

August 1980

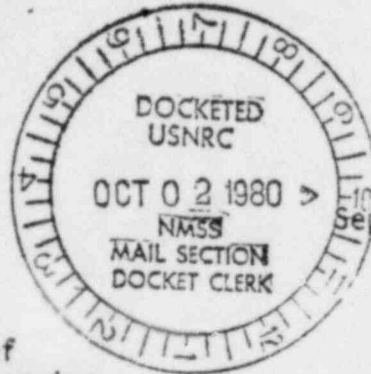
PDR

70-882

Columbia University in the City of New York | New York, N.Y. 10027

HEALTH PHYSICS OFFICE

211 Engineering Terrace



September 18, 1980



Mr. Leland C. Rouse, Chief
Fuel Fabrication and Processing
Branch
Division of Fuel Cycle and
Material Safety
U.S.N.R.C.
Washington, D.C. 20555

RE: Docket No. 70-882 - Renewal of SNM-870

Dear Mr. Rouse:

The following is a renewal application for our SNM-870 license in accordance with section 70.22 of 10CFR part 70.

1. (a) The Trustees of Columbia University in the City of New York, 116th Street and Broadway, New York, N. Y. 10027
 - (1) CAMPUS LABORATORIES- bounded by 114th Street and 120th Street, between Broadway and Amsterdam Ave., N.Y.C., N.Y. 10027
 - (2) BARNARD COLLEGE-bounded by 116th Street and 120th Street, between Broadway and Riverside Drive, N.Y.C., N.Y. 10027
 - (3) Nevis Cyclotron Laboratory, Irvington, New York
- (b) Columbia University is incorporated in the State of New York. It's operations are primarily in the City of New York, except for its outlying Laboratories, such as, the Nevis Laboratory.
- (c) The names, addresses and citizenship of the principal officers of administration of the University are as follow:

<u>Names and Address</u>	<u>Citizenship</u>
Michael I. Sovern, President 60 Morningside Drive New York, N. Y. 10027	US
Paul Carter, Exec. V.P. for Admin. 313 Low Library	US
Ellen Futter, President 109 Milbank Barnard College	US

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Names and Address

Citizenship

Charles S. Olton, Dean
110 Milbank
Barnard College

US

- (d) The Corporation is not owned, controlled, or dominated by an alien, a foreign corporation, or a foreign government.
2. The material is to be used for basic research and educational purposes.
 3. This license is requested for 3 years.
 4. See Table I

TABLE I

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4.	<u>ISOTOPE</u>	<u>CHEMICAL OR PHYSICAL FORM</u>	<u>ACTIVITY (CURIES)</u>	<u>MASS (GRAMS)</u>	<u>MANUFACTURER & MODEL NO.</u>	<u>LOCATION</u>
a.	Pu-239	Sealed Source	2.0	32	NUMEC	ALTSCHUL 6th flr. Barnard College
b.	Pu-239	Sealed Source	5.0	80	NUMEC	Pupin, 3rd & 6th floors
c.	Pu-239	Sealed Source	0.5	9	MONSANTO	Eng. Terrace
d.	Pu-239	Sealed Source	0.125	2	NUMEC	Nevis, Cyclotron Building
e.	Pu-239	Sealed Source	1.0	16	MONSANTO M-211	Eng. Terrace Reactor Bldg.
f.	"	"	"	"	MONSANTO M-212	Eng Terrace Reactor Bldg.
g.	"	"	"	"	MONSANTO M-213	Eng Terrace Reactor Bldg.
h.	"	"	"	"	MONSANTO M-214	Eng Terrace Reactor Bldg.
i.	"	"	"	"	MONSANTO M-215	Eng. Terrace Reactor Bldg.
j.	"	"	"	"	M-1229	"
k.	"	"	"	"	M-1230	"
l.	"	"	"	"	M-1231	"
m.	"	"	"	"	M-1232	"
n.	Pu-239	Sealed Source	1.0	16	M-1239	"
o.	Pu-239	Related Detectors	0.050	0.81		Eng. Terrace & Nevis-Dead Storage
p.	U-235	Fission Detectors	<0.001	2.37		Eng. Terrace Rm 289

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q. U-235 Solids <0.001 286

Pupin & Eng. Terrace
Dead Storage

r. U-233 Plates <0.001 0.025

Pupin & Eng. Terrace
Dead Storage

5. Specification of Activities

Item 4(a)- Teaching chemistry students the Principles of induced activity and gamma spectroscopy.

Item 4(b)- Teaching physics students the principles of induced activity and gamma spectroscopy.

Item 4(c)- Calibrate neutron instruments

Item 4(d)- Test neutron detectors

Item 4(e through n)- Teaching nuclear engineering students the principles of induced activity, gamma spectroscopy, and as a source of neutrons for operating a sub-critical reactor (water or graphite moderated)

Item 4(o through r)- Storage items that are not presently being used.

6. Facility Description:

No specially designed facilities are required. Licensed material in the form of sealed sources are kept either in the original paraffin filled shipping containers, paraffin filled neutron howitzer, or in the bottom stringer of the graphite moderated sub-critical reactor. These areas are normal classroom laboratories or lecture halls in the buildings specified under item 4 above.

7. Administrative and Organizational Responsibility

PRESIDENT-Michael I. Sovern

EXEC. V.P. FOR ADMIN.-Paul Carter

RADIATION SAFETY COMM.-Dr. H. Rossi, Chairman
 Dr. C. Squires, Prof. in
 Biological Science
 Paul Carter, Exec. V.P. for Admin.
 Gilbert Miller, Security & Safety Officer
 Dr. C. Schetlin, Medical Officer

HEALTH PHYSICS OFFICER-Philip M. Lorio

HEALTH PHYSICS OFFICE STAFF-L. Rothman, H. P. Tech., Sec., Industrial - Hyg.

b) Education, Training, and Experience of Safety related staff.

(1) Philip M. Lorio-see attached resume

(2) L. Rothman-see attached resume

c) Administrative Controls - see sections II (A), (C), (D), (F), & (G) of the "Radiation Safety Code of Columbia University". A Laboratory Director or a Responsible Investigator that wishes to develop a radiation-Safety manual for use within his own area of interest shall have it approved by the Radiation Safety Committee.

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8. Routine Internal Inspections

- (a) Since the majority of the radiation safety program at Columbia University is licensed and inspected by the New York City Department of Health, monthly inspections are performed as required under ARTICLE 175 of the N.Y.C. Health Code. Wipe tests are performed on all Pu-Be neutron sources in January and July. The Plutonium detectors are wiped quarterly.

9. Training

- (a) The Health Physics Officer gives each new Radiation worker an orientation lecture in the techniques and risks of their work (see section V (M) of the "Radiation Safety Code of Columbia University". Re-training is not applicable to our operation.

10. Radiation Safety Program

- (a) Responsibilities and duties are specified in section I of the "Radiation Safety Code of Columbia University".

- (b) Individuals having radiation safety responsibilities are identified by name and pertinent training and experiences in items 7(b) (1 & 2) above.

(c) Personnel Monitoring

1. Personnel dosimeters are provided by the R. S. Landauer, Jr. and Co. on a monthly basis. Reports are received and reviewed upon receipt. See section V (A), (B), (H), (I), & (O) of "Radiation Safety Code of Columbia University".

(d) Surveys

1. Surveys are performed on a monthly basis
2. Decontamination is performed immediately after the measurement of levels exceeding the following:

ACCEPTABLE SURFACE CONTAMINATION LEVELS
(per 100 cm²)

<u>NUCLIDE</u>	<u>AVERAGE</u> (dpm)	<u>MAXIMUM</u> (dpm)	<u>REMOVABLE</u> (dpm)
U-235 (alpha)	5,000	15,000	1,000
Transuranics (U-233, PU-239)	100	300	20
Beta-gamma emitters	5,000	15,000	1,000

(e) Posting and Labeling

1. See section V (L) of "Radiation Safety Code of Columbia University"

(f) Report and Records

1. Reportable Events - see section V (G) of "Radiation Safety Code of Columbia University".
2. The Health Physics Officer shall comply with all Reporting requirements for persons subject to the USNRC regulations in accordance with Regulatory Guide 10.1.
3. Record Management - All records will be kept for 3 years except exposure records, which will be maintained indefinitely. Reports will be made on forms described in VI(G) of the "Radiation Safety Code of Columbia University".
 - a. Abnormal occurrences, - see item 10.e.1 above. (see form #8)
 - b. Critical analysis - not applicable
 - c. Inspections - monthly as per requirement of N.Y.C. Health Code Article 175. (see form #(9))
 - d. Instrument Calibration - see sticker on instrument
 - e. Orientation - see item #9 above. Each new radiation worker receives their orientation when he submits his form #1.
 - f. Personnel exposure reports are received from the R. S. Landauer, Jr. and Co., and include exposure reports for the period, quarter, calendar year and lifetime. They also show the permissible yearly and lifetime limits ((5(N-18))).
 - g. Routine and Special Survey are documented on form #9.
 - h. SNM control records are kept in accordance with 10CFR71.51.

(g) Radiation Protective Equipment

1. Protective clothing consist of laboratory coats and plastic gloves.
2. Radiation Survey Meters are initially calibrated by the company from which they were purchased and then calibrated 2x/year against an in-house standard. Radium-226 is used for a gamma calibration, Sr-90 and U238 for a beta Standard and Pu-Be for a neutron standard. Radium D for an alpha standard.

The following is a list of the instrument available:

<u>Company</u>	<u>Model</u>	<u>Radiations Measured</u>	<u>Ranges</u>
Texas Nuclear	9146	Neutrons	0-1000 mrem/hr
Eberline	PNR-4	Neutrons	0-5000 mrem/hr
Eberline E+190	E120	Beta-gamma	0-50 mrem/hr
Victoreen Panoramic	470A	Gammas	0-1000 rem/hr

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NMC windowless gas flow proportional	PCC-11T	Alpha, Beta	9×10^6 CPM
Packard Liquid Scintillation Counter	2001	Alpha, Beta	9×10^5 CPM

h) Waste Disposal

1. Since this licensed material is primarily sealed sources, no waste disposal is anticipated.
 2. Material in dead storage is monitored quarterly by taking wipe tests and counting on a NMC windowless gas flow proportional counter.
11. Modification of the "Radiation Safety Code of Columbia University
- a) Section I - Radiation Safety Committee members shall consist of:
 1. Chairman
 2. University Medical Officer
 3. Administrator - Exec. V.P. for Administration
 4. University Safety & Security Officer
 5. Faculty member - (Physics, Biological Sciences, Chemistry or Engineering)
 - b) Section IV - Waste Disposal:

Delete section IV (B) (4).
 - c) Section VII - Compliance with governmental Regulations:

Add 10CFR70 to Section VII (D).

If you have any questions concerning this matter, please feel free to contact me.

Respectfully submitted,

Philip M. Lorio
Philip M. Lorio
Health Physics Officer

PML/fh

Curriculum Vitae

Catherine Louise Squires

Born: April 9, 1941
Sacramento, California

Education:

A.B. University of California, Davis 1963. Bacteriology
M.A. University of California, Davis 1967. Microbiology
Ph. D. University of California, Santa Barbara 1972. Molecular
Biology and Biochemistry

Honors, Fellowships, Professional Societies:

Honors at entrance to the University of California
NSF Undergraduate Research Fellowship
NDEA Title IV Fellowship
USPHS Predoctoral Fellowship
Helen Hay Whitney Foundation Postdoctoral Fellowship
The Society of the Sigma XI
American Association for the Advancement of Science

Positions Held:

Assistant Professor, Department of Biological Sciences, Columbia University,
6/77 - present.

Williams Assistant Professor of Biology, Department of Biological Sciences,
Dartmouth College. (10/76 - 6/77).

Adjunct Assistant Professor, Undergraduate and Graduate Program in Biochem-
istry, Biochemistry Department, Dartmouth Medical School. (9/75 -
6/77).

Assistant Professor, Department of Biological Sciences, Dartmouth College.
(12/74 - 10/76).

Postdoctoral Research Fellow with Professor Charles Yanofsky, Department
of Biological Sciences, Stanford University. (1/72 - 11/74).

Predoctoral Fellow with Dr. Nancy Lee, Department of Biological Sciences,
University of California, Santa Barbara. (9/68 - 12/71).

Undergraduate Research Fellow ('62-'63), Laboratory technician ('63-'66)
and Graduate student ('64-'66) with Dr. John Ingraham, University
of California, Davis.

Publications and Theses:

- O'Donovan, G.A., Catherine Kearney (Squires) and J.L. Ingraham. 1965. Mutants of Escherichia coli with high minimal temperatures of growth. J. Bacteriol. 90:611-616.
- Squires, Catherine. 1967. Studies on a mutant of Escherichia coli exhibiting a cold-sensitive phenotype for lactose fermentation. M.A. Thesis, Department of Bacteriology, University of California, Davis.
- Squires, Catherine and J.L. Ingraham. 1969. Mutant of Escherichia coli exhibiting a cold-sensitive phenotype for growth on lactose. J. Bacteriol. 97:488-494.
- Squires, Catherine. 1972. Biochemical and genetic study of CRM in the L-arabinose operon. Ph. D. Thesis, Department of Biological Sciences, University of California, Santa Barbara.
- Squires, Catherine, J.K. Rose, C. Yanofsky, H.-L. Yang and G. Zubay. 1973. Tryptophanyl-tRNA and tryptophanyl-tRNA synthetase are not required for in vitro repression of the tryptophan operon. Nature New Biology 245:131-133.
- Rose, J.K., Catherine Squires, C. Yanofsky, H.-L. Yang and G. Zubay. 1973. In vitro transcription of the tryptophan operon by purified RNA polymerase: Regulation in the presence of partially purified repressor and tryptophan. Nature New Biology 245:133-137.
- Zalkin, H., C. Yanofsky and Catherine Squires. 1974. Regulated in vitro synthesis of Escherichia coli tryptophan operon messenger ribonucleic acid and enzymes. J. Biol. Chem. 249:465-475.
- Squires, Catherine, F. Lee, and C. Yanofsky. 1975. Interaction of the trp repressor and RNA polymerase with the trp operon. J. Mol. Biol. 92:93-111.
- Bertrand, K., L. Korn, F. Lee, T. Platt, Catherine Squires, Craig Squires and C. Yanofsky. 1975. New features of the regulation of the tryptophan operon. Science 189:22-26.
- Squires, Craig, F. Lee, K. Bertrand, Catherine Squires, M. Bronson and C. Yanofsky. 1976. Nucleotide Sequence of the 5' End of Tryptophan Messenger RNA of Escherichia coli. J. Mol. Biol. 103:351-381.
- Lee, F. Catherine Squires, Craig Squires, and C. Yanofsky. 1976. Termination of Transcription in vitro in the Escherichia coli Tryptophan Operon Leader Region. J. Mol. Biol. 103:383-393.
- Barry, Gerard; Catherine L. Squires and Craig Squires. 1979. Control features within the rplJL-rpoBC transcription unit of Escherichia coli. PNAS 76: 4922-4926.
- Wollenzien, P., J. Hearst, C. Squires and C. Squires. 1979. Determining the Polarity of the Map of Crosslinked Interactions in 16S rRNA from E. coli. J. Mol. Biol. 135:285-292.
- Barry, Gerard, Craig Squires and Catherine L. Squires. 1980. Attenuation and Process of the Messenger RNA from the rpl J1-rpoBC Transcription Unit of Escherichia coli. PNAS. in press

CURRICULUM VITAE

PHILIP M. LORIO

Residence: 244-39 86th Road
Bellerose, New York 11426

Date of Birth: September 10, 1926

Place of Birth: Brooklyn, New York

Professional Title: University Health Physics Officer

Business Address: Columbia University
Health Physics Office
116th Street and Broadway
New York, N.Y. 10027
(212) 280-4442

Educational Background: B.A. (Physics) 1950, Brooklyn College
Graduate Courses; Radiologic Physics,
Bio-Statistics and Radiation Biology
Columbia University, College of P & S.

Experience:

For 3-1/2 years I was the Health Physicist for an AEC contract at Columbia University. After that period of time, I was appointed the University Health Physics Officer. I initiated and developed the Health Physics program at Columbia University. This program includes authorizing isotope users, procurement of all radioactive material, supervision of all personnel monitoring and surveying, management of waste disposal, maintenance of all records, and giving all orientation and safety lectures. This responsibility includes three accelerators, a TRIGA 250 kilowatt research reactor, two sub-critical training reactors, and all the isotope laboratories in physics, chemistry, and the biological sciences. It also includes the surveillance of all X-ray equipment and to non-ionizing radiation. As of May, 1975, I have taken over the Radiation Safety Office of the Columbia-Presbyterian Medical Center which includes two Co-60 therapy units, a 4 MeV LINAC, a 22 MeV Betatron, a Nuclear Medicine department, 3 CAT Scanners, a large diagnostic X-ray department, a large number of medical and biological research laboratories.

I've worked as a consultant for the Consumer's Union in evaluating the X-ray hazards of color television sets and smoke detectors utilizing radioactive materials.

During the summer of 1971, I was hired by the AEC as a consultant to the National Accelerator Laboratory to provide the health physics assistance for dismantling the University of Chicago cyclotron.

I was a consultant for Landis & Gyr, Inc., Elmsford, N.Y. This company manufactured and distributed thickness gauges utilizing radioactive sources. I provided the necessary health physics services and the necessary information for license procurements and amendments as required.

In 1974, I evaluated for TWA, at LaGuardia Airport, the radiation profile at the hangar and in their passenger carrying aircraft.

From November of 1974 to February of 1975, I worked on a contract for the U.S. AEC for the Evaluation of Radiation Exposures to Cargo Handlers at the New York airports. This study was being done simultaneously at 6 different airports in the United States by the University personnel. The results of this study were published in the U.S. Nuclear Regulatory Commission's publication NUREG-0154 (1977).

I am the technical consultant for the Utility Workers Union of America, AFL-CIO Local 1-2. The members of this Union work at the nuclear power reactors operated by Consolidated Edison-Indian Point. I am a non-voting member of the Utility's management level Radiation Safety Sub-Committee.

In August of 1977, acting as a consultant for Hittman Nuclear Development Corporation of Columbia, Maryland, I provided the Health Physics Supervision and training necessary for performing the dismantling of the Illinois Institute of Technology's research reactor.

Professional Associations;

Charter Member of the National Health Physics Society
Member of the Greater New York Chapter of the Health Physics Society (GNYCHPS)
Secretary of the Greater New York Chapter, H.P.S., 1968-69, 1970-71.
President Elect of the Greater New York Chapter, H.P.S., 1971-72.
President of the Greater New York Chapter, H.P.S., 1973-74.
Permanent Executive Secretary of the Greater New York Chapter, H.P.S.
Chairman of the Executive Council of the GNYCHPS, 1976-77, 1977-78.

I was appointed by the Board of Directors of the National Health Physics Society at the Houston, Texas meeting in July of 1974, as a consultant for their newly formed "ad hoc" committee on Transportation of Radioactive Materials on Passenger Carrying Aircraft.

I was a member of the Subcommittee on Applied Health Physics Aspects of Medical and Educational Uses of Radioactive Materials. This is a sub-committee of the New York City Mayor's Advisory Committee on Radiation.

Certified Radiation Equipment Safety Officer, (CRESO) by the New York State Health Department.

I was a co-director of a Health Physics Certification Course sponsored by the Greater New York Chapter of the Health Physics Society in 1971 and 1978.

I give the Accelerator and non-ionizing radiation safety lectures at the New York Certification review courses.

In 1978, I gave the University Health Physics lecture at the review course sponsored by the Baltimore Washington Chapter.

R E S U M E

of

Leon Rothman

1820-81st St.
Brooklyn, N.Y.
11214
Phone: 236-4876

EMPLOYMENT

1970- Present Asst. Health Physicist
Columbia University, New York, N.Y.

1960- 1970 Operations Engineer, Van deGraaf accelerator
Columbia University, New York, N.Y.

1955-1960 Chief Van deGraaf accelerator Operator
Columbia University, New York, N.Y.

1951-1955 Engineering Assistant
Columbia University, New York, N.Y.

1949-1951 Electronics Technician
Columbia University, New York, N.Y.

(For amplification of experience at
Columbia see attached sheets)

1946-1947 Radio Tester
Freed Radio, New York, N.Y.

1944-1946 U.S. Navy
Electrician's Mate 3/C
Honorable Discharge

1943-1944 Radio Tester
Freed Radio, New York, N.Y.

1942-1943 Student (in paid program)
U.S. Signal Corps, Wright Field, Ohio

EDUCATION

1941-1942 Alexander Hamilton Vocational High School

1942-1943 U.S. Signal Corps Training School

(Continued)

EDUCATION (Continued)

1944-1944 U.S. Navy Electrician's Mate School
and Advanced Elect. Mate School

1946-1947 New Utrecht High School

1947-1949 R.C.A. Institute Advanced Technology Course (T-3)

PERSONAL

Born: March 3, 1926 in New York City

Married: 1948 Two daughters, ages 26 and 29

Health: No physical limitations

AMPLIFICATION OF EXPERIENCE AT
COLUMBIA UNIVERSITY

I was hired by Columbia University in August 1949 as an Electronics Technician to work on layout, construction, and installation of a Time of Flight system associated with a Slow Neutron Velocity Selector.

After completion of that project, I was assigned, in 1951, to a secret project concerning measurement of the fission cross-section of U-235. I assisted in the machining of parts, and subsequent assembly of a multi-plate fission counter. After the plates had been prepared they were turned over to a chemist for electroplating. The counter was assembled, and I assisted in testing using Ra Be Neutron Source before turning the counter over for use in several experiments at various laboratories.

In 1953, I was assigned as Engineering Assistant on a Pulse-Transformer Neutron Generator Research and Development Project. The project included development of a high current 500-KV pulse transformer accelerator and associated P.I.G. ion source. My assignment during this project was to assist in the construction and testing of pulse transformers and ion sources. I was required to design and build auxiliary equipment for testing as well as for the transmission of pulses, preparation of insulating materials, etc. This auxiliary equipment included vacuum systems, power supplies, and various pulsing systems.

When the Van deGraaff asscelerator arrived in 1955, I was assigned to it as Chief Operator. My initial duties were to supervise and participate in interconnecting the various stations before the HVEC Field Engineer arrived for assembly of the Van deGraaf accelerator. My duties during the installation were to assist the HVEC engineer in the physical installation and test-

ing of CN VDG prior to acceptance.

After acceptance of the Van deGraaf accelerator by Columbia University, my duties included supervising and participating in the operation and general care and maintenance of the Van deGraaf accelerator and associated vacuum systems. I was responsible for the weekly calibration testing and maintaining of the Neutron Monitoring and interlock system installed in the Van deGraaf accelerator experimental area. I also maintained the portable radiation monitoring instruments. During routine operation, I provided charged particle beams as required by researchers, helped to line up beams, assist researchers in setting up and operating various experimental apparatus.

During breakdown periods, I also was responsible for gas handling, which included operation and maintenance of 2400-lb. 60 CFM compressor to retrieve gas from tank prior to opening tank to make necessary repairs. I was also required to operate a 20-ton crane to raise and lower the tank for repairs and modifications to the terminal. I also supervised the installation of new ion sources and their tuning, filling of terminal gas bottles, etc., and helium leak chasing Van deGraaf accelerator when any modifications were made that may affect the vacuum in the machine.

In 1960, I became Van deGraaf accelerator Operations Engineer, and my duties were increased to include design of auxiliary equipment and responsibility for making modifications to the Van deGraaf accelerator.

A partial list of equipment which I have designed includes:

Adjustable beam stands for holding beam pipes.

Slit, viewing and beam stop assemblies following analyzing magnets.

Modification of HVEC beam stop to a Fail-Safe design.

Design and installation of high vacuum pumping stations using dry ice traps, mercury diffusion pumps and mechanical pumps.

Design and installation of vacuum extention from existing analyzing magnet to new analyzing magnet. This extention included isolating pneumatically controlled valves actuated by a vacuum safety circuit.

Installation of a general service rough vacuum svstem to enable rapid pump-down of auxiliary chambers anywhere on the experimental floor.

I was a member of a Group Safety Committee which was responsible for Radiation and general safety.

I have also been associated with tests and de-bugging of serveral terminals for the Columbia Van deGraaf Accelerator.

In 1970 I joined the Health Physics Office as Assistant Health Physicist. My duties include:

Incoming isotope shipment surveys

Laboratory and atomic surveys-(electron micrscopes, x-ray diffraction units, contamination of labs and personnel.)

Radiation Instrument calibration and repair.

Isotopes analysis by energy and activity.

Bioassays evaluation by liquid scintillation techniques

Exposure record keeping

Laboratory design for safe isotope handling

Radioactive waste managment

Laser surveys

Microwave surveys

Mercury surveys

NRRPT Registered in June 1976

Professional Societies

Member of the National "Health Physics Society"

Member of the Greater New York Chapter of the Health
Physics Society

Publications

Assisted in the "Evaluation of Airline Cargo Handlers Exposure to Radiation from shipments of Radioactive Materials". This work was done at LaGuardia Airport in New York City under contract (DR-75-0388) with the United States Atomic Energy Commission.