



THE RUSSIAN-AMERICAN
VLB EXPERIMENT

Part III*

Ken Kellermann

Following the "successful" test run at the end of September we had nearly two weeks before the main observing session scheduled for mid-October. The first few days were spent installing the 6 cm receiver, devising a chain of battery supplies to insure the continued operation of the atomic clock, and trying to establish some sort of communication with Green Bank. The first two projects were rapidly completed but continued attempts at telephoning only produced the now familiar "Amerika Nyet".

Our Russian hosts decided that we were adequately prepared for the observing with more than a week to spare, and that the extra time could be used to expose us to some Soviet culture. They proposed a trip to Middle Asia covering Armenia, Tashkent, and Samarkand.

The trip started out uneventfully with the three hour drive to the Simferopol airport. This being my fourth trip over this route it was beginning to lose its interest. In Simeropol we boarded an Aeroflot plane for Yerevan, the capital of the Armenian Soviet Socialist Republic. Since directly to the north of Yerevan are high mountains, airplanes are forced to manuever south of the city for landing. The Turkish border is only 15 miles south of Yerevan so it is not possible for modern jet aircraft to land without passing over the Turkish border, which would, of course, mean being immediately sited out by the waiting American anti-aircraft guarding the frontier. Thus, we were forced to fly on a relatively slow propeller driven airplane.

Although the flight was supposed to last about two hours, not too long after take off we began to descend. After landing we were told that we were in "Mineral Water", a small resort town (a Russian White Sulphur Springs) in the Georgian Soviet Socialist Republic, and, due to bad weather it would not be possible to land in Yerevan until the following morning. No one bothered to tell us what we were supposed to do in such a situation, so we proceeded to the airport building where we learned that there were some 10 other planes from all over the USSR which were also forced to detour to Mineral Water on the way to Yerevan. Somewhat over 1,000 passengers from these planes were occupying a rather small airport terminal. Our fellow passengers, who had apparently decided to camp out for the night in the terminal, were comfortably spread out on chairs, tables, and the floor in various states of dress and undress. Due to the rather overcrowded conditions and the lack of adequate sanitary facilities, the whole place had the aroma of one large toilet.

I haven't described yet the Russian public toilet facilities. Rules of common decency prevent an adequate description but it is sufficient to say that the best ones were just marginally adequate, while the worst are best left to the reader's imagination. Russian soap leaves one smelling considerably worse after washing than before, so we carefully rationed out our limited supply of soap that my wife thoughtfully imported from Holland. Russian toilet paper, when available, can be compared with a fine grained sandpaper. This is apparently not a result of any basic physiological difference between Russian and American skin, however, since even the Russians apparently find it objectionable. Our radio astronomy colleagues attempted to ease the situation by using chart paper which generally contained no useful data anyway. Unfortunately, however, chart recorder paper is rather slick and has

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* Conclusion

little absorbability as you can easily demonstrate for yourself in a simple home experiment. Fortunately this situation can be expected to improve as computers come into more widespread use by Russian radio astronomers, and softer computer output replaces chart recorder paper.

To get back to the story, we decided immediately that we would prefer to sleep outside on the street rather than in the terminal waiting room. As visiting foreigners are not allowed to undergo such indignities, Matveyenko went off to seek the local Intourist agent who's job it was to see to the comforts of visitors. After half an hour of "breathhtaking" waiting we were ushered into a rather plush Intourist office where we were informed that my wife and I could have the one remaining hotel room in town, and John and Matveyenko could share the floor of the Intourist office. Just in case the reader may think my wife and I had an unfair advantage it should be emphasized that the difference between the hotel room and the Intourist office was negligible compared with the difference between either of these facilities and the public waiting room. All of which goes to prove that although in a Communist state where all people are equal, some are more equal than others.

The following morning, after being treated to a fine breakfast in a private dining room by our friendly Intourist agent we proceeded to Yerevan. There we were met by Dr. Grant Tovmassian from the Byurvkan Observatory. After collecting our baggage following a one hour wait, Tovmassian informed us that during one week every seven years the Armenian church prepares its holy water and Armenians from all over the world return for the festivities. Since, of course, this was the week there were no hotel rooms available, so we were to stay at the observatory. Just before arriving at the observatory he added rather parenthetically that "of course as we must know there is no hot water available." My wife groaned a bit whispering to me, "All we need now are bugs in the bed." Her fears were

justified, but fortunately there weren't too many and they were not very large.

In spite of these hardships we spent several pleasant days visiting the observatory and seeing a bit of Armenia. I was asked to give a lecture at the observatory in their new lecture room equipped with numerous modern conveniences, including curtains which closed automatically by pressing a button. There were technical difficulties, however, with the automatic curtain closer, and there was no means to manually close the curtains, so I had to dispense with the slides.

On one occasion a sturdy looking Armenian thinking I was a Russian newspaper reporter approached me with a threatening look and asked (in Russian of course who I was and why I was taking so many photographs (I was carrying two cameras). I tried to reply in very poor Russian that I meant no harm. Matveyenko then came to the rescue and explained that I was an American tourist. But the Armenian didn't believe this and asked (in Russian, "Then why doesn't he speak English?"

To which Matveyenko replied, "Do you understand English?"

"No," he answered.

"Well!" returned Matveyenko.

By this time we were becoming increasingly curious about whether or not the Green Bank group had found fringes on the tapes we had sent back. We spent two successive evenings until midnight in Tovmassian's office trying to place a phone call to Barry Clark in Charlottesville. In order to impress the Russian telephone operators of the importance of the phone call Tovmassian told them that the observatory director, Prof. Ambartsumian, who is not only a prominent Soviet scientist but a powerful political figure as well, was calling. Sometime in the wee hours of the morning of the second night Tovmassian was awakened by a phone call and informed "Amerika - Speak". On the other end the CV operator was told that there was a call from Ambartsumian. Thinking that a call from such an important person must be for the NRAO director, Dr. Heesch was connected to Tovmassian, rather than Barry

Clark, to me. By the time things were straightened out the connection was broken. The next day we received a telegram from Barry stating that the tapes had not yet arrived and inquiring of their whereabouts.

Our immediate reaction was that somewhere either in Moscow, Washington, or both, teams of experts at the CIA or KGB were unsuccessfully trying to decode a magnetic tape containing a sequence of 150 million random numbers which had apparently been smuggled out of the USSR by the diabolical sequence of agents described at the end of the previous installment.

A frantic phone call to the American Embassy in Moscow met with the usual delays, first being told the lines were busy, then it was lunch time in Moscow, and then the Embassy was closed for the day.

That evening we booked, in advance, a phone call to Moscow for the following day at 9 a.m. from the Yerevan Post Office (also a telephone exchange) where connections were theoretically better. Arriving slightly before 9 o'clock we found the Post Office had never heard of us, but the operator arranged to place the call at 12 o'clock. We then had a small discussion about sending a telegram to Moscow.

Matveyenko claimed it was unnecessary since we would have the phone call in a few hours, but I was beginning to become familiar with Soviet efficiency and insisted on the telegram. At 12 o'clock we found a new operator who, of course, knew nothing about our call but she said she would book the call for 3 o'clock. And at three, well, its hard to belive, but there was another operator on duty and we started all over again. We waited around this time until we were informed that it was 5 o'clock in Moscow and the Embassy was closed-or as the Russians say, "not working".

The next day our schedule called for us to fly to Tashkent in the Uzebkistan Soviet Socialist Republic in Middle Asia only a few hundred miles distant from China and Af'ganistan. Apparently the arrangements were a bit confused and our Uzbek hosts hadn't expected us. While waiting for Matveyenko to "decide all

questions", I had an interesting half-hour conversation with another tourist who spoke no English, Russian, or Uzbek, but some strange language which I never deciphered. Finally, however, Matveyenko located a driver and I had to leave my friend still waving his hands trying to make himself understood.

We arrived at our hotel about 3 a.m. where it was necessary for the man on duty to first awaken the receptionist to complete the registration formalities and then the floor woman to give us our key.

After a few hours sleep we began the day's program which started with a lecture at the world famous Tashkent Astronomical Observatory. Following the lecture John and I were taken to the director's office for refreshments of tea and grapes. While enjoying this hospitality the door opened and a little bent up old woman in a tattered dress and shoes shuffled in. John and I looked at each other wondering why they had to send in someone to clean the room at a time like this. So we were a bit suprised when the new arrival was introduced as the "Head of the Solar Physics Division". Following an hour or so of pleasant chit-chat with the Division Head and Director, neither of whom spoke English, the Solar Physics Head insisted on showing us her little telescope in the garage. Then since we were clearly interested in time and frequency standards we had the pleasure of visiting the Uzbekistan Bureau of Standards where one of the local astronomers spent all day comparing an old German crystal oscillator with time station RGB in Rugby, England using a receiver similar to the Loran front-end we used in Leningrad.

For our second day in exotic Tashkent we went to the local bazaar to mingle with the natives. Here for the first time we found thriving Capitalism in the USSR. Farmers and merchants displayed their products on a get-what-you-can-for-it basis. Competition, usually unknown in the USSR was heavy and thriving. The highlight of the day was our introduction to PLOF, the Uzbek national dish. Matveyenko called it "natural food" meaning served as the natives eat it. It was quite an interesting dish

consisting of rice, spices and various kinds of meats. Unfortunately, this fine dish could not be handled by our already overworked digestive systems.

This, combined with the nature of the sanitary facilities, somewhat detracted from enjoying the rest of our stay in the USSR.

The following day was Monday, a working day and another opportunity to call the U.S. Embassy in Moscow. The plan was to spend the day in the Tashkent Post Office similar to the one in Yervan. After breakfast I inquired about the way to the Post Office. Matveyenko, however, having made an independent study of the problem arrived at a solution differing by 180° in azimuth. We then decided to take a taxi and let the driver decide.

After locating the taxi stand we tried unsuccessfully for more than an hour to get a taxi, so we decided to try the local street car. Again there was strong disagreement about which street car to take and in what direction. But it made little difference since it soon became clear that there were so many people waiting that it would be hours before we could get anywhere.

By this time I was getting hungry so we took time off from our project to eat lunch. Starting fresh in the afternoon, Matveyenko announced that there was really no rush because it only takes 15 minutes to get to the Post Office. We reminded him, however, that we spent more than two hours "going to the Post Office" before lunch and had never gotten more than 100 yards from the hotel.

Somehow we made it to the Post Office in downtown Tashkent where we were surprised to find an automatic telephone where for a few cents you could be immediately connected to any major city in the USSR from Kiev to Vladavostok. Getting the U.S. Embassy I found myself overhearing a conversation between the Embassy and a chap in some other remote part of the USSR who had lost his passport. Trying again, I learned that the tapes had in fact been sent to the USA and so we presumed that they had found their way to CV.

There seemed little we could do except

enjoy the remainder of our excursion the next day to Samarkand. Matveyenko decided that it would be more interesting to drive to Samarkand rather than fly. Since there were no observatories there he could not arrange for an official car to take us, so we had to hire an intourist car at a cost of 40 rubles (about \$44) for the four of us. The road outside Tashkent turned out to be a limited access 4 lane superhighway for half the distance. The second half was a primitive narrow road which included a river crossing containing more than a foot of rapidly flowing water. Following a 5 hour drive to Samarkand Matveyenko found that it was not possible to get a hotel, so after a short time of sightseeing we had to return to Tashkent. Most of our time in Samarkand was spent inspecting the ruins of a very old meridian transit instrument carved out of stone.

Back in Tashkent we learned that because we had caused the driver to work more than the regular 8 hour day the fee for the car would not be 40 rubles but the fantastic sum of 160 rubles. The entire following day was spent in elaborate discussions between Matveyenko and various representatives of Intourist and the Uzbek Academy of Sciences - sometimes up to three at a time. By the end of the day the price had returned to the original 40 rubles.

Meanwhile, another problem was beginning to grow. According to the original plan, if preliminary 3 cm tapes did not show fringes Barry was to hand-carry a small crystal clock from Green Bank to Crimea for a direct time comparison. We had been regularly trying, unsuccessfully, to call NRAO since leaving Crimea. We also sent several telegrams informing Barry that we thought we had the time correctly and that everything else was functioning satisfactorily. But not hearing anything about the 3 cm results we had to tentatively plan on Barry's arrival in the USSR and requested that our colleagues in Moscow be prepared to meet Barry at the Moscow airport and to arrange for his immediate travel to Crimea. And, of course, they must also provide batteries for his clock.

Our return trip to Crimea was on a propeller driven aircraft. For the whole

five hour flight the pilot was never able to synchronize the engines. If you have ever experienced this phenomenon you can imagine our mental state upon arriving back in Crimea. Moreover, we had the pleasure of sitting in front of a band of Gypsies that apparently had never taken a bath.

On the way to the observatory the following morning we were told by Moissiyev that "Oh, by the way, the clock stopped the other day". After I recovered from my mild hysteria, he went on to inform us that it only stopped for a few minutes before they started it again! At the observatory we learned that the crystal oscillator had become unlocked from the rubidium cell, but fortunately Kogan, who was faithfully watching it during our week's absence, had immediately relocked it so that in fact no damage was done.

We also received a telegram from NRAO that the tapes had arrived but that there were no fringes. There appeared to be some misunderstanding about the position of the Russian telescope due to my confusion over the way the Russians write the number 7 (similar to the American 4). To add to the confusion, Moissiyev had misplaced the piece of paper on which he had written the "exact" coordinates of the antenna at the time of construction. The best we could do was estimate the distance and direction of the antenna from a nearby optical telescope which is listed in the Nautical Almanac. The optical telescope, which was located on a cliff overlooking the antenna was estimated from sticks, stones, shadows, and some trigonometry to be about a kilometer away.

The new position was sent off to NRAO with the expectation that this would produce the fringes. The answer, received by telegram a few days later from John Broderick stated that there were still no fringes, and that the new position according to his map placed the telescope several miles out in the Black Sea!

By this time we were becoming increasingly annoyed at the poor communications. Telegrams often arrived garbled up with mixed Russian and English characters. Often the same telegram would arrive several

times spread over several days. On one occasion a three page telegram arrived one page at a time on three successive days.

Therefore, I decided to make a major effort to try a TWX machine located in the Intourist hotel in Yalta. Matveyenko, myself, and the local teletype operator spent one entire day trying to contact Green Bank. First we were told by Moscow that all international teletype calls had to go through Kiev. Kiev told us that the Russian teletype was not compatible with TWX. I explained that there was a giant computer in New York which understood all machines and could act as interpreter. Then somehow we got an operator in Vienna (yes, Vienna) who claimed that the Green Bank machine was broken. After many hours we had produced several feet of conversation between various operators, and our local operator excused herself for a short break.

I was alone in the teletype room, when all of a sudden the machine started to print NRAO GB WVA, the call sign of NRAO indicating that at last by some circuitous means our keyboard was directly connected to the Green Bank TWX machine, where unfortunately it was now about 3 a.m. in the morning. A further difficulty was that although the Russian teletype machine contained English letters they were not in the standard locations found on American typewriters. It took about half an hour to type out a single message telling Green Bank that now that we had a communications breakthrough to continue to use TWX instead of telegrams because it was faster and more reliable. The next day we received a telegram from Green Bank wanting to know what we said in the completely garbled and unintelligible TWX message. So much for reliability.

Meanwhile we hadn't given up on the telephone. The usual operator's report was that the lines to the USA were out of order. In a moment of desperation I tried to call Sweden, hoping to speak to anyone in the outside world. Following some clicks and crackles a clear voice asked in English, "Is this Helsinki?"

"No," I replied, "This is Yalta. Who are you?"

"This is New York," she said.

"Can you get me Charlottesville, Va.?"

"Yes, of course, just a moment please."
Pause. Clicks and crackles. Dead line.

The next day word arrived that Barry was in Moscow. But instead of coming directly to Crimea with the clock our Russian colleagues in Moscow felt he should stay a day or so to visit museums.

The crystal clock Barry was carrying was supposed to be accurate to about 50 microseconds per day. Even with the delay in Moscow, we expected that with careful calibration of the rate to be able to compare the clocks with an accuracy of 15-20 microseconds. When Barry arrived in Crimea we went directly to the observatory for the moment of truth. Much to our dismay the two clocks differed by nearly a whole second. We could have done better with Bill Howard's Accutron. Nevertheless, since our rubidium clock agreed with the loran transmissions (only because of the double error described in a previous installment) we had some confidence that we were still in good shape and were prepared for the big observing session about to begin.

John, Barry, and I arranged to work in rotation loading tapes. The Russians divided themselves into three teams of two men. One man was in the control room to operate the antenna while the second man, who was with us, translated and relayed our instructions via a very poor intercom system to the telescope operator. This man was the key to the whole operation as he was the only link between the English speaking tape loaders and the Russian speaking telescope operators.

Before the beginning of the three day 6 cm observing session we went to Yalta and stocked up on Russian sausage, cheese, bread, and fish, and a crate of soft drinks to last us through the session. Due to the lack of adequate sanitary facilities at the observatory, Barry, John, and I planned to take turns in going into Yalta for a bath, etc. For this purpose a car with driver was placed at our disposal. We never did find out what the Russians did about this problem, but with one outstanding exception they apparently managed.

Some hours before the run was scheduled to begin a small boat appeared on the

scene and anchored just off shore about 100 yards from the telescope. When we questioned our colleagues about this vessel we were variously told that it was a "fishing trawler", an "ionospheric research vessel", and an "oceanographic research vessel". At nightfall, a bright spot light on the boat scanned up and down the shore for about one hour. I was tempted to blink back with my electronic flash unit a few times to see what would happen, but John suggested that perhaps this was not too good an idea. There was also a rumor going around Green Bank about a U.S. Navy ship being sighted on Deer Creek, but this was never confirmed.

Since we still had no fringes from the first test run we decided that it was necessary to get some more tapes back to NRAO as soon as possible for processing. This time we would avoid the cloak and dagger operation with the U.S. Embassy and would try simple air freight. Realizing that it just might take a bit of time to arrange to ship a magnetic tape from Crimea to Charlottesville, I planned to leave Crimea on Monday morning to try to make the weekly Pan Am flight to New York leaving Moscow Tuesday afternoon. After the first hour or so when the initial excitement wore off and the numerous spectators began to depart, the operation settled down to an almost normal VLB run. As I had not yet fully recovered from my experience with the "national" dish in Tashkent several tapes were missed for shorts breaks.

At 5 a.m. on Monday morning I left for the 3 hour drive to the airport carrying two tapes. Arriving at the airport we learned that there was a message to call the observatory. Doing this, we were told that Barry had discovered that one of many switches had been set to the wrong position so all that we had done so far was no good. In particular the two tapes I was about to carry to Moscow to put on a plane to New York. There was no alternative but to get back in the car and return to the observatory.

Barry sent a telegram to Green Bank to alert them to our blunder, and since there was no guarantee when or if the telegram would arrive, he also tried to place

a call with the usual negative result. Therefore, I stopped in the friendly In-tourist hotel in Yalta, which we had established as a communications base, to get our friendly teletype operator to send a TWX. Of course, she was told by the operator that the U.S. and Soviet machines are not compatible, then that the NRAO machine was out of order, etc., but she kept trying. Meanwhile, Matveyenko and I were trying to telephone, thinking that we might have better luck from a "major" city such as Yalta than from the observatory.

The situation was fairly critical since the NRAO schedule called for the 6 cm receiver to be removed from the 140-foot as soon as the observing program was finished. Although this was only a few hours away, our colleagues in Green Bank did not know that we had only just begun in Crimea, and that it was necessary to repeat most of the program.

After several hours of fruitless telephoning, Matveyenko performed what must be considered the supreme achievement of the entire experiment. He called the U.S.S.R. Minister for Communications in Moscow and explained our problem. Ten minutes later through the miracle of electronics and some high level influence we were talking to Green Bank and for the remainder of the experiment a telephone call to the U.S. took only a few hours to complete rather than a few weeks.

Needless to say, the Green Bank end was a bit disgusted at having uselessly observed furiously for 36 hours, but agreed to repeat the beginning of the program. I was driven to the observatory, picked up two new (presumably good) tapes, gave a few words of encouragement to Barry and John, who were looking a bit tired and grubby and who now had to do the whole program themselves without time for pit stops in Yalta.

Again we set off on the third trip for the day between the observatory and the airport, my 6th, 7th, and 8th so far (out of a total of 10). John Broderick claims he made at least as many trips between Charlottesville and Green Bank. By this time Matveyenko was as proficient

as a U.S. travel agent at changing plane tickets, so the trip to Moscow was less exciting now that I was only carrying an inconspicuous box which was not even ticking.

The next morning in Moscow I began preparations to ship these tapes, already being one day behind schedule because of the previous day's fiasco. Matveyenko went to the "Akadamy Nauk" in the "official" car to get an "official" piece of paper from the Akadamy that would allow the tapes to leave the country. He was then supposed to meet me at the U.S. Embassy where I went to try to find out how one goes about shipping parcels in the Soviet Union. At the Embassy I was told to bring my tapes to the Pan Am agent at the airport. I had to wait almost two hours for Matveyenko because someone had absconded with his car and driver at the Akadamy. Meanwhile, the Russian cop guarding the U.S. Embassy was becoming suspicious of my pacing up and down in front of the Embassy still holding on to the precious package of tapes. When Matveyenko finally got a new car and arrived he still didn't have the letter from the Akadamy, so we had to return. By this time it was the lunch hour and we had to wait a bit longer for the necessary bureaucrats to finish their lunch.

Arriving with the necessary paper we proceeded to the Pan Am office at the airport where I was informed that because the agent had to "check-in" a group of 120 American tourists he did not have time to help me, but that I would have to go myself to the Aeroflot freight office where I waited in several lines, filled out many forms (in Russian) and paid my money. All this accomplished was to get a few stamps on the package of tapes which no one would take. By now it was almost plane time, so we rushed back to the departure building looking for the Pan Am man and some English speaking help. Not finding anyone I abandoned Matveyenko, flashed my passport and eased my way pass immigration and customs officials, and gave the package to the pilot as he was about to enter the plane.

From this point everything went right. Bill Howard flew to New York and brought the tapes to Charlottesville, setting an all-time VLB record of 48 hours to transport the

tapes from Crimea to Charlottesville - beating the old record of one week from Boston to Charlottesville.

Meanwhile, back in Crimea there was no joy. A telegram had arrived from Green Bank - the hydrogen maser had broken down and a power transformer on the 140-foot had blown up. So far one American, one Englishman, and one Texan had, if nothing else, succeeded in pretty well disrupting the entire political, economic, and social system in the USSR with nothing to show for it. In a little over a month we had dispatched various shipments of people and equipment between Stockholm, Moscow, Leningrad, and Crimea by air, rail, and road. We had made unprecedented demands on transportation and communication facilities, and had apparently cornered the market on all the storage batteries in the Soviet Union. And, particularly at the observatory we had men working endless hours carrying our crates first up, then down, then up again, chopping off pieces of their antenna to accommodate our equipment, and putting our receivers on and off the telescope.

So although preparations proceeded for the 3 cm observations, morale was low all around. Reference to Siberia entered the conversation with increasing frequency. You can therefore imagine the general joy and relief when the telegram arrived announcing strong fringes on 3C 454.3. Vitkevich was at first speechless, but rapidly recovering he cried, "BRING THE VODKA!" Remembering that we still had two days of observing left the celebration was, however, postponed.

The first day of the 3 cm run went smoothly until a telephone call arrived from Marshall Cohen, who explained that due to a few technical difficulties with the 3 cm receiver they had not yet started in Green Bank. I started to complain that we had needlessly worked hard all day running tapes, but remembered the reverse situation which had occurred a few days earlier and decided not to comment.

Our Russian colleagues took the news in stride, and reorganized their assignments to see the run through. Now that the end was in sight, John, Barry and I

thought that we should sponsor a small celebration to show our appreciation for all the help we had received. A cake was carefully designed, and John was sent to Yalta to arrange for its construction. It turned out to be such a big and important job that the details had to be settled at a high level conference between John Payne and the Director of Bakeries of Yalta. John expressed some concern on returning that Sandy Weinreb might not appreciate his spending an entire day arranging to bake a cake.

We had planned our surprise party to follow the end of observing, but as the last hour approached the observing room began to fill with spectators. When the last tape started the Russians produced, in their usual efficient manner, a round of glasses and several bottles of Cognac. and with toasts of Soviet-American friendship and cooperation, the first Green Bank Crimea VLB was declared a success on the basis of having analyzed less than one half of a percent of the data.

The party lasted well into the night. and after a few glasses of cognac, vodka and spirits, the language barrier disappeared. The highlight of the evening was an eloquent speech by Barry Clark delivered in excellent Russian. The following day those of us who were still mobile were treated to a dinner of shashlik (shish kabab), cognac, and champagne by Vitkevich. Following this we were taken to the Crimea Astrophysical Observatory where the director had prepared a small dinner featuring mainly wine and vodka. Back in Green Bank, according to reports, the exhausted observers just went to sleep!

EPILOGUE

Not too surprisingly all the tapes and equipment were lost on the return shipment to the USA. After a week of frantically calling Pan Am and Aeroflot in Washington, New York, and Moscow everything was located in an Air France warehouse in New York!

After much computer processing interference fringes were obtained on 12 sources at 6 cm which when combined with the results of previous expeditions will tell us more

about the structure of very small radio sources. At 3 cm the outcome was less satisfactory due in part to an improperly operating frequency standard in Green Bank. Only through careful painstaking analysis by Matveyenko did we finally find weak fringes at 3 cm, thus setting another VLB baseline record of 285 million wavelengths.

Perhaps more important than the scientific result, however, is the immense satisfaction that all the participants received from working together to successfully overcome what at times appeared as insurmountable bureaucratic, technical, and logistical difficulties. We would like to think that perhaps in some small way we have contributed to an increased understanding between Soviet and American people, and demonstrated that scientific cooperation between the U.S.A. and the U.S.S.R. is possible.

Needless to say, plans are now being made for a bigger and better experiment for next year.



Russian-American VLB cake

BASIC RESEARCH

Beaty Sheets

It is with regret that we note the departure of one of our Associate Scientists, Dr. Ivan Pauliny-Toth, from the Observatory in June. Dr. Pauliny-Toth has been with the Observatory since 1962, coming to us from Cambridge, England. He and his family will reside in Bonn, Germany, where he will be associated with the Max-Planck-Institut.

Others leaving NRAO during the July-August period include Dr. McAdam, Dr. Mezger, Dr. Courtney Gordon, and Dr. Kurt Gordon. Bruce McAdam is going around the world and has spent extended periods of time in both Canada and the U.S. en route. Peter Mezger is leaving to assume his position as Director of the Max-Planck-Institut für Radioastronomie. Courtney and Kurt Gordon are leaving to take on positions at Hampshire College, which is a new college in the 5-college astronomy program.

OLD FRIENDS - NEW FACES

Frances Copper

Observers using the Green Bank telescopes during July and August are as follows:

J. Ball, Harvard College Observatory
 T. Clark, NASA-Goddard Space Flight Center
 J. Dickel, University of Illinois
 C. Gottlieb, Harvard College Observatory
 J. Knapp, University of Maryland
 A. E. Lilley, Harvard College Observatory
 J. Moran, Haystack Facility, M.I.T.
 P. Palmer, University of Chicago
 H. Penfield, Harvard College Observatory
 L. E. Snyder, University of Virginia
 W. W. Warnock, University of Illinois
 H. G. Willis, University of Illinois
 J. L. Yen, University of Toronto
 B. Zuckerman, University of Maryland

Dr. Robert V. Wagoner, Cornell University, will come to the Charlottesville Lab July 9, 1970, to give a colloquium on "The Source of the Far-Infrared Background Radiation."

CORRECTION to the May issue, "Towards Restoration Of The Environment" by Ken Cottrell, instead of being a Festival, it will be "The First West Virginia Rolling Rivers CELEBRATION". Also, the location and date of this event has been changed from Thursday, August 13, 1970 at Ona, West Virginia, to Friday, August 21, 1970 at the State Fair in Lewisburg, West Virginia.
