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REPORT ON TRIP POST-VISIT TO MANAGUA, NICARAGUA

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by

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We arrived in Managua at 10:00 a.m., June 5, 1967. In the afternoon we visited the U. S. Embassy. We were referred to Mrs. Gongora, U. S. A. I. D. Secretary, to whom we explained our mission. Other officers were out on business. Later we made appointments with Dr. Tomas Urroz of the Ministry of Education, and with other persons of various institutions.

Ministry of Education:

Dr. Tomas Urroz informed us that because of recent national events they had had an irregular year of studies and that this was the reason for not having scheduled the three Nicaraguan teachers on special presentations around the country. However, he was going to do this beginning July 1st. Dr. Urroz also mentioned that he had written a chapter on radioisotopes using information from the manual, "Radioisotopes in Basic Research" of Atoms in Action. That chapter will be included in the official program of high school chemistry of Nicaragua. Editorial Recalde, a private enterprise, has offered to print 3000 copies of this chapter, which will be distributed to students and teachers in all the country. Dr. Urroz showed us the manuscript and the illustrations being prepared. We were very impressed with the modern approach followed in describing atomic structure, isotopes and nuclear energy. Dr. Urroz invited us to attend the NASA Exhibit on Space Science which has been coordinated by the Ministry of Education. This exhibit was being presented at the Ramirez Goyena Institute. High school students in groups of 420 to 700 each were attending a one-hour lecture demonstration. The scheduling of the schools had been patterned on the schedule made for the high school program of "Atoms in Action". Dr. Urroz would like to receive some copies of the "Understanding the Atom" series from which he is planning to use material in various science courses. Four sets have been requested from DTIE in Oak Ridge. Dr. Urroz also mentioned that he has a son studying Engineering in Minnesota who will soon start on a Master of Science program. Dr. Urroz is very interested in having his son take a radioisotope course at ORAU Special Training Division.

Radioisotopes in Basic Research:

Between June 6 and June 8, we met with the following participants:

1. Dr. Octavio Arguello V., Instituto Nacional del Seguro Social. He has been doing some research with antibiotics and with some substances extracted from coffee and other native plants. These substances, according to Dr. Arguello, inhibit bacterial growth in vitro and prevent infections when applied to wounds. At present, he is working with Bacillus tuberculosis. Dr. Arguello has given samples of the isolated substances to Dr. Hartwell of the Cancer Institute in Washington for toxicity tests.
2. Professor Cipriano Pascual, Instituto Pedagogico. Professor Pascual expressed his satisfaction about the impact of the "Atoms in Action" presentation in Managua. He has included a great deal of material from the course he took in "Atoms in Action" in his course of Biology and Chemistry.
3. Dr. Jaime Bengoechea, Private Practice. At the end of the course "Atoms in Action", he performed a trial experiment to compare the bone deposition of  $^{45}\text{Ca-EDTA}$  versus  $^{45}\text{CaCl}_2$  after intravenous administration. His preliminary results show a higher deposition with the  $^{45}\text{Ca-EDTA}$ . He would like to investigate this further.
4. Ing. Jorge H. Diaz, F. A. O. He and his group are working on the use of fertilizers throughout the country. They hope to be able to use radioisotopes and improved seeds in the future.
5. Dr. Roderick Solis, Junta Nacional de Asistencia y Prevision Social. He informed us that the new 250-bed Social Security Hospital (Hospital "Rene Shick") being built at Leon will have a radioisotope laboratory. Also, that a group of physicians who took our medical radioisotope course is planning a radioisotope laboratory at the Social Security Hospital of Managua. Dr. Solis mentioned that they have funds for this. At the present time they are planning a new building for this hospital. The old building would become a maternity hospital. The Nicaraguan government is also planning a laboratory for analyses of foods and drugs. Radioisotope techniques will be used in this laboratory. He would like to have information about radioisotope techniques in this field. Dr. Solis also informed us of another government laboratory whose budget has been already approved. This is a laboratory of pathology and toxicology. They also hope to include radioisotope techniques in its operation. In this regard, he would like to have information about liquid scintillation counting. Finally, Dr. Solis told us that the Social Security Hospital will soon have a Cobalt-60 therapy machine.
6. Ing. Enrique Cerda, Estacion Experimental Agricola La Calera. They have been using thin-layer and gas chromatography to determine chlorine-insecticides in meats. Due to the low amounts present (around 0.025 ppm), they would like to use radioisotopes in this procedure. We recommended liquid scintillation methods as a way to attain precision quantitative determinations at that level. This would involve training of personnel as well as equipment. Dr. Cerda would like to extend his studies to forages and milk. He requested information about training and equipment. He also informed us that their work in insect control continues in cooperation with the C.I.A. of Turrialba, Costa Rica.

7. Drs. Adrian Roque (Biochemistry) and Cesar Baldizon (Pathology) of the Medical School at Leon, U.N.A.N. The Medical School will erect a new building. They will also build a university hospital. They will incorporate radioisotope techniques both in teaching and in practice. They requested information on medical training courses at Oak Ridge. We recommended close contact with the group of physicians who will work with radioisotopes at the Social Security Hospital in the near future.
8. Dras. Soledad Aleman, Mary de Caldera and Elida Martinez, Pharmacists, private practice. They have not had a chance to consider radioisotope techniques.
9. Dr. Rolando Mendoza, Director of the Department of Biology, U.N.A.N. was absent on a business trip to Costa Rica.
10. Dra. Leana Useda, Facultad de Ciencias Quimicas, U.N.A.N., Leon. She had been transferred to Managua.
11. Dr. Roger Argenal, Director of the Physics Department, U.N.A.N., Leon. He had just arrived from New Orleans, where he is pursuing studies for the Ph.D. degree at Tulane. A special arrangement allows him to work six months at Leon and six months at Tulane. Dr. Argenal was absent the day we visited Leon.
12. Dra. Luisa E. Benedict. Absent at the University of Puerto Rico where she is studying biology.
13. Prof. Adan Diaz D., Normal School. They have modified course programs in science and introduced sections on radioactivity and radioisotopes at his school.

Radioisotopes in Medical Diagnosis:

1. Drs. Cesar Zepeda M., Alfonso Moncada, Rene Vargas L. of General Hospital. At present, Dr. Zepeda is the only physician using radioisotopes. He operates in his private office. They will prepare a joint proposal to the Social Security directors for a radioisotope laboratory. This laboratory will provide service of diagnosis and therapy in the following cases: thyroid disease, blood disturbances, cancer of the prostate, osteomyelitis, cancer of the pancreas and others.
2. Drs. Roberto Calderon G. and Leopoldo Torres, General Hospital. They are more interested in radiology. They would like to have Roger Cloutier (ORAU) visit Managua to perform a radiation safety survey at the hospitals. They are making arrangements to have Oscar Hidalgo S., Nicaraguan physicist working at Berkeley, California, to return to Nicaragua to work for the Nicaraguan government on a permanent basis. I.A.E.A. is assisting in this arrangement. Mr. Hidalgo would render his services to all Central American countries. One of his assignments would be to assist physicians in the proper use of radiation sources.

3. Dr. Luis Esponza R., Social Security Hospital. He informed us that Dr. Enrique Castro G., Nicaraguan physician trained in Los Angeles, California, in radioisotope applications will soon return to Nicaragua. There is a possibility of his incorporation in the Social Security Hospital personnel. He also mentioned that it is possible that Dr. Castro will stop at Oak Ridge on his way back to Managua.
4. Dr. Roberto Aguilar G., General Hospital. Absent, he is in Lexington, Kentucky, working in Radiology.
5. Drs. Ramiro Cruz, (Hospital Bautista), Alejandro Martinez and Adolfo Montiel (Social Security). Have not been able to use radioisotopes. Future applications are possible.

#### Nuclear Electronics:

1. Prof. Cesar Saavedra R., Instituto Ramirez Goyena. He informed us that Dr. Freire of U.N.E.S.C.O. will acquire a set of instruments for electronics work to be used in teaching at his institute. This equipment will be operated by Prof. Anibal Fonesca (H. S. Program) and himself. Prof. Saavedra is very interested in undertaking advanced studies in Electronics. We suggested the Capitol Radio Engineering Institute in Washington, D. C.
2. Prof. Reynaldo Guadamuz, Instituto Vocacional. He introduced us to the Director of the Institute. Prof. Salvador Rocha. They are using the "Atoms in Action" manual on Nuclear Electronics and the RCA manual on transistors, both given to "Atoms in Action" participants, in teaching courses at their institute. Specifically, they have introduced the algebraic approach to Ohm's law and the theory of semiconductors. Other teachers of the institute are using information taken from the "Understanding the Atom" series. They would like to have some extra copies. They are also making arrangements to send some instructors for extra training in the U. S. and in Europe. The Capitol Radio Engineering Institute of Washington was suggested to them. Director Salvador Rocha and Prof. Guadamuz were very thankful for our visit and of the assistance given by the training provided by "Atoms in Action" in Managua.

#### Radioactivity and Applications:

Most participants of this course were students of the School of Education, Science majors. We visited the school on two consecutive evenings, during which we talked to many participants. Among them, we could mention, Manuel Rocha M., Felix Perez, Maria M. Sequeira, Mercedes Jarquin, Damaso Vidaurre, Mariano Lacayo, Guadalupe Jarquin, Reynaldo Arrostequi, Marina del Socorro, Buena Ventura Gonzalez and Reynaldo Vallecillo. Most of these were taking biology. They have recently turned in monographs requested by the school as part of the requisites to graduate as science teachers. All of them had chosen either the topic of radiation effects or radioisotope applications

in various programs. Much of the material used had been taken from course materials provided by "Atoms in Action".

High School Teachers:

Professors Anibal Fonesca, Alberto Lara and Leonard Tom, high school teachers who presented the lecture-demonstrations of the high school program of "Atoms in Action", agreed in the following statements: "Atoms in Action" has brought improvement in the teaching and training programs of Nicaragua at all levels; they have used part of the equipment they assembled at Oak Ridge (part is not operating); they are willing to present lecture-demonstrations in schools of the interior if these are scheduled by the Ministry of Education. Other news was: Prof. Tom is making arrangements to obtain a scholarship from A.I.D. with the assistance of I.N.D.E. (Instituto Nacional de Desarrollo Educativo); he will study analytical chemistry towards the degree of Master of Science. Professor Anibal Fonseca has recently attended, in San Jose, Costa Rica, a course for Central American teachers of physics. On the afternoon of June 7, Jerry Minter checked and put in operation the faulty equipment Mr. Tom has at the Instituto Ramirez Goyena.

School of Agriculture:

Dr. Orlando Lindo, Director, told us that the projects on insect control (directed by Dr. D. Walker) and on irradiated sorghum seeds (Ing. Salazar) initiated in "Atoms in Action" are continuing. He would like to receive information on radiation sources and radioisotope uses in agricultural sciences. He suggested also that as a follow-up program, regular visits to the universities by U. S. scientists could be planned. A program of conferences in various countries could be planned once a year. Radiation physics, nuclear physics and radioisotope applications in medicine, agriculture and industry could be the main areas. This program would keep up-to-date the teaching in the peaceful uses of atomic energy. Spanish fluency would be of vital importance.

We finished our visit to Managua in the evening of June 8. Early the next day Jerry Minter traveled to Guatemala at a request of C.O.N.E.N. Max Lombardi returned to Oak Ridge.