronic equipment	300.00		
4. Computer time	800.00		
5. Communications, etc.	600.00		
6. Laboratory services		3,000.00	
7. Glass shop & machine work	<u>          </u>	<u>1,500.00</u>	
	4,600.00		4,500.00
 Total Proposed	53,417.50		11,489.80
 Estimated Balance, September 30, 1962	8,919.86		
 New funds requested from AEC	<u>44,497.64</u>		

\*Rate fixed by the Army Audit Agency

Henry C. Thomas  
Henry C. Thomas  
Principal Investigator

A. H. Shepard, Jr.  
A. H. Shepard, Jr.  
Business Officer and Treasurer

EXPENDITURE STATEMENT

Contract No. AT-(40-1)-2130

The following statement shows the contributions of both the Atomic Energy Commission and the University of North Carolina for the period October 1, 1961 - September 30, 1962. Column A gives actual expenditures for the period October 1, 1961 - May 31, 1962 (The University's contribution being in part estimated). Column B gives estimates for the period June 1, 1962 - September 30, 1962. These estimates are in part based on actual encumbrances.

The estimated balance is based on the contribution of the Atomic Energy Commission of \$40,353 as stated in Modification No. 5 of the contract.

	Column A		Column B	
	AEC	UNC	AEC	UNC
Salaries and Wages	19,720.14	2,494	13,820	1,246
Equipment	306.83			
Supplies (approx.)	2,200.00		400	
Travel	523.06		200	
Communications (approx.)	160.00		100	
Indirect cost	5,473.50		4,975	
Retirement and FICA	800.86		662	
Laboratory Services		2,650		1,350
	<u>29,184.39</u>	<u>5,144</u>	<u>20,157</u>	<u>2,596</u>

Total expenditures (AEC) for the period 10/1/61 - 9/30/62: 49,341.39

Estimated unexpended balance 9/30/62 8,919.86

Total funds available (AEC) for period 10/1/61 - 9/30/62: 58,261.25

**PROPOSED BUDGET**

Contract No. AT-(40-1)-2130

For the Period Oct. 1, 1962-Sept. 30, 1963  
(Revised Oct. 1, 1962)

	<u>AEC</u>	<u>UNC</u>
<b>I. <u>Personnel</u></b>		
Henry C Thomas, Director		
3/4 time, 9 months	7,000.00	1,250.00
Full time, 3 months	3,600.00	
<b>Research Associates</b>		
K. B Deshpande, full time	10,000.00	
Isao Hashimoto, full time	9,000.00	
<b>Research Assistant</b>		
Darryl Howery, half time	2,600.00	
<b>Secretarial</b>		
	900.00	
Consultation within UNC		<u>1,200.00</u>
	<u>33,100.00</u>	2,450.00
<b>II. <u>Overhead</u></b>		
36% of salaries and wages*	11,916.00	450.00
FICA and Retirement (State)	<u>1,677.50</u>	<u>68.75</u>
	13,593.50	518.75
<b>III. <u>Operating Expenses</u></b>		
1. Supplies, expendable	2,400.00	
2. Travel	750.00	
3. Service on electronic equipment	300.00	
4. Computer time	1,300.00	2,100.00
5. Communications, etc.	600.00	
6. Laboratory services		3,000.00
7. Glass shop & machine work		<u>1,500.00</u>
	<u>5,350.00</u>	<u>6,700.00</u>
<b>Total Proposed</b>	<b>52,043.50</b>	<b>9,568.75</b>
<b>Estimated Balance, September 30, 1962</b>	<b>7,045.94</b>	
<b>NEW FUNDS REQUESTED FROM AEC</b>	<b><u>44,997.56</u></b>	

\*Rate fixed by the Army Audit Agency

*Henry C. Thomas*  


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Henry C. Thomas  
Principal Investigator

*A. H. Shepard, Jr.*  


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A. H. Shepard, Jr.  
Business Officer and Treasurer

**EXPENDITURE STATEMENT**

Contract No. AT-(40-1)-2130

The following statement shows the contributions of both the Atomic Energy Commission and the University of North Carolina for the period October 1, 1961-September 30, 1962. Column A gives actual expenditures for the period October 1, 1961 - June 30, 1962 (The University's contribution being in part estimated). Column B gives estimates for the period July 1, 1962 - September 30, 1962. These estimates are in part based on actual encumbrances.

The estimated balance is based on the contribution of the Atomic Energy Commission of \$57,598 as stated in Modification No. 6 of the contract increased by \$1018 from overestimate for the period ending 9/30/61, making a total of \$58,616.19.

	Column A		Column B	
	AEC	UNC	AEC	UNC
Salaries and Wages	23,812.95	937.50	9,787.49	312.50
Equipment	367.03			
Materials and Services	2,436.09	663.00*	400.00	
Travel	671.19		200.00	
Communications (approx.)	170.00		100.00	
Indirect cost	8,580.17	337.50	3,653.67	112.50
Retirement and FICA	956.66	51.60	435.00	17.20
Laboratory Services	<u>                    </u>	<u>2,650.00</u>	<u>                    </u>	<u>1,350.00</u>
	36,994.09	4,639.60	14,576.16	1,792.20

\* Credited directly to AEC account.

Total expenditures (AEC) for the period 10/1/61 - 9/30/62:	51,570.25
Estimated unexpended balance 9/30/62	7,045.94
Total funds available (AEC) for period 10/1/61 - 9/30/62:	58,616.19

(Modification No. 6 plus \$1018 from overestimate for period ending 9/30/61)

1. TO: **R. G. Humphries** Chairman Contract Board. From: **Res. & Dev. Div.**

It is requested that the Contract Board take the necessary action to process the following described contract action in accordance with the provisions of Bulletin OR-O&M-19:

2. Nature of Action Requested

Selection of New Contractor and Negotiation of Contract.

Modification of Contract No. **AT-(40-1)-2130**

Contractor: **University of North Carolina Chapel Hill, North Carolina**

Review and approval of Contract, Sub-contract or Purchase Order.

Other (Explain) \_\_\_\_\_

Number: \_\_\_\_\_  
Name: \_\_\_\_\_

3. Nature of Services to be Covered by Contract

Construction

Architect-Engineer

Other

(Explain) **Research**

4. Funding

Amount to be Obligated by this Contract Action : **None**

Source of Funds

Approved ORO Financial Plan, \_\_\_\_\_ Quarter, Fiscal Year 19\_\_\_\_

Project No. \_\_\_\_\_ or, Activity No. \_\_\_\_\_

Funds to be Obligated: Allotment No. \_\_\_\_\_ (F.Y. 19\_\_\_\_ Funds)

Procurement Directive No. \_\_\_\_\_ Dated \_\_\_\_\_

Issuing Office \_\_\_\_\_

Concurrence in Funding Statement: (signed) \_\_\_\_\_

*A. E. Miller*

Chief, Budget Branch

5. Project or Activity to be Covered by Contract Action:

Location of Work: \_\_\_\_\_ Construction Directive No. \_\_\_\_\_

Estimated Cost of Work to be Covered by this Contract Action \$ \_\_\_\_\_

Schedule: Date Work to Start \_\_\_\_\_ Estimated Completion Date \_\_\_\_\_

Description of Project or Activity: \_\_\_\_\_

(If more space is required use separate sheets and attach heretos)

<p>6. Contract Board Docket No. _____ (To be assigned by Board Secretary)</p>	<p>7. Request Submitted By: (signed) <u>C. S. Shoup</u> Date: _____ Title: _____ C. S. SHOUP CHIEF, BIOLOGY BRANCH RESEARCH AND DEVELOPMENT DIVISION</p>
<p>8. <u>Complete Description of Services to be Furnished by Contractor:</u>  Headquarters designated research contract  TITLE: "Scientific Problems in Disposal of Fission Products"  (If more space is required use separate sheets and attach hereto:)</p>	
<p>9. <u>Description of other changes to be covered by Modification:</u> Modify contract to (1) reflect the transfer of title of a Helium Leak Detector, Property No. X-64481, from Oak Ridge National Laboratory, Union Carbide Nuclear Company, to the University of North Carolina, (2) reduce the AEC contribution for the current contract period by the amount of \$662.62 which is the depreciated value of the equipment, and (3) increase the Contractor's contribution to the project by \$662.62. (If more space is required use separate sheets and attach hereto:)</p>	
<p>10. <u>Negotiated Contracts.</u> (Show why it appears desirable to negotiate new contract or to negotiate modification to existing contract) Letter from H. C. Thomas to G. S. Shoup dated November 9, 1961  Memorandum to Frank K. Pittman from Herman M. Roth dated November 24, 1961  (If more space is required use separate sheets and attach hereto:)</p>	
<p>11. <u>Contracts, Subcontracts, or Purchase Orders Submitted for Review and Approval:</u> (Furnish brief description of action in this space and attach pertinent documents)  None</p>	
<p>12. <u>Disputes:</u> Attach a statement summarizing the dispute together with pertinent documents and Background Material.  None</p>	

2770

THE UNIVERSITY OF NORTH CAROLINA  
CHAPEL HILL

DEPARTMENT OF CHEMISTRY

November 9, 1961

Dr. C. S. Shoup  
Research and Development Division  
U. S. Atomic Energy Commission  
Oak Ridge, Tennessee

Dear Dr. Shoup:

Reference: ORS:LM

Thank you for your letter of October 30 on the subject of the Leak Detector.

The Department of Chemistry here would like to avail itself of the opportunity of acquiring this instrument essentially under the terms of your first suggestion. The University will compensate our research contract account by the amount of the reduction in the AEC contribution. As soon as arrangements can be made, I shall write to you again on the subject.

We have been given to understand by Mr. Benson that Property No. X - 64481, the leak detector in question, is carried as of November 7, 1961 at \$662.62.

Value verified  
by Mr. Benson  
ORNL, on 11-14-61  
J.M.

The arrangement will be advantageous to all concerned here. Thank you again for your cooperation in the matter.

Yours sincerely,

*Henry C. Thomas*

H. C. Thomas  
Professor

CC: Dr. Morrow

HCT:ej

61386

CONTRACTS-2130 (H.C.)

NOV 13 1961

1129157

Frank K. Pittman, Director  
Division of Reactor Development, Headquarters

November 24, 1961

Herman M. Roth, Director  
Research and Development Division, Oak Ridge Operations

CONTRACT NO. AT-(40-1)-2130 - UNIVERSITY OF NORTH CAROLINA

ORS:LM

This will confirm a telephone conversation of November 17, 1961, between Dr. Joseph A. Lieberman of your Division and Lamar Medley of this Office regarding the transfer of title of a Helium Leak Detector, Property No. X-64481, to the University of North Carolina for use under the above contract.

The University of North Carolina requested that title to the Leak Detector, which has been on loan to them from the Oak Ridge National Laboratory since December 1957, be transferred to the University for further use in connection with the performance of research work under Contract No. AT-(40-1)-2130. We have been advised by the Union Carbide Nuclear Company that the Detector may be disposed of as far as their need is concerned.

In view of the above, we propose to effect the transfer of title to this piece of equipment to the University for use under the subject contract by reducing the AEC contribution for the current period by the amount of the depreciated value of the equipment which is \$662.62. The Contractor agrees to increase its contribution to the project by a like amount, thus leaving the total cost budget the same. These arrangements are satisfactory to the University of North Carolina, ORNL, and this Office and were concurred in by Dr. Lieberman. Therefore, an amount of \$662.62 in AEC funds will be available for other financing.

Original Signed By

/s/ Herman M. Roth

Original forwarded to AEC Headquarters

1129158

1. TO: R. G. Humphries Chairman Contract Board. From: Research & Development Div.

It is requested that the Contract Board take the necessary action to process the following described contract action in accordance with the provisions of Bulletin OR-O&M-19:

2. Nature of Action Requested

Selection of New Contractor and Negotiation of Contract.

Modification of Contract No. AT-(40-1)-2130

Contractor: University of North Carolina Chapel Hill, North Carolina

Review and approval of Contract, Sub-contract or Purchase Order.

Other (Explain) \_\_\_\_\_

Number: \_\_\_\_\_  
Name: \_\_\_\_\_

3. Nature of Services to be Covered by Contract

Construction

Architect-Engineer

Other

(Explain)

Research

4. Funding

Amount to be Obligated by this Contract Action \$ 40,353.00

Source of Funds

Approved ORO Financial Plan, \_\_\_\_\_ Quarter, Fiscal Year 19\_\_

Project No. \_\_\_\_\_ or, Activity No. 04 60 40 01

Funds to be Obligated: Allotment No. 24-21-9 (F.Y. 1962 Funds)

Procurement Directive No. 62-031 Dated 9-11-61

Issuing Office Research & Development

Concurrence in Funding Statement: (signed) \_\_\_\_\_

*A. Emilla*

Chief, Budget Branch

5. Project or Activity to be Covered by Contract Action:

Location of Work: \_\_\_\_\_ Construction Directive No. \_\_\_\_\_

Estimated Cost of Work to be Covered by this Contract Action \$ \_\_\_\_\_

Schedule: Date Work to Start \_\_\_\_\_ Estimated Completion Date \_\_\_\_\_

Description of Project or Activity:

(If more space is required use separate sheets and attach heretos)

<p>6. Contract Board Docket No. _____ (To be assigned by Board Secretary)</p>	<p>7. Request Submitted By: (signed) _____ Date: <u>SEP 19 1961</u> File: <u>C S Shoup</u> C. S. SHOUP CHIEF, BIOLOGY BRANCH RESEARCH AND DEVELOPMENT DIVISION</p>
<p>8. <u>Complete Description of Services to be Furnished by Contractor:</u>  Headquarters Designated Research Contract  TITLE: "Investigation of Sorption and Ion Exchange Phenomena in Natural Soils and Treated Material" (If more space is required use separate sheets and attach hereto:)</p>	
<p>9. <u>Description of other changes to be covered by Modification:</u>  Modify contract to provide for the performance of additional research to be completed not later than September 30, 1962. The AEC will contribute \$40,353. The Contractor will contribute \$5,648 and the estimated unexpended balance is \$17,908. (If more space is required use separate sheets and attach hereto:)</p>	
<p>10. <u>Negotiated Contracts.</u> (Show why it appears desirable to negotiate new contract or to negotiate modification to existing contract)  Contract Authorization from Frank K. Pittman to S. R. Sapirie dated September 11, 1961.  (If more space is required use separate sheets and attach hereto:)</p>	
<p>11. <u>Contracts, Subcontracts, or Purchase Orders Submitted for Review and Approval:</u> (Furnish brief description of action in this space and attach pertinent documents)  None</p>	
<p>12. <u>Disputes:</u> Attach a statement summarizing the dispute together with pertinent documents and Background Material.  None</p>	

1961

1129160

APPENDIX "A"

TITLE VI

This TITLE VI describes the research program and cost estimates agreed upon between the Commission and the Contractor.

1. PROGRAM

a. Scope and Plan of Approach:

The Contractor will continue the conduct of research into the problem of disposal of the radioactive by-products of nuclear fission into such systems as various types of clays, other soil minerals and sand beds. This research will include such areas as (1) work on the sorptive properties of heat-treated clays, (2) investigation of the isotopic nonexchangeability of strontium, barium and other ions on representative clays and other soil minerals, and (3) studies of exchange sorption on natural and synthetic zeolites.

2. BUDGET

a. Outline of Cost Estimates:

(1) <u>Salaries and Wages:</u>	\$38,700.00
Dr. H. C. Thomas (2/3 of time for 9 months, full time 3 months)	\$10,600.00
Research Associates	23,600.00
Technician	2,400.00
Secretarial Assistance	900.00
Consultation	1,200.00
(2) <u>F.I.C.A. and Retirement:</u>	2,062.00
(3) <u>Supplies and Services:</u>	7,800.00
(4) <u>Travel:</u>	900.00
(5) <u>Overhead</u> (37.33% of Salaries and Wages):	<u>14,447.00</u>
TOTAL	\$63,909.00

b. Items of property to be procured or manufactured by the Contractor, or to be furnished by the Government, title to which will vest or remain in the Government (see Article V): None, except that it is recognized that title to the following property procured or manufactured by the Contractor or furnished by the Government under earlier TITLES remains in the Government:

- Analyzer - American Instrument Co.
- 1 Cat. No. 5-445 Roller Particle size Analyzer
  - 1 " " 5-451 Sound-resistant cabinet
  - 1 " " 5-456 Spec. Brass Sample Tube
  - 1 " " 5-452 Low Pressure Air Pump

Centrifuge - Macalaster Bicknell  
1 Internat'l Size 1 S.B. Serial # Z 6663

Demineralizer - Penfield Products  
1 M-8 Cartridge Type

Drop Collector - Technicon Chromatography Corp.  
1 Drop counting accessories for Time Flow Fraction Collector

Fraction Collector - Technicon Chromatography Corp.  
1 Time Flow Fraction collector with 150 minute timer

Pumps - Milton Roy Co.  
1 MM2-B-11.5 "Mini Pump"  
Macalaster Bicknell  
3 Eastern Model D6 Centrifugal Pump - Bronze Casting  
Macalaster Bicknell  
1 Eastern, Midget, Low pressure model D-6 Crackle finish  
Bronze #35193

Relays - Central Scientific Co.  
1 Cat. #99784 Relay  
1 " #99785-A Electrode Relay, 50/60 cycle 115 V

Shaker - Macalaster Bicknell  
1 Burrell Shaker, Size C

Spectrophotometer - Will-N.Y. Inc.  
1 Beckman DU Serial No. 89442  
1 Powersupply Serial No. 77284

WRD-1  
(11-60)

UNITED STATES ATOMIC ENERGY COMMISSION  
CONTRACT AUTHORIZATION

DATE SEP 11 1961  
Serial No. 62-031

TO S. R. Sapirie, Manager  
Oak Ridge Operations Office  
FROM *[Signature]*  
Frank K. Pittman, Director  
Division of Reactor Development

NEW CONTRACT  
 RENEWAL OF  
CONTRACT NO. 7030  
AT(40-1)-2130  
PROJECT AGREEMENT NO.

1 CONTRACTOR  
University of North Carolina

2 TERM  
- 12 months -- beginning  
as soon as possible.

3 PROJECT TITLE Investigation of Sorption and Ion Exchange Phenomena in Natural Soils and Treated Materials.

4 RECOMMENDED TYPE  
 AT OPTION OF YOUR OFFICE  CPFF  
 COST REIMBURSEMENT  FIXED PRICE  
 OTHER

5 FINANCING  
 THE ESTIMATED COST FOR THE TERM IS \$40,000  
 COST CEILING IN THE AMOUNT OF \$40,000  
HAVE ~~BEEN~~ BEEN PROVIDED IN THE OR  
OPERATIONS OFFICE FINANCIAL PLAN.  
 GSO IN THE AMOUNT OF \$ N/A  
HAS (NOT) BEEN PROVIDED IN YOUR FINANCIAL PLAN.  
 YOU SHOULD (NOT) ABSORB GSO REQUIREMENTS  
WITHIN TOTAL AVAILABILITY.  
 COSTS ARE CHARGEABLE TO BUDGET ACTIVITY  
04 60 40 01.  
 IT IS DESIRED THAT THIS CONTRACT BE FUNDED FOR ITS  
ENTIRE TERM  
 IT SHOULD BE NOTED THAT HEADQUARTERS HAS NOT  
MADE A DETAILED REVIEW OF OVERHEAD, GENERAL AND  
ADMINISTRATIVE EXPENSES, EQUIPMENT AND OTHER  
RELATED COSTS AS IT IS EXPECTED THAT THE OPERATION  
OFFICE WILL INVESTIGATE THESE ITEMS AS PART OF  
ANY CONTRACT NEGOTIATIONS.  
 FEE CALCULATIONS ARE TO BE MADE BY THE OPERATION  
OFFICE CONSISTENT WITH AEC FEE POLICY AND  
STANDARD AEC SCHEDULES.  
 NO PART OF THE FUNDS UNDER THIS CONTRACT MAY BE  
USED FOR CONFERRING OF A FELLOWSHIP WITHIN THE  
MEANING OF THE APPROPRIATION RIDER.  
 OTHER.

6 CLASSIFICATION  
WORK TO BE PERFORMED IS UNDER CATEGORY I  
AS DEFINED IN AEC MANUAL SECTION 3403

7 REPORTING REQUIREMENTS  
 ALL ASPECTS OF THE WORK SHALL BE DESCRIBED IN  
SUFFICIENT DETAIL SO AS TO ENABLE OTHERS TO USE  
THIS INFORMATION.  
 PROVISIONS OF AECM 3202 AND 3203 APPLY.  
 ONE COPY OF ALL REPORTS IS TO BE SENT TO THE  
REPORTS AND STATISTICS BRANCH, DRD.  
 THE CONTRACTOR WILL SUBMIT INFORMAL MONTHLY  
LETTER REPORTS TO DRD ( COPIES) AND TO THE  
OPERATIONS OFFICE ( COPIES).  
 QUARTERLY TECHNICAL REPORTS WILL BE SUBMITTED  
BY THE CONTRACTOR AT WHICH TIME MONTHLY REPORTS  
WILL STILL BE REQUIRED.  
 A DRAFT FINAL SUMMARY REPORT FOR THE CONTRACT  
PERIOD IS TO BE SUBMITTED TO THE DIRECTOR, DRD,  
DAYS BEFORE (AFTER) COMPLETION OF THIS  
CONTRACT AND BEFORE THE REPORT IS REPRODUCED.  
 IT IS REQUESTED THAT THE  
OPERATIONS OFFICE RECEIVE THIS REPORT AND  
FORWARD IT TO THE HEADQUARTERS TECHNICAL POINT  
OF CONTACT TOGETHER WITH AN EVALUATION OF THE  
REPORT AND RECOMMENDATIONS AS TO FUTURE WORK  
PROPOSED, IF ANY.  
 FINAL REPORT DUE DAYS AFTER APPROVAL OF  
DRAFT.  
REPORTING REQUIREMENTS REMAIN THE SAME AS  
PREVIOUSLY AUTHORIZED, EXCEPT AS NOTED ABOVE.  
 COPIES OF FINAL REPORT REQUIRED.

No change in reporting requirements.

B 9576

SEP 13 1961

1129163

UNITED STATES ATOMIC ENERGY COMMISSION CONTRACT AUTHORIZATION	DATE PAGE NO. 2 Serial No. 62-031
TO S. R. Sapirie, Manager, OR	CONTRACT NO. AT(40-1)-2130 PROJECT AGREEMENT NO.
CONTRACTOR University of North Carolina	
<p>8 SCOPE OF WORK</p> <p>Continue work on sorption of radioactive tracers in natural earth materials.</p> <p>Complete study of anion uptake by thoriated silica gels.</p> <p>Scope of work is described in The University of North Carolina's Proposal (Revised August 14, 1961).</p>	
<p>9 SPECIAL PROVISIONS AND INSTRUCTIONS</p> <p>IT IS REQUESTED THAT YOU KEEP THE CONTRACTS BRANCH, DRD, ADVISED AS TO ANY PROBLEMS ENCOUNTERED IN YOUR NEGOTIATIONS AND THE DATE OF EXECUTION OF THIS CONTRACT, TOGETHER WITH THE AMOUNT OF FUNDS OBLIGATED. THIS NOTIFICATION SHOULD BE MADE DIRECTLY TO DRD RATHER THAN WAITING FOR THE NORMAL DISTRIBUTION OF THE CONTRACT DOCUMENT OR MONTHLY CONTRACT REPORT.</p> <p style="text-align: center;">RECEIVED AUG 20 1961</p>	
<p>10 HEADQUARTERS TECHNICAL POINT OF CONTACT</p> <p>Chief, Environmental &amp; Sanitary Engineering Branch,          Nuclear Safety, Division of Reactor Development</p>	
<p>11 ENCLOSURES</p>	

1129164

To: The United States Atomic Energy Commission  
Research and Development Division  
Post Office Box E  
Oak Ridge, Tennessee

From: The University of North Carolina  
Chapel Hill, North Carolina

Proposal for Renewal of Research Contract

No. AT-(40-1)-2130

It is proposed that the above designated contract between the United States Atomic Energy Commission and the University of North Carolina be renewed for one year, from October 1, 1961 to September 30, 1962.

The scope and plan of approach of the work will remain very similar to that described in Appendix A, Title V, of Modification 4 of the contract with some specific changes the reasons for which are made clear in our progress report, namely: (1) Work on the sorptive properties of heat-treated clays has been substituted for the study of the Utah bentonites. (2) Attempts to find a model for the low capacity cation exchangers such as are found in sand beds have not thus far been particularly successful and this work will not be emphasized. We do wish to extend and push to completion the study of the thoriated silica gel anion exchanger.

It appears to us most important that a thorough investigation be made of the isotopic nonexchangeability of strontium, barium, and other ions on representative clays and other soil minerals. It will certainly be necessary to understand this aspect of 'fixation' in view of the possibility of its effect on the injection of solutions of fission wastes into beds of clayey sands. We are, in fact, now engaged in extending this work.

1129165

We wish to continue our fundamental studies of exchange sorption on natural and synthetic zeolites. Our belief that such studies can tell us much about the nature of exchange sorption on aluminosilicates has not been altered. In this connection we may remark that we have offered our services in the examination of a series of commercially prepared artificial zeolites and altered clays in the event that the Atomic Energy Commission undertakes to support this work.

*Henry C. Thomas*

---

Henry C. Thomas  
Principal Investigator

**PROPOSED BUDGET**

Contract No. AT-(40-1)-2130  
For the period October 1, 1961 through September 30, 1962

**I. Personnel**

	<u>AEC</u>	<u>UNC</u>
Henry C. Thomas, Director		
Part time, 9 months	\$ 7,000.00	\$ <del>3,200.00</del> <i>delete</i>
Full time, 3 months	3,600.00	
Research Associates, 2	18,400.00	
Research Associates, 2	5,200.00	
Technician	2,400.00	
Secretarial	900.00	
Consultation within UNC		<u>1,200.00</u>
	<u>\$37,500.00</u>	<u><del>\$4,940.00</del></u>

**II. Overhead,**

(37.33% of wages and salaries*)	<i>1394</i> 13,998.25	<i>448</i> <u>1,844.10</u>
(F.I.C.A. and Retirement (State))	<u>2,062.50</u>	<u><del>305.70</del></u> <i>delete</i>
	<u>\$16,061.25</u>	<u>\$2,049.80</u>

**III. Operating Expenses**

1. Supplies, expendable	2,400.00	
2. Travel	900.00	
3. Service on electronic equipment	800.00	
4. Communications, etc.	600.00	
5. Laboratory services		2,500.00
6. Glass shop & machine work		<u>1,500.00</u>
	<u>\$4,700.00</u>	<u>\$4,900.00</u>

Total Proposed	<i>57261.00</i> \$58,261.25	\$10,989.80
Estimated Balance, Sept. 30, 1961	\$17,908.34	<u><del>5648</del></u>

New funds requested from AEC	\$40,352.91	
	<i>40,353</i>	

• Rate fixed by the Army Audit Agency  
Salary changes represent University policy.

*Henry C. Thomas*  
\_\_\_\_\_  
Henry C. Thomas  
Principal Investigator

*A. H. Shepard, Jr.*  
\_\_\_\_\_  
A. H. Shepard, Jr.  
Business Officer and Treasurer

**EXPENDITURE STATEMENT**

Contract No. At-(40-1)-2130

The following statement shows the contributions of both the Atomic Energy Commission and the University of North Carolina for the period October 1, 1960 - September 30, 1961. Column A gives actual expenditures for the period October 1, 1960 - May 31, 1961 (the University's contribution being in part estimated). Column B gives estimates for the period June 1, 1961 - September 30, 1961. These estimates are in part based on actual encumbrances.

The estimated balance is based on the contribution of the AEC of \$65,532.00 as stated in Modification No. 4 of the contract.

	Column A		Column B	
	AEC	UNC	AEC	UNC
Salaries and Wages	\$16,153.36	\$2,494.33	\$12,951.68	\$1,245.67
Equipment	2,502.72		2,707.65	
Supplies	2,318.45		1,160.00	
Travel	768.06		918.00	
Communication, etc.	269.66		135.00	
Indirect Cost	4,328.90		3,410.18	
Laboratory Services	<u>26,341.15</u>	<u>2,733.00</u> \$5,227.33	<u>21,282.51</u>	<u>1,367.00</u> \$2,613.67
Total expenditures (AEC) for the period 9/30/60 - 9/30/61				\$47,623.66
Estimated unexpended balance 9/30/61				<u>17,908.34</u>
Total funds available (AEC)				\$65,532.00

1. Chairman  
TO: R. G. Humphries Contract Board. From: Research and Development Div.

It is requested that the Contract Board take the necessary action to process the following described contract action in accordance with the provisions of Bulletin OR-O&M-19:

2. Nature of Action Requested

Selection of New Contractor and Negotiation of Contract.

Modification of Contract  
No. AT-(40-1)-2130

Contractor: University of North Carolina  
Chapel Hill, North Carolina

Review and approval of Contract, Sub-contract or Purchase Order.

Other (Explain) \_\_\_\_\_

Number: \_\_\_\_\_  
Name: \_\_\_\_\_

3. Nature of Services to be Covered by Contract

Construction

Architect-Engineer

Other

(Explain) Research

4. Funding

Amount to be Obligated by this Contract Action \$ 46,958.00

Source of Funds

Approved ORO Financial Plan, \_\_\_\_\_ Quarter, Fiscal Year 19\_\_

Project No. \_\_\_\_\_ or, Activity No. 04 04 05 027

Funds to be Obligated: Allotment No. 4-11-51 (F.Y. 196 Funds)

Procurement Directive No. Mem (Sub. to Sg) Dated 10-13-60

Issuing Office Director's Office

Concurrence in Funding Statement: (signed) \_\_\_\_\_

O. Miller  
Chief, Budget Branch

5. Project or Activity to be Covered by Contract Action:

Location of Work: \_\_\_\_\_ Construction Directive No. \_\_\_\_\_

Estimated Cost of Work to be Covered by this Contract Action \$ \_\_\_\_\_

Schedule: Date Work to Start \_\_\_\_\_ Estimated Completion Date \_\_\_\_\_

Description of Project or Activity:

(If more space is required use separate sheets and attach hereto)

<p>6. Contract Board Docket No. _____ (To be assigned by Board Secretary)</p>	<p>7. Request Submitted By: (signed) _____ Date: <u>NOV 17 1960</u> Title: <u>C. S. Shoup</u> C. S. SHOUP CHIEF, BIOLOGY BRANCH RESEARCH AND DEVELOPMENT DIVISION</p>
<p>8. <u>Complete Description of Services to be Furnished by Contractor:</u> Headquarters Designated Research Contract.  TITLE: "Scientific Problems in Disposal of Fission Products"  (If more space is required use separate sheets and attach hereto:)</p>	
<p>9. <u>Description of other changes to be covered by Modification:</u> Modify contract to provide for the performance of additional research to be completed not later than September 30, 1961. The AEC will contribute \$46,958. The Contractor will contribute \$10,340.58 and the estimated unexpended balance is \$18,574.  (If more space is required use separate sheets and attach hereto:)</p>	
<p>10. <u>Negotiated Contracts.</u> (Show why it appears desirable to negotiate new contract or to negotiate modification to existing contract)  Memo from F. K. Pittman to S. R. Sapirie dated October 12, 1960. Teletype from F. K. Pittman to S. R. Sapirie dated November 8, 1960.  (If more space is required use separate sheets and attach hereto:)</p>	
<p>11. <u>Contracts, Subcontracts, or Purchase Orders Submitted for Review and Approval:</u> (Furnish brief description of action in this space and attach pertinent documents)  None</p>	
<p>12. <u>Disputes:</u> Attach a statement summarizing the dispute together with pertinent documents and Background Material.  None</p>	

1129170

APPENDIX "A"

TITLE V

This TITLE V describes the research program and cost estimates agreed upon between the Commission and the Contractor.

1. PROGRAM

a. Scope and Plan of Approach:

The Contractor will continue the investigation of the sorption of various types of ions on zeolite type minerals. With the possibility of the disposal of radioactive wastes into deep sand beds in mind, the Contractor proposes to study the kinetics of the sorption process on sands of low ion exchange capacity. In addition, the Contractor will conduct investigations concerning (1) the sorption of trivalent positive ions from acid solutions on to montmorillonite clay, (2) the behavior of a glassy Utah bentonite in the sorption process, and (3) the properties of a synthetic anion exchanger which will provide an extreme example of anion exchange properties of soil minerals.

2. BUDGET

a. Outline of Cost Estimates:

(1) <u>Salaries and Wages:</u>		\$51,510.00
Dr. H. C. Thomas (60% of time 9 mos., full time 3 mos.)	\$13,210.00	
Research Associates	27,000.00	
Research Assistants and Laboratory Assistance	9,200.00	
Secretarial Assistance	900.00	
Consultation	1,200.00	
(2) <u>Supplies:</u>		3,600.00
(3) <u>Laboratory, Glass and Machine Shop     Services, etc.:</u>		5,400.00
(4) <u>Freight, Phone, Postage, etc.:</u>		600.00
(5) <u>Travel:</u>		1,200.00
(6) <u>Overhead (26.33% of Salaries and Wages):</u>		<u>13,562.58</u>
	TOTAL	\$75,872.58

- b. Items of property to be procured or manufactured by the Contractor, or to be furnished by the Government, title to which will vest or remain in the Government (see Article V): None, except that it is recognized that title to the following property procured or manufactured by the Contractor or furnished by the Government under earlier TITLES remains in the Government:

Analyzer - American Instrument Co.

- 1 Cat. No. 5-445 Roller Particle size Analyzer
- 1 " " 5-451 Sound-resistant cabinet
- 1 " " 5-456 Spec. Brass Sample Tube
- 1 " " 5-452 Low Pressure Air Pump

Centrifuge - Macalaster Bicknell

- 1 Internat'l Size 1 S.B. Serial # Z 6663

Demineralizer - Penfield Products

- 1 M-8 Cartridge Type

Drop Collector - Technicon Chromatography Corp.

- 1 Drop counting accessories for Time Flow Fraction Collector

Fraction Collector - Technicon Chromatography Corp.

- 1 Time Flow Fraction collector with 150 minute timer

Pumps - Milton Roy Co.

- 1 MM2-B-11.5 "Mini Pump"
- Macalaster Bicknell
- 3 Eastern Model D6 Centrifugal Pump - Bronze Casting
- Macalaster Bicknell
- 1 Eastern, Midget, Low pressure model D-6 Crackle finish  
Bronze #35193

Relays - Central Scientific Co.

- 1 Cat. #99784 Relay
- 1 " #99785-A Electrode Relay, 50/60 cycle 115 V

Shaker - Macalaster Bicknell

- 1 Burrell Shaker, Size C

Spectrophotometer - Will-N.Y. Inc.

- 1 Beckman DU Serial No. 89442
- 1 Powersupply Serial No. 77284

Survey Meter - (Beta Gamma) - National Tech. Labs.

1 #10800 Beckman Geiger Counter, Model "MX-5"  
Serial No. 21529

Counters - Eagle Signal Corp.

1 HZ 50A6 Microflex Counter 115 V 50/60 cycle;  
400 count range, AAR A-212

1 HN84 Cabinet

Autoscalers - General Radio

2 SC-4 Eagle Preset Counters

Pump - Sigmamotor Co.

1 Model T-6SH, with Graham 28A Variable drive,  
1/6 h. p. motor - all mounted on special  
base Serial No. 129 (S-547)

BRA019EUB063

RR RUEBOE

DE RUEPAE 006

ZNR

R 081607Z

FM USAEC WASHDC

1099

TO USAEC OAK RIDGE TENN

AEC GRNC

BT

UNCLAS TO S R CAPIRIE FROM FRANK K PITTMAN PD REURTT REF ORS CLN JDB  
CLN 306 OF OCTOBER 27 AND OUR MEMO OF OCTOBER 12 SUBJECT EXTENSION  
OF CONTRACT AT/40-1/-2130 WITH THE UNIVERSITY OF NORTH CAROLINA PD  
ADDITIONAL FUNDS IN THE AMOUNT OF \$2000 WILL BE PROVIDED, MAKING A  
TOTAL OF \$47 000 FOR THIS LUMP-SUM CONTRACT PD END REF CLN RD CLN  
ADM CLN C CLN RHH AEC-285

BT

CFN 306 27 12 AT/40-1/-2130 \$2000 \$47 000 AEC-285

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CHAPELHILL NCAR OCT 24 1103A EST

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US AEC ATTN C S SHOUP

UNEXPENDED BALANCE REMAINING IN CONTRACT NUMBER

AT/40-1/ 2130 SEPTEMBER 30 1960 \$18 574.16

UNIVERSITY NORTH CAROLINA J A BRANCH

AT/40-1/ 2130 30 1960 \$18 574.16

OCT 25 1960

~~110307~~

*2130/4*

1129175

October 25, 1960

HERMAN M. BORN  
DIRECTOR  
RESEARCH AND DEVELOPMENT DIVISION  
USAEC  
OAK RIDGE, TENNESSEE

ORIGINAL SIGNED BY  
RICHARD G. MARRS

HERMAN M. BORN

PRIORITY

U. S. ATOMIC ENERGY COMMISSION  
DIVISION OF REACTOR DEVELOPMENT  
WASHINGTON 25, D. C.  
FOR: FRANK K. FITZMA

MEMO OF OCTOBER 12, 1960, TO S. R. HAPPEL, SYMBOL RD:ADM:G:R.H.,  
SUBJECT "REVISION OF CONTRACT AT(40-1)-2130 WITH THE UNIVERSITY OF  
NORTH CAROLINA, CHAPEL HILL, NORTH CAROLINA" AUTHORIZING REVERSAL OF  
ABOVE CONTRACT WITH NEW AEC FUNDS IN THE AMOUNT OF \$45,000. PROPOSAL  
REQUESTED \$45,999 IN NEW FUNDS. PARA UNIVERSITY OF NORTH CAROLINA  
HAS ADVISED US THAT THE ACTUAL UNEXPENDED FUNDS UNDER CONTRACT ON  
SEPTEMBER 30, 1960, WERE \$18,574.16. IF WE ARE TO UTILIZE BUDGET AS  
INCLUDED IN PROPOSAL, IT IS NECESSARY THAT WE RECEIVE AN ADDITIONAL  
ALLOCATION OF \$1,958. OTHERWISE, WE WILL NEED TO OBTAIN A REVISED  
BUDGET FROM UNIVERSITY BASED ON REDUCED AEC CONTRIBUTION. PLEASE  
ADVISE ASAP WHICH METHOD YOU DESIRE US TO FOLLOW. END BORN ORS:JES-306

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Duplication

Re-478-2388

11:30

Res. & Dev.

SIGNATURE

DATE

*[Handwritten signatures]*  
10/27/60

*[Handwritten notes and stamps]*  
1520  
CONTRACTS  
2130  
(U.N.C.)

1129176

## Office Memorandum • UNITED STATES GOVERNMENT

TO : S. R. Sapirie, Manager  
Oak Ridge Operations Office

DATE: OCT 12 1960

FROM : *for* Frank K. Pittman, Director  
Division of Reactor Development *A. E. Goldman*

SUM. OCT 14 1960

SUBJECT: EXTENSION OF CONTRACT AT(40-1)-2130 WITH THE UNIVERSITY OF NORTH CAROLINA, CHAPEL HILL, NORTH CAROLINA

RD:AIM:C:RJH

It is requested that your office negotiate, execute, and administer an extension to Contract AT(40-1)-2130 with the University of North Carolina, Chapel Hill, North Carolina, in accordance with the following provisions:

I. Title: "Scientific Problems in Disposal of Fission Products"

II. General Description and Scope of Work:

The University will continue to make progress on soil studies in connection with the investigation of both theoretical laboratory aspects for the adsorption of radioactive tracers and to develop analytical procedures for the study of the motion of these tracers with water in the soil; advance the research in connection with the scientific problems encountered when radioactive nuclides are released into contact with the soil minerals; continue the work for the evaluation of the permanence of the fixation of nuclides in glasses; exploratory work in the sorption of cesium and strontium on vermiculite will be completed; competition of Cs and Na on special clay minerals (clinoptilolite, etc.) and temperature effects will be investigated and studies of a highly theoretical nature will continue in connection with the thermodynamics of interfacial regions in order to better understand the sorption of fission fragments on minerals.

III. Type of Contract: Lump-sum.

IV. Term of Contract: For one year beginning approximately Oct. 1, 1960.

V. Security Provisions: This contract, and the work performed thereunder, is Unclassified, Category I.

VI. Financing:

A. Funds in the amount of \$45,000 have been provided to Oak Ridge Operations Office in Financial Plan #2 to cover the costs of this contract. This is a lump-sum contract and no requirement exists for funds for GSO. Costs are to be charged to Budget Activity 04 04 05 02 1.

B. It should be noted that Headquarters has not made a detailed review of overhead, general and administrative expenses, salaries, equipment and other related costs as it is expected that the Operations Offices will investigate these items as part of any contract negotiations.

VII. Reporting Requirements:

Reporting requirements are the same as authorized in our memorandum of December 8, 1959, with the addition of one copy of each report to be sent to Reports and Statistics Branch, DRD.

VIII. Special Instruction:

A. No part of the funds under this contract may be used for the conferring of a fellowship within the meaning of the appropriation rider.

B. It is requested that you keep the Contracts Branch, DRD, advised as to any problems encountered in your negotiations and the date of execution of this contract, together with the amount of funds obligated. This notification should be made directly to DRD rather than waiting for the normal distribution of the contract document or monthly contract report.

IX. Headquarters Technical Point of Contact:

Chief, Environmental and Sanitary Engineering Branch,  
Nuclear Technology, Division of Reactor Development.



THE UNIVERSITY OF NORTH CAROLINA • Consolidated Office

University of North Carolina in CHAPEL HILL • North Carolina State College of Agriculture and Engineering in RALEIGH • The Woman's College in GREENSBORO

WILLIAM FRIDAY  
President

CHAPEL HILL

June 29, 1960

Dr. Herman M. Roth, Director  
The United States Atomic Energy Commission  
Research and Development Division  
Post Office Box E  
Oak Ridge, Tennessee

Dear Dr. Roth:

Enclosed herewith please find a proposal for renewal of Research Contract No. AT-(40-1)-2130: "Scientific Problems in Disposal of Fission Products." An amount of \$45,999.81 is requested for the period from October 1, 1960, to September 30, 1961. This research is under the direction of Dr. Henry C. Thomas of the Institute of Natural Science, University of North Carolina at Chapel Hill.

We hope that this proposal will merit your consideration.

Cordially,

William Friday

Enclosures

1129179

JUL 5 1960

THE UNIVERSITY OF NORTH CAROLINA  
CHAPEL HILL

DEPARTMENT OF CHEMISTRY

June 30, 1960

Dr. Herman M. Roth, Director  
Research and Development Division  
U. S. Atomic Energy Commission  
Post Office Box E  
Oak Ridge, Tenn.

Re Contract At-(40-1)-2130

Dear Dr. Roth:

Enclosed herewith are our progress reports, renewal request, expenditure statement, etc. The budget for the proposed work for next year has been drawn up after consultation with Dr. Joseph A. Lieberman in Washington.

Contrary to the statement in the progress report, we have been able to complete our account of sorption on vermiculite and this portion of our progress report is enclosed herewith. According to the terms of the contract this has been treated as a draft.

Very truly yours,

*Henry C. Thomas*

Henry C. Thomas

HCT:BJR  
Enclosures

1129180

JUL 5 1960

6533

TO: The United States Atomic Energy Commission  
Research and Development Division  
Post Office Box E  
Oak Ridge, Tennessee

FRCM: The University of North Carolina  
Chapel Hill, North Carolina

Proposal for the Renewal of Research Contract  
No. AT-(40-1)-2130

It is proposed that the above designated contract between the United States Atomic Energy Commission and the University of North Carolina be renewed for one year, from October 1, 1960 to September 30, 1961.

The scope and plan of approach of the work will remain in outline the same as described in Appendix "A", Title IV, of Modification No. 3 of the above designated contract. Much of the work here described has been substantially completed, or perhaps better said, carried as far as appears to be reasonable. Work of a similar nature involving sorption on the mineral clinoptilolite has been started. We hope to pursue these studies and studies on similar zeolites to considerable lengths. It is probable that by this means we will obtain a better understanding of the phenomena of exchange sorption in general.

In view of the possibility of the disposal of radioactive wastes into deep sand beds, we have started a program which has as its final aim the study of the kinetics of sorption on sands of low exchange capacity. To this end, we are attempting to synthesize sandy materials with silanol surfaces. The preliminary experiments show definite promise, and we wish to continue this work. Directly related to this, we wish to extend our former work on tri-positive ions to studies of the sorption of these from acid solution, first on montmorillonite clay. It appears probable that any disposal method into sand beds will be markedly influenced by competitions between aluminum and the radioactive nuclides.

Work of a somewhat more academic nature is being carried on by two graduate student assistants. This involves study of the behavior of a glassy Utah bentonite (this material can be considered as an extreme example of a sandy exchanger), and a study of the properties of a synthetic anion exchanger (which provides an extreme example of the anion exchange property of soil minerals). Both of these investigations remain in a preliminary stage, but show promise of supplying useful background knowledge, and we believe they should be carried to a reasonable conclusion.

BUDGET

CONTRACT NO. AT - (40-1) - 2130

Proposed for the period October 1, 1960 through September 30, 1961

I. Personnel	AEC	UNC
Henry C. Thomas, Director		
Part-time, 9 months	\$ 6,170.00	\$ 3,740.00
Full-time, 3 months	3,300.00	
Research Associates, 3	27,000.00	
Research Assistants, 2	4,800.00	
Laboratory Assistant	4,400.00	
Secretarial assistance	900.00	
Consultation within UNC		<u>1,200.00</u>
	<u>\$46,570.00</u>	<u>\$4,940.00</u>
II. Overhead to University (26.33% of wages and salaries)	 \$12,261.88	 \$1,300.70
III. Operating Expenses		
1. Supplies, expendable	\$ 3,600.00	
2. Special machine work	500.00	
3. Travel	1,200.00	
4. Service on electronic equipment	800.00	
5. Freight, phone, postage, etc.	600.00	
6. Laboratory services*		\$2,500.00
7. Glass shop and machine shop		<u>1,600.00</u>
	<u>\$ 6,700.00</u>	<u>\$4,100.00</u>
Total proposed for above period	\$65,531.88	\$10,340.70
Estimated balance, September 30, 1960	<u>\$19,532.07</u>	
New funds requested from AEC	\$45,999.81	

\*The increase in this item reflects the additional contribution of the University through its newly established Health Physics service.

Henry C. Thomas

Henry C. Thomas  
Principal Investigator

W. D. Carmichael Jr.

W. D. Carmichael, Vice President  
and Finance Officer

<p>6. Contract Board Docket No. _____ (To be assigned by Board Secretary)</p>	<p>7. Request Submitted By: (signed) Date: <del>JAN 25 1960</del> <u>JAN 25 1960</u> C. S. Shoup CHIEF, BIOLOGY BRANCH RESEARCH AND DEVELOPMENT DIVISION</p>
<p>8. <u>Complete Description of Services to be Furnished by Contractor:</u> Headquarters designated research contract TITLE: "Scientific Problems in Disposal of Fission Products"  (If more space is required use separate sheets and attach hereto:)</p>	
<p>9. <u>Description of other changes to be covered by Modification:</u>  See Attachment "A"  (If more space is required use separate sheets and attach hereto:)</p>	
<p>10. <u>Negotiated Contracts.</u> (Show why it appears desirable to negotiate new contract or to negotiate modification to existing contract)  Memorandum from Frank K. Pittman to S. R. Sapirie dated December 8, 1959.  (If more space is required use separate sheets and attach hereto:)</p>	
<p>11. <u>Contracts, Subcontracts, or Purchase Orders Submitted for Review and Approval:</u> (Furnish brief description of action in this space and attach pertinent documents)  None</p>	
<p>12. <u>Disputes</u> Attach a statement summarizing the dispute together with pertinent documents and Background Material.  None</p>	

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Attachment "A"

Modify contract to provide for the performance of additional research to be completed not later than September 30, 1960. The AEC will contribute \$40,314. The Contractor will contribute \$9,041.37, and the estimated unexpended balance is \$11,110. Include provisions for the submission of reports as follows:

- |                                |   |
|--------------------------------|---|
| 1. Informal Monthly Report     | Seven Copies  |
| 2. Complete Scientific Report* | Twenty-two copies<br>(including reproduction masters) within<br>30 days after expiration<br>of contract term. |

\*Results of the investigation will be described in the final report in sufficient detail to allow other interested groups to utilize the information. Five draft copies of the final report shall be submitted to the Research and Development Division, within 15 days before completion of this contract and before report is reproduced.



- b. Items of property to be procured or manufactured by the Contractor, or to be furnished by the Government, title to which will vest or remain in the Government (see Article V): None, except that it is recognized that title to the following property procured or manufactured by the Contractor or furnished by the Government under earlier TITLES remains in the Government:

Analyzer - American Instrument Co.

1 Cat. No. 5-445 Roller Particle size Analyzer  
1 " " 5-451 Sound-resistant cabinet  
1 " " 5-456 Spec. Brass Sample Tube  
1 " " 5-452 Low Pressure Air Pump

Centrifuge - Macalaster Bicknell

1 Internat'l Size 1 S.B. Serial # Z 6663

Demineralizer - Penfield Products

1 M-8 Cartridge Type

Drop Collector - Technicon Chromatography Corp.

1 Drop counting accessories for Time Flow Fraction Collector

Fraction Collector - Technicon Chromatography Corp.

1 Time Flow Fraction collector with 150 minute timer

Pumps - Milton Roy Co.

1 MM2-B-11.5 "Mini Pump"  
Macalaster Bicknell  
3 Eastern Model D6 Centrifugal Pump - Bronze Casting  
Macalaster Bicknell  
1 Eastern, Midget, Low pressure model D-6 Crackle finish  
Bronze #35193

Relays - Central Scientific Co.

1 Cat. #99784 Relay  
1 " #99785-A Electrode Relay, 50/60 cycle 115 V

Shaker - Macalaster Bicknell

1 Burrell Shaker, Size C

Spectrophotometer - Will-N.Y. Inc.

1 Beckman DU Serial No. 89442  
1 Powersupply Serial No. 77284

Survey Meter - (Beta Gamma) - National Tech. Labs.

1 #10800 Beckman Geiger Counter, Model "MX-5" Serial No. 21529

Counters - Eagle Signal Corp.

1 HZ 50A6 Microflex Counter 115 V 50/60 cycle; 400 count range  
AAR A-212

1 HN84 Cabinet

Autoscalers - General Radio

2 SC-4 Eagle Preset Counters

Pump - Sigmamotor Co.

1 Model T-6SH, with Graham 28A Variable drive, 1/6 h. p.  
motor - all mounted on special base Serial No. 129  
(S-547)

## Office Memorandum • UNITED STATES GOVERNMENT

TO : S. R. Sapirie, Manager  
Oak Ridge Operations Office

DATE: DEC 8 1959

FROM : Frank K. Pittman, Director *agu for*  
Division of Reactor Development

SUBJECT: EXTENSION OF CONTRACT AT(40-1)-2130 WITH THE UNIVERSITY OF  
NORTH CAROLINA, CHAPEL HILL, NORTH CAROLINA

SYMBOL: RD:ADM:C:DEG

It is requested that your office negotiate, execute, and administer an extension of Contract AT(40-1)-2130 with the University of North Carolina, Chapel Hill, North Carolina, in accordance with the following provisions:

1. Title: "Scientific Problems in Disposal of Fission Products"
2. Scope of Work: The following work will be carried out:
  - a. Continue to investigate scientific problems encountered when radioactive nuclides are released into contact with the soil minerals; specifically to advance the studying both theoretically and in the laboratory for the adsorption of radioactive tracers and to develop analytical procedures for the study of the motion of these tracers with water in the soil.
  - b. Laboratory research equipment has been provided and is in use for the evaluation of the permanence of the fixation of nuclides in glasses. These facilities will be used in the study of diffusion in glasses.
  - c. As a long term objective, the investigator plans to provide a center for advanced instruction and research in the problems related to the disposal of fission products. 5093
3. Type of Contract: At the discretion of the Oak Ridge Operations Office
4. Term of Contract: October 1, 1959 - September 30, 1960
5. Security Provisions: This contract, and the work performed thereunder, is unclassified.

J12457

DEC 10 1959

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6. Financing: Funds in the amount of \$40,000 are available in the current OROO Financial Plan. Costs are to be charged to Budget Activity 4452. It is desired that this contract be funded for its total term as authorized.

It should be noted that Headquarters has not made a detailed review of overhead, general and administrative expenses, equipment and other related costs as it is expected that the Operations Office will investigate these items as part of any contract negotiations.

Fee calculations are to be made by the Operations Office consistent with AEC fee policy and standard AEC schedules.

7. Reporting Requirements:

- a. Informal monthly reports in five copies for the 12-month period are to be submitted to the Division of Reactor Development.
- b. Draft final summary report for the 12-month period is to be submitted to the Director, Division of Reactor Development, 15 days before completion of this contract and before report is reproduced.
- c. All aspects of the work shall be described in sufficient detail so as to enable others to use this information.
- d. Twenty copies of the final report, and a reproducible master, are required within 30 days after contract term.
- e. Provisions of AEC Manual 3203 apply.

8. Special Provisions and Instructions:

- a. No part of the funds under this contract may be used for the conferring of a fellowship within the meaning of the Appropriation Rider.
- b. It is requested that you keep the Contracts Branch of the Division of Reactor Development advised as to any problems encountered in your negotiations and the date of execution of this contract. This notification should be made directly to DED rather than awaiting the normal distribution of the contract document or monthly contract report.

S. R. Sapirie

-3-

9. Headquarters Technical Point of Contact: Chief, Environmental and Sanitary Engineering Branch, Nuclear Technology, Division of Reactor Development.

Enclosure: *9/1/77*  
Proposal

1129190

THE UNIVERSITY OF NORTH CAROLINA  
CHAPEL HILL

ACCOUNTING DEPARTMENT

ADDRESS REPLY TO:  
Box 690  
CHAPEL HILL

Attn: Research Accounting

January 6, 1960

C  
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P  
Y

Dr. C. S. Shoup  
Chief, Biology Branch  
Research and Development Division  
U. S. Atomic Energy Commission  
Oak Ridge, Tennessee

Re: Contract Number AT-(40-1)-2130

Dear Dr. Shoup:

This is to confirm to you that the overhead rate of 26.33 per cent is applicable to Salaries and Wages under the above mentioned contract. The following charges should be made in the budget submitted for the period October 1, 1959 through September 30, 1960:

Item II	Overhead to University (26.33% of Salaries and Wages)	\$ 8,654.67
Item	Total proposed for above period	51,424.67
Item	New Funds requested from AEC	40,313.90

Very truly yours,

V. P. Bowles  
Assistant Director of Accounting

rod

1129191

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JAN 11 1960

Backup Notes

January 15, 1960

AEC Headquarters notified us by telephone that they intended for us to negotiate the modification to Contract No. 2130 in the amount requested in the proposal rather than in the amount of \$40,000. as indicated in the authorization. Archie Miller informed me that it is not necessary to receive a supplement to the authorization in order to authorize new funds in the amount of \$40,314, since the funds are available in the current CROO Financial Plan.

J. D. Burleson

1129192

59 10418

**TO:** The United States Atomic Energy Commission  
Research and Development Division  
Post Office Box E  
Oak Ridge, Tennessee

**FROM:** The University of North Carolina  
Chapel Hill, North Carolina

PROPOSAL FOR THE RENEWAL OF RESEARCH CONTRACT

No. AT - (40-1) - 2130

It is proposed that the above designated contract between the United States Atomic Energy Commission and the University of North Carolina be renewed for one year, from October 1, 1959, to September 30, 1960.

The scope of the work to be performed remains as described in Title III, "1," "a" of Modification No. 2 of subject contract with the following change. Since it has become apparent that a fundamental study of diffusion in glasses will require equipment, space, and personnel far in excess of our presently available facilities, we have not carried out our original intention of starting work along these lines. It became apparent from our leaching studies that investigations of diffusion in glasses would require levels of radioactivity which could not be handled in our laboratory. Such investigations would undoubtedly prove valuable, but they should be carried on in a laboratory equipped for glass technology and by personnel familiar with the highly specialized problems involved. We propose to continue our work along these lines only via leaching studies on materials prepared by others.

It is thought that the most valuable contribution that we can make will be through continued work on the fundamental chemical and physical problems involved in sorption on soil minerals, with particular reference to those cases of immediate interest in the waste disposal problem. We propose then, more specifically, to direct our efforts to studies of sorption on vermiculite, because of the probable practical value of this mineral; on attapulgite, because of the theoretical value of this work; to continue work on the sorption of the trivalent metals on montmorillonite; and so far as is possible, at the same time to prosecute the studies of flow through packed beds with various tracers.

1129193

J 6654 JUN 29 1959

BUDGET

Contract No. AT - (40-1) - 2130

Proposed for the period October 1, 1959, through September 30, 1960

	<u>AEC</u>	<u>UNC</u>
<b>I. Personnel</b>		
Henry C. Thomas, Director		
Part-time, 9 months	\$ 6,170.00	\$ 3,740.00
Full-time, 3 months	3,300.00	
Galen R. Frysinger	9,600.00	
Research Associate	6,600.00	
Laboratory Assistant	3,600.00	
Laboratory Assistant (part-time)	2,400.00	
Secretarial	1,200.00	
Consultation within UNC		1,200.00
	<hr/>	<hr/>
	\$ 32,870.00	\$ 4,940.00
<b>II. Overhead to University</b>		
(28-30% of Wages and Salaries)	\$ <del>9,302.21</del> <sup>8654.67</sup>	\$ <del>1,398.02</del> <sup>1200.70</sup>
25.33%		
<b>III. Operating Expenses</b>		
1. Supplies, expendable	\$ 4,800.00	
2. Special machine work	500.00	
3. Travel	1,200.00	
4. Service on electronic equipment	800.00	
5. Freight, phone, postage, etc.	600.00	
6. Laboratory services		\$ 1,200.00
7. Glass shop and machine shop		1,600.00
	<hr/>	<hr/>
	\$ 7,900.00	\$ 2,800.00
<b>IV. Special Equipment</b>		
1. Sample collector	\$ 2,000.00	
	<hr/> <hr/>	<hr/> <hr/>
Total proposed for above period	\$ 52,072.21 <sup>50,007</sup>	\$ 9,138.02
Estimated balance, September 30, 1959	\$ 11,110.77	<sup>9,040.70</sup>
New funds requested from AEC	<u>\$ 40,961.44</u> <sup>40,313.90</sup>	

Signed:

*Henry C. Thomas*

Henry C. Thomas  
Principal Investigator

*W. D. Carmichael*

W. D. Carmichael  
Vice President and Financial  
Officer

1129194

**EXPENDITURE STATEMENT**

Contract No. AT - (40-1) - 2130

The following statement shows the contributions of both the Atomic Energy Commission and the University of North Carolina for the period of October 1, 1958, through May 31, 1959. In columns A are given actual expenditures for this period, the University's contribution being in part estimated. In columns B are given estimates for the period June 1 - September 30, 1959.

	Column A		Column B	
	<u>AEC</u>	<u>UNC</u>	<u>AEC</u>	<u>UNC</u>
Salaries and wages	\$ 14,709.24	\$ 2,493.33	\$ 9,156.64	\$ 1,246.67
Equipment	989.25		770.00	1,400.00
Supplies	2,784.93		2,000.00	
Travel	164.12		1,150.00 <sup>*</sup>	
Postage, phone, etc.	328.41		200.00	
Overhead	5,622.90		2,591.33	
Laboratory services	<u>                    </u>	<u>2,200.00</u>	<u>                    </u>	<u>1,100.00</u>
	\$ 24,598.85	\$ 4,693.33	\$ 15,867.97	\$ 3,746.67
Total Funds Required	\$ 40,466.82			
Total Funds Available	51,577.59			
Balance on September 30, 1959	11,110.77 <sup>#</sup>			

\*H. C. Thomas to Ion Exchange Conference, Gatlinburg, Tenn.; H. C. Thomas, G. R. Fryinger to San Francisco, Working Conference on Waste Disposal.

#The indicated balance of \$11,110.77 is due to two causes as explained in the Research Proposal and in the Progress Report: the resignation of a research associate on May 31, 1959, and principally the fact that diffusion studies in glasses were not undertaken.

1. **Chairman**  
**TO: J. R. Moore** **Contract Board.** From: Res. & Dev. Div.

It is requested that the Contract Board take the necessary action to process the following described contract action in accordance with the provisions of Bulletin OR-O&M-19:

2. Nature of Action Requested

Selection of New Contractor and Negotiation of Contract.

Modification of Contract  
 No. AT-(10-1)-2130  
 Contractor: University of North Carolina  
Chapel Hill, North Carolina

Review and approval of Contract, Sub-contract or Purchase Order.  
 Number: \_\_\_\_\_  
 Name: \_\_\_\_\_

Other (Explain) \_\_\_\_\_

3. Nature of Services to be Covered by Contract

Construction  Architect-Engineer  Other  (Explain) Research

4. Funding

Amount to be Obligated by this Contract Action \$ 49,209.00

Source of Funds

Approved ORO Financial Plan, \_\_\_\_\_ Quarter, Fiscal Year 19\_\_\_\_  
 Project No. \_\_\_\_\_ or, Activity No. 4305  
 Funds to be Obligated: Allotment No. 24-91-91 (F.Y. 1959 Funds)  
 Procurement Directive No. memo Dated 9-30-58  
 Issuing Office Div. of Doctor Development

Concurrence in Funding Statement: (signed) A Miller  
 Chief, Budget Branch

5. Project or Activity to be Covered by Contract Action:

Location of Work: \_\_\_\_\_ Construction Directive No. \_\_\_\_\_  
 Estimated Cost of Work to be Covered by this Contract Action \$ \_\_\_\_\_  
 Schedule: Date Work to Start \_\_\_\_\_ Estimated Completion Date \_\_\_\_\_  
 Description of Project or Activity:

(If more space is required use separate sheets and attach hereto)

<p>6. Contract Board Docket No. _____ (To be assigned by Board Secretary)</p>	<p>7. Request Submitted By: (signed) <u>C. S. Shoup</u> Date: <u>OCT 14 1958</u> Title: _____ C. S. SHOUP CHIEF, BIOLOGY BRANCH RESEARCH AND DEVELOPMENT DIVISION</p>
<p>8. <u>Complete Description of Services to be Furnished by Contractor:</u></p> <p>Headquarters designated research contract. TITLE: "Disposal of Radioactive By-Products of Nuclear Fission".</p> <p>(If more space is required use separate sheets and attach hereto:)</p>	
<p>9. <u>Description of other changes to be covered by Modification:</u></p> <p>Modify contract to provide for additional research to be completed not later than September 30, 1959, with new funds in the amount of \$49,209. Include provision in Appendix "C" for submission of a monthly status letter in quadruplicate.</p> <p>(If more space is required use separate sheets and attach hereto:)</p>	
<p>10. <u>Negotiated Contracts.</u> (Show why it appears desirable to negotiate new contract or to negotiate modification to existing contract)</p> <p>Memorandum from Frank K. Pittman to S. R. Sapirie dated September 30, 1958.</p> <p>(If more space is required use separate sheets and attach hereto:)</p>	
<p>11. <u>Contracts, Subcontracts, or Purchase Orders Submitted for Review and Approval:</u> (Furnish brief description of action in this space and attach pertinent documents)</p> <p>None</p>	
<p>12. <u>Disputes:</u> Attach a statement summarizing the dispute together with pertinent documents and Background Material.</p> <p>None</p>	

4639

1129197



THE UNIVERSITY OF NORTH CAROLINA  
CHAPEL HILL, NORTH CAROLINA

Contract No. AT-(40-1)-2130

Henry C. Thomas  
Project Leader.

DISPOSAL OF THE RADIOACTIVE BY-PRODUCTS OF  
NUCLEAR FISSION

Resume:

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The Contractor will continue studies associated with basic concepts of radioactive waste disposal and will evaluate and test proposed methods of disposal, ionic diffusion, exchange, absorption, heating, etc. in appropriate materials. Fundamental diffusion studies of radioactive nuclides in glasses will be carried out.

---

C. S. Shoup

OKOU

## Office Memorandum • UNITED STATES GOVERNMENT

TO : S. R. Sapirie, Manager  
Oak Ridge Operations Office  
(THRU) E. J. Bloch, Director, PROD

FROM : Frank K. Pittman, Acting Director  
Division of Reactor Development

DATE: SEP 30 1958

SUBJECT: RENEWAL OF CONTRACT NO. AT(40-1)-2130 - UNIVERSITY OF NORTH CAROLINA

SYMBOL: RD:EDB:MDM

It is requested that your office negotiate, execute, and administer an extension to the subject contract in accordance with the following provisions:

1. TITLE:

✓ Disposal of the Radioactive By-Products of Nuclear Fission.

2. PRINCIPAL INVESTIGATOR:

✓ Dr. Henry C. Thomas

3. SCOPE:

The scope of work is to have two principal objectives:

- a. To investigate problems directly related to the "return to nature" of the radioactive fission products.
- b. To provide facilities for and to carry out critical testing, on a laboratory scale, of proposals for the disposal of fission products.

4. TERM OF CONTRACT:

X October 1, 1958 to September 30, 1959.

5. CLASSIFICATION PROVISIONS:

✓ Unclassified.

6. FINANCING:

✓ Cost for a 12-month period is approved at \$50,000.

(continued)

11 9639

OCT 1 1958

1129200

SEP 30 1958

A cost ceiling of \$45,000 has been provided in this Fiscal Year 1959 financial plan under activity 4305.

7. REPORTING REQUIREMENTS:

Monthly progress reports and completion reports.

8. SPECIAL PROVISIONS:

No part of the funds under this contract may be used for the conferring of a fellowship within the meaning of the appropriation rider.

9. TECHNICAL POINT OF CONTACT:

J. A. Lieberman, Chief, Sanitary Engineering Section, Engineering Development Branch, Division of Reactor Development.

Enclosures: *DMR*  
Copy of Contract Selection Record  
Univ. of North Carolina Renewal Proposal



UNIVERSITY OF NORTH CAROLINA  
CHAPEL HILL

J. A. BRANCH  
Business Manager

August 21, 1958

Dr. C. S. Shoup  
Chief, Biology Branch  
Research and Development Division  
U. S. Atomic Energy Commission  
Oak Ridge, Tennessee

Dear Dr. Shoup:

In answer to your telegram of yesterday, we enclose an expenditure statement for Government funds under Research Contract Number AT-(40-1)-2130 together with an explanatory letter from Dr. Thomas.

Sincerely yours,

J. A. Branch,  
Business Manager

By H. L. Ferguson, Jr.

CONTRACT - 2130 (U.S.A.)

1129202

0-207110.2

AUG 21

THE UNIVERSITY OF NORTH CAROLINA  
CHAPEL HILL

DEPARTMENT OF CHEMISTRY

August 21, 1958

Dr. C. S. Shoup  
Chief, Biology Branch  
Research and Development Division  
United States Atomic Energy Commission  
Oak Ridge, Tennessee

Dear Dr. Shoup:

Your telegram arrived just as I was completing a survey of the accounts on Government funds for Contract AT-(40-1)-2130. I am, therefore, able to send you at once an expenditure statement for the AEC contribution. This is enclosed.

You will notice that if the grant is reduced by the total amount for travel shown in the supplemental budget for the period July through September (\$1400) we will be in the red by \$628.28. The reason for this lies in a bad guess made by myself for current expenses for supplies, which have been averaging two hundred dollars a month more than estimated for the summer period.

I hope this report will be acceptable to you in this form.

Very sincerely yours,

*Henry C. Thomas*

Henry C. Thomas  
Professor of Chemistry

Enclosure

cc

1023 478 52 64 15 45

CONTRACTS - 2130 (HJM)

OAK RIDGE OPERATIONS  
R 2 V E C

H 8367  
AUG 25 1958

1129203

**Expenditure Statement**  
**(AEC Contribution Only)**

Research Contract Number AT-(40-1)-2130

Actual expenditures and encumbrances as of August 16, 1958, with  
estimates through September 30, 1958.

1. Salaries and wages	\$26,247.52	
2. Equipment	6,673.62	
3. Supplies	8,868.31	
4. Travel	465.18	
5. Telephone, freight, etc.	264.48	
6. Indirect cost (at 29.28 per cent of 1.)	7,685.27	
	<u>\$50,204.38</u>	
Total amount of grant		\$50,956.00
Funds remaining September 30.*		\$ 771.62

\*This subject to adjustment for unused expenses to Geneva.  
Please see accompanying letter.

---

Henry C. Thomas  
Professor of Chemistry

To: The United States Atomic Energy Commission  
Research and Development Division  
Post Office Box E  
Oak Ridge, Tennessee

From: The University of North Carolina  
Chapel Hill, N. C.

Proposal for Renewal of Research Contract  
No. AT - (40-1) - 2130

It is proposed that the above designated contract between the United States Atomic Energy Commission and the University of North Carolina, which through Modification No. 1 has been extended through September 30, 1958, be renewed for a period of one year, from October 1, 1958 through September 30, 1959.

The scope of the work to be performed remains as described in Appendix "A", Title I, l.a. "Scope and Plan of Approach" of the subject contract, with, however, the following addition. It is felt that much of the work described will, during the next year, be reduced to routine. We hope by the winter or spring of 1959 to be in a position to start in a small way some fundamental work on the diffusion of radioactive nuclides in glasses. Provision is made in the accompanying budget for equipment for this purpose. The testing equipment necessary for this work is already in running condition. Request is also made for funds to engage part-time laboratory assistance for this and other work. This is a continuation of the provision in Modification 1.

All major items of equipment necessary to prosecute the work are now on hand and in running condition. Nearly all needs for measurement of radioactivity have been anticipated.

1129205 The loan of the helium leak detector from the Oak Ridge National Lab-

oratory has relieved us of the necessity for immediately purchasing this equipment. We show only maintenance for this equipment in the attached budget.

Salaries in the attached Budget remain as described in the budget leading to Modification 1.

The overhead figure of 29.28 per cent has been explained in a letter from Chancellor W. B. Aycock to Dr. C. S. Shoup, Chief, Biology Branch, Oak Ridge Operations Office, U.S.A.E.C.

Proposed Budget

U.S.A.E.C. Contract AT-(40-1)-2130  
 For the period: October 1, 1958 through September 30, 1959

I. Personnel	A.E.C.	U.N.C.
Henry C. Thomas, Director		
Part time, 9 months	\$ 6,170.00	\$3,740.00
Full time, 3 months	3,300.00	
Galen R. Frysinger	8,000.00	
Ernest A. Knipp	7,800.00	
Laboratory Assistant, Part time	2,500.00	
Secretarial	3,000.00	
Consultation within U.N.C.		<u>1,200.00</u>
	<u>\$30,770.00</u>	<u>\$4,940.00</u>
 II. Overhead to University (29.28% of Wages and Salaries)	 \$9,009.46	 \$1,446.43
 III. Operating Expenses -		
1. Supplies (Expendable)	\$ 2,400.00	
2. Special Machine Work	500.00	
3. Travel	800.00	
4. Service on electronic equipment	900.00	
5. Freight, phone, postage, etc.	600.00	
6. Laboratory services		1,200.00
7. Glass and machine shop		1,500.00
 IV. Special Equipment		
Toward surface area measurements	\$ 2,000.00	
Furnace	3,000.00	
Vibrating reed electrometer		<u>\$ 1,600.00</u>
	<u>\$49,979.46</u>	<u>\$10,686.43</u>

Estimated balance remaining, Sept. 30, 1958: None

Total funds requested from A.E.C.: \$49,979.46

Signed:

*Henry C. Thomas*  
 \_\_\_\_\_  
 Henry C. Thomas  
 Principal Investigator

*W. D. Carmichael*  
 \_\_\_\_\_  
 W. D. Carmichael  
 Vice President and Finance Officer

EXPENDITURE STATEMENT

Research Contract No. AT-(40-1)-2130

Based on expenditures through June 16, 1958, with encumbrances through September 30, 1958, including the contributions of both AEC and the University.

	Expenditures:	Encumbrances
Salaries and Wages	\$18,025.17	\$10,800.00
Equipment	9,029.61	2,433.67
Supplies	7,044.71	196.19
Travel	213.48	1,400.00
Other*	2,222.02	1,000.00
Overhead**	3,327.82	3,165.00
	<u>\$39,862.81</u>	<u>\$18,994.86</u>
Total funds required	\$58,857.67	
Total funds available	\$58,857.67	

\*Including an estimate of \$2000 for the University's contribution of services and facilities.

\*\* Including an overhead figure shown on the original proposal as part of the University's contribution.

1. TO: J. R. Moore Chairman  
 Contract Board. From: Res. & Dev. Div.

It is requested that the Contract Board take the necessary action to process the following described contract action in accordance with the provisions of Bulletin OR-O&M-19:

2. Nature of Action Requested

Selection of New Contractor and Negotiation of Contract.

Modification of Contract No. AT-(40-1)-2130

Contractor: University of North Carolina Chapel Hill, North Carolina

Review and approval of Contract, Sub-contract or Purchase Order.

Other (Explain) \_\_\_\_\_

Number: \_\_\_\_\_  
 Name: \_\_\_\_\_

3. Nature of Services to be Covered by Contract

Construction  Architect-Engineer  Other  (Explain) Research

4. Funding Amount to be Obligated by this Contract Action \$ 6,037.00 1202.00

Source of Funds

Approved ORO Financial Plan, \_\_\_\_\_ Quarter, Fiscal Year 19\_\_

Project No. \_\_\_\_\_ or, Activity No. 4305

Funds to be Obligated: Allotment No. 24-81-91 (F.Y. 1958 Funds)

Procurement Directive No. TT Dated 6-2-58

Issuing Office Div. of Director Powell

Concurrence in Funding Statement: (signed) Almiller

Chief, Budget Branch

5. Project or Activity to be Covered by Contract Action:

Location of Work: \_\_\_\_\_ Construction Directive No. \_\_\_\_\_

Estimated Cost of Work to be Covered by this Contract Action \$ \_\_\_\_\_

Schedule: Date Work to Start \_\_\_\_\_ Estimated Completion Date \_\_\_\_\_

Description of Project or Activity:

(If more space is required use separate sheets and attach hereto)



# Office Memorandum • UNITED STATES GOVERNMENT

TO : J. W. Ould, Jr., Assistant General Counsel

DATE: June 3, 1958

FROM : John R. Moore, Director, Contract Division

SUBJECT: MODIFICATION TO CONTRACT AT-(10-1)-2130 -  
UNIVERSITY OF NORTH CAROLINA

SYMBOL: ACD:BSH

Please prepare an appropriate modification to the subject contract to provide for the performance of additional research to be completed not later than September 30, 1958, with new funds in the amount of \$6,037. This action is covered by Contract Authorization No. (Teletype) dated June 2, 1958, in the amount of \$6,037.

A Request for Contract Action dated June 2, 1958, from the Research and Development Division, is enclosed for your use.

John R. Moore

Enclosures:

- 1. Request for Cont. Action
- 2. Budget
- 3. TT Authorization 6-2-58

CC: L. B. Mackay  
 C. S. Sheup  
 A. Brown, w/encls. 1 & 2

*We were advised by the University in a Teletype conversation that the amount of funds available for financing the proposed period from 8-1-55 to later than 9-30-58 is in excess of our funds request. Shall therefore be reduced by this amount.*

9075  
6-6-58

RECEIVED

Budget for Contract No. AT-(40-1)-2130  
7-1-58 - 9-30-58

(1)	<u>Salaries and Wages:</u>	\$10,177.51
	Dr. H. C. Thomas (Full time 3 mos.)	\$4,677.51
	Research Associates	3,950.00
	Laboratory Assistant	400.00
	Secretarial Assistance	750.00
	Consultation	400.00
(2)	<u>Supplies:</u>	875.00
(3)	<u>Services on Leak Detector:</u>	150.00
(4)	<u>Freight, Phone, Postage, etc.:</u>	400.00
(5)	<u>Glass Shop and Machine Shop:</u>	450.00
(6)	<u>Travel:</u>	1,400.00
(7)	<u>Overhead (29.28% of salaries and wages):</u>	2,979.97
	Total	<u>\$16,432.48</u>

The AEC's contribution to the above budget will be <sup>1,202.</sup> \$6,937; the Contractor's contribution will be \$2,475.48; and the estimated unexpended balance is \$7,920.  
12,955.

805  
6-6-58

RECEIVED  
COMM. & RECORDS SECT.  
TELETYPE SUB-SECT  
BY... *UP* -----

1968 JUN 2 AM 0:08

TWX NR 01 P R I O R I T Y

ROUTED -----  
SENT -----  
LONGER *JULY-02*  
RETURNED -----

FROM USAEC WASHDC JUNE 021322Z  
TO USAEC OROO OAK RIDGE TENN

JUN 2 1968  
1969

ATTN S R SAPIRIE FROM W KENNETH DAVIS AND E J BLOCH PD  
SUBJECT RENEWAL OF CONTRACT NO AT-/40-1/-2130 - UNIVERSITY OF NORTH  
CAROLINA IT IS REQUESTED THAT YOUR OFFICE NEGOTIATE CMM EXECUTE CMM AND  
ADMINISTER AN EXTENSION TO THE SUBJECT CONTRACT IN ACCORDANCE WITH THE  
FOLLOWING PROVISIONS CLN

1. TITLE

-----  
DISPOSAL OF THE RADIOACTIVE BY-PRODUCTS OF NUCLEAR FISSION

2. PRINCIPAL INVESTIGATOR CLN

-----  
DR HENRY C THOMAS

3. SCOPE CLN

-----  
THE SCOPE OF WORK IS TO HAVE THREE PRINCIPAL OBJECTIVES CLN

- A. TO INVESTIGATE PROBLEMS DIRECTLY RELATED TO THE "RETURN OF NATURE"  
OF THE RADIOACTIVE FISSION PRODUCTS PD
- B. TO PROVIDE FACILITIES FOR AND TO CARRY OUT CRITICAL TESTING CMM  
ON A LABORATORY SCALE CMM OF PROPOSALS FOR THE DISPOSAL OF FISSION  
PRODUCTS PD
- C. TO PROVIDE A CENTER FOR ADVANCED INSTRUCTION IN THE SCIENTIFIC  
FUNDAMENTALS OF THE PROBLEMS INVOLVED IN DISPOSAL AND RETURN TO  
NATURE PD

JUN 2 1968  
H 5355

END PAGE ONE

1129213

4. TERM OF CONTRACT CLN

-----  
JULY 1 CMM 1958 TO SEPTEMBER 30 CMM 1958 PD /IT IS ANTICIPATED THAT THAT THIS CONTRACT WILL BE EXTENDED FOR A ONE-YEAR PERIOD BEYOND SEPTEMBER 30 PD/

5. CLASSIFICATION PROVISIONS CLN

-----  
UNCLASSIFIED PD

6. FINANCING CLN

-----  
IT IS OUR UNDERSTANDING PER TELEPHONE CONVERSATION OF MARCH 27 CMM 1958 CMM BETWEEN KENNETH HAWTHORNE AND DAN LINN THAT FUNDS IN THE AMOUNT OF \$13 957 ARE AVAILABLE WITHIN THE EXISTING 4000 PLAN PD THIS AMOUNT IS TO COVER THE PERIOD FROM JULY 1 TO SEPTEMBER 30 PD COSTS FOR FY 1959 ARE ESTIMATED AT \$45 000 PD

7. REPORTING REQUIREMENTS CLN

MONTHLY PROGRESS REPORTS AND COMPLETION REPORTS PD

8. SPECIAL PROVISIONS CLN

-----  
NO PART OF THE FUNDS UNDER THIS CONTRACT MAY BE USED FOR THE CONFERRING OF A FELLOWSHIP WITHIN THE MEANING OF THE APPROPRIATION RIDER

9. TECHNICAL POINT OF CONTACT CLN

-----  
J A LIEBERMAN CMM CHIEF CMM SANITARY ENGINEERING SECTION CMM ENGINEERING DEVELOPMENT BRANCH CMM DIVISION OF REACTOR DEVELOPMENT PD



FEB 28 3 10:10



DOCK RIDGE CLEVELAND

Supplemental Budget

USAEC Contract AT-(40-1)-2130

For the period: July, 1958 through September, 1958

	AEC	UNC
1. Personnel		
Henry C. Thomas, Director (3 Mo.*)	\$1,542.51	\$ 935.00
Full Time, 2 Months	2,200.00	
Galen R. Frysinger	2,000.00	
Ernest A. Knipp	1,950.00	
Laboratory Assistant, Part Time	400.00	
Secretarial	750.00	
Consultation within U.N.C.		<u>400.00</u>
	<u>\$8,842.51</u>	<u>\$1,335.00</u>

11. Overhead to University (29.28% of Wages and Salaries)	\$2,589.49	\$390.48
--	------------	----------

111. Operating Expenses		
1. Supplies (Expendable)	\$ 875.00	
2. Travel (Geneva**)	1,400.00	
3. Service on Leak Detector	150.00	
4. Freight, phone, postage	100.00	
5. Laboratory Services		\$ 300.00
6. Glass and Machine Shop		<u>450.00</u>
	<u>\$ 13,957.00</u>	<u>\$ 2,475.00</u> 9075

Estimated balance remaining, June 30, 1958 \$ 12,755.00

Total funds requested from AEC \$1,202.00

\* 9 Months Salary paid over 12 Months by University of North Carolina

\*\*Paper written by H. C. Thomas by request AEC. (UN not yet decided)

Signed

*Henry C. Thomas*  
 Henry C. Thomas  
 Principal Investigator

*W. D. Carmichael*  
 W. D. Carmichael  
 Vice President and Finance Officer

1129215

JUN 9 1958 H 5652

## Office Memorandum • UNITED STATES GOVERNMENT

TO : J. W. Ould, Jr., Assistant General Counsel

DATE: August 20, 1957

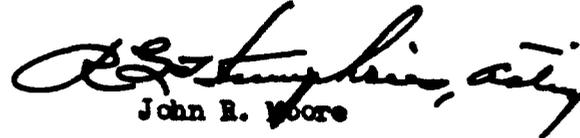
FROM : John R. Moore, Director, Contract Division

SUBJECT: REQUEST FOR NEW CONTRACT WITH THE UNIVERSITY OF NORTH CAROLINA  
CHAPEL HILL, NORTH CAROLINA

SYMBOL: ACD:DS

It is requested that you prepare an appropriate research contract with the University of North Carolina, Chapel Hill, North Carolina for a period of one year beginning July 1, 1957, with AEC funds in the amount of \$49,754. Designate Dr. Henry C. Thomas as Senior Investigator.

Request for contract action from C. S. Shoup, Chief, Biology Branch, Research and Development Division, is enclosed for your use.

  
John R. Moore

## Enclosures:

1. Reqst for Cont. Action
2. Budget breakdown
3. Program Resume'
4. Memo fm WKDavis, Div. of Reactor Development, dtd 6/20/57
5. Cy ltr to DGreen dtd 8/5/57, w/cys Form 67
6. Cy ltr dtd 7/24/57 fm Univ. of N.C. to CSShoup, w/proposal

CC: C. S. Shoup  
L. D. MacKay  
Alice Brown w/cy encl 1 & 2



1. TO: J. R. Moore Chairman Contract Board. From: Res. & Dev. Div.

It is requested that the Contract Board take the necessary action to process the following described contract action in accordance with the provisions of Bulletin OR-O&M-19:

2. Nature of Action Requested

- X Selection of New Contractor and Negotiation of Contract. University of North Carolina Chapel Hill, North Carolina
Modification of Contract No. Contractor:
Review and approval of Contract, Sub-contract or Purchase Order. Number: Name:
Other (Explain)

3. Nature of Services to be Covered by Contract

Construction Architect-Engineer Other (Explain) Research

4. Funding Amount to be Obligated by this Contract Action \$ 49,754.00

Source of Funds

Approved ORO Financial Plan, Fiscal Year 1958
Project No. or, Activity No. 4305
Funds to be Obligated: Allotment No. 24-81-91 (F.Y. 1958 Funds)
Procurement Directive No. RA 57-58 Dated 6-20-57
Issuing Office Div. of Reactor Development

Concurrence in Funding Statement: (signed) O. Miller Chief, Budget Branch

5. Project or Activity to be Covered by Contract Action:

Location of Work: Construction Directive No.
Estimated Cost of Work to be Covered by this Contract Action \$
Schedule: Date Work to Start Estimated Completion Date
Description of Project or Activity:

(If more space is required use separate sheets and attach hereto:)

TES

<p>6. Contract Board Docket No. _____ (To be assigned by Board Secretary)</p>	<p>7. Request Submitted By: (signed) <u>C. S. Shoup</u> Date: <u>July 1, 1957</u> Title: _____ C. S. SHOUP CHIEF, BIOLOGY BRANCH RESEARCH AND DEVELOPMENT DIVISION</p>
<p>8. <u>Complete Description of Services to be Furnished by Contractor:</u> Research contract TITLE: "Disposal of the Radioactive By-Products of Nuclear Fission"  (If more space is required use separate sheets and attach hereto:)</p>	
<p>9. <u>Description of other changes to be covered by Modification:</u> New contract for a period of one year beginning July 1, 1957, with AEC funds in the amount of \$49,754. Designate Dr. Henry C. Thomas as Senior Investigator.  (If more space is required use separate sheets and attach hereto:)</p>	
<p>10. <u>Negotiated Contracts.</u> (Show why it appears desirable to negotiate new contract or to negotiate modification to existing contract) Memorandum from W. K. Davis to S. R. Sapirie, dated June 20, 1957.  (If more space is required use separate sheets and attach hereto:)</p>	
<p>11. <u>Contracts, Subcontracts, or Purchase Orders Submitted for Review and Approval:</u> (Furnish brief description of action in this space and attach pertinent documents) None</p>	
<p>12. <u>Disputes:</u> Attach a statement summarizing the dispute together with pertinent documents and Background Material. None</p>	

OK  
H  
8/16

BUDGET FOR NEW CONTRACT - DR. HENRY C. THOMAS  
FOR PERIOD 7-1-57 - 6-30-58

(1)	<u>Salaries and Wages:</u>	\$30,400.00
	Dr. H. C. Thomas (60% of time for 9 mos. Full time for 3 mos.)	\$11,500.00
	Research Associates	15,700.00
	Consultation	1,200.00
	Secretarial Assistance	2,000.00
(2)	<u>Equipment:</u>	12,150.00
	To be purchased	12,150.00
	*Government Furnished ( <del>See Attachment A</del> )	.00
	<i>(See subsection b, below)</i>	
(3)	<u>Supplies:</u>	2,000.00
(4)	<u>Laboratory, Glass Shop, and Machine Shop Services:</u>	3,200.00
(5)	<u>Freight, Transportation, Phone, Postage, etc.:</u>	1,500.00
(6)	<u>Travel:</u>	1,200.00
(7)	<u>Overhead (29.28% of Salaries and Wages):</u>	8,901.00
		\$59,351.00
TOTAL		

\*This equipment was formerly used in connection with earlier work on the research activities covered by this contract, ~~at Yale University~~. The equipment will be transferred to the Contractor through arrangements being made with the New York Operations Office. Title to the equipment will remain with the AEC.

*of the Commission*

The AEC's contribution to the above budget will be \$49,754.

Attachment A

Listing of equipment to be transferred from Yale University to the University of North Carolina under Contract No. AT-(40-1)-2130. Title to the equipment is to be retained by the AEC.

Analyzer - American Instrument Co.

- 1 Cat. No. 5-445 Roller Particle size Analyzer
- 1 " " 5-451 Sound-resistant cabinet
- 1 " " 5-456 Spec. Brass Sample Tube
- 1 " " 5-452 Low Pressure Air Pump

Bath - Will-N.Y. Inc.

- 1 Cat. No. 28341 Water Bath, 8 openings

Centrifuge - Macalaster Bicknell

- 1 Internat'l Size 1 S.B. Serial # Z 6663

Demineralizer - Penfield Products

- 1 M-8 Cartridge Type

Drop Collector - Technicon Chromatography Corp.

- 1 Drop counting accessories for Time Flow Fraction Collector

Preamplifier - Tracerlab Inc.

- 1 P-10 Pre-Amplifier

Meter - Tracerlab Inc.

- 1 TPN 100 M-3 Weston, Model 267

Fraction Collector - Technicon Chromatography Corp.

- 1 Time Flow Fraction collector with 150 minute timer

Pumps - Milton Roy Co.

- 1 MM2-B-11.5 "Mini Pump"
- Macalaster Bicknell
- 3 Eastern Model D6 Centrifugal Pump - Bronze Casting
- Macalaster Bicknell
- 1 Eastern, Midget, Low pressure model D-6 Crackle finish  
Bronze #35193

Relays - Central Scientific Co.

- 1 Cat. #99784 Relay
- 1 " #99785-A Electrode Relay, 50/60 cycle 115 V

Shaker - Macalaster Bicknell

- 1 Burrell Shaker, Size C

Spectrophotometer - Will-N.Y. Inc.

- 1 Beckman DU Serial No. 89442
- 1 Powersupply Serial No. 77284

Stirrer - Macalaster Bicknell

1 "Mag-Mix" Precision #65904

Survey Meter - (Beta Gamma) - National Tech. Labs.

1 #10800 Beckman Geiger Counter, Model "MX-5" Serial No. 21529

Vise - N.T. Bushnell Co.

1 #123 Vise D & C

Counters - Eagle Signal Corp.

1 HZ 50A6 Microflex Counter 115 V 50/60 cycle; 400 count range  
AAR A-212

1 HN84 Cabinet

Autoscalers - General Radio

2 SC-1B Autoscalers "wired for use with Eagle Precept Counters  
and equipped with P-1 preamplifiers and S-100 timers"

2 SC-4 Eagle Preset Counters

1 SC-1B Autoscaler

1 SM-60A Electrical Timing Clock (S-100)

Timer - Timperly

1 Electronic Timer

Milliammeters - Hatry

2 Weston 471 ammeters Serial Nos. 48531 & 48512

Transformers - Hatry

1 Kyson T667

2 " T177

Pump - Sigmamotor Co.

1 Model T-6SH, with Graham 28A Variable drive, 1/6 h.p.  
motor - all mounted on special base Serial No. 129  
(S-547)

UNIVERSITY OF NORTH CAROLINA  
DEPARTMENT OF CHEMISTRY  
INSTITUTE OF NATURAL SCIENCES  
CHAPEL HILL, NORTH CAROLINA.

Dr. Henry C. Thomas,  
Project Leader.

## DISPOSAL OF RADIOACTIVE BYPRODUCTS OF NUCLEAR FISSION

### Resume'

---

The Contractor will undertake research in the field of <sup>a</sup>radioactive waste disposal with three objectives: (1). To investigate problems related to the "return to nature" of radioactive fission products, including sampling, soil studies, ion movement and exchange, adsorption, etc., (2) Critical testing, on a laboratory scale, of proposals for the disposal of fission products, testing of materials, , etc; (3) and provide a center for advanced instruction and training in the *scientific* fundamentals of problems involved in radioactive waste disposal.

C. S. Shoup

OK 00

Office Memorandum • UNITED STATES GOVERNMENT

TO : S. R. Sapiro, Manager  
Oak Ridge Operations Office  
(THRU) E. J. Bloch, Director, Div. of Production  
FROM : W. K. Davis, Director *DM Morris for*  
Division of Reactor Development  
DATE: JUN 20 1957

SUBJECT: CONTRACT WITH THE UNIVERSITY OF NORTH CAROLINA, CHAPEL HILL,  
NORTH CAROLINA, RD 57-58

SYMBOL: RD:EDB:MDM

It is requested that your office negotiate, execute, and administer the subject contract under the following provisions:

- ✓ 1. Project Title:  
Disposal of the Radioactive By-Products of Nuclear Fission.
- ✓ 2. Principal Investigator:  
Dr. Henry C. Thomas
3. Scope of Work:  
The scope of work is to have three principal objectives:
  - ✓ A. To investigate problems directly related to the "return to nature" of the radioactive fission products.
  - B. To provide facilities for and to carry out critical testing, on a laboratory scale, of proposals for the disposal of fission products.
  - C. To provide a center for advanced instruction in the scientific fundamentals of the problems involved in disposal and return to nature.
4. Technical Liaison:  
J. A. Lieberman, Chief, Sanitary Engineering Section, Engineering Development Branch, Division of Reactor Development.
- ✓ 5. Security:  
Unclassified.
- ✓ 6. Term of Contract:  
One (1) year.
- ✓ 7. Type of Contract:  
At the option of your office.

CONTRACTS *201*

G 5688

1129223

8. Financing:  
Funds in the amount of \$50,000 will be made available in the FY 58 financial plan.
9. Budget Activity:  
Work under this contract is chargeable to budget activity 4630.
10. Reports:  
Please request that the University of North Carolina submit monthly progress reports and completion reports to the Chief, Engineering Development Branch, Division of Reactor Development, U.S. Atomic Energy Commission, Washington 25, D.C.
11. Equipment:  
Please arrange for the transfer of the equipment from Yale University to the University of North Carolina in accordance with the proposal and existing AEC regulations. The proposal did not include the following equipment but is to be included in the transfer from Yale to the University of North Carolina.  
  
One (1) Model T6SH Sigmamotor Pump, with Graham 28A Variable drive, 1/6 H.P. motor - all mounted on a special base, Serial No. 129 (S-547).
12. No part of the funds under this contract may be used for the conferring of a fellowship within the meaning of the appropriations rider.
13. Special Provisions:  
Please note that the selection of this contractor has been made by the Division of Reactor Development Contract Selection Board. A copy of this board action is attached for your files. It is expected that this contract will be administered by the Oak Ridge Operations Office and is not considered to be a Washington designated contract.

Attachments

1. U. of N.C. Proposal
2. Contract Selection Board

CONTRACT SELECTION BOARD  
DIVISION OF REACTOR DEVELOPMENT

Contractor and Location:

University of North Carolina  
Chapel Hill, North Carolina

Date: JUN 20 1957

Estimated Cost:

\$50,000.00

Project Title:

Disposal of the Radioactive By-Products of Nuclear Fission.

Description of Work:

The work is to follow along these three principal objectives:

- a. To investigate problems directly related to the "return to nature" of the radioactive fission products.
- b. To provide facilities for and to carry out critical testing, on a laboratory scale, of proposals for the disposal of fission products.
- c. To provide a center for advanced instruction in the scientific fundamentals of the problems involved in disposal and return to nature.

Principal Investigator:

Dr. Henry C. Thomas

Justification of Negotiation in Lieu of Formal Advertising:

Dr. Thomas for a number of years has been carrying out specific investigations on the physical and chemical reactions between specific nuclides and clay minerals in direct support of our clay fixation work at BNL. In the course of this work, he has made significant contributions to the advancements of the BNL activity and has materially assisted in the initiation of ground disposal schemes at other AEC installations, particularly at Savannah River and Oak Ridge. AEC financial support in FY 1957 for this work at Yale in the amount of \$18,000 was under his supervision and he is now transferring to the University of North Carolina in July 1957.

✓  
G 5643

JUN 20

1-129225

Important related work which has been initiated by Dr. Thomas at Yale, and which is vital to the fixation approach to ultimate disposal, is the determination of the stability of the "fixed" material, i.e., the rate of diffusion of radioactive nuclides through the material. During the course of his past work at Yale, Dr. Thomas developed a special method for these stability determinations which promises to be most useful.

When the nature and scope of the proposed extension and expansion of the work was discussed with Yale University, it was indicated that since the work was now taking on more of an applied or development aspect, Yale would rather not take on the project.

Accordingly, other potential contractors were considered. Among these were the University of Utah, the Johns Hopkins University, the University of California and the University of North Carolina. University of North Carolina was selected because of the arrangements whereby Dr. Thomas was able to be put on the UNC faculty and be given the job of principal investigator, thereby taking advantage of his unique experience and his intense enthusiasm for the work.

Method Used to Solicit Proposals:

University of North Carolina submitted proposal without solicitation.

Contractors Considered:

See above.

Reasons Why Successful Contractor Was Selected:

See above.

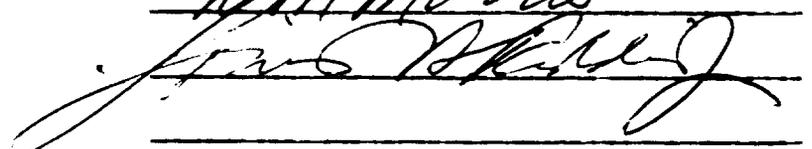
Proposed by:

Action of Contract Board

Recommended Approval

Recommended Disapproval

  
\_\_\_\_\_  
R. C. Dalzell  
(J. A. Lieberman)

  
\_\_\_\_\_  
  
\_\_\_\_\_

Handwritten marks at top left corner.

AM

August 5, 1957

Yale University  
New Haven, Connecticut

Attention: Mr. Donald Green, Controller

Gentlemen:

Reference is made to letter of this office dated July 25, 1957, approving the transfer of property from Yale University, Sub-contract S-167, under Associated Universities, Inc., Prime Contract No. AT(30-2)-GEM-16, to the University of North Carolina under lump sum Contract No. AT-40-1-2130, with the Oak Ridge Operations Office.

Enclosed is A.E.C. Shipping and Receiving Form, in triplicate, to effect transfer of these items. It is requested that proper signature of the University of North Carolina be obtained acknowledging receipt of this property and one signed copy returned to this office.

Very truly yours,

Charles G. Iax  
Acting Area Manager

Enclosure:  
Form 67, in tripl.

cc: P. Roney, NYOO, w/encl. ✓  
E. R. Cort, AUL-BNL, w/o encl.

RECEIVED

AUG 6 1957

U.S. ATOMIC ENERGY COMMISSION  
NEW YORK OFFICE

AUG 5 1957

6 7017

1129227

SHIPPING DOCUMENT	TALLY OUT	PACKING LIST	MEMORANDUM RECEIPT	PROPERTY TAGS	SHEET 1 OF 3 SHEETS
RECEIVING TALLY	TALLY IN	LOADING LIST	PROPERTY TAGS		

**UNITED STATES ATOMIC ENERGY COMMISSION**  
**SHIPPING AND RECEIVING FORM**  
 ABC Form 47 (Feb. 20, 1947)

FROM — *Name and address of shipper (and of vendor if different)*  
**Yale University, New Haven, Conn.**  
**Subcontract S-107 (Prime Contract A3-30-2-OTI-16,**  
**Associated Universities, Inc.)**

TO — *Name and address of consignee (and destination if different)*  
**University of North Carolina**  
**Chapel Hill, North Carolina**  
**Contract No. A3-40-1-2130**

BY SHIPPER — *Carrier, routing, method*

QUANTITY	UNIT	DESCRIPTION OF ITEM	PRICE		CONDITION OR REMARKS
			UNIT	TOTAL	
		<b>ANALYZER - American Instrument Co.</b>			
1	ea.	Cat. No. 5-445 Roller Particle size Analyzer		980.00	
1	ea.	" " 5-451 Sound-resistant cabinet		160.00	
1	ea.	" " 5-456 Spec. Brass Sample Tube		60.00	
1	ea.	" " 5-452 Low Pressure Air Pump		100.00	
		<b>BATH - MILL-S.Y. Inc.</b>			
1	ea.	Cat. No. 26341 Water Bath, 8 openings		52.00	
		<b>CENTRIFUGE - Macalister Nicomall</b>			
1	ea.	Interact'1 Size 1 S.S. Serial # 6663		440.00	
		<b>REDUCER - Fenfield Products</b>			
1	ea.	M-S Cartridge Type		75.00	
		<b>NEP COLLECTOR - Technicon Engineering Co.</b>			
1	ea.	Drop counting accessories for the flow chart		111.00	

SHIP TO — *Name and address of consignee*  
**Mr. L. S. F. C., T.S.A.F.C., 2000 ...**

1129228

UNITED STATES ATOMIC ENERGY COMMISSION  
**SHIPPING AND RECEIVING FORM**  
**CONTINUATION SHEET**

AEC Form 87a (Mar. 5, 1947)

SHEET 2 OF 3 SHEETS

QUANTITY RECEIVED	UNIT	DESCRIPTION OF ITEM	PRICE		CONDITION OR REMARKS
			UNIT	TOTAL	
		<b>AMPLIFIER - Tracerlab Inc.</b>			
1	ea.	N-10 Pre-Amplifier		40.00	
		<b>METER - Tracerlab Inc.</b>			
1	ea.	TPM 100 M-3 Weston, Model 267		12.00	
		<b>FRACTION COLLECTOR - Technicon Chromatography Corp.</b>			
1	ea.	Time Flow Fraction Collector w. 150 min. timer		65.00	
		<b>PUMPS - Milton Roy Co.</b>			
1	ea.	MB-3-11.5 "Mini Pump"		39.00	
3	ea.	Eastern Model D6 Centrifugal Pump - Bronze Cast	1.00	23.00	
1	ea.	Eastern, Midget, Low pressure model D-6 Crackle finish, Bronze #35193		45.00	
		<b>RELAYS - Central Scientific Co.</b>			
1	ea.	Cat #99784 Relay		40.00	
1	ea.	Cat #99785-A Electrode Relay, 90/60 cycle 115V		40.00	
		<b>SHAKER - Macalaster Nickell</b>			
1	ea.	Burrell Shaker, Size C		155.00	
		<b>SPECTROPHOTOMETER - Mill-N.Y. Inc.</b>			
1	ea.	Beckman DU Serial No. 09442		1500.00	
1	ea.	Power supply Serial No. 77264		325.00	
		<b>STIRrer - Macalaster Nickell</b>			
1	ea.	"Mag-Mix" Precision #69904		32.50	
		<b>SURVEY METER (Beta Gamma) - National Tech. Labs.</b>			
1	ea.	#10800 Beckman Geiger Counter, Model "ME-5" Serial No. 21529		390.00	

1129229





THE UNIVERSITY OF NORTH CAROLINA

CHAPEL HILL

THE UNIVERSITY OF NORTH CAROLINA COMPREHENSIVE: THE UNIVERSITY IN CHAPEL HILL, STATE COLLEGE IN RALEIGH, AND THE WOMAN'S COLLEGE IN CARRINGTON

WILLIAM BRANTLEY AYCOCK, *Chancellor*

July 21, 1957

Dr. C. S. Shoup, Chief  
Biology Branch  
Research and Development Division  
United States Atomic Energy Commission  
Oak Ridge, Tennessee

Your Reference: QRS:EMM

Dear Dr. Shoup:

Your letter of July 18, 1957, addressed to Dr. Arthur Roe of our Institute of Natural Science has come to my attention since Dr. Roe is out of town. We are happy to be informed of the AEC's approval of our research proposal for one year in the amount requested.

We are disturbed to note that this contract has been approved for a period of one year beginning August 1, 1957. Dr. Thomas was told early in the spring by the Washington Office of the AEC that work should be started on this contract on July 1 and he was assured that the contract would be so drawn. On that basis he proceeded from Yale University to the University of North Carolina late in June. He has been here and at work on this contract since July 1. Therefore, it's necessary that this contract start from that date. /A

You raised several questions relating to the budget which was submitted with the original proposal, especially as to items relating to the contribution of the University of North Carolina to this project. We are enclosing a new budget which we feel more adequately shows the University's contribution in this respect. Items 4 and 5 under Section V of the original budget have been taken into consideration in computing the University overhead rate so that they should not be shown as separate items, and item 6 has been assigned a monetary value and appears in the column for the contribution of the University.

You requested information as to our basis for using a rate of 29.25% to cover overhead costs. The University made a study of its overhead costs for the year ending June 30, 1956, in accordance with the standard procedures for computing overhead rates as established in the so called "Blue Book." This study was submitted to the Army Audit Agency which reviewed

1129231

BUDGET

Work at the University of North Carolina, Chapel Hill, North Carolina on  
 "Disposal of the Radioactive By-Products of Nuclear Fission"

	AEC	UNC
<b>I. Personnel</b>		
1. Henry C. Thomas, Director, 60% 9 mo. Full time 3 mos.	\$5,100.00 3,000.00	\$3,400.00
2. Two full-time scientists	13,200.00	
3. Others, part time	2,500.00	
4. Secretarial	2,000.00	
5. Consultation within the U.N.C.		1,200.00
	<u>\$25,800.00</u>	<u>\$4,600.00</u>
<b>II. Overhead to the University (29.28% of Wages and Salaries paid by AEC)</b>		
	\$7,554.00	\$1,347.00
<b>III. Operating Expenses</b>		
1. Supplies (expendable)	\$2,000.00	
2. Special machine work	500.00	
3. Travel	1,200.00	
4. Freight, transportation, phone, postage, etc.	1,500.00	
5. Laboratory services		\$1,200.00
6. Glass Shop and Machine Shop services		1,500.00
<b>IV. Special Equipment</b>		
1. Helium leak detector	\$5,000.00	
2. Scintillation spectrometer	5,000.00	
3. Proportional counter	1,200.00	
4. Marchant calculating machine		950.00
	<u>\$19,754.00</u>	<u>\$9,597.00</u>

ARMY AUDIT AGENCY  
Atlanta Branch, Atlanta Region  
Peachtree - Seventh Building  
Atlanta 21, Georgia

ARAUD-ARO-AB-319.1

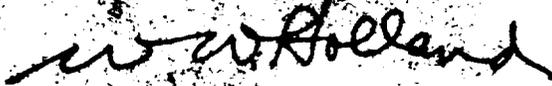
24 May 1957

Mr. C. E. Teague  
Business Manager  
University of North Carolina  
Chapel Hill, North Carolina

Dear Sir:

Reference is made to the inclosed copy of letter which was written in response to your inquiry concerning status of overhead rate negotiations for fiscal year ended June 30, 1956. This letter should result in formal negotiations and amendment of contracts to include the negotiated overhead rate.

Sincerely yours,



W. W. HOLLAND  
Chief

1 Incl  
Ltr., Atlanta Branch Office,  
5/24/57

Copy furnished:  
Atlanta Regional Office, USAAA

G 6593  
MAY 26 1957

1129233

ARAUD-ARO-AB-319.1

21 May 1957

**SUBJECT:** Advisory Report on Overhead Study Fiscal Year Ended 30  
June 1956 University of North Carolina Chapel Hill,  
North Carolina Audit Report No. ABC 1026(6)

**TO:** Chief, Wright-Patterson Headquarters  
Liaison Office  
Auditor General, USAF (AF AHD-MP)  
Wright-Patterson Air Force Base, Ohio

1. The subject report was forwarded to your office on 1 March 1957 in sufficient copies to permit distribution to applicable Air Force procurement activities. Paragraph 2 of the report of audit indicated that the Air Force had the preponderance of procurement for fiscal year 1956 and therefore should sponsor and conduct the overhead rate negotiations in accordance with ASPR 9-706. The audit report recommended a fixed overhead rate of 29.26% of direct salaries and wages, which was concurred in by the contractor.

2. Reference is made to the inclosed copy of letter, wherein the Business Manager of the University of North Carolina is inquiring as to the status of the overhead rate negotiations. It is requested that reply to this inquiry be forwarded directly to the University of North Carolina, with an information copy to this office.

3. As a matter of information, the Office of Naval Material has conducted overhead rate negotiations with the University of North Carolina in previous years. However, for the fiscal year ended 30 June 1956 all navy contracts contained fixed overhead rates and there was no occasion for negotiation in regard to Navy contracts.

FOR THE REGIONAL DIRECTOR:

1 Encl  
Ltr., University of North  
Carolina 5/20/57

W. W. HOLLAND  
Chief

Copies furnished:  
University of North Carolina  
Atlanta Regional Office, USAAA

1129234

to be transferred to Chapel Hill, N.C.

	Cost Price
<u>Analyzer</u> - American Instrument Co.	
1 Cat. No. 5-445 Roller Particle size Analyzer	\$ 910.00
1 " " 5-451 Sound-resistant cabinet	160.00
1 " " 5-456 Spec. Brass Sample Tube	60.00
1 " " 5-452 Low Pressure Air Pump	100.00
<u>Bath</u> - Will-N.Y. Inc.	
1 cat. No. 28341 Water Bath, 8 openings	52.00
<u>Centrifuge</u> - Macalaster Bicknell	
1 Internat'l Size 1 S.B. Serial # Z 6663	440.00
<u>Demineralizer</u> - Penfield Products	
1 M-8 Cartridge Type	75.00
<u>Drop Collector</u> - Technicon Chromatography Corp.	
1 Drop counting accessories for Time Flow Fraction Collector	582.00
<u>Pre-amplifier</u> - Tracerlab Inc.	
1 P-10 Pre-Amplifier	40.00
<u>Meter</u> - Tracerlab Inc.	
1 TPN 100 M-3 Weston, Model 267	12.00
<u>Fraction Collector</u> - Technicon Chromatography Corp.	
1 Time Flow Fraction collector with 150 minute timer	865.00
<u>Pumps</u> - Milton Roy Co.	
1 MM2-B-11.5 "Mini Pump"	519.00
Macalaster Bicknell	
3 Eastern Model D6 Centrifugal Pump - Bronze Casting each	41.00
Macalaster Bicknell	
1 Eastern, Midget, Low pressure model D-6 Crackle finish, Bronze #35193	45.00
<u>relays</u> - Central Scientific Co	
1 Cat #99784 Relay	40.00
1 " #99785-A Electrode Relay, 50/60 cycle 115 V	40.00
<u>Shaker</u> - Macalaster Bicknell	
1 Burrell Shaker, Size C	155.00
<u>Spectrophotometer</u> - Will-N.Y. Inc.	
1 Beckman DU Serial No. 89442	1,500.00
1 Powersupply Serial No. 77284	325.00
<u>Stirrer</u> - Macalaster Bicknell	
1 "Mag-Mix" Precision #65904	32.50
<u>Survey Meter</u> (Beta Gamma) - National Tech, Labs.	
1 #10800 Beckman Geiger Counter, Model "MX-5" Serial No. 21529	250.00
<u>Vise</u> - N.T. Bushnell Co.	
1 #123 Vise D & C	5.50

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Items from Sterling Chemistry Lab., Yale University

Counters - Eagle Signal Corp.

- 1 EZ 50A6 Microflex Counter 115 V 50/60 cycle; 400 count range  
AAR A-212
- 1 50A4 Cabinet

82.00

Autoscalers - General Radio

- 2 SC-1B Autoscalers "wired for use with Eagle Precise Counters  
and equipped with P-1 preamplifiers and S-100 timers" each
- 2 SC-4 Eagle Precise Counters
- 1 SC-1B Autoscaler (V-cc-44)
- 1 SM-60A Electrical Timing Clock (S-300)

650.00

50.00

60.00

25.00

Timer - Timperly

- 1 Electronic Timer

100.00

Ammeters - Nixie

- 2 Weston 471 ammeters Serial Nos. 48531 & 48532

each

25.00

Transformers - Nixie

- 1 Kysen T667
- 2 " T177

each

15.00

25.00

Pump - Sigmastar Co.

- 1 Model T-69H, with Graham 28A Variable drive, 1/4 h.p. motor -  
all mounted on special base Serial No. 129 (S-527)

150.00

A Proposal to the United States Atomic Energy Commission  
Division of Reactor Development

From: The University of North Carolina, Chapel Hill

Prepared by: Henry C. Thomas, presently of Yale University

It is proposed to the Division of Reactor Development that there be established at the University of North Carolina at Chapel Hill, beginning 1 July 1957, a group to carry on work in fields directly related to the disposal of the radioactive by-products of nuclear fission. The work of this group will have three principal objectives:

- A. To investigate problems directly related to the "return to nature" of the radioactive fission products.
- B. To provide facilities for and to carry out critical testing, on a laboratory scale, of proposals for the disposal of fission products.
- C. To provide a center for advanced instruction in the scientific fundamentals of the problems involved in disposal and return to nature.

In the following paragraphs the specific proposals in each of these categories will be outlined.

A. In the first category, three specific problems are suggested for investigation:

(1) The first of these relates to the desirability of having a reliable tracer for ground water. The problems involved in predicting the travel of radioactivity in the earth depend upon a knowledge of the flow pattern of underground water, a knowledge presently very difficult to obtain. It is proposed first to develop the use of helium as a tracer for water. Helium is the one element least likely to adsorb on the soil minerals and so

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JUL 11 1957

most likely to move as nearly as possible with the speed and direction of the water carrying it. The mass spectrometer affords a very sensitive analytical method for this element. This study will entail first the development of a method for the sampling and analysis of small amounts of helium dissolved in water and, secondly, a study--first in the laboratory and then in the field--of the reliability of the method. This part of the work will be directed particularly toward developing practical procedures for applying the method under field conditions.

(2) After the first part of the above-described work is completed, it will be possible to investigate more carefully than has heretofore been possible the effects of dispersion in slow flow through granular solids. A general study of packed beds typical of various types of soil is to be carried out. These experiments must be pursued to a fairly large scale in order to evaluate for practical purposes the significance of small-scale laboratory work in the larger applications.

The findings of this work must then be combined with our knowledge of the adsorbability of various ions on soil minerals. Through this work it is hoped to develop a reliable and easily usable method of predicting the motion of radioactivity through the soil. This latter part of the work is to be considered rather a long-term objective than a specific problem. The mathematical problems here involved are exceedingly complex, and it is thought that eventually much use must be made of high speed computing facilities. (We are aware of the excellent work that has already been done and is now in progress in this general field. The problem is, however, of broad scope and much remains to be done.)

(3) The third specific proposal in (A) is also of a long-range character. There has recently been developed by the writer a means of describing the behavior of ions in respect to their properties in exchange adsorption which opens the possibility of a great simplification in this work. (This development has not yet been published. An outline of it is in preparation and will shortly be submitted to the Atomic Energy Commission.) In short, it appears possible to assign to an ion a single number, of the nature of a relative work of adsorption, which should adequately describe its behavior, with respect to another ion similarly described, insofar as adsorption on a given silicate mineral is concerned. Thus a table of a few numbers for each ion of interest may prove to be a sufficiently accurate summary of all of its behavior, at least insofar as adsorption from dilute solutions is concerned. It is proposed to investigate thoroughly this approach, to delimit its usefulness, and to carry the work to a usable conclusion. In this connection it will be necessary to amplify considerably the scope of work previously carried on at Yale University and, using the methods there developed, study a larger number of soil minerals under a wider variety of conditions.

In this connection it must be remembered that not all adsorption of fission fragments is of the type found with clays. Hydrous iron oxide may be an important constituent of the soil, e.g., as it is in the Savannah River neighborhood. Its behavior with the fission fragments must also be studied from this point of view. (This promises to be a problem of some difficulty, and it is not proposed to start work of this nature with the staff presently proposed.)

A fourth closely related problem is posed by the many important questions which remain to be answered as regards the possible radioactive contamination

of the submarine sediments of our harbors. A general investigation of exchange adsorption from sea water is here called for. If this work is not soon done elsewhere, it might be considered a legitimate problem for the laboratory group presently proposed.

B. In the second category mentioned, it is thought that the laboratory at the University of North Carolina should, so to speak, pay its own way by carrying out evaluations of proposals for the disposal of radioactive wastes. Several of these depend upon the fixation of activity in a variety of solids, sintered masses and glassy materials. The usefulness of such methods, of course, depends on their economics and on the stability of the products. The latter will be determined by the rate of diffusion of the radioactive nuclides through the materials. The stability of these materials may be determined by measuring these diffusion coefficients under the prescribed conditions. The writer has developed at Yale University a method specially designed for such measurements which has proved to be quite simple in application. It is proposed that this method be applied to critical and exhaustive testing of the materials produced by these proposed methods of disposal. It will be easily possible to arrange a large battery of tests and, with a relatively small amount of day-to-day work, carry out long term evaluations. Although it is not impossible that some basic information on the general subject of diffusion in solids may result from this work (and so lend to it added interest), this phase of the work at Chapel Hill is presently considered not as research per se but rather as a means of steadily producing useful information and so justifying the more elaborate scientific work above outlined.

C. The work proposed for the group at Chapel Hill will necessarily include most features of every problem brought up in the disposal of radio-

activity. It is thought that after a year's operation the group will automatically become a useful center of information. Further use can be made of the group by making its facilities and experience available to other workers in the field. Perhaps short-term assignments of workers from other sites will prove useful. These workers could carry on their own investigations in Chapel Hill and at the same time take advantage of the opportunity of reviewing the basic scientific problems in the general field. It is not proposed that the group at Chapel Hill necessarily give formal "courses" in applied hydrodynamics and adsorption chemistry, but rather that it should assume the responsibility for making this material easily available to its visitors. There are evident advantages of such an informal approach both for the visitor and for the laboratory. The latter will certainly profit by receiving fresh ideas from its visitors, who will also serve to remind the group at Chapel Hill of the practical nature of its problems and so help to prevent useless diversions. The work of the group at Chapel Hill can thus be well coordinated with the activities of others in the same field.

It is seen from the above outline that the proposal for the University of North Carolina is envisioned as a continuing effort. It is thought that the laboratory suggested will fill a real need and be of great value in the future development of atomic energy.

Administration. The work is to be carried out in the Department of Chemistry of the University of North Carolina, although the program will be housed administratively in the Institute of Natural Science. The program will be directed by Dr. Henry C. Thomas, presently of Yale University, who will become a member of the faculty of the Department of Chemistry this summer.

Personnel:

Dr. Henry C. Thomas has been engaged in work of the nature described

in this proposal for about ten years and has directed nearly all of his research activity toward the development of the theoretical and experimental tools necessary for the work.

Dr. Galen R. Frysinger, presently at the Max-Planck Institute for Physical Chemistry at Goettingen, Germany, graduated from Yale with the Ph.D. in 1956 and has for three years been engaged in the problems of inorganic adsorption.

Mr. Alan Sussman, shortly to receive his doctorate at Yale, is an exceptionally capable man in the laboratory and has spent two years working in the field of diffusion in solids.

Equipment.

The three items of special equipment mentioned are needed for the following purposes:

The helium leak detector will be modified slightly to serve for the measurement of trace amounts of helium from water.

The scintillation spectrometer will be used in the routine testing and also as a general purpose instrument for the measurement of radio-activity.

The proportional counter will also be used for this latter purpose particularly in experiments on adsorption. It is especially necessary to make possible experiments using low levels of activity to avoid the necessity for extensive handling equipment.

