

LBL--27859

DE90 003992

COOPERATION BETWEEN THE U.S. AND THE USSR
IN THE PEACEFUL USES OF ATOMIC ENERGY

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October 1989

Presented at the International Conference, "Fiftieth Anniversary
of Nuclear Fission," Leningrad, U.S.S.R., October 16-20, 1989

This work was supported by the U.S. Department of Energy under Contract
DE-AC03-76SF00098.

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The decade of the 1960's saw a marked expansion of cooperation between the United States and the Soviet Union for the peaceful uses of atomic energy. In my opinion, this development constituted one of the most encouraging elements in the international scene.

Until 1955 contacts between American and Soviet nuclear scientists were virtually nonexistent, as indeed (after World War II) were U.S.-USSR contacts in other fields except as required in formal intergovernmental relations. Then, in July 1955, the discussions of the Heads of Government meeting in Geneva led to the declaration of a policy with the following aims:

To lower the barriers which now impede the interchange of information and ideas between our peoples.

To lower the barriers which now impede the opportunities of people to travel anywhere in the world for peaceful, friendly purposes, so that all will have a chance to know each other face to face.

To create conditions which will encourage nations to increase the exchange of peaceful goods throughout the world.

In connection with these objectives, it was noted that atomic science "possesses a tremendous potential for helping raise the standards of living and providing greater opportunity for all the world."

The task of planning ways to implement this policy was entrusted to the Foreign Ministers and their staffs in meetings which began in October 1955. The following year, the policy of the U.S. government to encourage mutually beneficial contacts with eastern European countries --including the Soviet Union--was declared in a statement by President Eisenhower on June 29, 1956. Soon thereafter negotiations were initiated that led to the signing in January

1958, by U.S. Ambassador William S. B. Lacy and Soviet Ambassador G. N. Zaroubin, of the first "Agreement Between the United States of America and the Union of Soviet Socialist Republics on Exchanges in the Cultural, Technical, and Educational Fields."

Meanwhile, in August 1955, the Geneva Conference on Peaceful Uses of Atomic Energy had provided the setting for the first significant contacts and the first impetus toward collaboration between East and West in this field. In September 1956, both the United States and the Soviet Union were among the 81 signatories of the Statute establishing the International Atomic Energy Agency. During the next two years, some visit exchanges between the United States and Soviet Union by nuclear scientists took place on an informal basis. Initial steps toward formal cooperation in peaceful nuclear applications followed, pursuant to the 1958 Lacy-Zaroubin agreement. Among the various programs provided for under this agreement was an exchange of exhibits in the peaceful uses of atomic energy. In addition, there were many scientific and technical visits and exchange projects in which USAEC and/or USAEC contractor employees participated. The 1958 Geneva Conference offered additional opportunities for interesting contacts.

The Lacy-Zaroubin agreement was succeeded by a similar one signed in Moscow on November 21, 1959, which specified exchanges to be carried out in 1960-1961. Three days later USAEC Chairman John A. McCone and his Soviet counterpart Professor Vasily Semenovitch Emelyanov, Director of the Main Administration on the Use of Atomic Energy, signed in Washington a "Memorandum on Cooperation between the United States and the Soviet Union in the Field of the Utilization of Atomic Energy for Peaceful Purposes." This Memorandum, known as the McCone-Emelyanov Memorandum, specified four principal areas in which visits and information were to be exchanged during 1960 and 1961 and the procedures to be followed in arranging them. It also declared the parties' agreement to consider the feasibility and the possibility of making new

scientific instruments available on a reciprocal basis. In order to assure that the IAEA and its members would "benefit to the fullest from this effort for further development of the peaceful uses of the atom," it was also agreed that the Agency would be given all reports and the results of the exchanges carried out. It would also be asked, to the extent possible, to assist in the consideration of possible joint projects by sponsoring meetings, symposia, or studies considered necessary for such planning.

The provisions of this Memorandum had been developed gradually in the course of numerous personal discussions between principal U.S. and USSR officials concerned with nuclear energy. In Vienna in May 1959, Dr. Isidor I. Rabi (U.S. representative to the IAEA Scientific Advisory Committee) and Dr. John A. Hall (USAEC assistant General Manager for International Affairs) had broached to Emelyanov the ideas of an exchange on controlled fusion and nuclear power. Further discussions on the subject of an information exchange were held in the Soviet Union two months later by Professor Emelyanov and Admiral Hyman G. Rickover, who was accompanying then-Vice President Richard Nixon on his visit to the Soviet Union. When Premier Nikita S. Khrushchev visited the United States in September 1959, Emelyanov came with him in order to discuss peaceful uses cooperation with Chairman McCone. Further talks were possible during a trip Chairman McCone made in the Soviet Union in October with a group of U.S. nuclear scientists, and during a reciprocal visit to the United States by Professor Emelyanov and a party of eight at the end of the same month. It was during this visit that the McCone-Emelyanov Memorandum was signed.

I have mentioned these details because of the vital part the many meetings and talks played in reaching initial agreement on U.S.-USSR cooperation in peaceful nuclear applications. While useful and constructive in all of our cooperative activities, such personal contacts and discussions are particularly important in relationships especially likely to be affected

by international political developments. They have, therefore, been essential to the continuation and expansion of our cooperation with the Soviet Union.

At the time I assumed my USAEC responsibilities, something over a year after the signing of the McCone-Emelyanov Memorandum, some of the cooperation planned had been initiated. Despite the renewed international tension of that period, satisfactory visit exchanges had taken place in the fields of high energy physics and controlled thermonuclear fusion. Furthermore, a small group of U.S. and Soviet scientists had met at the American Institute of Physics in New York on September 16, 1960, to consider the scientific desirability and feasibility of large accelerators with energy in excess of 300 BeV. A number of individual scientific and individual exchanges conducted outside the Memorandum on Cooperation had also been arranged or were being explored, including one in theoretical high energy physics. Effort by the U.S. toward implementation of the other exchanges covered by the Memorandum, however, had been unsuccessful. One of my first tasks, therefore, was to try to carry out the agreed-on programs and develop realistic plans for cooperation in the years ahead. I was deeply convinced of the value of this cooperation. It had long been my view that scientific and technical exchanges could serve to increase understanding and friendship between the Soviet Union and the United States. I had some personal knowledge of such exchanges; before and during my tenure as Chancellor at Berkeley I had received many Soviet bloc nationals. I was eager to promote further U.S.-USSR contacts, which I was sure would be mutually beneficial.

In February 1961 the Soviet organization concerned with peaceful nuclear applications (which in June 1960 had been renamed the "State Committee on the Utilization of Atomic Energy," or SCAE) was still directed by Professor Emelyanov. I had first known Emelyanov years before as a fellow chemist, having met him when he visited Berkeley in the early 1950's, and I had seen him in the intervening years at the First and Second Geneva Conferences on

Peaceful Uses of Atomic Energy. With our previous cordial associations as a foundation, I looked forward to a constructive relationship with him.

As there was no chance of an immediate meeting, I wrote Emelyanov on March 3, 1961, reviewing the status of our cooperation and the various exchange possibilities. This followed a meeting with U.S. Ambassador to the Soviet Union, Llewellyn Thompson, on February 16th, at which he had agreed to discuss these matters with Emelyanov and Chairman Khrushchev. I shall not attempt to give the detailed background pertinent to these proposals; suffice it to say that they had been the subject of extensive correspondence and discussions, which had not yet led to the necessary agreement on details.

The IAEA Fifth General Conference in September 1961 afforded me the first opportunity to discuss our exchanges in person with Emelyanov who, in addition to serving as the Soviet member of the IAEA Scientific Advisory Committee and on the Board of Governors, also headed his country's delegation to the Conference. On several occasions, however, our conversation centered entirely on IAEA matters not closely related to my present subject of our cooperation with the Soviet Union. This was the case, for example, at a dinner given by Indian Ambassador Arthur S. Lall on September 29th, at which IAEA questions of particular interest to U.S., Soviet, and Indian delegations were discussed, especially the imminent election of a new Secretary-General (on which we strongly disagreed). Among the guests at this dinner, incidentally, was former Foreign Minister Vyacheslav M. Molotov. Since September 1960 he had served as Permanent Soviet Representative to the IAEA with the rank of Ambassador, though apparently without any real representative authority. The 1961 General Conference was the last that he attended.

After the talks in Vienna, discussion of topics of mutual U.S.-USSR interest in the nuclear area was renewed in correspondence with the principal officials of the SCAE (State Committee on Atomic Energy of the Soviet Union) --at first with Professor Emelyanov, and then with Andronik M.

Petrosyants, who became SCAE Chairman in February 1962. (Emelyanov remained with the organization for several years as a Vice Chairman.) Plans for the Third Geneva Conference on the Peaceful Uses of Atomic Energy were among the subjects on which we exchanged views; however, generally our letters concerned the exchange program. The exchanges in reactor development and waste disposal were scheduled definitely for March and April 1962, but the Soviet Union was unable to accommodate our delegations, so the visits did not take place. Aside from frustrations such as these, we were confronted by the problem of planning for the future. On March 8, 1962, the third "overall" U.S.-USSR Agreement on Exchanges was signed in Washington, providing for exchanges in 1962 and 1963. It was time to look toward negotiation of a new Memorandum on Cooperation in Peaceful Uses of Nuclear Energy and agreement on exchanges that could be carried out.

Virtually no real progress on future planning had been made when I returned to Vienna in September 1962 for the Sixth IAEA General Conference. I was hopeful that conversations with the Soviet representative there would lead to some positive action regarding our exchanges. The atmosphere seemed more favorable than that of 1961. In general the USSR delegates appeared to be more interested in cooperation, demonstrating fuller support of the IAEA than previously and apparently seeking to avoid any major differences or difficulties. On several occasions Emelyanov and I had cordial talks that ranged far from the subject of our exchanges but in the final instance did lead to a decision on action.

Not long after the meetings in Vienna, we did receive the expected proposals from the Soviet Union for future exchanges. We considered these generally satisfactory and an excellent basis for a mutually beneficial program. Most points of difference were soon resolved in my correspondence with Petrosyants and in a meeting of USAEC and SCAE representatives. As soon as I felt confident that agreement could be achieved, I invited Petrosyants

and Emelyanov to meet with us in Washington to settle time details and sign the new Memorandum here. In reply, recalling that the previous Memorandum had been signed in Washington, Petrosyants cordially invited me and my colleagues to come to the Soviet Union for the event and for visits to Soviet research facilities. I accepted with great pleasure, and plans were made for our visit to take place in May 1963.

In addition, on the flight to Moscow, we had an unexpected last-minute companion: Vitalii I. Goldanskii, Chief of the Radiation and Nuclear Chemistry Group at the Chemical Physics Institute of Moscow (Fig. 3). Goldanskii, an outstanding scientist with whom I was well acquainted, had been visiting U.S. nuclear research facilities including the USAEC Brookhaven National Laboratory. On learning of our projected trip, he had asked me only a few days earlier whether he could "hitch a ride" home with me. I had agreed without hesitation. While officials of both the U.S. State Department and the USSR Embassy in Washington may have been somewhat taken aback by this impromptu arrangement, neither side raised any objection (Fig. 2).

Our trip was indeed a memorable one. Everywhere, we were cordially received and treated with the warmest hospitality. Our hosts accepted unhesitatingly the itinerary we had proposed, and even included some additional sites they thought would interest us. Throughout the trip, we were accompanied either by Chairman Petrosyants or by one of his vice chairmen. Our journey marked a considerable number of "firsts," starting with record flying time to Moscow with the fine pilots and crew of the presidential plane, "Air Force One," and continuing through milestones that were more significant from our point of view. We were the first foreign group to visit the Soviet Reactor Testing Station at Ulyanovsk/New Melekes and the site of the 70-BeV High-Energy Accelerator at Serpukhov; the first western visitors since the war to visit the Radium Institute in Leningrad; and the first foreign group to see many industrial reactors and certain other scientific equipment.

On May 21, 1963, all of our delegation with Morokhov went to the USSR Academy of Sciences, where I introduced our group, and President Mstislav V. Keldysh introduced his group. Later Manson Benedict and I presented to N. N. Semenov a certificate of membership in the U.S. National Academy of Sciences on behalf of NAS President Frederick Seitz. Albert Ghiorso and I presented a mendelevium folio to Keldysh (Fig. 3). Albert Crewe and I presented CP-1 graphite pieces to Keldysh, Mikhail D. Millionshchikov (Vice President of USSR Academy of Sciences), and Morokhov (SCAE). Academicians Tamm, Aleksandr P. Vinogradov, V. I. Spitsyn, Skobeltsyn, and Lev A. Artsimovich were also present.

On May 29, 1963, I had an appointment in the Kremlin for an hour and a quarter with Leonid Ilyich Brezhnev, Chairman of the Presidium of the USSR Supreme Soviet. (Two days before, my Soviet hosts proudly told me they had made an appointment for me with an important official of the Soviet government, namely the president. When I indicated some hesitation or lack of knowledge of this individual, they hastened to assure me that this presented a very unusual opportunity for me, because the president, a man named Leonid Brezhnev, was destined in their opinion to play a very important role in the future of the Soviet government.)

Brezhnev seemed a personable man of pleasant appearance, about 55 or so, with more of a Western manner than most Soviet officials. He first asked me if this was my first visit to the Soviet Union. When I replied that it was, he said he thought it was a good start and added: "Good relations require frequent visits." He agreed with me that this was particularly true in the field of science because of the international aspect of scientific research, which makes science an excellent vehicle for continuing contact and the development of good relations.

He asked me about Soviet atomic power plants and whether I thought that Soviet scientists were working in the proper direction. I replied that the

Soviet approach was very similar to ours, and that similar problems were being encountered, such as corrosion. I said that cooperation in solving such problems would help both countries, and Brezhnev replied that he would welcome such cooperation. He agreed with my statement that there was a place for atomic power now in the economies of both countries, particularly in areas where other sources of power were scarce and expensive.

As a memento of my visit, I presented him with a square, transparent paperweight, containing (as I explained) a small piece of the original graphite taken from the reactor (CP-1) in which the world's first self-sustaining chain reaction was achieved on December 2, 1942, in Chicago, and Brezhnev responded to this gift with great warmth. After thanking me, Brezhnev said he wanted to leave the subject of science. He said that I would doubtless meet with President Kennedy upon my return and that he wanted me to tell the president that Khrushchev means what he says about peaceful coexistence and peaceful cooperation in his speeches, addresses, and documents sent to the President.

Brezhnev's manner was warm and friendly; he seemed to display a good understanding of science and technology when he spoke of the details of the work in various institutes. All in all, he made a favorable impression of a man who wanted to get along with the United States. My talk with him was perhaps even more interesting in retrospect, since his replacement of Khrushchev as First Secretary of the Communist Party of the Soviet Union occurred less than a year and a half later. I think it is worth mentioning that although at the time of our meeting a number of people regarded him as a mere figurehead, the opinion was growing among certain experts (including Ambassador Kohler) that he was assuming a position of increasing importance and that--I was told prophetically--he might actually be the successor to Khrushchev. I had the impression, which I could not document, that he spoke as though he anticipated his future role in the government.

Sooner than I expected, I visited the Soviet Union again, in August of the same year, 1963. Unable at that time to achieve agreement on general and complete disarmament, the United Kingdom, the United States, and the Soviet Union had reached agreement on the Limited Test Ban Treaty, banning nuclear weapons tests in the atmosphere, in outer space, and under water. The treaty was to be signed in Moscow, and I was invited to be a member of the U.S. delegation attending this event.

From 11 a.m. to noon on Monday, August 5, 1963, the U.S. delegation visited Nikita Khrushchev in his Kremlin office, which is long and narrow. We sat at a table with a green felt top, like a pool table. There were windows on the west side, pictures of Lenin and Marx, an electric clock on Khrushchev's desk, bookcases, and two telephones at the conference table (but I saw only one telephone at Khrushchev's desk). Gromyko, Kuznetsov, Smirnovsky, and Dobrynin were present. After greetings by Khrushchev and Rusk, Khrushchev said the Test Ban Treaty was only a first step.

At 4:30 p.m. we attended the historic signing of the Limited Nuclear Test Ban Treaty, in Catherine's Hall, by Rusk, Gromyko and Home simultaneously, followed by speeches by Gromyko, Rusk, Home and U Thant (Fig. 4). I stood just behind Khrushchev and he and I tipped our champagne glasses together for toasts at least five times. About 50-60 press representatives and photographers were present.

At about 5:15 p.m. we attended a huge reception in Georgian Hall (magnificent!) where Khrushchev pulled a prepared speech out of his pocket and delivered it. I had a chance to talk to Brezhnev, Petrosyants, Gromyko, Kuznetsov, Dobrynin, Zorin, Tsarapkin, and Voroshilov (of the military).

During my May visit to the Soviet Union I had invited Chairman Petrosyants and his colleagues to visit nuclear facilities in the United States. Upon my return from Moscow I sent him a formal invitation, suggesting the coming fall. He accepted, and plans were developed accordingly. The

visit took place during the period from November 16-December 3, 1963.

I was disappointed by the fact that the physicist Georgiy N. Fierov, who was scheduled to participate in the visit and for whom a visa had been issued, did not come. Members of the delegation indicated that his absence was due to ill health. Either I, another USAEC Commissioner, or the USAEC General Manager accompanied the Soviet delegation during almost the entire trip.

The tour proceeded according to plan until Friday, November 22nd. I was with the group, visiting facilities at the Lawrence Radiation Laboratory at Berkeley, when word came of President Kennedy's assassination. The effect of the terrible tragedy made it impossible to proceed with the events scheduled for the day. After considering various aspects, including particularly the physical safety of our guests, I decided to cancel the balance of the activities planned for Friday and Saturday and have the group go to Yosemite National Park until Sunday evening. The original schedule was resumed on Monday with a visit to the National Reactor Testing Station in Idaho. There, at the suggestion of the Soviet delegation, television sets were installed at the EBR-II building and at the Central Facilities cafeteria, to permit viewing of the funeral preliminaries and part of the service. I, of course, had returned to Washington and the members of Petrosyants group were very touched to see me as one of the officials attending the service at Arlington Cemetery.

I cannot speak too warmly of the comportment of our visitors at this difficult time. They made the necessary schedule changes and spur-of-the-moment arrangements easier by their unhesitating cooperation. Even more important, perhaps, they were genuinely sympathetic to the United States and saddened, sincerely sharing our grief.

After completing their tour of major unclassified nuclear facilities in the United States, the Soviet delegates came to Washington. They met with us at USAEC Headquarters on November 30th for a review of their impressions, a discussion of ways to implement our exchange program, and a comprehensive

briefing on the U.S. civilian power development program. Following our meeting, during the luncheon we gave in honor of our Soviet guests, Chairman Petrosyants and I continued our conversation regarding future exchanges.

As I had hoped, the successful accomplishment of my visit to the Soviet Union in May 1963 and Petrosyants' return visit to the United States heralded the start of a continuing series of exchanges in accordance with the program established in our Memorandum on Cooperation. During the next three years, exchanges of delegations of scientists were completed in many areas.

Areas for exchange visits included solid state physics, controlled thermonuclear reactions, radioactive waste disposal, power reactor development, radioneurological research, and low-energy physics. In addition, a U.S. team of medical tracer specialists visited medical facilities in the Soviet Union. Several long-term reciprocal assignments were made, involving specialists in high energy physics and controlled thermonuclear reactions. A modest reciprocal USAEC-SCAE exchange of unclassified documents on a monthly basis proceeded satisfactorily. Aside from all these activities conducted pursuant to our Memorandum, scientists of each country continued to visit nuclear facilities in the other, in conjunction with attendance at conferences or through visits arranged by other organizations participating in the overall U.S.-USSR exchange program.

In addition to the various activities summarized above, in June 1964, a cooperative program for the exchange of technical information on nuclear desalination was initiated. A meeting was held in Washington on this subject on July 14, 1964. This was followed by a Soviet tour of U.S. desalting and reactor facilities. A formal U.S.-USSR agreement on cooperation in the general field of desalination, including the use of nuclear energy, was signed in Moscow on November 18, 1964, during a visit of U.S. desalting experts to the Soviet Union. In 1966, this agreement was extended to remain in effect for two more years.

There were several occasions during this period when I was able to discuss the progress of our exchange program with Petrosyants and/or Emelyanov. In the course of the Third Geneva Conference on the Peaceful Uses of Atomic Energy (at which Emelyanov served as President), both of them, as well as Nikolai S. Khlopín of the USSR Institute of Atomic Energy and Igor V. Tikhonov of the SCAE, were among the representatives of 15 countries for whom I had the pleasure of hosting an overnight visit on the U.S. Nuclear Ship Savannah, then in Sweden (Fig. 5). There were, of course, numerous other opportunities for talk during the Geneva Conference; I recall a particularly pleasant and relaxing lunchtime when Mr. and Mrs. Emelyanov and my wife and I were among the guests of German Ambassador and Mrs. von Keller at their charming home, "Villa Primerose," in suburban Geneva-Vesenz.

My trip to the Soviet Union in September 1969 was one of my most interesting and rewarding as Chairman of the USAEC. Occasioned by four special events --the Thirteenth General Conference of the IAEA in Vienna, a symposium convened in Stockholm by the Nobel Foundation on the role of science in society, the 100th Anniversary Commemoration in Leningrad of Mendeleev's formulation of the periodic system of the elements, and the opening in Bucharest of the USAEC's "Atoms-in-Action" exhibit--this trip afforded an opportunity to visit nuclear facilities in a number of countries including the Soviet Union and other East European countries.

As discoverer of the periodic table, Mendeleev is an authentic hero of Russian science, and the Leningrad symposium was a major event. I had received a special invitation to attend, undoubtedly because of my role in extending and establishing the validity of the table with respect to a number of new man-made elements. Another factor was probably the Russian scientists' satisfaction over the fact that as long ago as 1955 (when U.S.-USSR relations were somewhat cool) we in the United States, after discovering element 101, had named that element Mendelevium. In any case, I accepted my invitation

with pleasure and keen anticipation.

Before our tour of the Institute we met in the office of Professor V. O. Arutunov, Director of the Institute. Present were B. N. Oleinik (Deputy Director), L. K. Kayak (Division Chief, Linear Measurements), M. F. Yudin (Division Chief, Ionizing Radiations), A. I. Kartashev (Division Chief, Optics), I. A. Yaritsyna (Chief of Laboratory, Ionizing Radiations), F. M. Karavayev, S. A. Smolitch (Scientific Secretary), and B. I. Ignatyev (translator). Arutunov explained the work of the Institute. The Institute is organized in some 60 divisions and was noted as having responsibilities similar to our National Bureau of Standards. Among the divisions are theoretical, magnetics, thermal, optics, and ionizing radiation. There are about 300 control laboratories throughout the Soviet Union that are a part of the Metrology Institute and have the responsibility of verifying reference standards and calibration of measuring equipment. It was stated their control laboratories have the "right and duty to stop production in a plant if a violation of the standard is detected."

We toured the Mendeleev rooms. We saw the appointment calendar (stack of sheets) in Mendeleev's study with the sheet for January 11, 1907, on top, with a note in Mendeleev's handwriting (his last in this appointment calendar) saying he had an appointment with the Minister of Industry for 1 p.m. - he became sick, didn't return to the office in the intervening days, and died on February 14, 1907.

One of my most treasured possessions is an autographed copy of one of Mendeleev's books. In August 1959, when I was serving as Chancellor of the University of California at Berkeley, I received this very precious gift. The book was sent to me by Emmanuel Tspelzon, who described himself as "an old Moscow secondhand bookseller." The accompanying message read:

During this visit to the U.S.S.R., Vice President, U.S.A., R. Nixon informed us that before his departure for the Soviet Union he was visited

by his friend, professor of chemistry, Mr. Seaborg, who named the 101st element, discovered by him, of the D. I. Mendeleev Periodic Table after this great Russian chemist.

In this friendly act of the American scientist each Soviet citizen discerns a great respect toward our people and its culture, as well as one of the steps toward the liquidation of the absurd, according to Nikita Sergeevich Khrushchev, tense state of "cold war" between two great nations.

May I present to you, in commemoration of your remarkable discovery and your noble act, the book by Dimitri Ivanovich Mendeleev Fundamentals of Chemistry with his autograph.

The autograph reads, "To my deeply appreciated colleague, Dr. N. I. Bistrov, in commemoration of saving my son, D. Mendeleev, 1889." Mr. Tsipelzon wrote that Mendeleev presented this book to Bistrov when he arrived back in Moscow, having left the meeting of the Royal London Society where he was to read a paper because he heard that his son was deathly ill, and discovered that thanks to Bistrov, his son was already on the road to recovery.

Arutunov then led us on a tour of the Institute. This consisted of very brief 5-10 minute stops at several rooms where specific standard investigations were conducted. Among these were light frequency work for timing devices using krypton in the optics department under Kartashev, voltage and ampere calibration data in the electrical measurement department under P. M. Goryunov, and dosimeter work in the neutron calibration department under Yaritsyna. We also were shown the official USSR standard for the meter and kilogram which were located in a special vault which required three separate keys, each in the possession of a different person, to open.

Once back at my desk after this extremely interesting trip, I was anxious for the earliest possible implementation of the U.S.-USSR exchange plans discussed in Moscow. Prompt arrangements for the proposed joint high energy physics experiments seemed especially desirable. I wrote Petrosyants in this connection on November 12, 1969, pointing out the need to insure that the new Memorandum on Cooperation (necessary to cover exchanges in 1970 and 1971) contained appropriate provisions. This time there were no long delays. The

fourth U.S.-USSR memorandum on Cooperation in the Peaceful Uses of Atomic Energy was signed in Washington (by Abraham Friedman for the USAEC and Ivan Smolin for the SCAE) on February 10, 1970, as an annex to the seventh overall U.S.-USSR Agreement on exchanges, signed the same day. Later Chairman Petrosyants and I signed copies of the memorandum and exchanged them by mail.

In line with our conversations and various letter exchanges, this latest Memorandum contained a section---Article VI---declaring our mutual agreement to conduct joint projects in high energy physics. Subsequently, a Protocol setting forth general procedures for collaborative activity pursuant to Article VI was developed and was signed in Washington on November 30, 1970. The Protocol stipulated that details regarding the joint experiments to be conducted would be spelled out in annexes to this document.

Actually, thanks to the Memorandum on Cooperation's Article IV ("Visits by Invitation"---a provision that, as I mentioned earlier, was first included in the 1968 Memorandum), it was possible to start the first of our joint projects even before the Protocol was signed. Pursuant to exploratory discussions held at the Serpukhov facility and in Moscow in the spring and fall of 1969 and the spring of 1970, a five-man U.S. group headed by Darrell Drickey of the University of California, Los Angeles, spent six months at Serpukhov (September 1970 to April 1971) collaborating with Soviet physicists in a study of pion-electron scattering. Work proceeded so satisfactorily on this project that after a short stay at home Dr. Drickey and several colleagues returned to Serpukhov in the summer of 1971 to gather additional data. Several other visits also took place in the field of high energy physics. For example, while preparations were under way for the U.S. team's stay at Serpukhov, two Soviet physicists were attending a summer seminar at the National Accelerator Laboratory at Batavia, Illinois; their assignment there was regarded as a useful preliminary to the eventual selection of a U.S.-USSR collaborative project as part of the experimental program of the 200

BeV accelerator under construction at Batavia.

In addition to the cooperation in high energy physics, exchanges in other nuclear fields continued to expand during the 1970-71 period. A visit a Soviet reactor team had made to the United States in November 1969 was reciprocated in June 1970, when a U.S. reactor group of ten (representing industry as well as the USAEC) spent two weeks in the Soviet Union. As Petrosyants had promised me, our group was able to visit all the facilities requested, including the Shevchenko fast reactor and desalting project. In the area of controlled thermonuclear reactions (CTR), three U.S. turbulent heating specialists visited laboratories in Moscow and Kharkov in late 1970, and arrangements were made for three Soviet superconductivity specialists to visit the United States. Long-term assignments in the same general area (CTR and plasma physics) were arranged. Also worth noting, though not part of the collaboration covered by our Memorandum on Cooperation, is the fact that while Drickey and his group were working at the Serpukhov Institute of High Energy Physics, Dr. Robert D. Sard of the University of Illinois was also working there as a member of a CERN group engaged in an experiment utilizing the boson spectrometer.

During my talks in Moscow in September 1969 Petrosyants proposed an exchange of high level delegations during 1970. I concurred in this idea, and tentative plans were made accordingly. Unfortunately, schedule demands on both sides necessitated postponement of our trips until 1971. Early that year, arrangements were agreed on for the SCAE Chairman and a group of Soviet scientists to visit nuclear facilities in the United States, April 15th-28th, and for a U.S. group to travel with me in the Soviet Union in August.

I welcomed the Soviet delegates on their arrival in New York on April 14, 1971, and accompanied them during part of their stay in the United States (Fig. 6). Their travel and visits took place as scheduled. At its conclusion I and the other USAEC Commissioners met with our guests for a review and

resumé to U.S. facilities and related USAEC programs, a resumé of Soviet programs, discussion of future exchanges, and plans for my forthcoming visit to the Soviet Union.

On entering the Soviet Union for the fourth time, I had the newly acquired status of Foreign Member of the USSR Academy of Sciences. The distinction of election to the Academy had been conferred on me during the organization's annual General Assembly meeting in March. Knowing how few foreign scientists were admitted, I felt greatly honored when I received the cable by which President Keldysh and Secretary General Peive of the Academy notified me of my selection. I deeply appreciated the heart-warming messages of congratulations that came in the succeeding weeks from SCAE Chairman Petrosyants and many other leading Soviet scientists. My formal admission to membership occurred on July 13th at the USSR Embassy, where Ambassador Dobrynin presented me with the certificate of my election (Fig. 7).

Three weeks later I was on my way to Moscow. The warmth of the welcome accorded us was too clearly genuine to be credited to policy or protocol. All with whom we came in contact--scientists and laymen, officials and ordinary citizens--displayed great respect for us as scientists and as Americans and seemed to appreciate our manifestations of respect for them and their achievements. I was interested to note the extensive news coverage our activities received in all the cities we visited. There were articles in the local newspapers, usually on the front page, describing our delegation and our visits to the local institutes. There was also radio coverage in nearly all instances, and apparently the progress of our delegation was covered by Moscow radio as we travelled around the Soviet Union.

Our trip was especially worthwhile in enabling my colleagues and me to become acquainted with a broader range of Soviet institutions than had been possible for me on my previous visits to the Soviet Union. I think that the Soviet method of supporting science and other areas of learning through

institutes has much to recommend it, especially from the standpoint of continuity of funding, though the system has the weakness that there is not so much cooperation between the institutes and the universities as there should be with respect to the teaching of students.

In the nuclear field, I observed substantial progress since my first tour of Soviet atomic energy installations in May 1963. In reactor construction, particularly, I received an impression of significant advances and improvement since that time. In many ways, the trip of August 1971 represented a high point in the development of U.S.-Soviet cooperation in peaceful nuclear applications.

This visit to the Soviet Union, August 4-19, 1971, included detailed discussions and inspection of nuclear power reactors, visits to technical institutes of the State Committee on Atomic Energy (SCAE) and of Academies of Sciences (all Union and various individual Republics), a meeting with Chairman A. M. Petrosyants and senior officials of the SCAC, a number of lectures, and meetings with officials of scientific societies. A chartered Aeroflot jet aircraft was provided by the SCAC, which permitted visits to nine cities in ten days, with a total distance travelled of 12,110 kilometers, or approximately 7,500 miles (Fig. 8). The cities visited, besides Moscow and environs, were Minsk, Leningrad, Melekes, Novosibirsk, Tashkent, Samarkand, Erevan, Tbilisi, and Shevchenko.

The schedule was as demanding as any I had undertaken in my official travels for the Atomic Energy Commission but the trip was unusually informative and rewarding. During the concluding four days of the trip, while in Moscow, I presented papers at two international meetings (Fifth International Conference on Organometallic Chemistry and Thirteenth International Congress of the History of Science) and also lectured to the staff of the Institute of Physical Chemistry. I also delivered a letter from Dr. Philip Handler, President of the U.S. Academy of sciences, to Dr. M. V. Keldysh,

President of the USSR Academy of Sciences, which encouraged cooperation in future planning and experiments for large and high-cost accelerators required for high energy physics research; we reviewed plans for discussions involving U.S., Soviet and European experts on these subjects. A separate meeting was held with Dr. I. I. Artobolevski, President of the Znanie Society, the Soviet counterpart of the American Association for the Advancement of Science, of which I was president-elect; we discussed cooperative exchange arrangements between our two societies.

One nontechnical item of interest about the trip is worth noting. The special plane provided for our travel was a twin engine jet (TU 134) capable of carrying about 75 people and containing three separate compartments with seats and tables for meetings or working. There was a five-man crew and four hostesses. We were informed that Premier Kosygin frequently uses the same plane.

Acknowledgement

This work was supported by the U.S. Department of Energy under Contract DE-AC03-76SF00098.

FIGURE CAPTIONS

- Fig. 1. Arrival of the U.S. Scientific Delegation to USSR at Moscow's Shermetyevo Airport. Left foreground are U.S. Ambassador Kohler, Seaborg and Chairman A. M. Petrosyants. XBB 719-8718
- Fig. 2. Seaborg and A. M. Petrosyants signing U.S.-U.S.S.R. Agreement for Cooperation, Moscow, May 1963. XBC 732-1117
- Fig. 3. Presentation of the Mendeleevium Folio to President Keldysh, U.S.S.R. Academy of Sciences, Moscow, May 21, 1963. (L to R): I. U. Morokhov, M. D. Millionshchikov, Seaborg, M. V. Keldysh, A. Ghiorso. (in foreground, back to camera) D. V. Skobeltsyn. CBB 779-8726
- Fig. 4. Scene as the Limited Test Ban Treaty was signed in St. Catherine's Hall in the Kremlin, August 5, 1963. Signing at table are, from left, Secretary of State Dean Rusk, Soviet Foreign Minister Andrei Gromyko, and British Foreign Minister Lord Home. In the front row are, from left, Senator George Aiken, Senator J. William Fulbright, Senator Hubert Humphrey, U.S. Ambassador to the U.N. Adlai Stevenson, and between them (slightly behind) Senator Leverett Saltonstall, U.N. Secretary-General U Thant, and Premier Khrushchev. Behind Lord Home and his aide is Edward Heath (British Lord Privy Seal) and beside him, to the left is Soviet Deputy Foreign Minister Valerian Zorin, and beside him and slightly behind to left is Soviet Ambassador to the U.S. Anatoly Dobrynin. To the extreme right is the author. XBB 876-4855
- Fig. 5. A. M. Petrosyants, Helen Seaborg and Seaborg visit to NS Savannah in Baltic, September 1964. XBB 732-1142
- Fig. 6. A. M. Petrosyants riding bicycle around one-sixth of the main ring, during visit to National Accelerator Laboratory, April 16, 1971. XBB 732-1266
- Fig. 7. Persons attending presentation ceremony for Seaborg to membership in the Soviet Academy of Sciences at the Soviet Embassy, Washington, D.C., July 13, 1971. L to R (front Row): David Seaborg, Dianne Seaborg, Helen Seaborg, Mrs. Dobrynin. (Second Row): Roger Batzel, Mike May, Justin Bloom, Steve Seaborg, Eric Seaborg (hidden by Helen Seaborg). (Third Row): Clarence Larson, Jane Larson, Em Rubin, Julie Rubin, Herman Pollack (behind Julie Rubin). XBB 779-9281
- Fig. 8. At the airport in Moscow, the U.S. delegation, with members of the Soviet State Committee, the crew members and stewardesses, August 15, 1971. (L to R): M. V. Maidionov (crew member), I. G. Timerbulatov, stewardesses, V. F. Menshikov (crew member), Seaborg, Captain Kzavchenko, crew member, head stewardess, A. G. Meshkov, E. Kintner, J. Taylor, S. V. Patrakeev, J. Rubin, Em Rubin, R. Hirsch, Maggie Hollingsworth, Helen Seaborg, L. Squires, R. Duffield, R. Hollingsworth, J. Lewin, R. Cool, and Klara Biriukova. XBB710-11065.



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