PRNC-47

PUERTO RICO NUCLEAR CENTER

GENERAL INFORMATION
(Revised July 1965)

OPERATED BY UNIVERSITY OF PUERTO RICO UNDER CONTRACT
NO. AT (40-1)-1833 FOR U. S. ATOMIC ENERGY COMMISSION

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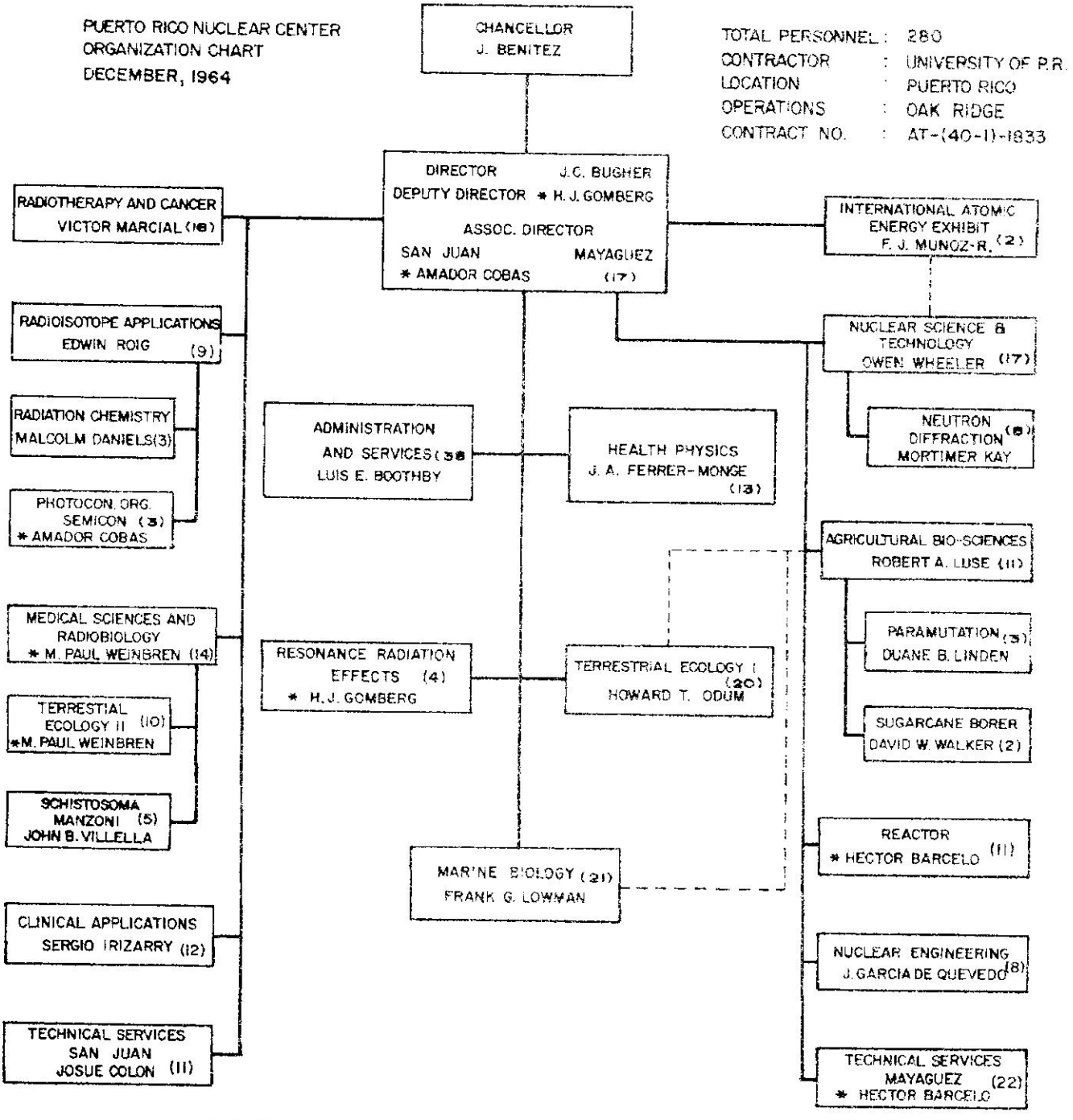
PUERTO RICO NUCLEAR CENTER
ORGANIZATION CHART
DECEMBER, 1964

TOTAL PERSONNEL : 280
CONTRACTOR : UNIVERSITY OF P.R.
LOCATION : PUERTO RICO
OPERATIONS : OAK RIDGE
CONTRACT NO. : AT-(40-1)-1833



* DUAL FUNCTIONS

PUERTO RICO NUCLEAR CENTER
FY - 1966

	Salaries	Travel	Materials & Supplies	Other	Overhead	(Operations) Subtotal	Equipment	Total
Director's Office	$ 160,000	$15,000	$ 6,000	$ 11,250		$ 192,250	$ 10,000	$ 202,250
Administration & Services	140,000	1,000	12,500	2,000		155,500	3,000	158,500
General Services	-	-	-	160,000		160,000	-	160,000
Nuclear Sc. & Technology	76,000	2,000	5,000	1,000		84,000	12,000	96,000
Reactor	84,000	1,000	5,000	1,000		91,000	7,500	98,500
Health Physics	71,000	2,000	5,000	1,000		79,000	14,000	93,000
Agricultural Bio-Sciences	81,000	2,000	7,000	2,000		92,000	7,500	99,500
Radioisotopes	81,000	2,000	5,000	3,000		91,000	12,000	103,000
Radiotherapy & Cancer	102,000	2,000	7,000	4,000		115,000	8,000	123,000
Clinical Applications	76,000	1,000	8,000	1,000		86,000	10,000	96,000
Medical Sc. & Radiobiology	78,000	1,000	8,000	1,000		88,000	10,000	98,000
Nuclear Engineering	38,000	2,000	4,000	1,000		45,000	5,000	50,000
Technical Serv. - Mayaguez	86,000	3,000	11,000	1,000		101,000	-	101,000
Technical Serv.- Río Piedras	42,000	500	8,000	2,000		52,500	1,000	53,500
Unassigned	-	-	-	-		-	-	-
	$1,115,000	$34,500	$91,500	$191,250		$1,432,250	$100,000	$1,532,250
Int. Nuclear Energy Exhibit	19,900	15,000	6,100	-	$ 12,000	53,000	-	53,000
Total 07						$1,485,250		
Overhead Credit (est.)						-252,250		
Shop & Reactor Services to Programs 05 & 06						- 80,000		
						$1,153,000		

PROGRAM 06 Biology & Medicine	Salaries	Travel	Materials & Supplies	Other	Overhead	(Operations) Subtotal	Equipment	Total
Resonance & Radiation	$ 20,000	$ 1,000	$ 5,000	$ 2,000	$ 12,000	$ 40,000	$ 6,000	
Marine Biology	128,300	2,000	17,500	21,200	77,000	246,000	20,000	
Terrestrial Ecology I	88,000	16,000	15,000	12,200	52,800	184,000	17,000	
Terrestrial Ecology II	26,200	1,000	10,000	31,100	15,700	84,000	8,000	
Schistosomiasis	26,000	1,000	2,200	9,200	15,600	54,000	8,000	
Sugarcane Borer	16,000	-	3,400	-	9,600	29,000	1,000	
	$ 304,500	$21,000	$53,100	$ 75,700	$182,700	$ 637,000	$ 60,000	
PROGRAM 05 Physical Sciences								
Solid State	$ 22,800	$ 5,000	$ 3,700	$ 1,000	$ 12,500	$ 45,000	$ 4,000	
Neutron Diffraction	45,200	4,300	5,000	62,400	27,100	144,000	10,000	
	$ 68,000	$ 9,300	$ 8,700	$ 63,400	$ 39,600	$ 189,000	$ 14,000	
PROGRAM 08 Isotope Development								
Food Irradiation						$ 17,000		

PUERTO RICO NUCLEAR CENTER

GENERAL NARRATIVE

The budget proposal for FY-1967 reflects a modest increase in the 07 budget commensurate with a healthy conservative development of the program. It marks the beginning of a second phase for PRNC in which the training and research areas, having been stabilized, will seek depth and maturity.

The second phase may be tied to the favorable report on PRNC by the AEC Ad Hoc Committee which made its evaluation at the end of calendar 1965. Subsequent action by the Commission in accepting the committee's report, including the shift of supervision to the Division of Training and Education gave assurance of the greater stability of PRNC necessary for sound development.

Programmatic support for specific research projects by the Divisions of Biology and Medicine, Research, and Isotope Development has also shown a moderate healthy increase in keeping with the development of staff and facilities.

As facilities improve, PRNC will be able to take on the solution of additional problems of direct interest to the AEC program divisions. By virtue of its location in the island tropics, PRNC can offer a unique environment, particularly in the life sciences, which makes possible solution of important special problems under the most favorable conditions. Particularly noteworthy in this regard are the programs in terrestrial and marine ecology, and their relationship to the possible use of nuclear explosives for the proposed Isthmus Canal.

We believe PRNC can offer more useful support to the AEC programs than is now being used. The new Animal Quarters Building in Río Piedras, and Administration and Shop Buildings in Mayaguez will make handling of current programs more effective. However, there will continue to be severe crowding in the Río Piedras building which will be relieved only by construction of the proposed extension of the Bio-Medical building. We urgently solicit support for this construction project.

Important results achieved within the Divisions and Programs are very briefly stated in the Division and Program narratives. They are summarized in greater detail in the 189's and Renewal Proposals which accompany the Budget Proposal. Complete Progress Reports have been written for each program receiving support from the Divisions of Biology and Medicine and of Research.

The following list includes a brief selection of highlights taken from the Division and Program Reports:

1. The completion of the irradiation phase of the Terrestrial Ecology I Program. The three-months exposure in the Luquillo Experimental Forest

was completed without incident and the program now enters its third phase of post-irradiation studies in the forest.

2. During the irradiation a virus made its appearance among the rats and mosquitoes of the area. Studies leading to the identification of this virus are now in progress. This is the first discovery of an indigenous arthropod-borne virus in Puerto Rico.

3. Studies of the iodine uptake by human thyroids have shown that persons of the tropically adapted population of Puerto Rico have normal values that differ from those of northern latitudes. Uptake is consistently less in Puerto Rico than in Continental United States.

4. Laboratory colonization of the Sugarcane Borer Diatrea saccharalis was achieved as a necessary step in the exploration of radiation as a mean of controlling this parasite.

5. The completion of a new building to house experimental animals, principally mice, and laboratories devoted to virology and cancer will permit the full activation of 06 and 07 programs in Radiobiology and Virology.

6. By incorporating bromine in the DNA of onion root tips by feeding bromodeoxyuridine, it was found that the frequency of chromosome breaks in a constant flux of monoenergetic x-rays was substantially increased at the k absorption edge of bromine (13.48 Kev). This extends the similar results with other elements in metalloenzyme systems.

7. Agricultural Bioscience: This division, which had been practically inactivated because of insufficient funds for fiscal year 1965, received the benefit of an overhead adjustment in programs 05 and 06 and was again made operative in the second half of fiscal year 1965. The increase shown for fiscal year 1966 represents the level the agricultural portion of the program must achieve if PRNC is to be effective in this vital area by fiscal year 1967.

8. Nuclear Engineering: Graduate work in nuclear engineering has achieved a high level of activity with approximately twenty students through the year. The great interest is a reflection of the imaginative plans for nuclear power of the Puerto Rico Water Resources Authority for the next twenty years.

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DIVISIONAL NARRATIVE

Director's Office: The Director's Office operates at both Río Piedras and Mayaguez as does the Administration and Services Division. Separation of programs and administrative activity results in high communication and travel costs. In both items expenditures will be greater due to a recent increase in telephone rates granted by the FCC and the increase in local air rates.

Weekly staff seminars at both Río Piedras and Mayaguez are an established part of our scientific program. Visiting scientists and consultants are scheduled as guest lecturers whenever feasible and their contribution has added substantially to the scientific background of the staff.

PRNC has been host to several scientific groups which chose to meet in Puerto Rico because of interest in the programs of the Center. It was host to the first Inter-American Power Reactor Conference sponsored by the OAS at which were discussed the generation of electricity by nuclear energy, desalting of sea water, and the construction of canals by use of nuclear explosives.

At the invitation of the AEC Division of Special Projects, PRNC in collaboration with the Oak Ridge Institute of Nuclear Studies participated in the "Atoms-at-Work Exhibit" in El Salvador. Personnel are scheduled to participate in this project in other Central American countries during the next fiscal year.

The Summer Institute of Radiobiology was suspended for the purpose of conducting a survey of task participants to evaluate the use being made of their training and of the equipment acquired under this program.

Staff in the Director's Office has been increased for the purpose of improving the Center's operation in relation to needs of Latin American countries and especially their universities. It is planned to resume staff travel to Latin America to encourage institutional interrelationships.

Administration and Services: Three major changes have been instituted in the methods of rendering accounting service. First, to correct previous deficiencies, cashier services and accounting have been completely separated. There is now no overlap in work assignments. Second, accounting operations using IBM 1620 equipment of the University have been initiated. It is now possible to give the Director's Office and the Division and Program Heads prompt information on their fiscal status. Third, new personnel have been added so that the necessary services can be rendered promptly and effectively.

In cooperation with the Technical Service Divisions and the Reactor Division, all service operations are charged on a monthly basis. All Divisions and Programs now pay for non-overhead services such as reactor irradiations, shop services (machine, carpenter, electronic and glass), long-distance phone calls, etc.

The Administration and Services Division in Mayaguez has been operating in scattered space and under very crowded conditions. In 1965 ground breaking is scheduled for a new building to house all these services appropriately, and in turn to release space in the main building for research use.

Reactor: A New Hazards Summary Report for the Swimming Pool Reactor, issued as a PRNC document and containing substantial new and revised old information was completed and delivered to the Atomic Energy Commission. The operators and supervisor for the second shift, to begin July, 1965, have been trained and the crew for a third shift is being recruited for training. On acceptance of the Hazards Summary Report, amendments to cover two megawatt operation will be filed. Initial studies for five megawatt operation, foreseen for FY-1968, have been initiated.

Use of the reactor for research has begun to impose steady-state load demand which leads to frequent conflict with the needs for nuclear engineering training and student experiments. Wherever possible, the L-77 reactor is used for this work and its use has been quite heavy in 1965. However, the L-77 is not always an adequately flexible unit, particularly for loading and criticality experiments. We would like to install a zero-power pool-type core in the second pool to take the low-power teaching load. A significant first step in this direction came with the acquisition from Ft. Belvoir of the complete vacuum-tube intrumentation console from their pool reactor. They have gone to a transistorized system. Further planning and preparation, including hazards studies will go on in 1966.

The major uses for the pool reactor have been in the neutron diffraction programs, which uses two spectrometers occupying six inch beam tubes, the study of radiation effect on thermal emissivity of graphite, which uses an 8 inch beam tube, the activation programs which use the pneumatic tube stations and open pool irradiations, and many special irradiations in support of research programs and thesis studies, such as fast-neutron-induced mutations in sugarcane. A borated-water shutter is being installed in a six inch beam tube, and a temporary block-type shielded room for irradiation of small animals erected around the tube exit.

The L-77 reactor has had a heavy schedule as the major training unit for the Nuclear Engineering Division. This unit was improved with new safety circuits, installed with ORO safeguard committee approval.

Division training activity for 1965 included two supervisors for the Colombia, S.A. reactor and six operators for the BONUS project. Division personnel are also directing thesis problems, primarily on heat transfer, for three students in the Nuclear Engineering program.

The increase in reactor based activity indicates a growing need for personnel space and laboratory type facilities within the reactor building. The necessary building volume and area is available for such development.

Nuclear Science and Technology: This division is responsible for teaching and research in nuclear energy related areas of the physical sciences. Through the division, support of the Master's degree programs in physics and chemistry of the University is provided. This support takes the form of the teaching of specialized graduate-level courses and provision of facilities and problems in nuclear energy areas for the required masters degree theses. In addition, facilities and research support for thesis work are provided to degree candidates at the masters and at the doctorate level who have been drawn from the United States and from Latin America. Studies in residence under these programs receive support from the U.S.-AEC Graduate Fellowship program, the International Atomic Energy Agency, their governments or other agencies of their home countries. The student continues his affiliation with his home university, and the degree is awarded by that university.

Post-graduate training and experience, for new Ph.D's and for mature scientists seeking advanced information and techniques are also provided for U.S. citizens and for qualified men from foreign countries.

In addition to the training-oriented teaching and research, the division provides the administrative framework and scientific environment for physical and chemical research at the professional level and of direct interest to the program divisions of the Atomic Energy Commission. This work is supported by the appropriate AEC division and the work done is pertinent to the program of the division, but its presence has a very marked influence in setting the standards of quality of the work expected from students in theses and in post-graduate work.

The major scientific areas of activity in the Division are solid state physics, hot-atom chemistry, neutron diffraction (reported separately), low energy neutron physics, radiation chemistry and instrumentation. The solid state physics research lies in two major areas. The nature of the electric properties of crystals and the effect of neutron, gamma and x-rays upon them, and the effect of selected energy photons on alkali-halide crystals. Three papers from the first group on the magnetic structure of $FeSb_2O_4$, and on dielectric properties of radiation-damaged triglycine sulfate and of rochelle salt were presented before the American Physical Society during the past year. The work on the alkali halide crystals is in part a doctoral thesis problem for a student of Harvard University. Through irradiation of the crystal with monochromatic radiation, it has

been possible to control the initial site of radiation interaction and observe the relationship between the radiation absorption and the formation of lattice vacancies. A significant relationship between them has been demonstrated. Further experimental work and theoretical analysis is in progress. This problem represents a joint effort of the Physics Department in Mayaguez, which is supplying space and the radiation source, and PRNC.

The hot-atom chemistry program has been devoted to a study of the valence state of compounds as formed using various isotopes of an element. Tin and antimony compounds were subjected to neutron irradiation and the change in valence state measured as a result of the irradiation and following thermal and gamma annealing. A paper on this subject was presented before the American Nuclear Society, with a graduate student as joint author. A similar program on organic phosphorous compounds has been initiated.

In instrumentation, emphasis is on radiation detection systems. The work on photomultiplier fatigue has produced a comprehensive paper in Nuclear Science and Engineering on a new semi-empirical theory of this effect and the experimental results confirming the theory. In addition, a graduate student thesis study of the statistical model used in analysis was completed. Another group, in the Physics Department laboratory, is developing and calibrating a high sensitivity calorimeter for absolute measurements of x-rays. During 1966, this work will be taken over by a new dosimetry group in the Health Physics Division although much of it will be used for the M.S. theses in physics and in nuclear engineering.

Radiation chemistry research has yielded papers on such diverse topics as radiation-induced bromination of 2-3 Dimethylbutane and the effects of radiation on estrone in solution. The results are in press in Radiation Research. In addition, a new effort based on radiolysis of hydrogen halides has been started. The radiolytic mechanism will be studied with a view to enhancing or at least maximizing the G value. The products represent direct sources of chemical energy produced from nuclear energy, and they will be studied further as possible fuel cell feed materials.

Nuclear Engineering: In its first full year of operation, this program underwent rapid expansion. Starting with 15 students, and about 9 full student-years of enrollment, it jumped to 25 students and over 20 student years with the addition of 10 engineers for the Puerto Rico Water Resources Authority. Additional teaching personnel were recruited from the Health Physics Division and from the PRWRA to help absorb the load increase. Since each student must complete a thesis before the College will grant the degree of Master of Science in Nuclear Engineering, PRNC is being hard pressed to develop about 15 suitable thesis problems. However, this has been done and the laboratory will benefit from work on many problems in instrumentation, heat transfer, reactor dynamics, dosimetry and radiation effects.

Upon graduation of the current large group, enrollment will stabilize at about 20 students and 12 student years of teaching, unless the Water Resources Authority makes another late decision to train more men. A full time staff member from U.C.L.A. has been added for 1966 to improve the handling of the base program, and the Water Resources Authority has pledged help again if they add more students.

The Nuclear Engineering Division of PRNC is, at this time, engaged primarily in backing the degree program of the College with advanced training and research support. However, in addition, research problems are being developed by the faculty in areas of direct interest to PRNC. These include studies on radiation effect on the thermal emissivity of graphite, development of a neutron energy selector based on absolute reflection techniques and the generation of random numbers based on short time fluctuations in decay rate of a long lived isotope. The last is in response to the need for a random number generator for shielding calculations using Monte Carlo methods.

The recent Latin American Conference of Nuclear Energy demonstrated the great interest in Latin America in nuclear power. Continued development of the PRNC program proper and cooperative work with BONUS and other atomic energy installations are needed to keep pace. Within the AEC Nuclear Science and Engineering Fellowship program, four recipients have selected the U.P.R.-P.R.N.C. program for their training.

Health Physics: The primary responsibility remains surveillance of conditions to insure health and safety of all PRNC personnel. Specific activities include personnel monitoring, area monitoring, environmental surveys, waste disposal, and decontamination as needed. In addition, all aspects of industrial safety and fire prevention are now centered in the division so that it is truly concerned with all aspects of guaranteeing a safe working environment.

The division personnel discharge their responsibilities through inspection, education and, where necessary, citation. The operating and research divisions are responsible for carrying through their activities in a safe manner without the immediate presence of health physics personnel, except in unusual cases.

In addition to the operational safety responsibility, the division operates an infirmary for orderly and proper attention to injuries, and also provides the "Occupational Health Program" developed in keeping with Manual Chapter 0528. This program has been started in Mayaguez and, as soon as the difficulties unique to the local environment are worked out, it will be extended to cover Río Piedras. Experience with the program up to now, based on about 150 employees, has been excellent.

To help the research groups, particularly in the life sciences, with the many-faceted difficulties of accurate radiation dose measurement, a Dosimetry group has been formed within the Health Physics Division. The group will help develop techniques and set standards for dosimetry with all types of ionizing radiation.

The educational program in Health Physics had been de-emphasized while effort was concentrated on improving the health physics service provided to the laboratory. While the improvement process is still in full swing, addition of staff and existing progress makes possible the focussing of attention on health physics education again.

Participation is continuing in the national Health Physics Fellowship program and four fellows, two from Puerto Rico and two from the United States have elected to take their program at U.P.R.-P.R.N.C.

Agricultural Bio-Sciences Division: The training and education function of the division continues in teaching nuclear techniques used in agricultural science (plant physiology, genetics and agricultural biochemistry). Work is done at both the undergraduate and the graduate levels by formal course offerings and by thesis research leading to the M.S. degree. At present, four students are at various stages in graduate studies carried out within the Division. In addition the staff is involved in the advanced training of an ORINS and an IAEA fellow, and in ORINS summer participants.

Research activities of the division fall within three major programs: "Effects of ionizing radiation on plants, application of radioisotope to crop studies, and food preservation through radiation".

The first of these programs is concerned with plants which are important economically in the tropics. Emphasis has been placed on neutron irradiation effects as the Puerto Rico Nuclear Center is unique in having a megawatt research reactor in the tropics available for biological studies. Irradiation effects are being evaluated in terms of the genetics, physiology and biochemistry of the plant system. Specific projects include production of a high sucrose mutant of sugarcane through neutron irradiation of feed material. Biochemical mass screening of plants grown from this seed is carried out at the first and second generation through use of a non-destructive tissue sampling and subsequent chemical assay for microgram quantities of sucrose and reducing sugars. Another project is investigation of the biochemical pathways of sucrose formation and degradation in sugarcane. Here, rates of protein formation in cell-free extracts of sugarcane tissues are measured by determining incorporation of C-14 labeled amino acids. Other studies are directed toward identification of nucleotides found in sugarcane.

Radioisotopes techniques have not yet been applied extensively to the agriculture of the humid tropics. To establish fundamental principles and relationships which may be applied to agronomic practice is the aim of this program within the Agricultural Bio-Sciences Division. At the present time projects here deal with uptakes of strontium and calcium by plants grown in soils containing different levels of these elements. Under development are projects studying the micronutrients nutrition of sugarcane as this may be influenced by agronomic and environmental factors, and the

cycling of micronutrients in tropical crops. In all of this work emphasis is placed on application of radioisotope tracer techniques.

The third area of division research is that of the preservation of tropical fruits and vegetables by ionizing radiation, with the aim of making feasible the shipment of this exotic food to commercial markets. Study of the radiation pasteurization of mangoes is being carried out, using the PRNC 2,000 curie cobalt 60 gamma source. Extension of storage life for up to thirty days at 50°F was found after 250 kilorad doses. Now being investigated are the best conditions of pre- and post-irradiation treatment and of varietal differences. Soon to be studied are the changes induced by radiation pasteurization in levels of vitamins, sugars, and pectins found in mangoes and the radiation survival of the microbial factors responsible for spoilage. Extension of these studies to bananas is likely, through Division of Radioisotopes Development's support.

The staff is engaged not only in the research indicated above, but also participates in the 06 program research of PRNC, particularly in the Terrestrial Ecology I Program, the Paramutation Program, and the Resonance in Radiation Program. Cooperative research with various agricultural institutions in Puerto Rico and in Central America (via the U.S.-AEC Atoms in Action Exhibit) continues.

International Atomic Energy Exhibits: PRNC is participating with ORINS in the Central American "Atoms-at-Work" exhibit. PRNC has responsibility for operation of the gamma source and neutron source and for developing the research program in physics, chemistry and biology in which these sources are used.

The Exhibit was inaugurated in San Salvador, El Salvador on February 23, 1965. Research work undertaken under the PRNC program included the uses of gamma radiation in entomology, genetics, food preservation and dosimetry. A total of 964 samples were irradiated using the $Cobalt^{60}$ gamma irradiation facility of the Exhibit; this was the largest number of samples irradiated during an AEC International Exhibit.

The research program undertaken in El Salvador has a close relationship with PRNC research programs at Puerto Rico and is also related to the agriculture and the economy of El Salvador. Five PRNC staff members and two technicians travelled to San Salvador during the Exhibit. Detailed follow up programs in entomology and genetics have been planned. Similar programs will be continued for the next three years that the Exhibit will be in Central America.

Radioisotope Applications: This Division continues to offer training in the use of radioisotopes in the physical and biological sciences. There will be an indefinitely continuing demand for this training, especially for students of the University of Puerto Rico. The basic course is offered

five times a year and it will probably not be necessary to expand it. With time, a larger proportion of students coming from Latin America will have already had the equivalent in their own universities.

The expansion of graduate work in chemistry related to radiation and nuclear reactions has been well established. The research program, all of which is built around the graduate activity, is being developed under two sections:

1. Organic Chemistry

    a. Synthesis of compounds of interest to the nuclear field, especially medicine and radiobiology.

    b. Quantitative study of organic reactions utilizing radioisotopes.

2. Solid State Physics of Organic Crystals (Sponsored by AEC Division of Physical Research).

This section studies the effect of neutron and of gamma and X-ray irradiation on the photoconductivity of organic crystals. Measurements have been limited to anthracene crystals; plans are being made to extend the work to other organic crystals.

The indications are that the program of this Division will attract all of the graduate students for which laboratory space can be provided. A temporary structure has been erected outside the Bio-Medical Building which can house eight graduate students.

Clinical Radioisotope Applications: The Clinical Applications Division is currently offering three types of courses for education and training of physicians; maintains diagnostic services at the Puerto Rico Nuclear Center to support its teaching program; operates the Radioisotope Laboratory at the University Hospital for the Medical Staff of this Hospital; collaborates in investigative work with other institutions according to the general policies of PRNC and conducts its own research program characterized by work of clinical nature on problems of local and general interest.

Radiotherapy and Cancer: The main purpose of this program is the training of physicians and allied personnel in all aspects of the application of nuclear energy to cancer. Another purpose is the development and carrying out of a program of research activities conducted with the purpose of improving our knowledge in the cancer and radiation fields.

The following functions are carried out to accomplish these purposes:

1. Formal instruction to physicians who want to become qualified radiation

therapists. This residency training lasts three years with the addition of a year of supervised practice in the specialty.

2. Formal instruction is also offered to experienced physicians in radiation therapy who have been engaged in this field for a considerable length of time, which permits them to conduct specific research projects in their field and participate in all teaching activities.

3. Training of fourth year medical students to familiarize them with cancer and radiotherapeutic techniques.

4. In-service training for nurses, technicians, and radiological physicists.

Medical Sciences and Radiobiology: The actual content of the field of radiobiology has been divided in a natural manner between Agricultural Bio-Sciences, Health Physics, Medical Sciences and Radiotherapy and Cancer. It can be said that radiobiology is oriented to plant science in Mayaguez and to medical science in Río Piedras. In the latter location the small program which previously existed in the Division of Radiobiology is being continued.

I. Tissue Culture Program

The first phase in the program was the development of a central tissue culture facility. It has been evident for some time that several divisional programs have a requirement for the employment of tissue culture techniques. It was also obvious that the size of this project would not permit the successful development of several tissue culture laboratories. The most logical solution to the problem seemed to be the establishment of a single tissue culture laboratory to serve the needs of all programs but in which the various members of the staff might have affiliations with other divisions and be directly interested in their special problems.

Beginning in FY-1964 and extending through FY-1965 several radiobiological studies were instituted with tissue culture cell lines. Chief among these are the studies of the intracellular capture of neutrons by organic compounds containing B-10. The organic chemistry section of the Radioisotope Applications Division has been preparing a series of new boron compounds which are described in the associated Form 189.

II. Indigenous Viruses and their Radiation Induced Genetic Variability

III. The use of gamma radiation to modify Schistosoma Mansoni cercariae so that they induce immunity to attack instead of causing disease.

The procedures outlined in the proposal are, at this stage, directed towards:

(1) defining useful parameters for assessing the effects produced and
(2) comparing the effectiveness of different approaches to the problem.

This program is scheduled over a two year period, by which time it will be possible to decide along what lines any further research might best be pursued, the hoped for end result being a contribution to knowledge which may eventually help in combating the disease.

Technical Services (Río Piedras): This section has charge of building maintenance at Río Piedras, the operation of a small electronic shop and general instrumental repair. Shop services in general and engineering supervision are supplied by the Mayaguez branch.

Technical Services (Mayaguez): The Division is responsible for maintenance of all buildings and general service facilities and for operation of the machine shop, carpenter shop, electronic shop and glass blowing shop.

For maintenance, a detailed schedule based on punched cards has been established and has proven to be very effective. It is being constantly revised to cover equipment not previously included, particularly new acquisitions.

The shops provide services on a cost basis for non-maintenance tasks. The largest operation this year was construction and installation of special partitions and equipment for the Latin American Nuclear Energy Conference. Addition of an electronics engineer has improved services available in the electronics shop. The glass shop is now being operated by personnel trained by our former scientific glassblower, who has returned to the United States. Glass shop service now provided is quite satisfactory, and a trainee from the Atomic Energy Commission Laboratory in Colombia is expected soon.

No immediate changes are contemplated as a new shop building is scheduled for construction in 1966. We expect to provide the necessary personnel for precision and vacuum quality work which the new facilities will make possible.

Resonance in Radiation Effects: The studies on radiation effects produced as a function of wavelength have been extended to cover genetic damage, in addition to the continuation of studies on inactivation of enzymes. A three-fold increase in chromosome breaks has been demonstrated in onion root tips labeled with BUDR, when irradiated first below and then above the K absorption edge of bromine. Work on carboxypeptidase with various metal labels is continuing, and studies on E. coli have been initiated. It appears that the total radiation effect depends on the site of initial absorption of the photon, for systems in which selected heavy atoms are incorporated into an otherwise light atom structure.

In support of the biological studies, development of new high-intensity low-photon-energy sources, using field emission techniques were initiated. Also, we have started study of photon focusing systems in the low energy range using total reflection techniques. To improve dosimetry, development of a high sensitivity calorimeter has also begun, in collaboration with the Health Physics Division.

This program operates in close collaboration with similar studies on radiation effects in alkali halide crystals, a part of a physics program within the Nuclear Science and Technology division of the U.P.R. Mayaguez Physics Department.

Marine Biology: This program, started in 1962, is designed to provide information on the distribution and movement of trace elements in selected but complete ecological and biogeochemical systems. It includes detailed studies of the marine biosphere and hydrosphere as well as limited studies of the lithosphere. Studies are made on land, on the sea, and in the sea. The geographic area under investigation centers on the west coast of Puerto Rico, with particular emphasis on the area surrounding the site of the BONUS project, but extending for marine observations along the north and south coasts and to the eastern extremity of the island.

Three rivers drain into the Mona Passage, marking the west coast of Puerto Rico; the Culebrinas north of Rincón, the Añasco, south of Rincón, and the Guanajibo south of Mayaguez. Each drains a watershed with a different type of soil system, permitting comparison, in a small geographic area of significantly different trace element distributions on and and off shore. Greatest effort up to now has been in the Añasco River valley and outflow area, with the others developing rapidly.

A complete spectrum of physical techniques has been brought to bear on these problems including tracing of natural and fall-out radioactive elements, and stable elements studies using neutron activation analysis, atomic absorption and flame spectrophotometry, calorimetric and fluormetric analysis, x-ray emission analysis and structural analysis using x-ray and

neutron techniques. Recent acquisitions of mass spectrometers will open this area, particularly for isotope ratio studies.

Analyses are applied to inorganic materials on land and from the bottom of the sea and to samples taken at all points in the food web.

This program has particular significance in the present period of developing use of nuclear energy. It is vital to our knowledge of the fate of radioactive materials from tests, nuclear plant outflow, accidental discharge, waste disposal and the proposed large scale use of nuclear explosives for earth moving.

Paramutation: Genetics regulatory systems which control gene mutation have been investigated with emphasis given to the paramutation system as it occurs in maize. Radiation treatments of the components of the system have indicated that the type of change which occurs is an inactivation process rather than a true mutational event. Radiosensitivity curves of the regulator responsible for paramutation change have been obtained. Additional sources of paramutation induction from South American sources have been evaluated and found to be generally associated with variegated aleurone types. A final report on this project, which will terminate in June 1965, is being prepared.

Induced Sterility for Population Control of the Sugarcane Borer in Puerto Rico: Gamma-induced sterility effects, artificial culturing methods, and behavior have been studied to determine the suitability of the method of sterile male population over-flooding for controlling or erradicating Diatrea Saccharalis (Fab.) (Crambidae, Lepidoptera). Dosage-effect studies have shown that adult males can be effectively sterilized at 18 kilorads, and at 14 kilorads in virgin adult females. Adult longevity and oviposition is not affected by radiation below 70 kilorads. Mortality dose for larvae is between 2 and 4 kilorads, and development is abnormal at dosages needed to produce sterility. Pupal development is adversely affected by dosages of 8 to 12 kilorads without induction of sterility. The artificial culturing methods developed are adequate for present needs and mass-rearing methods are under investigation.

Terrestrial Ecology Program I: Radioecology of a Tropical Rain Forest: The rain forest irradiation project was started in the Spring, 1963, with the objectives of determining effects of gamma irradiation on the lower montane rain forest near El Yunque and the movement of chemical elements of fall-out in the normal biogeochemical cycles. An area in the Luquillo Forest Reserve provided by the U.S. Forestry Service has been developed with trails, towers, instrumentation, electric power, and work facilities. A group of 12 participating investigators from

other universities began a year of measurements preceding irradiation. The project now involves 65 phases with 15 resident scientists and student assistants. The effect of irradiation will be assayed by measurement of animal noises, vegetation density to light, plant and animal populations, changes in microclimate, localized effects, cytogenetic effects, and changes in chemistry and fallout. A 10,000 curie Cesium 137 source was installed on January 19, 1965 and the irradiation was completed April 27, 1965. The study of the effects produced by the irradiation began on this date. Fall-out elements are traceable with existing levels of activity and with tracer experiments. The level of fallout held in the vegetation is relatively high indicating the effect nutrient holding ability of the vegetation.

Terrestrial Ecology Program II: Radiation Induced Variability in Indigenous Arthropod-Borne Animal Viruses of Puerto Rico: Field work on the regular study area was continued with successful mosquitoe and rat trapping and bleeding taking place at regular intervals. It is hoped to have a clear picture of the arboviruses present in El Verde before the radiation source is added. No viruses have as yet been encountered in the El Verde material.

The Mechanisms of Antigen-Antibody Reactions Following the Inoculation of Mice with Irradiated and Normal Schistosoma mansoni Cercariae: Approval for this program was received in December, 1963, and the first preliminary experiment designed to determine the number of sexually paired cercariae necessary to induce a standard infection is underway. A modest mouse colony is available and cultivation of host snails for the program has also been started. Previous work indicated an acquired resistance to challenge with virulent Schistosoma mansoni cercariae after infection by cercariae which had been damaged by exposure to gamma irradiation. When the optimal experimental procedures have been established, it is intended to make a detailed study of all detectable reactions occurring between the challenging parasite and the "immune" host.

PROGRAM 05

Neutron Diffraction Program: The Neutron Diffraction Program has undertaken work on magnetic ordering and on the determination of light atoms in the presence of heavy atoms; the two fields in which the neutron technique has provided unique contributions to solid state physics and chemistry.

Magnetic work has been undertaken with the cooperation of Brookhaven National Laboratory personnel. The structure of Fe_2SiO_4 has been solved and Pd_3Mn_2 and $CuCrO_2$ are under investigation.

The structure of $CaWO_4$ (a laser matrix) has been determined as part of the program of determining the positions of light atoms in the presence of heavy atoms. Under investigation are d-tartaric acid and its hydrogen bonding and Cu Formate $4H_2O$ which becomes antiferromagnetic at 17°K. Preliminary diffraction results indicate disordered hydrogens, and dielectric constant measurements indicate a hitherto undiscovered phase transition at -38°C which may be associated with the disorder. Work will continue on deuterated material and other hydrates with interesting physical properties.

In addition to the PRNC personnel and Brookhaven employees that initiated the project and have continued to cooperate with it, Dr. K. Okada, a solid state physicist from Nagoya Institute of Technology, Japan, is completing a two-year stay; Dr. H. Bielen, a German government scientist, spent two years here; and Dr. D.T. Cromer of Los Alamos Scientific Laboratory is spending a year at PRNC to work on alum structures.

Study of Radiation Damage in Organic Crystals using Electrical Conductivity: Effects of neutron, gamma, and x-ray irradiation on the electrical conductivity of anthracene crystals are under study. Initial phases of the study have been limited to changes in dark and photoconductivity produced by neutron, gamma, and x-ray irradiation which apparently knocks out hydrogen atoms from the crystal. Electrical conductivity was selected because evidence indicates this parameter is most sensitive to the presence of impurities or defects. Another phase of this investigation will include a more precise and direct technique for determining trap densities and depths by measuring mobility and conductivity as a function of temperature.

PUERTO RICO NUCLEAR CENTER
EXPENDITURES - FY 1965

Program 07 Training & Education	Salaries	Travel	Materials and Supplies	Other	Shop and Reactor Services	Overhead	Sub-total Operations	Equipment	Total
Director's Office	$ 126,166	$17,165	$ 9,156	$ 9,963	$ 5,715		$ 168,165	$ 32,905	$ 201,070
Administration & Services	131,134	441	12,613	-	317		144,505	1,870	146,375
General Services	-	-	-	150,249	-		150,249	-	150,249
Nuclear Science & Technology	69,774	3,307	7,873	2,105	3,067		86,126	6,558	92,684
Reactor Program	69,977	620	7,675	1,083	3,371		82,726	9,226	91,952
Radioisotope Applications	67,371	2,294	15,628	1,668	3,402		90,363	9,581	99,944
Health Physics	70,445	3,694	9,930	(3,218)	1,400		82,251	10,258	92,509
Radiotherapy and Cancer	108,010	1,489	7,185	1,260	2,493		120,437	4,067	124,504
Clinical Applications	70,279	2,033	17,356	3,534	1,977		95,179	9,954	105,133
Agricultural Bio-Sciences	62,005	4,691	8,515	1,518	1,049		77,778	1,564	79,342
Technical Services - Río Piedras	41,047	2,575	6,018	4,386	-		54,026	1,004	55,030
Medical Sciences & Radiobiology	84,679	2,814	15,933	158	405		103,989	9,666	113,655
Technical Services - Mayaguez	85,669	4,414	10,336	1,679	-		102,098	450	102,548
Nuclear Engineering	25,725	1,860	6,396	789	964		35,734	2,897	38,631
Radiobiology Institute	4,785	341	809	162	45	$ 858	7,000	-	7,000
International Nuclear Energy	13,684	7,459	1,533	1,016	2,033	8,002	33,727	-	33,727
Training Assistance to State & Local Govt.	2,500	-	65	202	-	1,500	4,267	-	4,267
Latin Interamerican Nuclear Power	250	2,299	1,929	5,522	-	-	10,000	-	10,000
	$1,033,500	$57,496	$138,950	$182,076	$26,238	$10,360	$1,448,620	$100,000	$1,548,620
Overhead Charges Program 06 and 05							(222,343)		
Shop and Reactor Charges							(71,288)		
Total Program 07							$1,154,989		

EXPENDITURES - FY 1965

Program 06 Biology & Medicine	Salaries	Travel	Materials and Supplies	Other	Shop and Reactor Services	Overhead	Sub-total Operations	Equipment	Total
Paramutation	$ 15,025	$ 626	$ 263	$ 86		$ 9,015	$ 25,015		$ 25,015
Radiation Chemistry & Photochemistry	20,016	313	3,683	366	$ 427	12,009	36,814	$11,796	48,610
Resonance in Radiation	19,226	2,893	5,487	1,140	2,019	11,008	41,773	8,559	50,332
Marine Biology	113,632	5,692	17,334	5,805	1,075	67,102	210,640	5,939	216,579
Terrestrial Ecology I	76,034	7,787	17,004	20,559	1,315	40,432	163,131	9,748	172,879
Terrestrial Ecology II	35,605	1,076	14,650	4,669	-	21,429	77,429	5,881	83,310
Schistosoma Mansoni	15,484	-	12,352	910	-	9,291	38,037	5,996	44,033
Sugar Cane Borer	14,542	775	3,184	672	-	8,726	27,899	4,081	31,980
Total Program 06	$309,564	$19,162	$73,957	$34,207	$ 4,836	$179,012	$620,738	$52,000	$672,738
Program 05 Physical Sciences									
Neutron Diffraction	$ 40,219	$ 3,766	$ 8,630	$10,050	$42,763	$ 24,131	$129,559	$17,687	$147,246
Solid State Physics	15,255	9,911	5,655	1,021	76	8,840	40,758	16,313	57,071
Total Program 05	$ 55,474	$13,677	$14,285	$11,071	$42,839	$ 32,971	$170,317	$34,000	$204,317

PRNC Expenditures FY 1958-1965
Program 07 - Training and Education

	FY - 1958			FY - 1959			FY - 1960			FY - 1961		
Quarter	Operations	Equip.	Total	Operations	Equip.	Total	Operations	Equip.	Total	Operations	Equip.	Total
1st	-	-	-	$ 40,290	$ 3,274	$ 43,564	$ 82,340	$ 29,992	$112,332	$148,249	$ 4,276	$152,525
2nd	$ 30,267	-	$ 30,267	59,253	31,651	90,904	91,699	15,513	107,212	165,737	3,360	169,097
3rd	43,097	$16,094	59,191	76,401	4,251	80,652	107,163	12,065	119,228	173,633	14,934	188,567
4th	45,704	24,458	70,162	107,236	187,017	294,253	169,061	165,036	334,097	266,145	166,113	432,258
Total	$119,068	$40,552	$159,620	$283,180	$226,193	$509,373	$450,263	$222,606	$672,869	$753,764	$188,683	$942,447

	FY - 1962			FY - 1963			FY - 1964			FY - 1965		
Quarter	Operations	Equip.	Total	Operations	Equip.	Total	Operations	Equip.	Total	Operations	Equip.	Total
1st	$ 244,338	$26,317	$ 270,655	$ 362,497	$ 66,002	$ 428,499	$ 305,793	-	$ 305,793	$ 277,613	$ 2,132	$ 279,745
2nd	316,422	28,758	345,180	308,614	37,362	345,976	274,798	-	274,798	272,535	26,813	299,348
3rd	317,333	30,222	347,555	262,864	5,730	268,594	287,683	-	287,683	261,247	22,594	283,841
4th	330,500	12,108	342,608	247,067	116,301	363,368	237,723	$70,000	307,723	343,594	48,461	392,055
Total	$1,208,593	$97,405	$1,305,998	$1,181,042	$225,395	$1,406,437	$1,105,997	$70,000	$1,175,997	$1,154,989	$100,000	$1,254,989

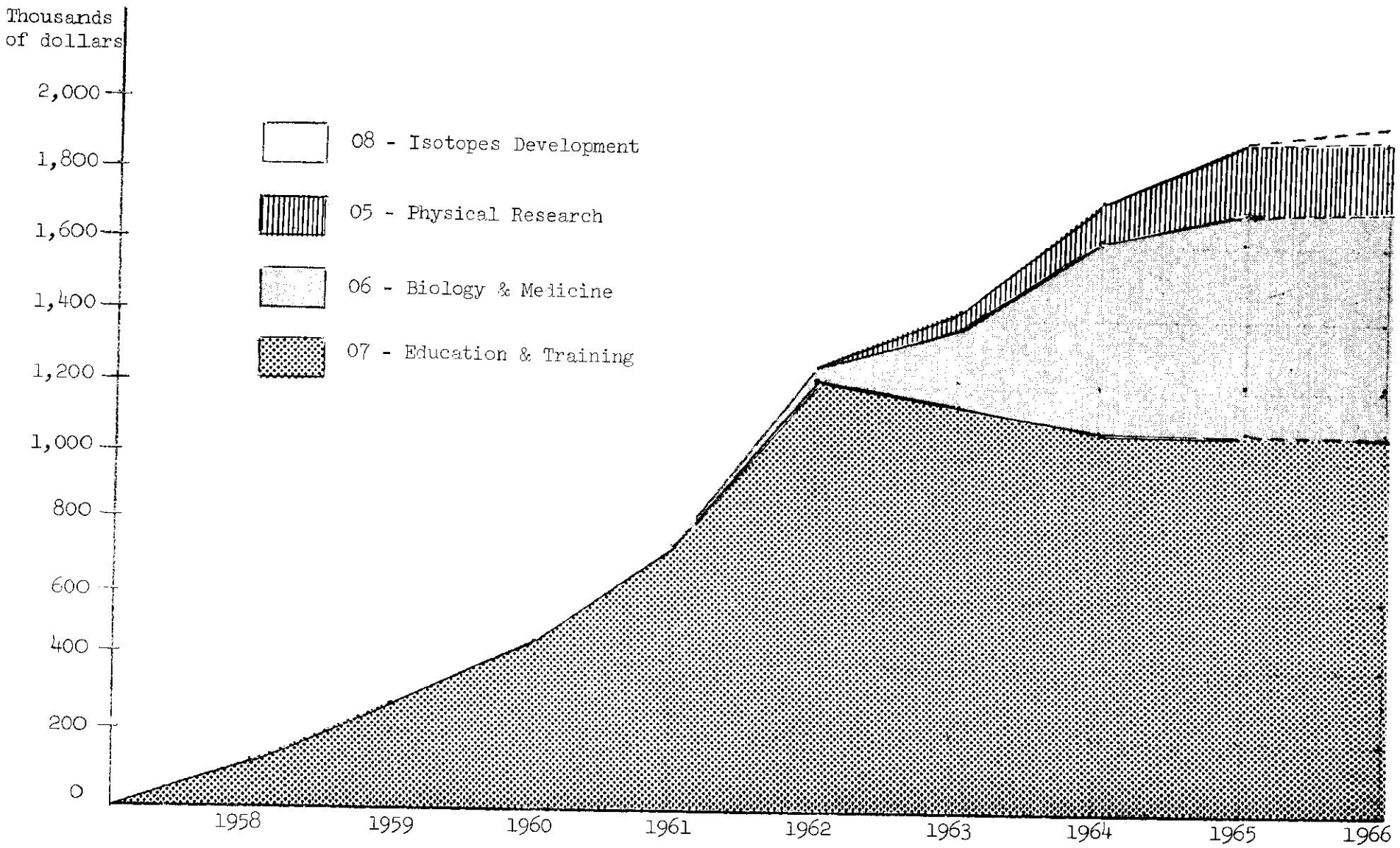
Program 06 - Biology and Medicine

	FY - 1962			FY - 1963			FY - 1964			FY - 1965		
Quarter	Operations	Equip.	Total	Operations	Equip.	Total	Operations	Equip.	Total	Operations	Equip.	Total
1st	-	-	-	$ 21,149	$ 8,337	$ 29,486	$116,246	-	$116,246	$135,254	$ 2,084	$137,338
2nd	-	-	-	30,460	(1,561)	28,899	147,877	-	147,877	147,584	4,374	151,958
3rd	-	-	-	54,854	2,482	57,336	141,953	-	141,953	141,732	17,761	159,493
4th	$31,503	$67,146	$98,649	111,384	166,312	277,696	118,922	$78,000	196,922	196,168	27,781	223,949
Total	$31,503	$67,146	$98,649	$217,847	$175,570	$393,417	$524,998	$78,000	$602,998	$620,738	$52,000	$672,738

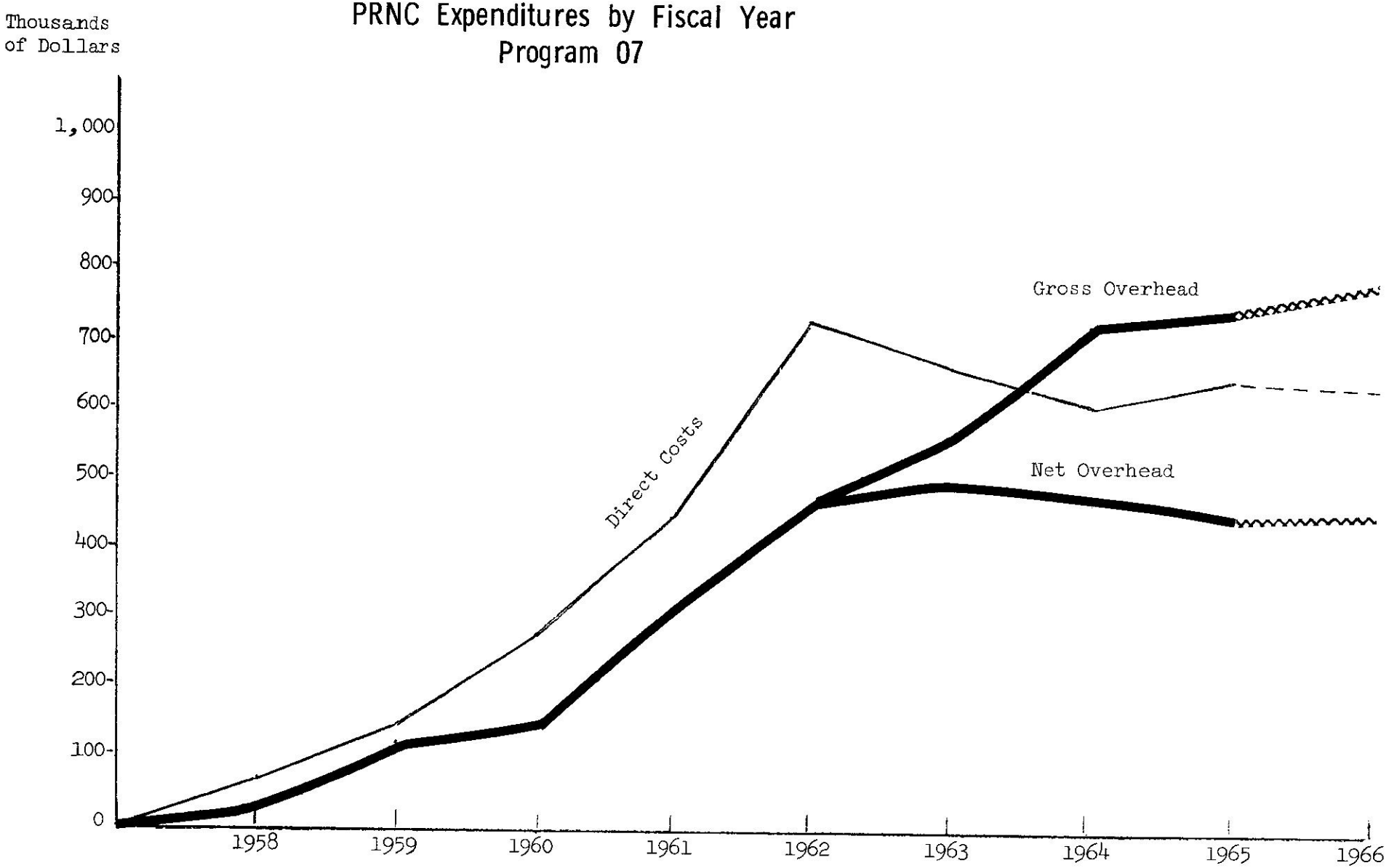
Program 05 - Physical Sciences

	FY - 1962			FY - 1963			FY - 1964			FY - 1965		
Quarter	Operations	Equip.	Total	Operations	Equip.	Total	Operations	Equip.	Total	Operations	Equip.	Total
1st	-	-	-	-	-	-	$ 23,241	-	$ 23,241	$ 26,775	$ (535)	$ 26,240
2nd	-	-	-	-	-	-	24,786	-	24,786	27,887	4,624	32,511
3rd	-	-	-	$15,033	$ 28,663	$ 43,696	57,630	-	57,630	58,846	4,974	63,820
4th	-	-	-	23,812	71,632	95,444	41,005	$16,000	57,005	56,809	24,937	81,746
Total	-	-	-	$38,845	$100,295	$139,140	$146,662	$16,000	$162,662	$170,317	$34,000	$204,317

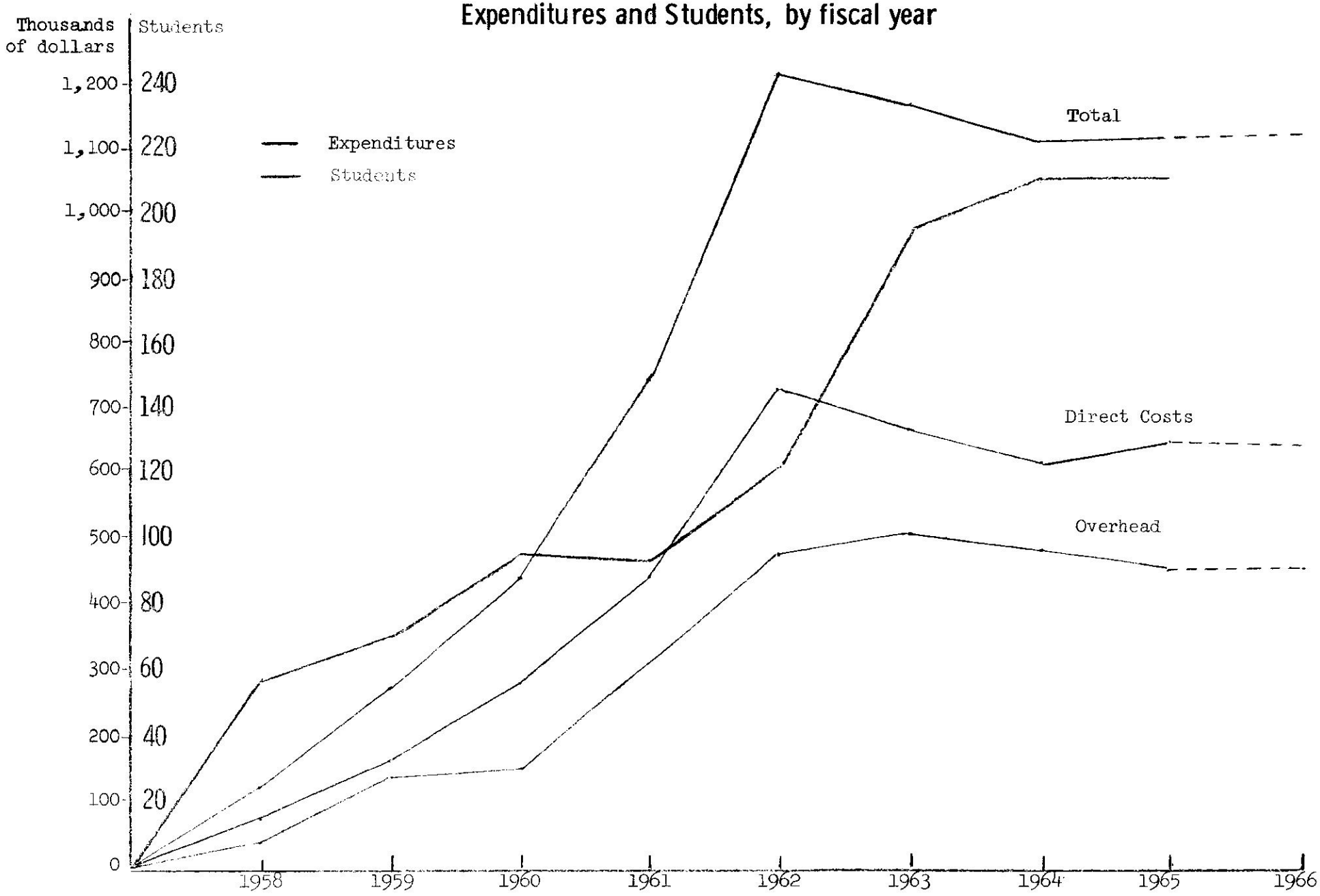
PRNC Program Expenditures by Fiscal Year



PRNC Expenditures by Fiscal Year
Program 07



Education and Training--Program 07
Expenditures and Students, by fiscal year



PUERTO RICO NUCLEAR CENTER
Capital Investment

	1958	1959	1960	1961	1962	1963	1964	1965	Total
BUILDINGS & GROUNDS									
Mayaguez	-	-	-	$1,824,855	$130,352	-	$ 7,981	-	$1,963,188
Río Piedras	-	-	-	586,956	8,903	-	1,320	$ 164	597,343
	-	-	-	$2,411,811	$139,255	-	$ 9,301	$ 164	$2,560,531
EQUIPMENT	$48,323	$218,764	$145,088	1,382,240	205,154	$161,588	369,868	249,663	2,780,688
Totals	$48,323	$218,764	$145,088	$3,794,051	$344,409	$161,588	$379,169	$249,827	$5,341,219

Equipment Categories

Laboratory Equipment	$1,389,212
Reactor and Associated Equipment	1,121,232
Heavy Mobile Equipment	16,753
Shop Equipment	63,629
Office Equipment	109,266
Miscellaneous Equipment	80,596
	$2,780,688

PUERTO RICO NUCLEAR CENTER
Employment Statistics by Fiscal Year

	FY-1958	FY-1959	FY-1960	FY-1961
Category	Program 07	Program 07	Program 07	Program 07
Scientific	19	16	21	25
Technical	12	23	31	37
Other	7	16	25	28
Administrative	5	8	10	30
Total	43	63	87	120

	FY - 1962		FY - 1963		FY - 1964		FY - 1965	
Category	Program 07	Programs 05 & 06	Program 07	Programs 05 & 06	Program 07	Programs 05 & 06	Program 07	Programs 05 & 06
Scientific	48	1	33	21	45	16	43	18
Technical	71	3	71	21	62	24	61	44
Other	53	1	31	8	54	19	52	28
Administrative	41	0	41	0	40	0	51	0
Total	213	5	176	50	201	59	207	90

PRNC Employment by Fiscal Year

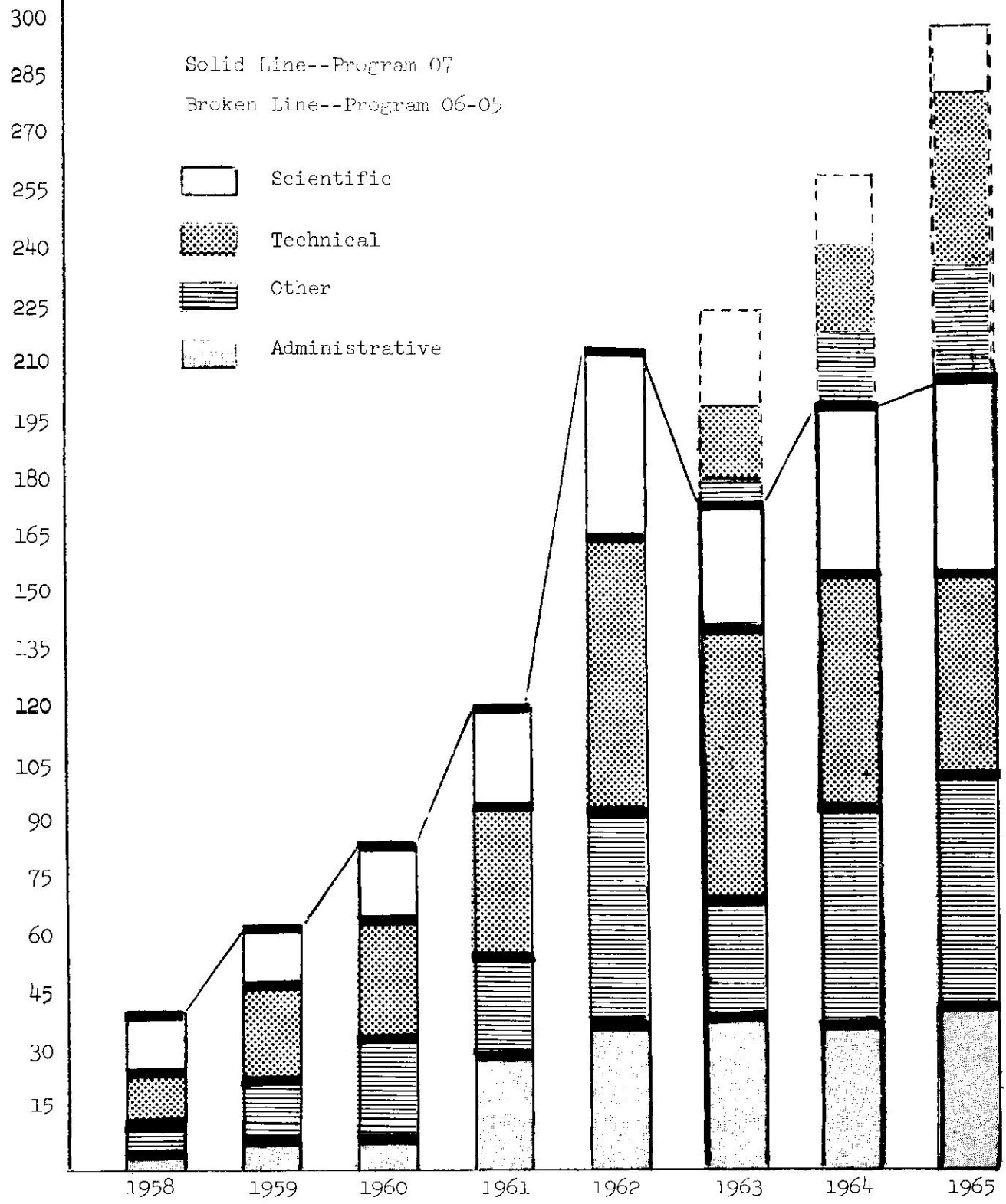


Table Showing PRNC Students by Country*
From FY 1958 through FY 1965

COUNTRY	1958	1959	1960	1961	1962	1963	1964	1965	TOTAL
Argentina	1	-	2	1	4	1	2	-	11
Bolivia	1	-	-	-	1	4	1	-	7
Chile	1	1	2	2	-	-	1	1	8
Colombia	1	5	3	6	3	6	7	4	35
Costa Rica	-	2	-	-	-	-	1	-	3
Cuba	-	1	3	-	-	-	3	1	8
Ecuador	3	-	1	1	-	-	1	1	7
El Salvador	-	-	1	-	1	1	2	-	5
Formosa	-	-	-	-	-	-	-	1	1
Great Britain	-	-	-	-	1	-	1	-	2
Guatemala	-	-	-	1	-	1	2	-	4
Haiti	-	-	1	-	-	-	-	-	1
India	1	-	-	-	1	-	-	-	2
Japan	-	-	-	-	-	-	1	-	1
Mexico	-	5	1	1	2	1	3	2	15
Nicaragua	-	-	1	1	-	-	-	-	2
Panama	-	-	-	-	-	1	1	-	2
Paraguay	-	-	-	-	1	3	2	-	6
Peru	-	1	3	1	1	1	5	-	12
Philippine Islands	1	-	-	-	-	-	-	-	1
Santo Domingo	-	-	1	-	-	14	1	1	17
South Africa	-	-	-	-	1	-	-	-	1
Spain	-	1	3	3	3	2	1	-	13
Uruguay	-	1	1	1	-	1	-	1	5
Venezuela	-	3	4	3	2	-	-	1	13
Total Non-U.S. Citizens	9	20	27	21	21	36	35	13	182
U.S. Citizens	50	52	71	74	101	161	176	198	883
TOTAL STUDENTS	59	72	98	95	122	197	211	211	1065

*An individual is counted once each Fiscal Year he is training.

Non U.S. Students at PRNC
1957 - June 30, 1965

ARGENTINA

1. Oriel Alva	Radioisotopes Radiotherapy and Cancer
2. Ernesto N. V. Amadey	Radioisotopes Radiotherapy and Cancer
3. Lucas C. Di Rienzo	Radiotherapy and Cancer
4. Héctor Miguel Forcher	Radioisotopes Clinical Applications
5. Aldo Ernesto Lanaro	Radioisotopes Clinical Applications
6. Jorge R. López Verde	Radioisotopes Clinical Applications
7. Marcelino Angel Rispoli	Radioisotopes Clinical Applications
8. Dolores A. Vázquez Retomazo	Radioisotopes
9. Manuel J. Caussi	Radioisotopes Clinical Applications Radiotherapy and Cancer
10. Miguel Mazzei Marino	Fundamentals of Radiological Hygiene
11. Marcelo Bertholds	Radioisotopes

BOLIVIA

1. José Forno Arce	Radioisotopes
2. Mario Vuksanovic	Radiotherapy and Cancer Clinical Applications
3. Pedro Vargas Fernández	Fundamentals of Radiological Hygiene
4. Zoilo Cordero Video	Fundamentals of Radiological Hygiene
5. Enrique Benavides Velasco	Fundamentals of Radiological Hygiene
6. René Balderas López	Fundamentals of Radiological Hygiene

BOLIVIA

7. Mario Iturralde	Radioisotopes Clinical Applications

CHILE

1. Humberto H. García Gallardo	Radioisotopes
2. Fritz Hinzer Windsor	Radioisotopes
3. Adriana MacGinty Dinator	Radioisotopes
4. Carlos R. Sayago Elizondo	Radioisotopes
5. Carlos T. Stevenson	Radioisotopes
6. Italo Zanzi Córdova	Radioisotopes Clinical Applications
7. Luis Bravo Navarrete	MS in Chemistry (Radioisotopes Division)

COLOMBIA

1. Jorge Amaya Pulgarín	Nuclear Science & Technology
2. César Arango Jaramillo	Radioisotopes Clinical Applications
3. Alvaro Ariza Londoño	Radioisotopes Radiotherapy and Cancer
4. Cecilia Arredondo Alba	Radioisotopes
5. Antonio Barragán	Reactor
6. Luis Guerrero Almonacid	Nuclear Science & Technology
7. Manuel Guzmán Jurado	Individual Courses
8. Alberto Jiménez Sánchez	Health Physics
9. Arecio Peñolaza	Radioisotopes
10. Santiago Pinto Vega	Nuclear Science & Technology
11. Guillermo Rodríguez Figueroa	Nuclear Science & Technology
12. Alvaro Rosas	Radiotherapy and Cancer
13. Enrique Sánchez Córdova	Radioisotopes

COLOMBIA

14. José E. Sandoval Sandoval	Nuclear Science & Technology Reactor
15. Leonardo Santamaría	Radioisotopes
16. Jaime Toro Gutiérrez	Nuclear Science & Technology Reactor
17. Arturo Valencia Serna	Radiotherapy and Cancer
18. Antonio J. Gómez Rodríguez	Fundamentals of Radiological Hygiene
19. Edgar Páez Mozo	Nuclear Science & Technology
20. Francisco H. Vasques Vasques	Radioisotopes
21. Nyole Ana Cabruñas de Paéz	Nuclear Science & Technology
22. Marta García y Angulo	Radioisotopes Clinical Applications
23. Augusto Villegas Arango	Fundamentals of Radiological Hygiene

COSTA RICA

1. Leonardo Mata Jiménez	Radioisotopes
2. Reinaldo Monge Valverde	Radioisotopes
3. Alvaro Ortiz Ortiz	Radioisotopes Clinical Applications

CUBA

1. Jorge Alsina Alonso	Nuclear Science & Technology
2. René F. Cárdenas Valdés	Radioisotopes
3. Germán Iasala Suaz	Radioisotopes
4. Orestes Mesa Santiusti	Radioisotopes
5. Carlos Víctor Wheeler	Nuclear Science & Technology

ECUADOR

1. Luis Espinosa Tamayo	Radioisotopes
2. Raúl Edmundo Estrada	Radioisotopes

ECUADOR

3. Ricardo Aníbal Muñoz	Radioisotopes Health Physics
4. Leonor B. Orozco López	Individual Courses
5. Fausto Muñoz Ribadeneira	Nuclear Engineering

EL SALVADOR

1. Vicente Alejandro Rodríguez	Agricultural Bio-Sciences
2. Marina M. Salazar Barahona	Radioisotopes Radiotherapy and Cancer
3. Oscar Nave Rebollo	Fundamentals of Radiological Hygiene

FORMOSA

1. Loh Kong	Agricultural Bio-Sciences

GREAT BRITAIN

1. Barbara Weinbren	Radioisotopes
2. William Bhagan	Biology 372 (Agricultural Bio-Sciences)

GUATEMALA

1. Luis Rodolfo Arroyave Cerna	Radioisotopes Clinical Applications
2. Irma Yolanda Zea Ponce	MS in Chemistry (Radioisotopes Division)
3. Luis Fernando Luna	Radioisotopes Agricultural Bio-Sciences

HAITI

1. Jean Foucauld	Radioisotopes

INDIA

1. Balaji D. Mundkur	Radioisotopes
2. Varadaraja Venkata Raman	Individual Courses

JAPAN

1. Kenkichi Okada	Individual Courses

MEXICO

1. Rodolfo Aguilera Cuenca	Radioisotopes Clinical Applications
2. Antonio Bosch	Radiotherapy and Cancer
3. Guillermo Cassab Hasfura	Radioisotopes Clinical Applications
4. Alfonso L. de Garay y Castro	Radioisotopes
5. Peter L. Eberstadt Sichel	Radioisotopes Clinical Applications
6. Senén E. González Corona	Radioisotopes Clinical Applications
7. Victoria González del Aguila	Radioisotopes
8. Juan Lartigue Gordillo	Nuclear Science & Technology
9. Efraín Navarro López	Radiotherapy and Cancer Clinical Applications
10. Arnoldo de Hoyos	Nuclear Engineering
11. Antonio Quijano Blanca	Clinical Applications
12. Graciela Maytorena Serna	Radiotherapy and Cancer

NICARAGUA

1. José Roberto Bravo Silva	Nuclear Science & Technology
2. Oscar Hidalgo Salvatierra	Health Physics

PANAMA

1. Ismenia Bernal Aizprúa	Fundamentals of Radiological Hygiene
2. Moisés A. Medina Sotillo	Fundamentals of Radiological Hygiene

PARAGUAY

1. Juan Facetti Masulli	Nuclear Science & Technology

PARAGUAY

2. Víctor M. Duarte Molinas	Fundamentals of Radiological Hygiene
3. Margarita López Borjas	Fundamentals of Radiological Hygiene
4. Mario Aguayo Zayas	Fundamentals of Radiological Hygiene
5. José M. Galiano González	Fundamentals of Radiological Hygiene
6. Bernardo Troche Ros	Fundamentals of Radiological Hygiene

PERU

1. Antonio Bullón	Radiotherapy and Cancer
2. Enrique Avila Laguna	Agricultural Bio-Sciences
3. Oscar Gifford	Individual Courses
4. Luis A. Maradiegue Ceballos	Radioisotopes
5. Napoleón Matos Rodríguez	Radioisotopes Radiotherapy and Cancer
6. Juan Reusche	Radiotherapy and Cancer
7. Jorge K. Román Calderón	Radioisotopes
8. Jorge Ernesto Díaz García	Fundamentals of Radiological Hygiene
9. Roberto López Ibarra	Fundamentals of Radiological Hygiene
10. César A. Montero Luna	Fundamentals of Radiological Hygiene
11. René J. Pinelo Molina	Fundamentals of Radiological Hygiene
12. Angel C. Rey Sánchez Gignoux	Fundamentals of Radiological Hygiene

PHILLIPINE ISLAND

1. Francisco Landagora	Radioisotopes

SANTO DOMINGO

1. Rafael González Massenet	Clinical Applications
2. Irka Marina Guzmán Abreu	Radioisotopes
3. Luis Manuel Henríquez Torres	Radioisotopes
4. William Rafael Jerez Brito	Radioisotopes

SANTO DOMINGO

5. Sevil S. Modeste Valerio	Clinical Applications
6. Sonia Elvira Oliva Guerrero	Radioisotopes
7. Andrés Peralta	Radiotherapy and Cancer
8. María M. Sabater de Macarrulla	Radioisotopes
9. José E. Sallent Jurgensen	Radioisotopes
10. Mayra A. Sánchez Cabral	Clinical Applications
11. Lídice M. Tavarez Lucas	Radioisotopes
12. Antonia Altagracia Vázquez	Radioisotopes
13. Víctor Suero Cuevas	Fundamentals of Radiological Hygiene
14. Fabio A. Cabrera Polanco	Fundamentals of Radiological Hygiene
15. Juan M. Moscoso Cordero	Fundamentals of Radiological Hygiene
16. Ramón A. Muñoz Jiménez	Fundamentals of Radiological Hygiene
17. Freddy Sallent Jurgensen	Radioisotopes

SOUTH AFRICA

1. Paul Weinbren	Radioisotopes

SPAIN

1. Ignacio Cantarell Costilla	Nuclear Science & Technology
2. Martina Castells de López	Radiotherapy and Cancer
3. José Manuel Tomé	Radiotherapy and Cancer
4. Jesús Vicente	Radioisotopes
5. José Nieto Iglesias	Biology 372 (Agricultural Bio-Sciences)

URUGUAY

1. Néstor Azziz Jozami	Nuclear Science & Technology
2. Ulises Gelós Peragini	Radioisotopes Clinical Applications

URUGUAY

3. Vicente Julio Medina	Nuclear Science & Technology
4. Luis H. Meyer	Radioisotopes Clinical Applications Health Physics Agricultural Bio-Sciences

VENEZUELA

1. Douglas E. Carrizo Rincón	Radiotherapy and Cancer
2. Guillermo Castillo Castillo	Radioisotopes Clinical Applications
3. Clemencia García Villamil	Radioisotopes Radiotherapy and Cancer
4. Manfred Hartung	Clinical Applications
5. Lía K. Merenfeld	Radiotherapy and Cancer Clinical Applications
6. José R. Ramírez Martínez	Health Physics
7. Modesto Rivero González	Radioisotopes Radiotherapy and Cancer
8. Mario Spinetti	Clinical Applications
9. Vernon Tang Yuk	Nuclear Science & Technology

PUBLICATIONS BY PUERTO RICO NUCLEAR CENTER RESEARCH STAFF

1958 - 1964

Almodóvar, I., and Truman Kohman, Thorium Isotopes Method for Dating Marine Sediments, based on Ph.D. thesis at Carnegie Institute of Technology (1960).

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Participation in Scientific Meetings

1958

Author	Title	Place Presented
Dr. Amador Cobas	Plans for a Health Physics Training Program at the Puerto Rico Nuclear Center	Symposium on Health Physics in Biology and Medicine- May, 1958 San Juan, Puerto Rico
Dr. Víctor Marcial	Cancer Morbidity in Puerto Rico	International Cancer Congress- July, 1958 London, England
	Cancer in the Puerto Rican Woman	Meeting of the Puerto Rico Medical Society- September, 1958 San Juan, Puerto Rico
	The Importance of Cobalt Teletherapy in a Radiotherapy Department	Interamerican Congress of Radiology- Nov., 1958 Lima, Perú
	Cobalt Teletherapy in Cancer	Symposium on Health Physics in Biology and Medicine- May, 1958 San Juan, Puerto Rico

1959

Dr. A. Cintrón Rivera	Hematology	2nd. Interamerican Atoms-for-Peace Symposium May, 1959 Buenos Aires, Argentina
	Vitamin B-12 Absorption in Tropical Sprue	Regional Meeting of the American College of Physicians- Oct., 1959 San Juan, Puerto Rico
	Serium Electrosphoretic Patterns in 1,100 cases of Schistosome mansoni	56th. Annual Meeting of the Medical Association of P.R.- Nov., 1959 San Juan, Puerto Rico

Author	Title	Place Presented
Dr. Juan D. Curet	The Absorption of Gamma and Beta Rays by Weakly Paramagnetic Substances	7th. Latin American Chemical Congress- April, 1959 Mexico City, Mexico
Dr. Víctor Marcial	Cancer of the Tongue	1st. Latin American Cancer Congress- October, 1959 Buenos Aires, Argentina
	Cancer Control in Puerto Rico- Ten Years Experience	56th. Annual Meeting of the Medical Association of P.R., Nov., 1959 San Juan, Puerto Rico
Mrs. I. Rieckehoff Mrs. Consuelo Russo Dr. Juan D. Curet	The Demonstration of Chemical Principles by the Use of Radioisotopes	7th. Latin American Chemical Congress- April, 1959 Mexico City, Mexico
Dr. Fred V. Soltero	Training in Radiochemistry in the Puerto Rico Nuclear Center	7th. Latin American Chemical Congress- April, 1959 Mexico City, Mexico

1960

Dr. Ismael Almodóvar Mr. T.P. Kohman	The Thorium Isotopes Method for Dating Marine Sedimeters	Meeting of the American Chemical Society- September, 1960 New York
Dr. Ismael Almodóvar Rev. I. Cantarell	An Experimental Study of Fatigue in Photomultipliers	Meeting of the American Chemical Society- September, 1960 New York
	A Practical Method for the Compensation of Fatigue Effects	Meeting of the American Chemical Society- September, 1960 New York
Dr. A.M. Andino Dr. A.L. Rodríguez	Radioactive Iodine Treatment in Hyperthyroidism	10th. Annual Meeting of the P.R. Chapter of the American College of Physicians- Oct., 1960 San Juan, Puerto Rico

Author	Title	Place Presented
Dr. Víctor Marcial	Treatment of Cancer of the Tongue	Sectional Meeting P.R. Chapter of the American College of Surgeons- August, 1960 San Juan, Puerto Rico
	Socio-economic Aspects of the Cancer Incidence in Puerto Rico	Conference on Society Culture and Health in the N.Y. Academy of Sciences- June, 1960 New York
Dr. Warren Miller Dr. Eddie Ortiz	Beta Spectra with a Plastic Scintillator	29th. Conference of the American Society of Physics Teachers- January, 1960 New York
	Instructional Laboratory Experiments with a Neutron Source	29th. Conference of the American Society of Physics Teachers- January, 1960 New York
	Compton Spectra	29th. Conference of the American Society of Physics Teachers- January, 1960 New York
Dr. A.L. Rodríguez Dr. Ernesto Marchand	Experience with and Integration of the Diodrast Renogram (a summary of the experience of 70 renograms)	10th. Annual Meeting of the P.R. Chapter of the American College of Physicians- Oct., 1960 San Juan, Puerto Rico
Dr. A.L. Rodríguez	Serial In-Vitro Uptake of Fe-59 by Bone Marrow Suspensions in Different Hematologic States	P.R. Medical Association Meeting- November, 1960 San Juan, Puerto Rico
	1961	
Dr. John C. Bugher	The Puerto Rico Nuclear Center Research Reactor: Characteristics and Program Plans	Symposium on the Programming and Utilization of Research Reactors- October, 1961 Vienna, Austria

Author	Title	Place Presented
Rev. I. Cantarell Dr. Ismael Almodóvar	Fatigue in Photo-multiplier Tubes and its Relationship to the Matter Effect	Meeting of the American Nuclear Society- June, 1961 Pittsburg, Pennsylvania
Dr. John C. Bugher	Health Perspectives of our Radioactive World (The First Annual Bronfman Lecture)	2nd. General Session of the American Public Health Association, 89th. Annual Meeting, Nov., 1961 Detroit, Michigan
Dr. J.L. García de Quevedo	Education and Research Centers	IAEA, Regional Symposium on Education and Nuclear Energy- November, 1961 Bariloche, Argentina
Dr. Henry J. Gomberg	Fission, Fusion and Radiation Energy in a New Dimension	Samuel Sackett Series of Lectures on Nuclear Energy- October, 1961 Chicago, Illinois
Dr. Víctor Marcial	Cancer of the Esophagus	Annual Meeting P.R. Chapter of the American College of Surgeons- February, 1961 San Juan, Puerto Rico
	The Prognostic Value of Cytology in Cancer of the Cervix-Uteri	1st. National Cancer Congress- 7th Radio-logical Workshop- August, 1961 Bogotá, Colombia
	Radiotherapy for Advanced Cancer: Cancer Control Program in Puerto Rico	1st. National Cancer Congress- 7th Radio-logical Workshop- August, 1961 Bogotá, Colombia
	Cancer of the Tongue	American Roentgen Ray Society Meeting- Sept., 1961 Miami, Florida
	Carcinoma of the Esophagus	7th. Interamerican Congress of Radiology- September, 1961 Sao Paulo, Brazil

Author	Title	Place Presented
Dr. Víctor Marcial (Cont.)	Teletherapy Isotope	7th. Interamerican Congress of Radiology September, 1961 Sao Paulo, Brazil
	Cancer Control in Puerto Rico, Twelve Years Experience	National Cancer Institute of Guatemala- November, 1961 Guatemala City
	Treatment of Cancer of the Tongue	12th. National Congress in Medicine of the College of Physicians and Surgeons of Guatemala- November, 1961 Guatemala City
	Cancer of the Esophagus	12th. National Congress in Medicine of the College of Physicians and Surgeons of Guatemala- November, 1961 Guatemala City
	Carcinoma of the Penis, Therapeutic Problems	Annual Meeting of the Radiological Society of North America- Nov., 1961 Chicago, Illinois
Mrs. I. Rieckehoff	Common Ion Effect on Solubility- A demonstration with Radioisotopes	Caribbean Chemistry Conference- April, 1961 University College of the West Indies Kingston, Jamaica
Dr. A.L. Rodríguez	The Role of Calcium on the Intestinal Absorption of Vitamin B-12 in Tropical Sprue	2nd. Annual Meeting of the University of P.R., School of Medicine- June, 1961 San Juan, Puerto Rico
Dr. Edwin Roig	The Thallous-Thallic Exchange at Various Acidities in Perchlorate Media	Caribbean Chemistry Conference- April, 1961 University College of the West Indies Kingston, Jamaica

Author	Title	Place Presented
Dr. H.H. Szmant	Chemistry in Latin America	1st. Interamerican Congress of Chemical Engineers October, 1961 San Juan, Puerto Rico
Dr. Howard J. Teas	Application of Atomic Energy in Agriculture	In response to joint invitation of AEC and the Governor of Nebraska- October, 1961 Lincoln, Nebraska
Dr. José M. Tomé	Carcinoma of the Anterior Two-Thirds of the Tongue	Annual Meeting of the P.R. Medical Association November, 1961 San Juan, Puerto Rico
Dr. Mario Vuksanovic Dr. J.A. del Regato	Carcinoma of the Skin Overlying Cartilage	Annual Meeting of the Radiological Society of N.A.- November, 1961 Chicago, Illinois

1962

Mr. Héctor Barceló	Comparison of Rod Worth by Period and Analog Computer Methods	Conference on Light Water Moderated Research Reactors- June, 1962 Oak Ridge, Tennessee
	Elimination of Control Rod Vibration Caused by Water Flow	Conference on Light Water Moderated Research Reactors- June, 1962 Oak Ridge, Tennessee
Dr. Antonio Bosch	Effects of L-Triiodothyronine in Altering the Response of Kidneys to Cobalt-60 Irradiation	48th. Annual Meeting of the Radiological Society of N.A.- November, 1962 Chicago, Illinois
Dr. Malcolm Daniels	Photochemistry of Thymine Solutions	Colloquium on Photochemical Transformation of Natural Products, 2nd. Int. Symposium- Sept., 1962 Prague, Czechoslovakia
Dr. Juan Facetti	Distribution of Radioactive Antimony Formed by Nuclear Transformation in Antimony Oxides	Eastern Regional Meeting American Chemical Society November, 1962 Gatlinburg, Tennessee

Author	Title	Place Presented
Dr. Henry J. Gomberg	Utilization of Nuclear Energy for Civilian Purposes	7th. Convention of the PAU of Engineering Societies- August, 1962 San Juan, Puerto Rico
Dr. Sergio Irizarry	Case Report of Patient with Carcinoma of Thyroid Treated with I-131	59th. Meeting of the P.R. Medical Association November, 1962 San Juan, Puerto Rico
	The Use of Renogram in the Clinical Evaluation of Carcinoma of the Cervix Uteri	4th. Interamerican Symposium on the Peaceful Applic. of Nuclear Energy- April, 1962 Mexico City, Mexico
Dr. Francis K.S. Koo	Polygenic Variability Induced by Thermal Neutron Irradiation	Annual Meeting of the Radiation Research Society- May, 1962 Colorado Springs, Colorado
Dr. D.B. Linden	Effects of Ionizing Radiation on Paramutation	American Society of Agricultural Sciences October, 1962 Mayaguez, Puerto Rico
Dr. Frank G. Lowman	Accumulation of Radionuclides in Marine Plankton and their Passage through Food Chains	3rd. International Symposium on Water Pollution- Aug., 1962 Cincinnati, Ohio
Dr. Víctor Marcial Dr. Pablo L. Morales	Prognostic Factors in Cancer of the Esophagus	Annual Meeting of the Radiological Soc. of P.R. and the American College of Radiology- Feb., 1962 San Juan, Puerto Rico
Dr. Víctor Marcial	Cancer Mortality in Puerto Rico	59th. Annual Meeting P.R. Medical Assoc.- Nov., 1962 San Juan, Puerto Rico
Dr. Andrew Maretzki	Aspects of Ascorbic Acid Metabolism in Acerola	American Society of Agricultural Sciences October, 1962 Mayaguez, Puerto Rico
	Ascorbic Acid Synthesis	59th. Annual Meeting Puerto Rico Medical Association- Nov., 1962 San Juan, Puerto Rico

Author	Title	Place Presented
Dr. V.J. Medina	The Influence of Copper, Iron, and Form of Nitrogen on Mo99 Uptake in Cajanus indicus	American Society of Agricultural Sciences October, 1962 Mayaguez, Puerto Rico
Dr. Eddie Ortiz	Inelastic Scattering of Iron Using a Neutron Source	Meeting of the American Physical Society January, 1962 New York
Dr. Edwin Roig	The Thallous-Thallic Exchange at Various Acidities in Perchlorate Media	8th. Latin American Congress of Chemistry September, 1962 Buenos Aires, Argentina
Dr. H.H. Szmant	Scientific Documentation in the Field of Chemistry	Seminar on Scientific Documentation in L.A. sponsored by UNESCO September, 1962 Lima, Perú
	The Structure of Beta-Hydroxysulfides Obtained by the Oxidative Addition of Thiols to Olefine	8th. Latin American Congress of Chemistry September, 1962 Buenos Aires, Argentina
	The Synthesis of Intramolecularly Coordinated Boron compounds	8th. Latin American Congress of Chemistry September, 1962 Buenos Aires, Argentina
	Scientific and Technological Resources of Latin America	Seminar on Chemical Industry of L.A. and the Common Market, 8th. L.A. Congress of Chemistry September, 1962 Buenos Aires, Argentina
	The Scientific and Technological Resources of L.A. and the Alliance for Progress	The Johns Hopkins University- April, 1962 Baltimore, Maryland
Dr. William Stucki	An Investigation of the Carotenoid Pigments of Achiote	American Society of Agricultural Sciences October, 1962 Mayaguez, Puerto Rico

Author	Title	Place Presented
Dr. Howard J. Teas	Keto Acids in Some Tropical Plants	Annual Meeting of the Society for Economic Botany- June, 1962 Washington, D.C.
	Inhibition of Banana Fruit Ripening by Gamma Radiation	2nd. International Congress of Radiation Research- Aug., 1962 Harrogate, England
Dr. José M. Tomé	Hodgkin's Disease: Our Experience at the Dr. I. González Martínez Oncologic Hospital	59th. Annual Meeting Puerto Rico Medical Association- Nov., 1962 San Juan, Puerto Rico
Dr. Jeanne Ubiñas	Carcinoma of the Tonsil	Annual Meeting of the Radiological Society of P.R. and the American College of Radiology February, 1962 San Juan, Puerto Rico
Dr. John Villella	Immune Responses to Irradiated Cercariae of Schistosoma Mansoni	American Society of Parasitologists and the Helminthological Society- June, 1962 Washington, D.C.
Dr. J.A. Wethington	Dosimetry from Photon Spectra and Pulse-Height Distributions	2nd. International Congress of Radiation Research- Aug., 1962 Harrogate, England

1963

Dr. Ismael Almodóvar	A Neutron Diffraction Refinement of the Ca WO_4 Structure	International Union of Crystallography- September, 1963 Rome, Italy
	Method for the Isolation of Thorium from Siliceous Materials	2nd. Caribbean Chemical Symposium- August, 1963 Río Piedras and Mayaguez, Puerto Rico
	New Results in the Search for Alpha Particles from the Thermal Neutron-Induced U^{238} (n, α) Th^{235} Reaction	Physics Department of the University of Bonn September, 1963 Bonn, Germany

Author	Title	Place Presented
Dr. Ismael Almodóvar Rev. I. Cantarell Dr. Helmut Bielen	Search for Alpha Particles from Thermal Neutron-Induced U^{238} (n, α) Th^{235} Reaction	2nd. Caribbean Chemical Symposium- August, 1963 Río Piedras and Mayaguez, Puerto Rico
Dr. Helmut Bielen	Determination of Dissociation Vapour Pressure and Structure of Some Heavy Metal Sulfides	2nd. Caribbean Chemical Symposium- August, 1963 Río Piedras and Mayaguez, Puerto Rico
Dr. John C. Bugher	Nuclear Centers in Latin America: their part in Scientific Development	Study Group Meeting on Research Reactor Utilization
Rev. I. Cantarell Dr. J.A. Gonzalo	Transient Radiation Effects on Electron Emission of High-Resistivity Layers	American Nuclear Society November, 1963 New York
Rev. I. Cantarell	Time-Dependent Schottky Emission in Photomultiplier Tubes	American Nuclear Society November, 1963 New York
Dr. Malcolm Daniels Dr. Alec Grimison	Photochemistry of Thymine	2nd. Caribbean Chemical Symposium- August, 1963 Río Piedras and Mayaguez, Puerto Rico
Dr. B. Chalmers Frazer	Magnetic Ordering in Some Related Orthorhombic Cmcm and Pnma Structures	Symposium on Ferro-Magnetism and Ferro-electricity, June, 1963 Leningrad, Russia
Dr. Sergio Irizarry	Fat Absorption Study with I-131 Labelled Oleic Acid in Patients with Cancer of the Uterine Cervix Receiving Cobalt Radiation to the Abdomen	Thirty Second Annual Meeting of the P.R. Dietetic Association June, 1963 San Juan, Puerto Rico
Dr. Mortimer Kay	Neutron Diffraction Studies at the Puerto Rico Nuclear Center	International Colloquium of Neutron Diffusion and Diffraction- Sept., 1963 Grenoble, France

Author	Title	Place Presented
Dr. Francis K.S. Koo	Actions of 5-Bromouracil Deoxyriboside on Plant Chromosomes	11th. International Congress of Genetics September, 1963 Scheveningen, The Netherlands
Dr. Duane B. Linden	Effects of Radiation on Paramutation	11th. Annual Meeting of the Radiation Research Society May, 1963 Milwaukee, Wisconsin
	Radiation Induced Modification of Paramutation Expression	11th. International Congress of Genetics September, 1963 Scheveningen, The Netherlands
Dr. Duane B. Linden Mr. José Cuevas Mr. Vicente Rodríguez	Use of the PRNC Gamma Irradiation Facility in Agricultural Research	Fall Meeting of the American Society of Agricultural Sciences October, 1963 Mayaguez, Puerto Rico
Dr. Frank G. Lowman	Activation Analysis Method for Scandium, Antimony, and Phosphorus	2nd. Caribbean Chemical Symposium- Aug., 1963 Río Piedras and Mayaguez, Puerto Rico
Dr. Robert A. Luse Dr. Henry J. Gomberg	Resonance Radiation Effects of Low-Energy Monochromatic X-rays on Catalase	11th. Annual Meeting of the Radiation Research Society May, 1963 Milwaukee, Wisconsin
	Resonance Radiation Effects of Low-Energy Monochromatic X-rays on the Mettaloenzyme Catalase	2nd. Caribbean Chemical Symposium- Aug., 1963 Río Piedras and Mayaguez, Puerto Rico
Dr. Robert A. Luse	Basic Mechanisms in the Radiation Chemistry of Proteins and Nucleic Acids in Aqueous Media	Conference on Basic Mechanisms in the Radiation Chemistry of Aqueous Media May, 1963 Gatlinburg, Tennessee

Author	Title	Place Presented
Dr. Víctor Marcial	Cancer of the Penis	9th. Congress of the Pan Pacific Surgical Association November, 1963 Honolulu, Hawaii
Dr. Víctor Marcial Dr. José M. Tomé	Radiotherapy in Carcinoma of Cervix Uteri	Annual Meeting of the Western Branch of the P.R. Medical Association April, 1963 Mayaguez, Puerto Rico
Dr. F.J. Muñoz Miss Milagros Miró	Effect of Copper Sulfate on the Ceric Dosimetry System	2nd. Caribbean Chemical Symposium- August, 1963 Río Piedras and Mayaguez, Puerto Rico
Dr. Eddie Ortiz Dr. Juan Facetti	High Energy Gamma Photons-Neutron Conversion Device for Half-Life Measurements	American Physical Soc. January, 1963 New York
Dr. H. Harry Szmant Mr. E.P. Olavarría	Base-catalyzed Formation of Imidates	2nd. Caribbean Chemical Symposium- August, 1963 Río Piedras and Mayaguez, Puerto Rico
Dr. H. Harry Szmant Dr. Edwin Roig Mr. Raúl H. Figueroa	Association Constants for Sulfoxide-Phenol Complexes	2nd. Caribbean Chemical Symposium- August, 1963 Río Piedras and Mayaguez, Puerto Rico
Dr. David Walker Mrs. Adela Alemañy	Longevity of Adult Diatrea saccharalis (Fab.) Crambinae, Pyralididae, Lepidoptera	Fall Meeting of the American Society of Agricultural Sciences October, 1963 Mayaguez, Puerto Rico
Dr. David Walker	Mating Behavior and Fecundity of Diatrea saccharalis	Entomological Society of America Meeting December, 1963 St. Louis, Missouri
	Mating Behavior of the Sugar-Cane Borer, Diatrea saccharalis (Fab.) Crambinae, Pyralididae, Lepidoptera	Fall Meeting of the American Society of Agricultural Sciences October, 1963 Mayaguez, Puerto Rico

Author	Title	Place Presented
Dr. David Walker Mr. Miguel Figueroa	Oviposition by Diatrea saccharalis (Fab.) Crambinae, Pyralididae, Lepidoptera	Fall Meeting of the American Society of Agricultural Sciences October, 1963 Mayaguez, Puerto Rico
Dr. M. P. Weinbren	Rift Valley Fever and Nairobi Sheep Disease	7th. International Cong. of Tropical Medicine and Malaria September, 1963 Río de Janeiro, Brazil
Dr. Owen H. Wheeler Mrs. E.G. de Rodríguez	Acid-catalyzed Solvolysis of Some Substituted -γ- Butyrolactones and -γ- Valerolactones	2nd. Caribbean Chemical Symposium- August, 1963 Río Piedras and Mayaguez, Puerto Rico
Dr. Owen H. Wheeler Mr. D. González	Oxidation of Primary Aromatic Amines with Manganese Dioxide	2nd. Caribbean Chemical Symposium- August, 1963 Río Piedras and Mayaguez, Puerto Rico

1964

Rev. I. Cantarell Dr. Eddie Ortiz Mr. Heriberto Plaza	Experimental Demonstration of Neutron Albedo in Water	XXXIII Annual Meeting of the American Assoc. of Physics Teachers January 20-25, 1964 New York City
Rev. I. Cantarell	A. General Time Effect of the Schottky Type	Latin American Conference on Nuclear Spectroscopy and Solid State Physics February 24-27, 1964 Lima, Perú
Rev. I. Cantarell	Excitons and Color Centers in MgO	Latin American Conference on Nuclear Spectroscopy and Solid State Physics February 24-27, 1964 Lima, Perú
Rev. I. Cantarell Dr. Juan Facetti Miss Eloísa Trabal Mr. Ricardo Vega	Neutron Radiation Effects on Solid State Detectors	Latin American Conference on Nuclear Spectroscopy and Solid State Physics February 24-27, 1964 Lima, Perú

Author	Title	Place Presented
Rev. I. Cantarell Rev. José M. Brussi Dr. Julio A. Gonzalo	Variation of the Internal Field Produced by Gamma Irradiation in Tryglicine Sulfate Crystals by an A.C. Field	Latin American Conf. on Nuclear Spectroscopy and Solid State Physics February 24-27, 1964 Lima, Perú
Dr. Juan F. Facetti Miss Eloísa Trabal Mr. Sigfredo Torres	Distribution of Sb^{125} Formed in Tin Compounds by Neutron Capture	Latin American Conf. on Nuclear Spectroscopy and Solid State Physics February 24-27, 1964 Lima, Perú
Rev. I. Cantarell	Properties, Mechanism and Experimental Reduction of Effects of the Time Dependent Field Emission of Photomultiplier Tubes (PRNC-32)	Ninth Scintillation and Semiconductor Counter Symposium February 26-28, 1964 Washington, D.C.
Rev. I. Cantarell	Reduction of Fatigue Effects in Photomultiplier Tubes	Ninth Scintillation and Semiconductor Counter Symposium February 26-28, 1964 Washington, D.C.
Dr. Juan F. Facetti	Trace Analysis in Water from Lake Ypacaraí	Inter-American Symposium on the Peaceful Applic. of Nuclear Energy March 9-13, 1964 Valparaíso, Chile
Dr. Frank G. Lowman	Investigations in Trace Element Distribution in Marine Water and Sediments	Inter-American Symposium on the Peaceful Applic. of Nuclear Energy March 9-13, 1964 Valparaíso, Chile
Dr. Robert Stevenson	Stable Element Analysis of Some Marine Organisms	Inter-American Symposium on the Peaceful Applic. of Nuclear Energy March 9-13, 1964 Valparaíso, Chile
Dr. H. Harry Szmant Mr. Juan J. Rigau	The Structure of Four Isomeric 2-Phenyl-sulfinylindanols	Symposium dealing with "Organic Sulphur Comp." 147th. Nat'l. Meeting of the American Chem. Soc. April 6-10, 1964 Philadelphia, Pa.

Author	Title	Place Presented
Dr. Agustín Cajigas	Virus Studies Conducted in the Laboratories of the PRNC by a Combined Team from PRNC, the Puerto Rico Dept. of Health, and the U.S. Public Health Service, Communicable Disease Center, Atlanta, Georgia	British Ninth Scientific Meeting- April 13, 1964 Kingston, Jamaica
Dr. H. Harry Szmant	Informe sobre la Situación Actual de las Revistas Científicas y Técnicas Latinoamericanas: Quimica	UNESCO Meeting - Centro de Cooperación Científica de la América Latina University of Puerto Rico April 28 - May 1, 1964 Río Piedras, Puerto Rico
Dr. Julio A. Gonzalo	Polard Anisotropy Centers in Gamma-Irradiation Tryglicine Sulfate	American Physical Soc. Meeting- April 30, 1964 Washington, D.C.
Dr. Malcolm Daniels	Photoreactions of Some D.N.A. Bases	International Photo-biology Congress July 26-30, 1964 Oxford, England
Dr. Mortimer Kay Dr. A.S. Andresen Dr. Peter Ficher	A Neutron Diffraction Study of CaNH and CaND	Amer. Crystallographic Association Meeting July 26-31, 1964 Bozeman, Montana
Dr. Mortimer Kay Dr. R.A. Young Dr. R. Goodman	Goniostats for Siemens and Philips Diffracto-meter	Amer. Crystallographic Association Meeting July 26-31, 1964 Bozeman, Montana
Dr. Mortimer Kay Dr. R.A. Young Dr. A.S. Posner	X-Ray and Neutron Refinement of Hydroxi-apatite	Amer. Crystallographic Association Meeting July 26-31, 1964 Bozeman, Montana
Prof. K. Soderstrom Prof. R.B. Knight	PRNC Engineering and Related Activities	Eighth Convention of the Pan American Union of Engineering Assoc. (UPADI) August 17-21, 1964 Caracas, Venezuela

Author	Title	Place Presented
Dr. Aldo E. Lanaro Dr. Sergio Irizarry Dr. Mario Iturralde Dr. Manuel Paniagua Miss Zenaida Frías	Evaluation of the Renal Condition in Diabetics Using Radioactive Isotopes	1st. International Cong. of Nuclear Biology and Medicine- Sept. 21-25, 1964 Sao Paulo, Brazil
Dr. Antonio Bosch	Cancer of the Anterior 2/3 of the Tongue	8th. Inter-American Congress of Radiology October 2-9, 1964 Caracas, Venezuela
Dr. Antonio Bosch	Management of Cancer of the Uterine Cervix Associated with Pregnancy	8th. Inter-American Congress of Radiology October 2-9, 1964 Caracas, Venezuela
Dr. Víctor Marcial	Irradiación Pre-operatoria	8th. Inter-American Congress of Radiology October 2-9, 1964 Caracas, Venezuela
Dr. Víctor Marcial	Radioterapia Convencional y Supervoltaje	8th. Inter-American Congress of Radiology October 2-9, 1964 Caracas, Venezuela
Dr. Víctor Marcial	Significance of the Presence of Exfoliated Tumor Cells in Cases with Carcinoma of the Uterine Cervix after Radiation Therapy	8th. Inter-American Congress of Radiology October 2-9, 1964 Caracas, Venezuela
Dr. Víctor Marcial	The Radiologist & Cancer Control Activities in a Community	8th. Inter-American Congress of Radiology October 2-9, 1964 Caracas, Venezuela
Dr. José M. Tomé	Cancer of the Nasopharynx	8th. Inter-American Congress of Radiology October 2-9, 1964 Caracas, Venezuela
Dr. Jeanne Ubiñas	Cancer of the Tonsil	8th. Inter-American Congress of Radiology October 2-9, 1964 Caracas, Venezuela

Author	Title	Place Presented
Dr. Jeanne Ubiñas	Prognosis in Adenocarcinoma of the Uterine Cervix	8th. Inter-American Congress of Radiology October 2-9, 1964 Caracas, Venezuela
Mr. José Cuevas Ruíz	Agricultural Applications of the PRNC Cobalt-60 Gamma Irradiation Facility	Caribbean Food Crops Society Meeting October 18-24, 1964 Bridgetown, Barbados
Dr. Duane B. Linden	Extending Shelf Life of Mangoes with Irradiation	Caribbean Food Crops Society Meeting October 18-24, 1964 Bridgetown, Barbados
Dr. Víctor Marcial	Significance of the Presence of Exfoliated Tumor Cells in the Vaginal Smear in Patients Treated with Radiation for Carcinoma of the Uterine Cervix	Sixty-Second Annual Meeting of the Puerto Rico Medical Assoc. November 12, 1964 San Juan, Puerto Rico
Dr. Aldo E. Lanaro Dr. Sergio Irizarry	Significance of Scintigraphic, Clinical, and Pathologic Studies of Thyroid Nodules	1st. Argentinian Symposium of Nuclear Medicine November 19-21, 1964 Mendoza, Argentina
Dr. David Walker Mrs. Adela Alemañy Mr. Miguel Figueroa	Induced Sterility of Diatrea saccharalis (Fab.) by Gamma Radiation	Entomological Soc. of American Meetings Nov. 30 - Dec. 3, 1964 Philadelphia, Pa.
Dr. Juan Facetti Miss Eloísa Trabal Mr. Sigfredo Torres	Thermal Annealing of Neutron Irradiated Antimony Compounds	Annual Winter Meeting of the Amer. Nuclear Society Nov. 30 - Dec. 4, 1964 San Francisco, Cal.
Dr. Víctor Marcial	Cancer of the Mouth and Pharynx, Diagnostic and Treatment Problems	2nd. State Odontological Conf. Division of Oral Health of the Commonwealth of P.R. Dept. of Health December 9, 1964 San Juan, Puerto Rico

PRNC Weekly Seminars - Río Piedras

1961

DATE	LECTURER	TITLE OF LECTURE
Sept. 1	Dr. John C. Bugher Director*	Some Probability Considerations in Experimental Biology
8	Dr. Howard J. Teas Head, Agricultural Bio-Sciences Division*	DNA Genes and Radiation
15	Dr. Sergio Irizarry Head, Clinical Applications Division*	Total Body Counting in Metallic Research and Clinical Diagnosis
22	Dr. José A. Ferrer-Monge Head, Health Physic Div.*	Chemical Changes on Leaves and their use in Dosimetry
29	Dr. Robert A. Luse Associate Scientist Agricultural Bio-Sciences Division*	Enzyme Inactivation by Ultra-violet Radiation
Oct. 6	Dr. Amador Cobas Associate Director*	Physico-Chemical Aspects of the Interaction of Radiation with Matter
13	Dr. Conrado F. Asenjo Dept. of Biochemistry and Nutrition, School of Medicine, U.P.R.	Fecal-Fat and Tropical Sprue
20	Dr. Carlos García Benítez Dept. of Biology, U.P.R.	On the Increase of Sites for Chromosome Exchange Formation After Chromosome Duplication
27	Dr. Herminio M. Brau Radioisotopes Division*	Applied Research in Alcohol Technology
Nov. 3	Padre Ignacio Cantarell Nuclear Science & Technology Division*	Multi-Channel Pulse Height Analyzer
10	Dr. Ismael Almodóvar Head, Nuclear Science & Technology Division*	Tritium Labelling of Organic Compounds

DATE		LECTURER	TITLE OF LECTURE
Nov.	17	Mr. Alfonso Riera and Mr. Julián Roldán Agricultural Experiment Station, Río Piedras	Radioactive Iron 59 in Tropical Crops
	24	Capt. Charles R. Angel U. S. Army Tropical Research Medical Laboratory	Biological Dosimetry
Dec.	1	Dr. Leopoldo R. Cerecedo School of Medicine, U.P.R.	Tumor-host relationship studied in vivo and in vitro
	8	Dr. Edwin Roig Head, Radioisotopes Application Division*	Kinetics of the Tl (I)-Tl (III) Exchange in Perchlorate Media
	15	Dr. Víctor Marcial Head, Radiotherapy and Cancer Division*	Exfolliative Cytology in the Evaluation of Radiation Response of Cancer of the Cervix Uteri

1962

Jan.	12	Dr. J. A. Bonnet Agricultural Experiment Station, Río Piedras	Recent Investigations on the maturity of sugar cane in Puerto Rico
	19	Dr. Juan D. Curet Dean, Faculty of Natural Sciences, U.P.R.	The Concept Temperature
	26	Dr. W. Van Sciver Dept. of Physics College of Natural Sciences U.P.R.	The Physics of Radiation Detection and Measurements
Feb.	2	Dr. J. Oliver González School of Medicine, U.P.R.	Serological Diagnosis of Bilharziosis
	9	Dr. Raúl Marcial Dept. of Pathology School of Medicine, U.P.R.	Irradiation Injuries to Elastic Arteries
	16	Dr. L. del Rosario Dept. of Physics College of Natural Sciences U.P.R.	The Van de Graaff Generator and its Applications
	23	Dr. R. García Palmieri School of Medicine, U.P.R.	Coronary Artery Disease

DATE	LECTURER	TITLE OF LECTURE
March 2	Miss M. Palacios Radiotherapy and Cancer Division*	Phosphate Glass Dosimeters; Theory and Application
9	Dr. J. L. García de Quevedo Associate Director*	PRNC 1 Megawatt Research Reactor
16	Dr. Gustavo Candelas Dept. of Biology, U.P.R.	Mechanism involved in the association of the cells of sponges
30	Dr. R. Córdova Biology Department, U.P.R.	Bacterial Viruses
April 6	Dr. G. T. Blasini	Experimental Studies in Histoplasmosis
13	Dr. L. Haddock Dept. of Medicine School of Medicine, U.P.R.	Mode of Activation of Thyroid Hormones
27	Dr. O. Ramírez Torres Dept. of Chemistry, U.P.R.	The Inadequacy of the Present Long Form Periodic Chart
May 4	Dr. A. Pomales Dept. of Microbiology School of Medicine, U.P.R.	Fluorescence Techniques in Biological Research
11	Dr. J. Tomé Radiotherapy and Cancer Division*	Blood Biochemical Changes in Cancer Patients
18	Dr. H. H. Szmant Radioisotopes Application Division*	Radio Protective and Radio Sensitizing Agents
25	Dr. Leo Lathroum College of Pharmacy, U.P.R.	Cyanogen with Grignard Reagents
June 1	Miss H. Pabón Radicisotopes Application Division*	Determination of Maximum Permissible Exposure
8	Dr. F. Ramos Morales School of Medicine, U.P.R.	The Meaning of the Bilharzia Infection
15	Mr. José Janer Dept. of Health of P. R.	Demographic changes in Puerto Rico and their implications in the socio-economic development of the Commonwealth

DATE	LECTURER	TITLE OF LECTURE
June 22	Dr. Ricardo Méndez Bryan Dept. of Medicine School of Medicine, U.P.R.	Towards a geography in Rheumatoid Arthritis
29	Dr. R. Santini School of Medicine, U.P.R.	Precursors of the Folic Acid Active Factors of Blood
July 6	Dr. José del Castillo Dept. of Pharmacology School of Medicine, U.P.R.	Impulse Transmission across the Nerve-Muscle Junction
13	Dr. Duane Linden Agricultural Bio-Sciences Division*	Paramutation
20	Dr. Maurice P. Weinbren Head, Medical Sciences & Radiobiology Division*	Quantitative Aspects of Single-Cycle Virus Replication in an Intact Animal
Aug. 3	Dr. Frank Lowman Marine Biology Program*	Cycling of Elements in the Sea
10	Mrs. S. del Campo Radiotherapy & Cancer Div.*	Fluctuations in Sex Chromation during the Menstrual Cycle
17	Dr. Owen Wneeler Nuclear Science & Technology Division*	Kinetic Isotope Effect
24	Dr. Barbara Weinbren Clinical Applications Div.*	Study of the Serum Protein of Hippopotamus Linnacus
31	Mr. Héctor Barceló Head, Reactor Division*	Core-Physics Studies of PRNC Swimming Pool Reactor
Sept. 7	Dr. R. Levins Dept. of Biology Faculty of Natural Sciences U.P.R.	Optimum Genetic Systems
14	Dr. Paul Weinbren Head, Medical Sciences & Radiobiology Division*	Discussion of Arthropod-borne Viruses
21	Dr. José Maldonado School of Medicine, U.P.R.	Biological Studies on Schistosoma Mansoni
28	Dr. H. Heatwole Biology Dept., Faculty of Natural Sciences, U.P.R.	Detection of Hosts and mates by Megarhyssa a genus of parasitic insects

DATE		LECTURER	TITLE OF LECTURE
Oct.	5	Dr. Malcolm Daniels Radioisotopes Division*	Radiation Chemistry of Aqueous Solution, a Survey
	19	Dr. Evelina Ortiz Biology Dept., Faculty of Natural Sciences, U.P.R.	Pigments in Lizards
	26	Miss M. M. Palacios Radiotherapy & Cancer Div.*	Analog Dosimetry
Nov.	2	Mrs. Graciela Candelas Dept. of Biology, U.P.R.	CO_2 Fixation in Marine Invertebrates
	9	Dr. H. Harry Szmant Radioisotopes Division*	Modern Concepts of Organic Chemistry
	16	Dr. Robert Luse Agricultural Bio-Sciences Division*	Sucrose in Sugarcane by Isotope Dilution
	23	Dr. John C. Bugher Director*	Intracellular Atomic Nuclear Events and Lethality
	30	Mr. F. Sánchez Nieva Agricultural Experiment Station, U.P.R.	The Polarographic Determination of Dissolved Oxygen in Nectars
Dec.	7	Dr. Víctor Marcial Head, Radiotherapy & Cancer Division*	Cancer of the Penis
	14	Dr. C. García Benítez Dept. of Biology, Faculty of Natural Sciences, U.P.R.	CO_2 Effect on Chromosome Aberrations
	21	Dr. Andrew Maretzki Agricultural Bio-Sciences Division*	Aspects of Ascorbic Acid Metabolism in Acerola
	28	Dr. Marcelo Bertholds Clinical Applications Div.*	Potentialities of Autoradiography in Medical Research in Puerto Rico

1963

Jan.	4	Dr. E. Toro Goyco Radioisotopes Service Veterans Administration Hospital, San Juan	The Uptake of Radioactive Triiodo-thyronine by erythrocytes: uses and limitations

DATE		LECTURER	TITLE OF LECTURE
Jan.	18	Dr. Juan D. Curet Dean, College of Natural Sciences, U.P.R.	Weak Paramagnetism of Inorganic Salts of the Type K_nXO_4
	25	Dr. Oriel Alva Radiotherapy & Cancer Div.*	Radiobiology of the Eye
Feb.	1	Dr. John A. Wethington Reactor Division*	Dosimetry from Photon Spectra and Pulse-Height Distribution
	8	Dr. Andrew Maretzki Agricultural Bio-Sciences Division*	Aspects of Ascorbic Acid Metabolism in Acerola
	15	Dr. J. H. Simons Professor of Chemistry University of Florida	Space, Time and Energy
March	1	Dr. Marcelo Bertholds Clinical Applications Div.*	Potentialities of Autoradiography in Medical Research in Puerto Rico
	8	Dr. Julio V. Rivera Radioisotopes Service Veterans Administration Hospital, San Juan	Triolein Absorption
	15	Dr. Sergio Irizarry Head, Clinical Applications Division*	Introduction to Human Gamma-Radiography
	29	Dr. Antonio Bosch Radiotherapy & Cancer Div.*	Nephritis Post-radiation
April	5	Mrs. Graciela Candelas Dept. of Biology, U.P.R.	CO_2 Fixation in Marine Invertebrates
	19	Dr. A. Grimison Chemistry Dept., U.P.R.	The Photochemistry of Thymine Solutions
	26	Dr. H. J. Gomberg Deputy Director*	Investigation of Resonance in Radiation Effects
May	3	Miss Zenaida Frías Radiotherapy and Cancer Division*	Statistics in a Nutshell
	8	Dr. I. V. Khanolkar Director Emeritus Tatta Cancer Research Institute, Bombay, India	Cancer Research in India
	17	Dr. Edwin Roig Head, Radioisotopes Div.*	Szilard Chalmers Reactions in Solids

DATE		LECTURER	TITLE OF LECTURE
May	24	Dr. José M. Tomé Radiotherapy & Cancer Div.*	Hodgkin's Disease
	31	Dr. Amador Cobas Associate Director*	Electrical Conductivity in Organic Solids
June	7	Mrs. M.M. Palacios de Lozano Radiotherapy & Cancer Div.*	Radiotherapy Analog Dosimetry
	14	Dr. H. H. Szmant Radioisotopes Application Division*	Organic Chemistry Research Projects in the Radioisotopes Division
	21	Dr. Richard Biebl Plant Physiology Institute University of Vienna, Austria	The Effects of Ionizing Radiation in Plants
	28	Dr. Charles Gifford Professor of Comparative Physiology, Alfred University New York	Regulation of Blood Concentration of the Land Crab, Cardosoma
July	5	Dr. Víctor Marcial Head, Radiotherapy and Cancer Division*	Cancer of the Esophagus in Puerto Rico
	12	Dr. Paul Weinbren Head, Medical Sciences and Radiobiology Division*	Techniques Used in Arbovirology
	19	Dr. S. Y. Tyree Professor of Chemistry University of North Carolina	The Problem of Valence State Ionization Energies
	26	Miss Heidi Pabón Health Physics Division*	Semiconductors as Radiation Detectors
Aug.	2	Mr. Glenn Rowden Technical Representative Coulter Electronics Co. Florida	Theory and Application of the High Speed Automatic Suspended Particle Counter and Size Analyzer
	9	Dr. Eugene Odum Department of Biology University of Georgia	Some Aspects of Radiation Ecology
	16	Dr. Robert Luse Agricultural Bio-Sciences Division*	Effects of Monochromator X-rays in Metallo-enzymes
	23	Miss Vicky Meyers Radioisotopes Division*	Photochemistry of the Alkyl Halides

DATE		LECTURER	TITLE OF LECTURE
Aug.	30	Dr. Phillys Kahl Professor University of Georgia	Food Ecology of the Wood Stock in Florida: A Study of Behavioral and Physiological Adaptations to Seasonal Drought
Sept.	6	Miss Margaret Nickle Medical Sciences and Radiobiology Division*	Pleuro Pneumonia Like Organisms and Their Control
	13	Dr. A. J. Drummond Chief, Research Division Eppley Co. Newport, Rhode Island	Philosophy of Photometrics
	20	Dr. Jeannie Ubiñas Radiotherapy & Cancer Div.*	Carcinoma of the Tonsil
	27	Dr. Efraín Navarro Radiotherapy & Cancer Div.*	Carcinoma of the Lung
Oct.	4	Dr. José Oliver González Dept. of Parasitology School of Medicine, U.P.R.	Biological Functions of Antigenic Substances from Parasites
	11	Dr. Waldemar Adam Professor of Chemistry, U.P.R.	Electron Spin Resonance in Aromatic Hydrocarbons
	18	Mr. Manuel Vélez Professor, Dept. of Biology U.P.R.	Some Aspects of the Geographic Distribution of Diplopodes in Puerto Rico
	25	Dr. Aldo E. Lanaro Clinical Applications Div.*	Thyroid Function in the Republic of Argentina
Nov.	1	Dr. Max Wilson Professor of Philosophy CAMA, U.P.R.	The Philosophy of Science
	8	Mr. José E. Goyco Dept. of Biology School of Medicine, U.P.R.	Biological Evaluation of the Important Legumes in Puerto Rico
	15	Dr. J. D. Ovington Head, Woodland Section Nature Conservancy in Great Britain	Mineral Cycles in Woodlands
	29	Dr. Andrew Maretzki Agricultural Bio-Sciences Division*	Regulatory Mechanisms in Metabolism

DATE		LECTURER	TITLE OF LECTURE
Dec.	6	Dr. Malcolm Daniels Radioisotopes Division*	Molecular Basis of Phctobiological Effects of 2537Å Radiation
	13	Dr. Arne Sollberger Dept. of Pharmacology School of Medicine, U.P.R.	Statistical Problems in Biological Rhythms Research
	20	Mr. Clayton Gist Research Assistant University of California	U.C.L.A. Nuclear Test Site Activity

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Jan.	10	Dr. Diego Roca Franceschi Auxilio Mutuo Hospital Río Piedras, P. R.	Dizziness, Vertigo and Syncope
	24	Dr. Simon Fried Brookhaven National Laboratory	Resolution of States and Reactivities in Chemistry and Bio-Chemistry at Low Temperature
	31	Dr. Juan D. Curet Dean of Natural Sciences U.P.R.	The Quanticule Theory of Molecular Structure
Feb.	7	Dr. José Joaquín Figueroa School of Medicine, U.P.R.	Tumor of the Upper Urinary Tract
	14	Dr. Germán Malaret Chief, Dept. of Medicine Oncolcgical Hospital of P.R.	Hypertension
	21	Dr. Waldemar Adam Professor of Chemistry, U.P.R.	Electron Spin Resonance: Electron Transfer Reactions
	28	Dr. Sergio Irizarry Head, Clinical Applications Division*	Effects of Radiation on Intestinal Absorption in Humans
March	6	Mrs. Rosa Santana de Tirado Dept. of Chemistry, U.P.R.	The Effects of Beta Radiations on Certain Inorganic Salts
	13	Mrs. Graciela Candelas Professor of Biology, U.P.R.	Biochemistry of Amphibian Metamorphosis: Study and Local Forms
	20	Dr. H. Harry Szmant Radioisotopes Division*	Research in Sulphur Compounds

DATE		LECTURER	TITLE OF LECTURE
April	3	Dr. Howard T. Odum Head, Terrestrial Ecology Program: Part I*	Circuits of the Ecosystem
	10	Dr. Antonio Bosch Radiotherapy & Cancer Div.*	Cervix-Uterine Carcinoma and Pregnancy
	17	Dr. Luis F. Vallecillo Head, Dept. of Surgery Oncologic Hospital of P. R.	"Tumores de Mediastino"
	24	Dr. Manuel García Morín Ad Honorem*	Theoretical Interpretation of Some Aspects of Nuclear Magnetic Resonance
May	1	Dr. Owen H. Wheeler Head, Nuclear Science and Technology Division*	Hot Atom Chemistry of Organic Compounds
	8	Miss Zenaida Frías Radiotherapy & Cancer Div.*	Pitfalls in Medical Statistics
	15	Dr. José M. Tomé Radiotherapy & Cancer Div.*	"Tumor de Wilm"
	22	Dr. Amador Cobas Associate Director*	Fundamentals of Solid State Physics
	29	Dr. Alec Grimison Radioisotopes Division*	Excited States
June	5	Miss Heidi Pabón Health Physics Division*	The Dosimetric Applications of Thermoluminescense
	12	Mrs. M.M. Palacios de Lozano Radiotherapy & Cancer Div.*	Research Progress in LiF Dosimetry
	19	Dr. Iván Pelegrina, Head Dept. of Obstetrics and Gynecology, U.P.R. School of Medicine	Present Trends in Obstetrics
	26	Dr. John B. Villella Medical Sciences and Radiobiology Division*	Immunity to Parasitic Worms (Helminths)
July	3	Dr. José E. Medina Radiologist, University Hospital in Río Piedras	Mamography
	10	Dr. Helmut J. Bielen Neutron Diffraction Program*	Investigations with X-rays and Thermal Neutrons

DATE		LECTURER	TITLE OF LECTURE
July	24	Dr. A. Cajigas Ad Honorem*	The Dengue Epidemic
	31	Dr. Kenkichi Okada Neutron Diffraction Program*	Radiation Effects in Ferroelectrics
Aug.	7	Dr. Haydee Estremera Assistant Professor of Chemistry, U.P.R.	Imidazoles as Enzymatic Models for Phosphatase Activity
	14	Lt. Col. Michael P. Dacquisto Director, U. S. Army Tropical Research Medical Laboratory	Study of Human Chromosomes
	21	Dr. Charles Norman Professor of Biology University of West Virginia	Effects of Aging on D.N.A.
	28	Dr. Alec Grimison Ad Honorem*	Fate of Excited States
Sept.	4	Dr. Thomas Tosteson Assistant Professor of Biology University of Puerto Rico	The Effect of the Melanocyte Hormone on the Osmotic Properties of Isolated Frog Skin
	11	Dr. Raúl Marcial, Head Dept. of Pathology School of Medicine, U.P.R.	Lung Tumors
	18	Dr. Víctor A. Marcial Head, Radiotherapy & Cancer Division*	Significance of Persistent Tumor Cells in the Vaginal Smear of Patients Treated with Radiation for Carcinoma of the Cervix Uteri
	25	Dr. Malcolm Daniels Radioisotopes Division*	Photo-Reactions of Naturally Occurring Pyrimidenes
Oct.	2	Dr. Máximo Cerame Vivas Assistant Professor of Biology University of Puerto Rico	Distribution of Benthic Marine Invertebrates
	9	Dr. Alfredo Torruella Lecturer, Physics Department University of Puerto Rico	Nuclear Forces
	16	Dr. José Noel Correa Radiotherapy and Cancer Division*	Theoretical Considerations of Radiobiology Applied to Human Cancer Radiotherapy

DATE	LECTURER	TITLE OF LECTURE
Oct. 23	Dr. Robert A. Luse, Head Agricultural Bio-Sciences Division*	Effects of Low Energy X-rays on Biological Systems
30	Dr. Robert A. Stevenson Associate Scientist Marine Biology Program*	Stable Element Composition of Marine Animals and Plants
Nov. 6	Dr. Elí Ramírez Chief, Medical Services San Patricio Veterans' Hosp.	Coronary Insufficiency
13	Dr. Edwin Roig, Head Radioisotopes Division*	Self-Association of Dimethyl Sulfoxide
20	Dr. Adán Nigaglioni, Dean School of Medicine, U.P.R.	Recent Advances in the Study of Gastro-Intestinal Diseases
27	Dr. Frank G. Lowman, Head Marine Biology Program*	World-Wide Fallout in Marine Samples from Puerto Rico
Dec. 4	Dr. Jeanne Ubiñas Radiotherapy & Cancer Div.*	Adenocarcinoma of the Uterine Cervix
11	Dr. Orlando Bonilla Professor, School of Medicine U.P.R.	The Immune Globulin-Structure, Function and Immuno-Electrophoretic Study
18	Dr. Shmvel Zvi Weiss Solid State Physics Program*	Radiationless Transition Rate Constant in Anthracene

* Puerto Rico Nuclear Center

PRNC Weekly Seminars - Mayaguez

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DATE		LECTURER	TITLE OF LECTURE
Nov.	29	Dr. John C. Bugher Director*	Observations on Nuclear Energy Research in Europe
		Dr. J.L. García de Quevedo Associate Director*	Report on the IAEA Regional Symposium on Education and Nuclear Energy Held in Argentina
Dec.	6	Dr. J.A. Wethington Reactor Division*	Neutrons
	13	Dr. Ronald D. Macfarlane University of California Berkeley, California	Study of the n, a Reaction with the PRNC Reactor
	20	Dr. Henry J. Gomberg Deputy Director* Dr. J. Villella Medical Sciences and Radiobiology Division*	Radiation in Control of Parasitic Disease Cycles

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Jan.	10	Dr. Francis Koo Agricultural Bio-Sciences Division*	Mutation and Backmutation
	17	Dr. Leopoldo R. Cerecedo School of Medicine, U.P.R.	Tumor-Host Relationship Studies in vivo and in vitro
	24	Dr. Herminio Brau Radicisotopes Application Division*	Applied Research in Alcohol Technology
	31	Mr. J. Parrilla Calderón Health Physics Division*	Dosimetry of X and Gamma Radiation
Feb.	7	Dr. Louis Krumholz Department of Biology University of Louisville	Aquatic Radioecology
	14	Dr. David Copson College of Agriculture & Mechanic Arts, Mayaguez	Some Aspects of Darcy's Law and Microwaves

DATE	LECTURER	TITLE OF LECTURE
Feb. 21	Dr. Mahendra Singh Agricultural Bio-Sciences Division*	Effects of Ionizing Radiation on Chromosome Aberrations
28	Mr. F. Muñoz Ribadeneira Nuclear Science & Technology Division*	Dosimetría Química de Radiaciones Nucleares
March 7	Mr. Héctor Barceló Head, Reactor Division*	Reactor Parameters
14	Dr. Duane B. Linden Agricultural Bio-Sciences Division*	Paramutation
21	Dr. J. A. Facetti Nuclear Science & Technology Division*	Chemical Effects of Nuclear Transformation
28	Dr. J. Maldonado Capriles Director, Biology Department CAMA	Studies on the Reproductive System of Anthocoridae
April 4	Dr. Robert A. Luse Agricultural Bio-Sciences Division* Miss María M. Palacios Radiotherapy & Cancer Division*	Glass Dosimetry
11	Dr. Norman E. Delfel Federal Experiment Station Mayaguez	Distribution of C^{14} labelled Butazolidin in the Rat
18	Dr. R. B. Knight Nuclear Science & Technology Division*	Ionizing Radiation-Effect on Emissivity
25	Dr. Frank G. Lowman Marine Biology Program*	Marine Contamination
May 2	Dr. V. V. Raman Physics Dept., College of Agriculture & Mechanic Arts Mayaguez	Principles of Quantum Field Theory
9	Dr. J. A. Rivero Biology Dept., CAMA Mayaguez	The Role of Sound in the Behavior of Frogs

DATE		LECTURER	TITLE OF LECTURE
May	16	Dr. D. Walker Biology Dept., CAMA Mayaguez	Control of Insects by Sterilization
	23	Prof. Elmer Olivieri Cintrón Civil Engineering Dept. CAMA, Mayaguez	Hormigon
	30	Dr. M. García Morín Head, Chemistry Dept. U.P.R.	Aplicación de la Resonancia Magnética del Protón en la Determinación de Estructuras Moleculares
June	6	Dr. Peter Glynn Marine Biology, CAMA Mayaguez	Reproductive Cycles and the Dynamics of Marine Communities
	20	Dr. Eddie Ortiz Nuclear Science & Technology Division*	Método Experimental para Determinar la Energía de Enlace del Deuterón
	27	Dr. Frank G. Lowman Marine Biology Program*	Marine Contamination
July	11	Dr. M. García Morín Chemistry Dept., U.P.R.	Aplicación de la Resonancia Magnética del Protón en la Determinación de Estructuras Moleculares
	18	Dr. M. Díaz PiFerrer Biology Dept., CAMA Mayaguez	Asociaciones más Comunes en la Flora Marina de la Costa Oeste de Puerto Rico
Aug.	1	Dr. H. Harry Szmant Radioisotopes Application Division*	Radio Protective and Radio Sensitizing Agents
	8	Mr. Rubén Freyre Federal Experiment Station Mayaguez	Research Investigation with Tephrosia Vogelii
	22	Dr. M. Díaz PiFerrer Biology Dept., CAMA Mayaguez	Asociaciones más Comunes en la Flora Acuática de la Costa Oeste de Puerto Rico
	29	Dr. W. P. Stucki Agricultural Bio-Sciences Division*	Investigations on N_2 Excretion in Monogastric Animals
Sept.	5	Dr. O. H. Wheeler Nuclear Science & Technology Division*	Isotope Effect in Chemical Kinetics

DATE	LECTURER	TITLE OF LECTURE
Sept. 12	Dr. B. C. Frazer Nuclear Science & Technology Division*	Neutron Diffraction
19	Mr. Gonzalo González Nuclear Science & Technology Division*	Histéresis Térmica en Cristales Ferroeléctricos
26	Mr. O. Angleró Nuclear Science & Technology Division*	Modificación de un Flujo de Neutrones que Emergen de la Parte Superior de una Columna Termal Horizontal
Oct. 3	Mr. Carlos Figuerca Health Physics Division*	Radiation Safety in the Development and Use of Nuclear Energy for Rocket Propulsion
10	Dr. Carlos Aguayo Biology Dept., College of Agriculture & Mechanic Arts Mayaguez	Distribución de los Moluscos Terrestres de Puerto Rico y Cuba
17	Mr. Raúl McClin Marine Biology Program*	Determinación de I^{131} en Leche
24	Mr. J Parrilla Calderón Health Physics Division*	Shielding Against Fallout Radiation
31	Mr. Juan G. González Biology Dept., CAMA Mayaguez	The Importance of Phytoplankton and Microscopic Algae in the Productivity of Quahog Pond, Falmouth, Mass.
Nov. 7	Dr. H. H. Smith Biology Dept., Brookhaven National Laboratory	Comparative Cytogenetic Studies with Neutrons
14	Dr. F. Vázquez Nuclear Science & Technology Division*	Técnicas Empleadas en el Estudio de Resonancia en los Efectos de Radiación con Rayos X
21	Mr. S. Pinto Vega Nuclear Science & Technology Division*	Determinación de Mediavida de Fuentes de Fotoneutrones
28	Dr. Morris Rockstein University of Miami	Aging as Influenced by External Factors (Radiation, etc.)

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DATE	LECTURER	TITLE OF LECTURE
Jan. 24	Dr. W. Gordon Director Arecibo Ionospheric Observatory	Radioastronomy and the Terrestrial Ionosphere
30	Mrs. R.J. Santiago de Morales Health Physics Division*	Determinación de Fenoles Libres y Combinados en Plantas Irradiadas
Feb. 6	Dr. Philip Sadtler Pres., Sadtler Research Laboratories, Pennsylvania	Infrared - A Powerful Tool
14	Dr. Joseph H. Simons Professor of Chemistry University of Florida	Space, Time and Energy
20	Mr. J. Parrilla Calderón Research Associate Health Physics Division*	Calorimetric Determination of Energy Absorption Buildup Factor
28	Dr. H. J. Gomberg Deputy Director*	Resonance in Radiation Effects
March 6	Dr. David Walker Associate Professor Biology Dept., U.P.R.	Sterilization of Insects
14	Dr. Frank Martin Federal Experiment Station Mayaguez	A Theory of the Physiological and Genetic Control of Unilateral Incompatibility
20	Miss Milagros Miró Nuclear Science & Technology Division*	Efecto del Sulfato Cúprico en la Estabilidad del Dosímetro de Sulfato Cérico
28	Dr. John D. Weaver Professor, Geology Section CAMA, U.P.R.	Changing Sea Levels in the Caribbean
April 3	Mr. S. Pinto Vega Instructor, Physics Dept. U.P.R.	High Gamma Energies Neutron Conversion Device for Half Life Measurement
11	Dr. Robert A. Luse Agricultural Bio-Sciences Division*	Isotope Dilution in Sugarcane Research

DATE	LECTURER	TITLE OF LECTURE
April 17	Dr. Juan Colón Avilés Agronomy Dept., CAMA UPR	The Nitrogen Fraction of Soils
25	Dr. George W. Miskimen Federal Experiment Station Mayaguez	Zoogeography of the Coleopterous Family Chauliognathidae
May 1	Father Ignacio Cantarell Nuclear Science & Technology Division*	"Método para Controlar la Fatiga en Tubos Fotomultiplicadores"
9	Dr. Carlos Aguayo Biology Dept., CAMA UPR	"Los Orígenes de la Fauna Antillana"
June 13	Mr. Arturo Riollano Isabela Sub-station UPR	The Improvement of Pigeon Peas Through Breeding and Crop Management
July 11	Dr. B. C. Frazer Nuclear Science and Technology Division*	Impressions on a Visit to the Soviet Union
24	Dr. S. Y. Tyree Professor of Chemistry University of North Carolina	The Problem of Valence State Ionization Energies
Aug. 1	Dr. Richard Biebl Plant Physiology Institute University of Vienna Austria	Protoplasmatic Ecology of Marine Algae
15	Dr. Justo Hernández-Mora Professor of Chemistry UPR	Some Aspects of the Chemistry of Synthetic Drugs
Sept. 4	Dr. Julio A. Gonzalo Nuclear Science & Technology Division*	Statistical Theory of Ferro-electricity in Triglicine Sulfate
12	Dr. Max Wilson Professor of English and Humanities, UPR	Colloquium on the Philosophy of Science
26	Dr. Stanley Ratner Professor of Psychology UPR	Research on the Effects of Magnetic Fields on Animal Behavior

DATE		LECTURER	TITLE OF LECTURE
Oct.	2	Dr. Malcolm Daniels Radioisotopes Division*	Recent Developments in Radiation Chemistry
	16	Dr. Amador Cobas Associate Director*	Measurement of Radiation Damage in Anthracene Crystals
	24	Dr. Osvaldo Villafañe Professor of Mechanical Engineering, CAMA, UPR	A Survey of Experimental Stress Analysis - Development, Scope, and Methods
	30	Dr. Sergio Irizarry Head, Clinical Applications Division*	Effect of Radiation on Intestinal Absorption in Humans Measured by I-131 Tagged Fatty Acids
Nov.	6	Mr. Rafael Montalvo Nuclear Science & Technology Division*	Tritium Labeling and Counting Techniques
	14	Dr. J. B. McCandless Physician in Mayaguez, P.R.	Ecologies of Cartagena Lagoon
	20	Dr. K. S. Koo and Dr. Duane B. Linden Agricultural Bio-Sciences Division*	Their impressions of the Eleventh International Genetics Conference conducted at the Hague, Netherlands, Sept. 2-10/63
Dec.	4	Dr. N. Delsel Biochemist, Federal Experiment Station, Mayaguez	Research on Effects of Phosfon and Maleic Hydrazide on Sugar Cane Yield
	12	Dr. Owen H. Wheeler Acting Head, Nuclear Science & Technology Division*	Research Applications of Electron Paramagnetic Resonance

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Jan.	13	Dr. Margaret Sweeting Lecturer, School of Geography Oxford, England	Development of Limestone Topography in the Tropics
	20	Dr. Florencio Vázquez Nuclear Science & Technology Division*	Band Theory of Solids
	27	Dr. Paul Weinbren Head, Medical Sciences and Radiobiology Division*	Field Techniques in Arbovirology

DATE		LECTURER	TITLE OF LECTURE
Feb.	3	Dr. Frank G. Lowman Head, Marine Biology Program	Distribution of Some Trace Elements in Marine Organisms and Sediments
	10	Dr. Howard T. Odum Director, Terrestrial Ecology Program: Part I*	Circuits in Ecological Systems
	17	Dr. H. D. Graham Professor, Department of Biology, CAMA, UPR	Studies on the Reactions and Determination of Natural Plant Hydrocolloids
	24	Dr. Víctor A. Marcial, Head Radiotherapy & Cancer Div.*	Cancer in Puerto Rico
March	2	Dr. D. S. Sasscer Dept. of Nuclear Engineering Iowa State University	Gamma Transfer in the Vicinity of Voids in Shields
	9	Dr. G. Miskimmon Entomologist, Federal Agricultural Experiment Station, Mayaguez, P. R.	Zoogeography of the Soldier Beetle
	16	Dr. Robert Stevenson Marine Biology Program*	Stable Element Analysis in Marine Organic Compounds
	30	Dr. Owen H. Wheeler Head, Nuclear Science and Technology Division*	Mechanism of Tritium Labelling of Organic Compounds
April	6	Dr. Juan F. Facetti Nuclear Science & Technology Division*	Szilard-Chalmers Reactions in Inorganic Compounds of Phosphorus, Arsenic, and Antimony
	13	Dr. Allan Phillips Department of Agricultural Engineering, CAMA, UPR	Shallow Bins for Drying Coffee
	20	Rev. Ignacio Cantarell Nuclear Science & Technology Division*	Research Possibilities with Low Energy Accelerators
	27	Dr. Francis K. S. Koo Agricultural Bio-Sciences Division*	Nuclear Volume and Radiosensitivity
May	4	Prof. Kenneth Soderstrom Director, Dept. of Mechanical Engineering, CAMA, UPR	Temperature Rise in Fuel Elements of the PRNC Reactor as a Result of Immediate Loss of Water

DATE		LECTURER	TITLE OF LECTURE
May	11	Prof. D. S. Wimberly Biology Dept., CAMA, U.P.R.	The Marine Geology of Southern California
	18	Dr. Juan F. Facetti Nuclear Science & Technology Division*	Calculation of Activities of Samples Irradiated in the Reactor
Aug.	10	Dr. Julio A. Gonzalo Nuclear Science & Technology Division*	Neutron Diffraction Study of Magnetic Spiral in Manganese Dioxide
	17	Dr. Mortimer I. Kay Neutron Diffraction Program*	Neutron Diffraction Study of the Structure of Hydrosyapetite and Calcium Imide
	24	Dr. Andrew Maretzki Agricultural Bio-Sciences Division*	Amino Acid Composition of Pinguinain. An exceptionally small tiolytic enzyme
	31	Dr. David W. Walker Agricultural Bio-Sciences Division*	Prenuptial Behavior in Insects
Sept.	8	Prof. J. L. Amoros Southern Illinois University	Thermal Expansion in Relation to Crystal Structure
	28	Dr. H. Harry Szmant Radioisotopes Division*	Solvent Effects in Chemistry
Oct.	5	Mr. Arnoldo de Hoyos Nuclear Engineering Div.*	Random Numbers from a Radioactive Source
	19	Prof. H. Troche-Maldonado Physics Department CAMA, U.P.R.	Aging of Dielectric Properties of Some Ferroelectric Ceramics
	26	Dr. Peter Paraskevoudakis Health Physics Division*	Calorimeter Design for Soft X-rays
Nov.	9	Dr. H. Graham College of Agriculture and Mechanic Arts, U.P.R.	Metabolism of Sugar Alcohols and Some New Methods for Their Determination
	16	Mr. Michael Gileadi Health Physics Division*	Localization of Brain Tumors by Pneumography and Ventriculography
	23	Prof. Ray Pepinski, Head Department of Physics Florida Atlantic University	Optical Activity in Crystal
	30	Mr. Enrique Avila Marine Biology Program*	Primary Production in the Sea

DATE	LECTURER	TITLE OF LECTURE
Dec. 7	Dr. Frank G. Lowman Director, Marine Biology Program*	World-Wide Fallout in Marine Organisms
28	Dr. A. S. Posner Cornell University Medical College	The Change in Crystallinity of Hard Tissue with Fluoride Uptake

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