excerpts from a RUSSIAN DIARY

By **Luis W. Alvarez**

Luis W. Alvarez, professor of physics at the University of California at Berkeley and a member of that University's Radiation Laboratory, is one of the most widely-known American physicists of his generation. He was one of 14 US physicists invited to attend the Moscow Conference on High-Energy Physics, held May 14–20, 1956, by the Academy of Sciences of the USSR. Although his frank and revealing personal diary of that period was kept solely for his immediate friends and relatives, the author, whose contributions as a diarist have not gone unnoticed on other historic occasions, has generously offered the document for publication here for the information of physicists everywhere. Concerning the style in which it is written, Alvarez explains: "I wrote at high speed in the midst of a very busy schedule; I could have edited out the rough spots in the prose, but I think it is perhaps better to leave them in, as they emphasize the fact that the diary is a record of my feelings at a particular moment, and not a well thought out story of a trip. Most of the additions and corrections which were put in during the editing (in November 1956) are enclosed in parentheses." It should be added that space considerations have required a slight abridgement of the text in this published version, the deletions being confined mainly to traveling and sight-seeing episodes. This is Part I of the Alvarez diary. Part II will appear in a later issue.

I LEFT Los Angeles at midnight on Friday the 11th of May. I was the second through passenger by Scandinavian Airlines (SAS) over the polar route direct to Moscow. Murray Gell-Mann, who attended the conference, was the first such passenger and had his picture taken boarding the plane the day before. We first landed at Winnipeg and then flew over Hudson Bay and Baffin Island and landed in western Greenland, at South Stromfjord, just above the Arctic Circle. (From here on, I'll take it directly from my diary.)

Left South Stromfjord 2245 GMT (Greenwich Mean Time), May 12. It is a small town at the head of a long fjord extending to the west coast of Greenland. It is a USAF Base, but apparently not a fighter station. There were six or eight transports on the field, but no military planes of any sort. We saw a very mangy fox near our plane before we took off. No photographs are permitted by the Danish government anywhere in Greenland. We could not even photograph the edge of the main ice cap, about fifty miles inland from the airport. This was a beautiful sight, with relatively flat ice extending for hundreds of miles to the north, east, and south. Toward the west, the ice seemed to be flowing through valleys to the lower regions, in huge glaciers. One could see the bending of the lines of ridges on the ice, which show that the flow rate is greatest at the center of one of the glaciers and slowest near the walls of the valleys. It is not surprising that people were fast to guess that glaciers were slowly moving "rivers of ice". Soon after passing over the main ice sheet, a low-lying layer of cloud covered the ground. We could see an occasional mountain sticking up through the undercast, but for the most part, it looked as though we were flying over the ocean.

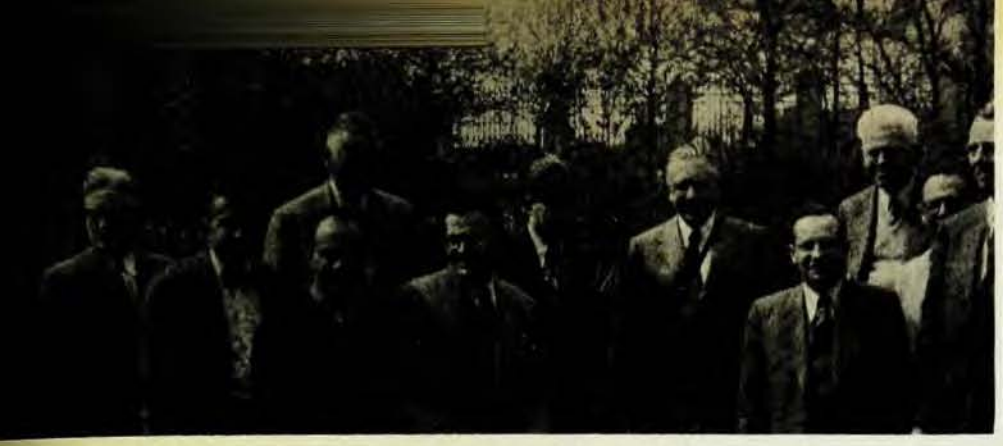
It started to get dark at about 0100 GMT on Sunday, May 13. If we had been a few hours later, we would not have had any darkness at all. At South Stromfjord, at midnight local time, the sun would have been only a few degrees below the northern horizon, so it would have been quite light. We will probably have a couple of hours of relative darkness. We are moving southward, and so is the sun.

0705 GMT, May 13—arrived Copenhagen. Beautiful clear day. We flew over the water, just out from the downtown area, and banked so we had a fine view of the whole city. Pief (Panofsky) and I took a taxi out to Bohr's Institute.

Dr. Bøggild showed us through the Institute for Theoretical Physics. We had lunch in his apartment on the top floor of the Institute. Otto Frisch was there.

1450 GMT (3:50 PM Copenhagen time). Left Copenhagen Airport in a Swedish made "Scandia" which looks very much like a Convair, and climbs as steeply. Inside the cabin, it has three seats per window instead of the Convair's four. Cabin looks like a DC-3 inside.

1722 GMT (6:22 Copenhagen time). Arrived at Riga, Latvia, USSR. Steward collected passports before we landed and said we will eat on the ground. Met at the plane by an attractive woman who guided us through passport and money accounting. The main airport building is one year old and is lavishly decorated inside. There is a large mural over the door into the two-story high main lobby. We were taken up a long, carpeted staircase to the



A few of the participants at the Moscow Conference on High-Energy Physics: Interpreter, Farago (Budapest), Foster (McGill), Smith (Brookhaven), unknown, Bakker (CERN), Goldanski (USSR), Cerenkov (USSR), Segrè (Berkeley), Veksler (USSR), Oliphant (Canberra), Pais (Princeton), Alvarez (Berkeley).

dining room, where we had a meal of fish and French fried potatoes. There is a three-piece orchestra (piano, violin, and cello) playing selections from Rose Marie at the moment. A number of Russians are dining and paying no attention to us. The lady guide just came in to say that our plane has engine trouble, so we are relaxing over more coffee and watching the Russian couples dancing. Two of the young men are wearing uniforms, but we can't tell what they are. Of the sixteen passengers on the plane, four are Americans or British going to the nuclear conference, and the other twelve are members of the British National Coal Board, visiting USSR mines.

At midnight, we were all taken to a suite of bedrooms in the airport building. Pief and I had a room together. We were wakened at 6:45, and our luggage was delivered to our rooms. After shaving, we went to the dining room we were in last night. The breakfast was delicious—two fried eggs and ham, with buttered toast and much coffee. The news now is that we will leave at 8:45 local time for Moscow on Aeroflot, the Russian national airline. Pief and I will go together on one plane, and the other fourteen will go in another Aeroflot plane. The SAS plane won't be ready until about 10:30. It is now May 14 at Riga.

0940 Riga local time. Took off from Riga airport in a Russian built DC–3 (IL–12). The field was very hazy—low ceiling and not too much visibility. There was a Russian built GCA set at the end of the field. I thought the two Longacre type "V-beam" search radars at each end of the field might be helping the tower, but they weren't rotating as we taxied by. Our interpreter this morning was a girl who spoke English quite well. She is an English teacher in Riga, and was at the airport because of our group's presence. She had studied English four years at Leningrad University but has not had much practice lately. She tried to pick out the Americans and British by their accents. I was her first guinea pig and after listening to me, she said, "I think you are English." The Coal Board collapsed in stitches at this, so then she said I was more "reprehensible" than the usual American. (I like to believe that she meant "comprehensible"!) She was very pleasant and made our stay very enjoyable. We are now flying above the clouds, so unfortunately we can't see the countryside below. The plane doesn't have safety belts or the usual no smoking sign. Instead, it has a clock, a barometer, and a thermometer where they would be. We are at 1200 meters and just leveling off. Another difference in the plane is that the window pane is single, with no airspace between the panes. So it frosts up inside, but one cleaning seems to correct this. The riveting on the wings is not of the flush type used by Douglas, but the heads are rounded and stick out. At DC–3 speeds, I don't suppose this makes any difference. Pief and I are the only foreign passengers out of the twenty-one aboard the plane. Now I'll go back to reading Tolstoy's *War and Peace*.

The man across the aisle spoke to me in English about the book. He is an electrical engineer who was in the USA and visited San Francisco during the war. We have come down to 400 meters, where we have a good view of the countryside. There is a great deal of water in the rivers, and many patches of water on the land. Apparently it is from melting snow. "The snow is late," according to my friend across the aisle. Some places look as though they had been flooded. Much of the land is forested, but some of it is being farmed. I don't know where we are now, at 1050 Riga time, as I don't have a map. I forgot to say that we didn't get our passports back until we were airborne.

I JUST woke up from a nap that lasted almost two hours. It is quite clear out now, with almost unlimited visibility. It is overcast with high clouds, but I have a fine view of the forests and farming area over which we are flying. Moscow should be fairly near, straight ahead, but I can't see it. Although we are only a few hundred feet above the ground, I haven't seen any people in the last ten minutes. There is an occasional small village or farm community with ten or twenty buildings with thatched roofs. (These were collective farm villages.) I can't tell whether they are houses or barns. We have passed over one thing I would call a town, with brick houses and streets. The villages usually consist of a road with perhaps a dozen houses or barns on each side in a parallel array. I have seen both houses and barns now but still no people in the fields nor on the roads. It is now 1 PM Riga time, and we are passing over suburban, built-up areas. Paved roads, with some automobiles, and a three-track railroad just passed under us. It is becoming apparent that we are approaching a big city. Most of the evidence of civilization is on the left-hand side of the plane, where I can't see it so well. Power lines are beginning to show up below, and the traffic is heavier on the roads. The houses on the ground are becoming more modern. Some of the layouts

of houses resemble American subdivisions in the country near a big city. We are now circling to land at the Moscow airport. As we land at 1:10 PM, I see a GCA set alongside the runway. There are dozens of DC–3's on the field, and many others of a type I don't recognize but which look very much like a Convair (IL–14). There are no four-engined planes on the field. (Russia has no four-engined transports.)

We were met by four physicists—three of them spoke good English. (I heard later that Veksler was at the airport to meet us the night before.) We were driven directly to the Lebedev Institute, where the conference started

The conference hall. ". . . foreign visitors are concentrated toward front and center. . . ."

about five minutes after we sat down. The conference hall is very large, and there must be about eight hundred or a thousand in attendance. The foreign visitors are concentrated toward the front and center, where earphones are provided to give simultaneous translation into English. It is hard to understand how the translator can be talking in English while listening at the same time in Russian to the sentence he will translate in a moment.

After a brief introduction and speech of welcome to the visitors, the first paper is on the 680-Mev synchrocyclotron at the Electro Physics Institute. This is well described in the literature, so I won't take any notes on it.

We were driven to our hotel in the limousine which brought us from the airport to the Lebedev Institute. The car was a chauffeur-driven ZIM (M for Molotov auto works); the other car for official visitors is the ZIS (S for Stalin). The ZIS is a carbon copy of a prewar Packard. Our interpreter helped us check in. My suite is 901 and has two rooms and a large bathroom. The sitting room has a table with a settee and several chairs around a table. There is a large desk, with marble desk set, a television set, radio, and piano. No doubt I was the first to play "Davy Crockett" on the piano. There is one TV station, which was showing a melodrama that was incomprehen-

The hotel ballroom.

sible to me. The bedroom has twin beds, a dresser, and a large clothes cabinet. The view from the window is spectacular. I look directly down Red Square and can see the gleaming and colorful domes of the Church of St. Basil. To the right of the church, and just across the street from the hotel, is the Kremlin. I don't have a view of the Lenin-Stalin mausoleum, as there is a large brick building (the Lenin Museum) between my window and the tomb. At night I can see the two illuminated red stars perched on top of a couple of spires inside the Kremlin walls. (I found out later that there is only one suite on each floor which has a view of Red Square. Emilio Segrè and I each had one of the "view suites"; some of the others complained that they had only a small room with a view of an air shaft.)

We had dinner in the huge ballroom of the hotel. The foreign visitors to the conference occupied four or five large tables at one end of the hall. Across from us was a table with representatives of the "Peoples Republic of China" and next to them was a delegation from Indonesia, each member wearing a black fez. The food was excellent and the service good. We haven't seen any Russian money yet. Everything is taken care of by our guides and interpreters. At dinner, I sat with Professor Tamm, a very distinguished Russian theoretical physicist. He speaks fluent English, and was a delightful dinner companion. He has a

Professor Tamm. ". . . a delightful dinner companion. . . ."

most engaging personality and did most of the talking. No one else wanted to interrupt him because he had so many interesting things to say. He was obviously very happy to see us in Moscow. After dinner, John Marshall and I walked around the Kremlin. We ran into some other friends later and John went with them, and I walked several blocks back to the hotel by myself. It was still light at 9:00 PM. I was tired after the long trip and went to bed at eleven, after writing some post cards and watching the television for a while, and washing my dacron shirt.

TUESDAY morning, I had breakfast with the gang, and decided to play hookey instead of going to the conference. After all, I'll hear most of the same things in Geneva in a few weeks. My guide, Nick, took me for a walk through the center of town, and about a third of the way around the Kremlin. I took a lot of pictures, which I hope turn out well. (They did.) We stopped at the Metropole Hotel to buy some Russian money. Nick is a very nice young man who is taking his doctor's degree in foreign languages at the University. He speaks excellent English, and is a very good companion. He went to Italy as the interpreter for the Russian scientists at last year's Pisa conference, and was in London this year for a couple of weeks. Those are his only trips outside Russia, but he knows a great deal about the outside world, as he reads American magazines, such as *Newsweek,* and so gets his news without the official filter which isolates the average Russian from foreign opinions. He tells me that in the last year, *Pravda* and the other official publications have been very friendly to us. This seems to be reflected in the complete lack of unfriendliness shown by the people as we walk around.

For the past two hours, I've been driven around Moscow in a taxi, and then in one of the official cars. We went out to the University, which is housed in the largest and tallest building in Moscow. It is on a hill overlooking the main part of the city. I took a number of pictures of the city and of the University buildings. Nick tried to find a place where I could photograph one of the log cabins which line the road to the University, with the skyscraper in the background. There were too many trees in the way, so I didn't get the shot. Moscow is much like Mexico City in that the very new and magnificent buildings are close to the very old and sometimes decrepit. We drove by the American Embassy, and I got pictures of it and the huge modern apartment building close by. This apartment is largely populated with scientists, writers, and other intellectuals. Nick said the average apartment had three rooms. Nick bought a new car with the money he has made by translating American writers into Russian. He has translated Dreiser and Steinbeck. His car cost nine months of his regular salary. It takes about two years of waiting to obtain delivery of a car—the demand is very great. We had a lot of interesting conversation about many things, including politics and public opinion. Until recently his only American reading, besides books, was the *Daily Worker*. He wanted to know how influential it is in the US, and I told him it was treated as a joke by the "oppressed workers" it tries to protect.

After lunch, Bob Wilson and I walked to the Hotel Metropole to get him some money. It was starting to rain when we arrived at the Moscow Hotel, so we didn't continue on to the GUM, the main department store, as we had planned to do. I went to my room and played the piano for a half hour, and then took the bus to the meeting on accelerators.

I'm now sitting in the front row, and apparently taking notes like mad. There are two simultaneous interpreters sitting in the second row. They lean over and give the speech in English, so those of us in the first row can understand what's going on. It is a bit exhausting for both the interpreters and the front row sitters. The meeting is at the Institute for Organic Chemistry. The lecture hall has wood panelling and handsome upholstered chairs, and it has the usual elaborately designed plaster ceiling. A kitten strolled out onto the stage during the last talk and came over so I could pet it. On each side of the stage is a picture about six by four feet. On the left is Lenin, and on the right is Stalin. The meeting started at 5 PM and ended at 8:30 PM. The bus took us back to the hotel for dinner. I sat next to one of the four girl interpreters—there are about eight or ten young men in the interpreter corps. All are graduates of the Moscow Institute of Foreign Languages, and all speak English very well. This is surprising in view of their almost complete isolation from English-speaking people since the war. None of the amazing "simultaneous interpreters" were raised bilingually, which I always thought was a prerequisite for such an occupation. They all learned English in school. After dinner, Cassels and Pickavance from England came up to my room for a drink of Scotch. We had a long talk and then went for a walk through a section of Moscow we hadn't visited before. We ended up walking down Gorky Street to the hotel. Gorky Street is the Fifth Avenue of Moscow, with the finest stores. I'm now ready to hit the sack.

WEDNESDAY. I almost slept through breakfast, but got up in time for a snack before the bus left. On the way out to the Lebedev Institute in the bus, we had a most interesting experience. One of our interpreters read several articles in today's *Pravda* to us in English. He read the stories of American reactions to the Russian statement that in the next few months, they will reduce their armed forces by 1.2 million men. We heard digests of articles in *The New York Times, Herald-Tribune,* and other papers. Then there was a report of a press conference with Dulles and a statement by Jim Hagerty at the White House. The most impressive thing was that the reporting was straight, without the editorial slanting we have heard is common in *Pravda*. We also had an account of the British frogman episode, with a good account of its effect on British politics and public opinion. Our interpreter asked us why the US was suspicious of the proposals, as the US papers had indicated. We then had a long and interesting discussion with our Russian friend about the openness of data about the US Armed Forces. He could hardly believe that so much detailed information was available concerning the American Armed Forces. He was amazed to hear that one could get official

lists of all officers in the Army, Navy, and Air Force, with their addresses and ranks, and that the budget figures are given in great detail. He asked why the figures couldn't be falsified. I said the opposition would complain about such things in public. Perhaps he got this point, as he said, "Well I guess that's what an opposition is for." (The idea of a "loyal opposition" is not easy to grasp, if you've never seen it in action.) We explained how the American public felt it didn't get a fair deal in these negotiations with the Russians. They can check our numbers, but we have to take theirs with no proof. I think we made some progress in mutual understanding. He said he had never heard anything about our openness with official figures. One can easily understand why Russians feel the way they do about us—they read we are suspicious of their proposals to reduce arms. They naturally assume we operate the same way they do, insofar as secrecy is concerned, and also in that opinions in newspapers are official government reactions.

I AM now in the big lecture hall at the Lebedev Institute, and Emilio Segrè is talking of the Berkeley work on antiprotons. He received an ovation when he took the platform—the first time I have heard any applause since I arrived. He spoke in English—several sentences at a time—and the interpreter then rendered it into Russian. It soon became apparent that between one-half and one-third of the audience could understand English when spoken. (They all read it.) There were often spontaneous "nyets" from all over the audience when the interpreter made a mistake, and there was laughter all over when Emilio made a joke. The applause was long and loud at the end of the talk. The paper is now being discussed. The chairman just called "Professor Pontecorvo", but someone else got up to make a point. Everyone leaned forward to see Pontecorvo, as he hasn't appeared at the meetings yet. He and Segrè were co-workers at Rome with Fermi, and people were anxious to see how the two would act toward each other here.

During the coffee break, I saw Pontecorvo, but I haven't talked with him. I had a long talk with a couple of young physicists who wanted to know some details of my recent work at Berkeley. They were familiar with all the published details, and asked a lot of pertinent questions about things we have done since. They are working hard at building the detection equipment for use with their super Bevatron, which will be working in the fall. They should be able to make good use of it immediately, as they can benefit from our experience. At Berkeley and Brookhaven, we had to feel our way slowly, as we had no one to tell us what kind of equipment would be needed. They will have all the proper tools ready when they get their first beam.

After lunch I walked around by myself for an hour and a half and took pictures. I had walked by myself before, and had taken pictures (with my interpreter), but this was my first time really on my own. When I was taking a close-up of the SW gate of the Kremlin, a civilian came up to tell me in Russian that I couldn't take pictures. I told him in English that it was all right, but he kept on arguing. I was worried that a crowd might gather. But for some reason I don't understand, he finally stopped protesting and walked up the path to the gate, and I got my picture.

Back at my hotel, I bought stamps for the children and then went across the street to the National Hotel, where I had drinks with several Americans in the apartment of the *London Express* correspondent. He wasn't there, but an American girl was acting as hostess. She and I have a mutual friend in the States who suggested she get in touch with me. The head of the Moscow AP bureau was there with a touring American girl, and a man who writes for the *Christian Science Monitor* and NBC. We talked of many things, particularly the fact that the Moscow correspondent of *The New York Times* had "the lead, the off lead", and another story on the front page yesterday. Moscow is supplying most of the exciting foreign news these days, and the correspondents are run ragged.

They asked how the conference was going, and if anyone had seen Pontecorvo. I told them about Segrè's speech and Pontecorvo's question which didn't get asked. After some other conversation, the AP man and his friend went off for dinner before the theater—Premier Mollet of France will be at the Bolshoi tonight with the heads of the Soviet State. I found out later that I had supplied one of the hot stories out of Moscow by my remarks about Segrè's speech and Pontecorvo's question. I have given reporters stories in the past, but always knew that I was doing it. I have always believed conversations with a reporter at a social function are off-the-record, and that a reporter wouldn't write what he had heard from you at a party without asking permission and making sure your version was to the best of your memory. But my AP friend had filed the story before going to the Bolshoi Theater.

The three of us made more talk and then went to the restaurant, where we had a fine dinner, using intourist tickets. I had chicken salad, creamed pea soup, steak and onions (excellent), ice cream, and coffee. It was more an American meal than Russian, and tasted good to me. After dinner, I walked to the Metropole Hotel with my dinner companions, and after leaving them, I saw a crowd at the front of the Bolshoi Theater. About a dozen fancy black limousines were parked there, waiting for the dignitaries to emerge. The cars drove off, probably to a side entrance, so I didn't see any of the big shots. I found Bob Wilson there, and we walked up and down Gorky Street for an hour before I came back to my room. I found the *London Express* correspondent waiting for me. Apparently he had heard that he had been scooped in his own apartment when he was away, so he had come to get the story directly from me. I told him I hoped he would play down the Pontecorvo incident and say more about the fact that tomorrow the Russians will show the Western scientists for the first time their cyclotron, which is the largest one operating in the world, and their Bevatron, which is the largest, but not operating. I don't know that I did any good, but I feel pretty unhappy about being the first pipeline into the conference for the reporters. They have been calling conference members without any suc-

Log cabin. ". . . they usually come in groups of about twenty-five, lined up on both sides of a road."

cess so far—no one will reply to an open request for information. I will apologize to Professor Tamm tomorrow if I see him, and make it a practice not to talk to reporters about anything, anywhere, for the rest of my stay here. (Written five days later: apparently the story was OK and no one is unhappy. A lot of the British visitors have talked to reporters.)

FRIDAY morning. I saw so many interesting things yesterday that I'm afraid I won't be able to catch up with my writing. We took the busses at 8 AM to drive north to the accelerator site. We passed through North Moscow and out into the country very rapidly. I have now been all the way across Moscow from south to north, and the most surprising thing is the very small radius of the city. My guide said there were nine million people in the city (I've also heard six million). This is hard to believe at first, but later, when you see the small floor area available to each family, you begin to believe it. On our way back last night, we examined the windows of all the apartment buildings we passed. We found that each apartment had two windows on the front of the building. This means that the width of the "standard apartment" is almost fifteen feet, and the usual length, as we could see when there was an alley or street at the end of the building, was almost thirty feet. So each family has about five hundred square feet of floor space, or about fifty square meters. We have heard that the rent is 1¼ rubles per square meter per month, so a typical rent would be 60 rubles per month. At the official rate, this is $15, and at the more actual rate (in terms of purchasing power) it is about $6. They told me at the Embassy later that the average person is limited to ten square meters, maximum. This checks well with our observations. The most interesting thing is that the typical small log cabin of the peasant has almost the same size and shape. We looked at hundreds of these cabins, and they come in a fairly standard pattern. They are about 15 × 30 feet, with the back part being a shed to hold wood for the fireplace. I won't describe them further as I have several pictures of typical cabins. One of the most apparent characteristics is that they are usually badly out of plumb. Either the ground shifted or the builders didn't have levels available. While I'm on the subject of these log cabins, I'll mention that they usually come in groups of about twenty-five, lined up on both sides of a road. These are the communities I saw from the plane flying to Moscow. These villages are the centers of the collective farms. The prosperity of the individual log cabins reflects the prosperity of that particular collective farm. The farmers have no basic wage "floor". The money they get all comes from the sale of goods produced on their community farm, and also from their individual farm plots. As we came back after dinner, we saw whole families working hard on their individual plots of land. They can sell the things they grow themselves at the farmers' market. The government makes this small concession to private enterprise, as it pleases both the farmers and the city people, who can get more food this way.

We had our best view of the life in the outskirts of the city on this trip. We saw long queues in front of shops, which reminded me of England after the war. The people are apparently fond of plants—often there will be green plants growing in most of the windows of an apartment building.

Our drive took us parallel to the Great Canal, which connects the Moscow River and the Volga River. There were locks every ten miles or so, with the land falling away slowly from Moscow. I was surprised to find that the city stops rather abruptly, and one immediately finds oneself in the farming area. There is no fringe of industrial activity as there is around every large American city. Moscow is not an industrial city, but is more like Washington—the center of the government. I haven't yet seen anything that could be called a factory, and only a few places that could be classed as small manufacturing plants. We have often heard it said that the Russian factories have been moved east of the Urals. From what I have seen so far, I am sure that they must be somewhere else, because they certainly aren't in Moscow.

There were about sixty of us in our two brightly painted, Austrian-made tourist busses, with plexiglas windows at the top. Everywhere we go in Moscow or in the country, people turn around to stare at the busses. Our busses were followed by two cars. We found out later that one car carried a doctor, and the other was filled with the typical Russian soda pop, which is on every table, at every meal. We stopped halfway to the Volga and had a picnic at the side of the road. When we reached the junction of the canal and the Volga, we saw the huge statues of Stalin and Lenin, one on each side of the water. We followed the Volga for a few miles, and then turned off the road to Mischerikoff's Institute, where the 680-Mev cyclotron is. It is the most powerful cyclotron in the world, but only for a few months more, when the Berkeley machine will be running at 720 Mev. We were taken

Mischerikoff's Institute, site of the 680-Mev cyclotron.

". . . Veksler's Institute, where they are completing the construction of the world's largest Bevatron—10 Bev as contrasted with Berkeley's 6.2 Bev."

[Initial operation of the accelerator at an energy level of 8.3 Bev was announced on April 11th by officials of the Soviet bloc's Joint Nuclear Research Institute.]

to a conference where Mischerikoff told us about the Institute, and showed us the plan of the cyclotron and all its various kinds of beams of high-speed particles. They are setting it up as an international laboratory, patterned after the CERN laboratory in Switzerland. Eleven countries in the Communist bloc will participate, including Outer Mongolia!

THE briefing in the conference was impressive, but we were all bowled over when we saw the cyclotron itself, and all the experimental apparatus which was set up for business. The workmanship on all parts of the cyclotron was of the very highest quality. The vacuum tank was made of thick plates of brass, and there were what we thought to be massive brass castings for re-entrant ports into the walls of the chamber. We expressed surprise at this, because we have difficulty in making large vacuum-tight brass castings. They said they weren't cast, so we then guessed that they were fabricated out of brass plate. But that turned out to be wrong—the pieces were hogged out of solid pieces of brass about a cubic foot in size. (I saw a smaller cyclotron at Alikanoff's laboratory today, where the whole chamber was hogged out of a solid piece of brass 40″ × 40″ × 10″!—the people say, "standard Russian practice".) They apologized for the air cooling on the magnet, and said they did it to save a few months in the construction period. I have seen all the large American cyclotrons and this is better engineered than any of ours. But even more impressive than the accelerator itself was the amount of experimental equipment, its technical excellence from the engineering and physics standpoints, and the number of experiments set up simultaneously. They have sixteen different beams, and there was a different and complicated experiment set up in most of them. I'll fill this section in later, as I am sure I'll remember the details. (A good description of this laboratory and its equipment was published in the *Scientific American*, Aug. 1956, p. 29. "Physics in the USSR", an interview with R. E. Marshak and R. R. Wilson by E. P. Rosenbaum.)

After an hour or two at the cyclotron site, we drove two kilometers to Veksler's Institute, where they are completing the construction of the world's largest Bevatron—10 Bev as contrasted with Berkeley's 6.2 Bev. The machine looks very much like ours, but weighs 36 000 tons instead of our 9000 tons. They have done a few things better than we did (I like the compact straight sections and the large access holes through the yoke), but I think they will be in trouble because of the lack of working space around the machine, inside the building. I wouldn't be surprised to find the wall on one side torn down the next time we come. It was obvious that everyone at both labs was very pleased to show us what they had done. We are (almost) the first foreigners in this "Volga Laboratory", and all of us can appreciate what they have done and are doing. The labs are surrounded by a pair of tough looking barbed wire fences separated by about twenty feet, with guards posted at handy intervals. They kept the whole operation secret until about a year ago, when the cyclotron started to turn out good results. Then at Geneva last summer, they announced for the first time that their Bevatron was almost finished. Now they are willing and happy to show it all to Western scientists. They have shown this same characteristic in the field of athletics—they didn't compete in the Olympics until they could win, and they didn't announce they were in the high-energy nuclear physics field until they had winning machines to exhibit.

After a complete tour of the 10-Bev machine, we went through the very large building that houses the four huge motor generators and the associated rectifier equipment. All generators were turning when we arrived. They had a large diffusion cloud chamber to show us in the same building, but it had apparently just stopped making tracks as they asked us to look in; we didn't see anything. I was cheered up to find they are human enough to foul up a demonstration, just like everybody else. On the second floor of the generator building are two large control rooms. One contains the equipment for frequency tracking and is about thirty feet on a side and covered on all sides with racks of electronic equipment. The floor was the standard hardwood and there was the standard Victorian chandelier hanging from the ceiling. This combination of Victorian décor, both inside and out, doesn't seem to us to fit with the ultramodern scientific equipment inside, but it is again standard Russian practice. We then

went to the main control room, which is "out of this world". It is sixty feet on a side and two stories high, with racks around the walls on both stories. In the center of the room is a large control desk, which NBC could be proud of. The engineering keeps surprising us all the time —it all looks as though it had been built by GE.

We left Veksler's Institute and drove through the town of 5000 people, which has been built specially to house the people working at the two big labs. There was a big banquet waiting for us on the second floor of a new building. Mischerikoff gave a toast of scientific friendship between Russia and the Western world, and Vicky Weisskopf gave a good responding speech. We had the usual fine 2½-hour meal, with too many courses to count. We finally went down to the busses and found a delegation of townspeople waiting to see us off. There must have been over a thousand men, women, and children, all there to see some real live Americans. (Or more accurately, Westerners.) After all, it would have been more probable last year to find a bunch of Martians in that spot than a group of Americans. As we started to drive off, everyone waved at us, and we waved back. It was quite a touching affair, as several people remarked as we left.

On the way back, we did some research on the number of families in the log cabins along the road. About 20 percent of the cabins in the prosperous collective farm villages had television antennas on the roofs, and sometimes we could see several on one house. We concluded from this study that each family occupied the standard five hundred square feet. One member of our party almost fainted at the banquet from exhaustion—we are getting very little sleep and lots of exercise. The doctor took him to Veksler's house and gave him some pills, and he drove back in the car with the doctor. I'm sure we all hit the sack as soon as we arrived at the hotel.

Alikanian and his brother Alikanoff. ". . . Element 101, which we call Mendelevium, is missing."

Leaving the Volga Laboratories. ". . . several hundred of the townspeople waiting to see us off . . ."

TODAY I attended the session of the conference on accelerators. The session was devoted to linear accelerators for protons and electrons, and they made some nice references to my pioneering work in the field. They asked for some remarks from the floor by me, and these were duly translated for the audience. At noon I was taken to the Institute for Heat Research, which is run by Alikanoff. He had asked Steinberger, Smith, Riddiford, and me to be his guests, to show us his Institute, and have us tell him of our work. His people have two bubble chambers working—one with propane, and another with freon, which is sensitive for half the time. They also have a four-inch hydrogen chamber which has given tracks once. It is the usual beautiful mechanical object, and well thought out. It was started just before they received the *Review of Scientific Instruments* with the detailed article on our four-inch chamber. We saw their 40-inch cyclotron, which does time of flight neutron spectroscopy with a 250 channel circuit. The cyclotron was finished in 1949, and looks like an American prewar setup, with a few exceptions. They apparently didn't get into the very fancy era until 1950 or 1951. After a couple of hours touring the lab, we went to Alikanoff's home, which is on the Institute grounds. It is a beautiful place—well furnished and very large and comfortable. This is apparently the way the typical important scientist lives in Russia. We had heard that they were the privileged members of society, and I can certainly confirm that. Alikanoff won the Stalin prize several years ago. His house is only a year old, and is set in a lovely forest near a lake on which ducks are swimming. Alikanoff said I was the honored guest, so I sat at the foot of the table where his wife usually sits. She sat next to him, and his brother, Alikanian, sat on his right. The table was beautifully set and we took the standard 2½ hours to finish our fine meal. Someone got up every few minutes to give a toast to someone, or something, so we were feeling no pain at the end of the meal. Mrs. Alikanoff is a very nice looking young lady and was a gracious hostess. We met their two children, a boy about 15 and a girl about 8. I gave the girl a package of lifesavers which I had with me. After the meal, we went back to the lab, where I gave an hour and a half talk on our work on hydrogen bubble chambers. They apparently found it interesting, and they asked many good questions. (My talk was translated by Nikitin, who has done some excellent high-energy physics at the Volga lab, and who is now directing the hydrogen chamber work at Alikan-

off's Institute. I enjoyed my visits with him very much.) We finally had to leave, as we had tickets to the Bolshoi Theater at 7:30.

We sat in a box on the first level—there are six tiers of boxes in the horseshoe-shaped interior. It looks very much like La Scala inside, with vertical walls lined with boxes, a sloping first floor, and an orchestra section covered with straight chairs. There is a huge chandelier and gold leaf on the fronts of the boxes. There is a large box in the center on the second tier (two tiers high) where the big shots sit. Last Wednesday Bulganin and Khrushchev were there with Mollet, and tonight the officials of Indonesia were there with a Soviet official of lesser rank. The Indonesians wear black fezes—I had seen them in the dining room and wondered who they were. The audience was extremely well dressed and prosperous looking. If you came through Moscow blindfolded, and found yourself in our box, you would think Moscow was like any other city in the Western world. The people there were dressed the same and looked just like Westerners, for the most part. The Indonesians were welcomed in a speech by a very good looking young lady from the stage, before the curtain went up. (Pretty girls are so rare in Russia that they call for special mention.)

The ballet was Prokofiev's Romeo and Juliet. There was a very large symphony orchestra in the pit—complete with two harps. The production was unbelievably magnificent. There must have been about thirty different sets, all beautifully done. There were often more than a hundred people on the stage in very splendid costumes. The lighting was spectacular, and the dancing was up to the standards we have always associated with the Moscow State Theater. As far as all of us were concerned, the whole thing was out of this world. The theater is maintained as a national show place, and no expense is spared to make it impressive for the distinguished foreign guests who sit in the central box every night. I have seen some Broadway musicals that cost a good fraction of a million dollars to stage, and they look shabby compared to the production I saw tonight. It just has to be seen to be believed. (I have recently read reviewers of the Romeo and Juliet production which the Bolshoi company put on in London in the Fall of 1956. Even the most hard-boiled critics write in the starry-eyed prose I used above.) During the two intermissions I had drinks in the salon downstairs and walked through the foyer watching the people. It is now half past one on Saturday morning, and I'm all caught up —I've washed both my shirts, and brought my diary up to date.

SATURDAY morning. I am sitting in a room in Veksler's Moscow Institute. This was set up right after the war, and Veksler built a 250-Mev electron synchrotron at the same time a number of such machines were built in the US. They have never published any work from this machine, although it was working in 1946. We didn't know it existed until Veksler told about it at the Rochester Conference last spring. About six of us were invited to have a private tour of the Institute, instead of going to the morning session of the conference. Everyone else is

"We were met by Professor Čerenkov."

scheduled to visit here this afternoon, when no session is planned. As we entered the laboratory gate, we were met by Professor Čerenkov, the Russian whose name is most familiar to Americans. We all use Čerenkov counters, which are based on the effect he discovered in 1936. He said he will show us the original piece of apparatus he used twenty years ago in making his discovery. We were shown the synchrotron and the associated experimental equipment. Everything looked like an American prewar lab. It is again apparent that until about 1949 things went on without the unlimited funds which became available then. Veksler spends a lot of time at the Volga lab, but he retains the directorship of this lab. At the moment our synchrotron people are talking to about thirty young experimental people from this Institute about their work in the States. The periodic table over the blackboard has all elements the same as ours, except that Einsteinium and Fermium are called Athenium and Centurium. Element 101, which we call Mendelevium, is missing. I said that once a visitor to Berkeley commented on the fact that we hadn't yet added Berkelium and Californium to our chart, so I pointed out that they hadn't yet added Mendelevium. This got a good laugh. Someone just pointed out that Cassels is describing a measurement of the Panofsky effect, using the Čerenkov effect—both Panofsky and Čerenkov are in this small room, which is apparently Veksler's office. It is apparent from the enthusiasm Veksler shows for the physics being done in his small Moscow Institute, that this is where his heart is. I would guess that he was told to outdo the Americans at the Volga, and he has done this as a job. But the main load there is carried out by a large engineering staff, to which he is more of a consultant. As Mischerikoff said at his lab, no meson physicists were allowed around the big cyclotron until it was finished by the engineers. Prof. Čerenkov has just given me an original print showing Čerenkov light, which he took in 1936. He has inscribed it on the back.

After a session of picture taking outside the Institute, we drove back to the hotel in Nick's private car. It is a nice car, about the size of a typical British car. He was worried about running out of gas, and we asked him what he would do, as we haven't seen a single gas station the whole time we have been in Russia. He said he had some spare gas in the trunk compartment, and that there was a filling station near his home. He says gas costs 50 kopecks a liter, or 2 ruble a gallon for ordinary gas. This is 20 or 50 cents depending on the conversion factor you use. After lunch, he came up to my room to get my ticket, to change the reservation from Moscow-Stockholm to Leningrad-Stockholm. He said he wouldn't be seeing me again, as he has to study for his final exams and so is excused from further duty. He wrote out his address in Moscow so I could correspond with him. And a moment ago he came back with a box seat ticket for tonight's performance of Aida at the Bolshoi.