

I have been in this country for almost a month by now. I was away from Santiago most of the time. My schedule simply did not give me an opportunity to write letters. Now I am in Santiago for one day, and I shall try to give you as complete a report as time, paper, and pen permit (my supplies are quite limited).

One of the first problems I had to solve was to find out what the situation was here in Santiago, particularly in view of the fact that Dr. Rutllant did not come to the U. S. I gave you my impressions in my letter of February 13. Dr. Rutllant is planning to attend the next meeting for which, as far as we know, no date has been set yet. (March 30 as per telegram from W. Johnson).

Another problem to be tackled immediately was to find if possible a substitute for Guameyuca, that is a mountain located in the Vicuña area, but with a better surface than Guameyuca. This meant a trip on four wheels, four legs, and two legs to the North, and also a trip by air with our friends from the U.S. Air Mission. The first part was done between February 14 and February 27, the flight was not possible yet. It is now scheduled for March 24.

Problem No. 3 was to get the interferometers here and to get them into operation. Marilyn took the instruments to Alpine on Feb. 8, and they left the port of Houston on Feb. 12 on the "Gulf Farmer". The boat is due at Valparaiso on March 10. The most difficult and maybe most time-consuming journey the interferometers have to make is the one from one side of the Custom's House to the other.

Problem No. 4 was to see all our stations under summer conditions. As I mentioned above I saw Guameyuca and some of its neighbors under the said conditions, and also Alto del Toro. Robles is next and will be climbed tomorrow. Then follows Tabaco. By that time the summer will be over.

The fifth problem is the installation of the 13". I would like to have it on our best site which is Guameyuca (seeing and weather conditions are the best there!) This however is absolutely impossible. The same is true for Tabaco. The parts cannot be carried very far by mule. Thus only Robles and Alto del Toro are in question. Robles has probably somewhat better seeing. The road to the top is not yet completed although work is being done on it. The remaining part is so steep that we are not sure that the mules can take the telescopes up. To wait for the completion of the road means to wait at least until next summer. This I do not want to do. So the 13" will go on Alto del Toro.

This is, more or less the program I had in mind for the first few weeks of my stay in Chile. The following account of my activities here will show that for a change things worked quite well this time.

February 6: I left McDonald by car at 6:30 a.m. for Midland, Texas. Arrived at Miami at 10 p.m. Checked in at the International Airport Hotel on top of the Terminal Building. The hotel is excellent (measured

by U.S. standards) and expensive (measured by Miami standards).

February 9: I spent several hours trying to get some special shoes for climbing Guameyuca. The ideal shoes would have retractable alligator teeth in the soles, teeth out for going up, teeth in for going down. What I finally purchased is not too far from that and proved to be quite effective. Another business I had to do was to get some Life Insurance. The University of Chicago had informed me that I was not eligible for their Group Insurance Plan. This information I received the day before I left McDonald. So I had to do something about it in Miami. This turned out to be very difficult because the Insurance Companies do not know what our occupational hazards are. They were however very well informed about hazards of life in Chile. I got as far as leaving an application with one company (Aetna) but don't know yet whether it was approved.

The LAN flight left Miami at 9 p.m.

February 10: One-hour stops in Panama, Lima, Antofagasta. Arrival at Santiago at 5 p.m. Dr. Rutllant was at the plane. Again no difficulties with Immigration and Customs. We went to the Observatory which is still located at Gran Avenida in San Bernardo. There I had discussions with Romero, Torres, Wroblewski, and Moreno in order to clear the situation, to become familiar with what had happened in the past, and to make plans for the future.

February 11: I spent the day at the Observatory and prepared the equipment for a trip to Vicuña which was to start on the 14th.

February 12: With Rutllant in Santiago. I had to open a bank account. We saw Colonel Gustaves and arranged for a flight to Vicuña on March 4. He also made some suggestions about obtaining aerial stereo-photographs of our sites.

February 13: Trip to Farellones with Sr. Torres to inspect the observer shelter.

February 14: We, that is Hugo Moreno, Carlos Torres, Guillermo Romero, and myself left Santiago at noon for Vicuña. Our plans for Vicuña were that one party would observe on Guameyuca for three days, the other would inspect new sites in the area. After three days the two parties would interchange for another three-day session. Then we would return to Santiago. The equipment we were carrying consisted of one Denjon telescope, one Rüdell refractor, one thermo-hygrograph, a psychrometer, an altimeter, compass, two tents, four sleeping bags etc. The jeep was pretty well overloaded, its springs being bent upwards. The car however was moving all right. To our delight we discovered that the paving of the Panamericana had progressed as far as Los Vilos which we passed at 6:30 p.m. There the old dirt road began and soon our troubles also. The car passed over a rock which was somewhat higher than its clearance from the ground. As a result of this the rock was shattered, and the emergency brake too. Parts of the brake were still partially attached to the car

and dragging on the ground. These had to be fastened to the bottom of the car with some wire which we did not have with us. After some surveying of the area we made the repair in the indicated manner, leaving a gap in somebody's fence. We then proceeded to Los Vardi to get gas. This we got there, and a nail into one of the tires also. The station had no equipment for changing tires and no air pump (!), but we did. After this repair we went on for a few minutes, then we had another flat tire, which was again repaired on the spot. From then on things worked O.K.,

February 15: except that it was late at night, and we were very tired. Soon we reached the pavement south of La Serena, which was then a few hours away only. We calculated that we would arrive at La Serena at 6 a.m. ± 1h, while the repair shops would not open until 9 a.m. It would also not be worth while to check in at a hotel for a few hours only. So we stopped the car at a place called Chango Muerto and slept in the car for a few hours. Then we continued our journey and reached La Serena at 9 a.m. The repair of the emergency brake took a couple of hours. During that time we had breakfast, did some shopping, and continued to be tired. When the car was ready we left La Serena and reached the "Hosteria de Turismo" in Vicuña at 2:30 p.m. After unloading our personal belongings and Romero and myself, Moreno and Torres went to La Totorita at the foot of Guamayuca to leave all the equipment there, and to arrange for mules. These could not be obtained for the next day, but for the 17th. When they returned to the hotel we called at the Carabineros trying to get our friend Juan Leyton to climb mountains with us. Sr. Leyton however was not available; he was in the hospital. Another carabinero was assigned to us for the next days.

February 16: Sr. Fidel Cortes, the owner of La Totorita and Guamayuca visited us at the hotel together with his brother. We had a long and interesting discussion with him. We call Sr. Cortes "Don Fidel", and in the future I will refer to him by this name. Here is some of the information we got from the two men:

1. There is a spring on Guamayuca (at about 1100 m elevation) which yields 300 m³ per day. The water is excellent. Two years after a particularly rainy season the amount of water goes up. It never falls below the above amount. (Personal comments: I visited the spring. The amount is correct, the quality of the water is very good. There are two more springs, one at 1500 m with 30 m³ per day, another at 1700 m with an unknown but certainly small amount of water.)

2. Don Fidel estimates the cost of a road from La Totorita to the top of Guamayuca to \$15000. (Personal comment: At Farellones I met a Government Official who is supervising the reconstruction of the Farellones road and the Panamericans. He estimated the cost of a 2 km road from Farellones to Alto del Toro to \$15000-\$20000. Construction on Guamayuca will be more expensive because of the loose sand above the solid rock. The Guamayuca road would have to cover an elevation difference of 1300 m and a negligible horizontal distance. Thus his estimate comes out well above \$100000.)

3. Cerro Peralillo (2100 m, opposite Guamayuca) is knife-edged like Guamayuca. Water is available at Banos de Uchumi at 1300 m. The water however is hot, and contains minerals. The spring yields 500 m³ per day. (Personal comments: Peralillo has a good surface at 2000 m. I went there myself.)

4. Don Fidel is willing to give us a written guaranty of more than 200 completely clear nights per year. (Personal comments: At least that much. The administrator of the hotel told us that they used to advertise that people would not have to pay on cloudy days. We had to pay for every day!)

February 17: The four of us left the hotel at 6:20 a.m. for La Totorita. There we had breakfast. Then Moreno and Torres and the equipment left on mules for Guamayuca which they reached 8 hours later. Romero and I picked up the Carabinero and drove to various places from which mountains could be seen which we were interested in. Cerro Peralillo to the south of Guamayuca, and an unnamed mountain which we named "El Franciscano" because of its shape, turned out to be feasible for one-day trips on foot. Cerro Peralillo was put on the program for the next day. Later on it turned out that the Carabinero would not be free the next day. We decided to go to Peralillo anyway.

February 18: We left the hotel at 6:30 a.m. and reached Banos de Uchumi in a valley east of Peralillo at 8:30 a.m. over a rather poor road. Banos de Uchumi is at an elevation of 1300 m. From there we continued on foot. There is no trail to the top. We had to find our own. The highest point of Peralillo at a little over 2100 m was reached at 1:15 p.m. Peralillo is about 6 km long, slowly rising from S to N. At the northern end it drops steeply to the Rio Elqui which separates it from Guamayuca. Peralillo is shaped like a knife edge most of the way, with six individual peaks on it. The highest peak is at the N, and has a diameter of 20 m, the second peak (counting from N) is 60-80 m wide and 200-250 m long, its elevation is a little over 2000 m. All the other peaks are very small. No water anywhere except at Banos de Uchumi, which is at a distance of 6 km from peak No. 2. The peaks 3-6 are small. We left peak No. 1 at 2 p.m., reached the car at 5:30 p.m., and the hotel at 7 p.m., where we arrived very tired and bone dry.

STOCK REPORT NO. 2

This is the continuation of the report I gave you in my letter of March 4. I am now on Robles. Here I don't have to do any cooking or dish washing as is necessary on our other stations, and hence I have some time for writing:

February 18 (cont.): At night we established communication with the mountain party by light signals and Morse Code. We were not too familiar with the latter but could at least make certain that everything was well on Guamayuca. This signalling with light caused considerable excitement in Vicuña. The same performance was repeated every night with increasing public success. Incidentally, since light signals will not work in daytime we had arranged that smoke signals from certain points of Guamayuca (peak 1 or peak 5) would indicate an emergency situation.

February 19: We left the hotel at 7:15 and picked up the carabinero at Diaguatas. We drove to a pass on the Hurtado road at an elevation of 1000 m. From there we started on foot to "El Franciscano". Romero had to stay behind with the car as a consequence of the long hike of the day before. It was a very hot and windless day, in contrast to the day before. It took the carabinero and myself 2 1/2 hours to reach the top. What appeared from the ground to be a small peak on a large plane turned out to be an isolated very small peak completely separated from the high and flat area. The latter is almost at the foot of Cerro Portillo (<3000 m) and hence seems not well suited as a site. The same applies to "El Franciscano" itself because of its site. It became apparent, however, that "Calabozo" to the S of Vicuña might be a suitable place if its elevation (1600 m ±) proves to be sufficient for this area. The return to the car by a different trail took again over two hours. In the meantime the wind from the coast had started and it was sure pleasant on the mountains but still very hot in the valleys (<100° F). The Rio Elqui valley in which Vicuña is located however never is hot. It is quite windy there every day, and the daytime maxima seldom over 80° F.

February 20: At 8 a.m. we arrived at La Totorita to pick up Moreno and Torres who were supposed to come down on foot that same morning. They did not come until 3 p.m. In the meantime we visited the spring which supplies La Totorita. Comments about the spring were made earlier in this report.

February 21: In the afternoon we went to a valley at the foot of "El Franciscano" to find out whether the same conditions existed there as we found them the day before. It was, however, windy and cool though somewhat warmer than in Vicuña.

February 22: We left the hotel at 8:45 by car and arrived at La Totorita one hour later. From there Hugo Moreno and myself went to Guamayuca by mule. The trip took 3 hours. Torres and Romero returned to the hotel. They were to inspect "Calabozo" during the next days while

Moreno and I would observe on Guamayuca. The equipments (Danjon telescope, Riddell refractor) were located on the highest point of Guamayuca (2230 m by altimeter).

February 23: Guamayuca.

February 24: Guamayuca. We visited all the lower tops and measured their sites and elevations. During the day we finished our water supply. This created a rather difficult situation. Since we were planning to leave the mountain early the next morning we had left word that the mules which lead to take the equipment down should come up this evening. Expecting that we might be low on water we had asked the mulero to bring some water with him and bread too. In the later afternoon we finally saw the animals far down in the valley headed for the mountain. It was dark before they arrived. They had plenty of water with them, and to our delight a complete dinner, courtesy of Don Fidel.

February 25: After our last observation at 5 a.m. we began to disassemble and pack our equipment, tent, etc. This took three hours. Then Moreno and I left the mountain on foot and reached La Totorita in 1 1/2 hours. The mules were to take the equipment down. They reached La Totorita at 4 p.m., leaving the top shortly after us. At La Totorita Romero and Torres were expecting us and took us to the hotel. They returned to La Totorita to load the equipment.

February 26: We left Vicuña at 8 a.m.

February 27: Arrival at Santiago at 2 a.m. after a practically nonstop and trouble free trip.

Before I continue I want to insert some general remarks concerning the conditions in the Vicuña area. During this trip 6 nights were spent on Guamayuca. Seeing was observed on five nights only, because Moreno and Torres could not observe during the first night. All six nights were clear. Actually all 11 nights we spent in Vicuña were clear. The seeing was consistently very good during the five nights with observations. Hugo Moreno was on Guamayuca in October and found very good seeing at that time also (Danjon method only was used then). During our last visit however a haze problem existed. During the day wind comes from the ocean (up to 25 m.p.h.) and brings moist air which forms haze up to 3000 m elevation and more. During the afternoon cloud caps are formed above 3000 m. The clouds disappear at about 5 p.m., when the wind ceases. By sunset most of the haze has settled, but some still exists at the elevation of Guamayuca and a little above. This situation sometimes lasts all night, sometimes the haze goes further down, leaving Guamayuca in the clear. This situation seems to occur often during the summer, but supposedly not always. Anyway the amount of haze is very little at 2200 m. The moon does not show a halo, even if far down. On a moonless night the haze is readily visible in a strong flashlight beam. The haze is not characteristic for the Vicuña area only, it exists everywhere. Robles or Alto del Toro don't seem to be better off. During the nights that I was on Guamayuca one could see that the haze did not extend much higher. Maybe a gain of some 200 m in elevation may improve

things. There are several mountains in the area in the 2500-2700 m range. One named "Cabeza de León" (2700 m) seems to have a good surface. It is difficult to reach, being 20 Km away from Vicuña. I hope to be able to look at it from the air first before I go there by mule during my next visit to Vicuña. If the haze situation described above should turn out not to be a frequent phenomenon we probably can afford to lose some 200 m in elevation and go to Peralillo. If this is so Peralillo will be included in the seeing program, although this is a very tough proposition.

One problem turned out to be difficult to solve in Vicuña: to get mules. Don Fidel doesn't have any, so they had to be gotten elsewhere, and had to stay at La Tavorita during the entire time we were working there. To rent mules for 10 days and to feed them is quite expensive. For the money we spent on them we could have bought one mule. Consequently we are planning to buy animals, jointly with the NSF group. Don Fidel will keep the animals for us and use them while we are gone. When we are there, the animals will be available to us free of charge. We are thinking of four animals, \$75 apiece. So the Administration of the University of Chicago may soon find itself in the curious position to have some mules on the staff. I am glad this is a less-than-1000 dollar item. If we had to get approval of such a purchase I think we would have plenty of difficulties.

February 28: Visit to Cerro Calán. The building project has made some progress since my last visit in April. Assuming a constant rate of construction the office building may be ready by the end of 1960. The telescopes probably will not be in working condition until 1962 (with the exception of smaller equipment, of course, which may be ready soon).

February 29: Meeting with Sr. Raab and Sr. Pedros. Sr. Raab made the design for the 13" shelter, Sr. Pedros has to build it. There was a difference in opinion concerning the material to be used. Sr. Raab was proposing an all-corrugated-iron construction. This can be built quickly and can easily be dismantled and reerected elsewhere. Sr. Pedros sees considerable difficulties in the transportation of corrugated iron sheets by mules and therefore proposes an all-wood construction. Personally I have no preferences. I proposed a compromise solution: wooden structure and metal roof. This proposal was readily accepted. The wooden structure will be erected by Sr. Pedros, the metal roof will be prepared at the Observatory. Estimated time of completion: April 15. This gives us barely enough time to get the 15" working before the winter. Actually only the building has to be ready before the winter, and the parts of the telescope have to be up. Assembly of the instrument can be done during good weather spells later on.

After the discussions which took place at the Observatory Sr. Pedros took us to Farellones. From there Sr. Torres and I went to Alto del Toro on foot. Our baggage followed on a mule.

March 1: Alto del Toro.

March 2: Alto del Toro. Determination of meridian for orientation of 13" building.

March 3: We left Alto del Toro at 11:20 for Farellones on foot. A mule carried the sky patrol camera and part of our baggage to Farellones. There the sky patrol camera was reinstalled on the roof of the Posada. The relocation was advisable because during the winter it is necessary to continuously keep the plastic dome of the camera free of snow. Sr. Pedros will take charge of this, but obviously he cannot do it, if the camera is still located on Alto del Toro. Because of the small distance (2 km) sky conditions will be the same at both places.

Because we had no vehicle of our own with us we had to wait for somebody who was going down and had space for passengers. We had to wait until 8 p.m. when a truck was leaving for Santiago and could take us along.

March 4: We tested the motor-generator at the Observatory and hooked its output to the 13". Everything seems to be working all right. We had no means to determine how well the generator keeps the 60 cycle frequency. This will have to be checked later.

March 5: Shopping day in Santiago.

March 6: Santiago was left at 10 a.m. for Robles. After arriving at the end of the road Sr. Torres took the jeep back to Santiago because it was needed there during the next days. Sr. Romero and I continued on foot and reached the top at 5 p.m.

The Robles road from Caleu on is in miserable condition and very dangerous for a jeep. Last winter's damage has not been repaired. Repair is to begin soon. A good part of the remaining road from the end of the old one to the top is finished, but much work is still to be done. 20 men are working on it, but without any machinery. It was scheduled to be finished 20 days from now, but this is certainly impossible. It looks more like next summer. After completion and repair the road will be suitable for jeeps and pickups.

When we assembled the telescope we discovered that the focussing tube was missing, although all eyepieces were there. Without the focussing tube observing was not possible. Somebody apparently took it out and did not return it. Unfortunately it was too late to call Santiago by radio. So we had to be satisfied with weather observations for the first night.

March 7: At 8:30 a.m. we communicated with Santiago and got a message to the Observatory concerning the missing tube. It was located there quickly by the culprit who took it and closed the box without telling anybody about it. I am glad I am not him when it comes to telling Dr. Rutllant about it. The latter unfortunately was not there. Without his approval nobody can leave the Observatory or use any of the vehicles. We left word that somebody should bring the piece to Caleu by transportation of his choice. We would pick it up there making the trip 1000 m down and up again on foot. At 5:30 finally Dr. Rutllant was reached. He promised to give us every possible help but did not want to commit himself to send a man to Caleu the next

day. In view of these contradicting statements I was as mad as hardly ever before, but there was nothing I could do.

Here are a few things which I forgot to mention and which should be inserted in their proper place:

While I was on Guamayuca, Torres and Romero visited Calabozo. The roundtrip from Vicuña to the mountain and back took five or six hours with plenty of rest in between. Calabozo turned out to be 1500 m high. It has a very large and flat surface. No water except from the river (Rio Elqui) or from a canal (irrigation canal at 700 m elevation). This would make filtering necessary. In view of the "hazy experience" I had on Guamayuca I doubt that the site will be suitable.

Colonel Gustaves called our air trip off and rescheduled it for March 24. As I mentioned above, "Cabeza de León" is one of the sites I want to look at, and there are two more nearby.

The results of the observing session on Alto del Toro is as follows:

The haze problem exists there also, more or less to the same extent as on Guamayuca. (Let there be no misunderstanding. The haze we encounter here is very little, but I would like to get completely out of it.) The seeing was not too good on two nights (up to 3"), and good during the third night. An image of 3" is lousy by Chilean standards. We have not yet had such images on any of the other sites except for Cerro Calán which produces 10" images at times.

One thing is common to all sites during the summer: Variable wind from W during day time with speeds up to 25 m.p.h. The nights are usually calm. Sometimes a breeze from E or N exists. From what I could gather so far, during the winter strong winds (<30 m.p.h.) occur during storms only. Then one would not observe anyway because of the clouds. Clear nights are supposedly calm during the winter also.

Cloud statistics are available now for Alto del Toro from the sky patrol camera, and for Robles from nightly observations made by the radio station attendant. His reports are well related to certain features on the thermograph records and hence may be considered to be reliable. Carlos Torres is preparing a detailed report. I shall just mention what I have at hand here: Of the past 31 nights 30 were completely clear, one partly cloudy (that is on Robles). Alto del Toro is not quite that good. Of the three nights I spent there recently we had clouds during part of one night. The results of the sky patrol camera seem to indicate similar conditions at all times.

During day time things are very different. On many afternoons the entire Andes are in clouds, usually cumulus and sometimes alto-stratus. All this disappears at sunset. This makes it quite evident that any conclusions based on daytime cloud statistics are worthless. I remember that from the cloud statistics we received last year it appeared that Los Andes seems to be a favored spot for clear daytime skies. This effect is quite noticeable from Robles, from which one can see the Aconcagua Valley in which Los Andes

is located. This however does not mean much at night. Incidentally, Tabaco is very near Los Andes.

The "Gulf Farmer" carrying the interferometers is due in Valparaiso on March 10. We will make every effort to get the instruments through customs soon.

I received word that the vehicle "left Mobile, Alabama on February 29 for shipment". What that means is not clear to us. It may mean that it left Mobile by boat and is now on its way to Valparaiso. It may also mean that it was sent to some place in the States to be shipped from there.

Dr. Rutllant will attend the meeting on March 30. He expects to return to Chile by the end of April.

Here are two items we need for the expedition:

1. A portable radio which works with batteries as well as with 110 V and/or 220 V. During the winter it is necessary on Tabaco and Guamayuca to get the weather forecast so that the observers can leave the station on time when a storm approaches. Hugo Moreno was caught once on Tabaco in a snow storm, and it was a miserable experience.
2. A pair of binoculars, 7 x 50. They should be of U. S. or German make. Please don't send us a Japanese product. They are very cheap, but most of them very poor.

Dr. Rutllant could bring both the radio and the binoculars with him when he returns from the States. Thus there will be no custom difficulties.

The meeting in Chicago supposedly is taking place at this moment. I am very curious about the results, and I hope to hear about them soon.

I have been in Santiago for more than a week by now. Most of the equipment arrived during these days, and I had plenty to do getting it out of the hands of the customs, unpacking it, adjusting it, and preparing it for transportation by animals. By the end of this week everything should be ready, and we will be off for Vicuña.

I shall now continue my "activity report" for a while.

March 8: It became apparent that the focusing tube would not arrive on time. So we began to manufacture one ourselves. Using local supplies and tools only we finally produced something that seemed to work. Wood, nails, screws, wires went into it. A test at night proved that our device was at least as good as the original made by Zeiss. So we were able to observe the following nights.

March 9: El Roble

March 10: El Roble. The TELCO people came up in the morning and had a "Special Delivery" parcel for us, the focusing tube. We were supposed to give a signed declaration under oath over the radio that we would send it back to Santiago the next day. This we did.

March 11: Sr. Hinricksen from TELCO came to Robles. We had discussions concerning future TELCO developments on the mountain. There is one FM relay station on the mountain now. A number of microwave relays will be added in the near future, and possibly a TV relay. A new 60 ft. tower was just being erected. One or two even higher towers and a new building are planned for the near future. Everything will be erected on the top. Sr. Hinricksen stated that TELCO would be willing to replace all towers by pairs of towers on opposite edges of the mountain, and connected by cables, if the Observatory is willing to pay for this change. This would clear the entire surface of the summit for the astronomical development. An area of roughly 300 m x 150 m would be available for construction of major buildings.

At 3 p.m. we left Robles, and were taken to Santiago by the TELCO "Land Rover".

General Remarks about Robles

The haze condition reported earlier for Guayayuca exists in the same way on Robles also. It appears that the haze layer is slightly tilted upward to the E, and therefore it is difficult to find a site which is above the haze. The elevation of the mountains increases towards the E, and that of the haze layer too.

Seeing conditions during the last observing session were not as good as is usual for Robles.

The road to the top is now practically complete. In the upper section the road is so narrow, and the turns so sharp, that it is difficult for a Land Rover to get up. For the somewhat longer Jeep it is even more of a problem. Since the road has been built on the South side of the mountain, it will be closed for a good part of the winter (snow).

March 12: Santiago

March 13: "

March 14: "

March 15: Hugo Moreno and I left the Observatory at 10 a.m. We intended to go to Tabaco via a different route, that is, reach the summit from the E, rather than from Las Majadas to the W of the mountain. The road to Las Majadas is very difficult. Furthermore there are not enough animals available. Usually we get their only burros for the cargo. Burros are slower and less reliable than mules, and they carry less load. We had been told that in "El Asiento" at the foot of Tabaco near Putaendo a man named "El Cuyano" (this is a nickname for Argentinians) has mules available. El Asiento was somewhat difficult to find, but we finally found it. The road to El Asiento is quite good (of course not paved). In El Asiento we learned that El Cuyano was dead. There was, however, another person owning 25 mules. We went to the house of the man. He was out with his animals, working for a mine. We would find him on weekends only, we were told. This being a Tuesday, and no other mules in the area, the El Asiento approach was useless for us at the moment. So we went to Las Majadas again, where we arrived at 8 p.m. Arrangements for animals were made the same night by sending messengers in the darkness to various near and far neighbors owning one or two animals. Overnight stay in "Hotel Jeep".

March 16: Four burros and two horses were available. The four burros were not enough to carry all our equipment. It was necessary to leave some of it at Las Majadas to be taken up the next day. Also we could not take enough water with us the first day. More had to follow the next day. The trip from Las Majadas to the summit of Cerro Tabaco took four hours. During the afternoon high cirrus formed, and by sunset it was almost overcast. It stayed partly cloudy all night.

March 17: At 10 a.m. the Pereira brothers arrived with their animals, bringing the rest of our equipment, and more water. The latter was of very poor quality, and we were to find out later, where it came from. The two men helped us to erect the shelter for the thermograph while we provided them with camp style lunch and dinner. They left in the late afternoon. The sky was clear by that time, and we were able to observe the same night as well as the following one.

March 18: Inspection tour of Cerro Tabaco. The surface is more than one kilometer long, and on the average 300 m wide. A slightly lower portion in the middle would provide a water collection area of about 150000 m². Precipitation comes only in the form of snow. How much, that remains to be determined.

To the South of the main section of Tabaco is another similar plateau of maybe half the size, and about 150 m lower.

March 19: The Pereira brothers arrived with the animals at 8 a.m. Loading took about two hours. Moreno and I left on foot, the animals followed with the cargo and the two men on horseback. Down in the valley we passed the spring from which the water had been taken which came up the second day. It was a somewhat unpleasant surprise to find that a man and his little girl were just washing their feet in the pool. The spring itself was no longer running, and the pool had shrunk to a puddle about 10 ft in diameter and a few inches deep. (Well, we had our revenge. Hugo took a bath in the pool too! This shows how much one can get accustomed to things like this.)

The descent on foot to Las Majadas took three hours. Actually we did the last few hundred meters on horseback because we thought that it looked more appropriate this way. Transferring the cargo from the animals to the car was a tedious job, and finished by 3 p.m. We reached Santiago at 8:30 p.m.

General Remarks about Tabaco

Tabaco is physically the best suited site in our present testing program on account of its large surface. A good road passes closely to the foot of the mountain at its Southern end at an elevation of 400 m. It seems that a road without sharp turns can be constructed from there all the way to the top. Good springs which run all year are not available, but there is a fairly large collection area. Plenty of water of course is available in the valley. Some smaller springs exist below the 1300 m level, but most if not all of them dry out during the summer.

Meteorological conditions like existence of haze, cloudiness etc. are the same as on Robles because of their proximity. A comparison of simultaneous thermo-hygrograph recordings shows, however, that the daily temperature amplitude as well as the erratic temperature variations are smaller on Tabaco, and the humidity is somewhat lower too. The difference in seeing between the two sites is difficult to establish because it is small, if any difference exists at all. At first it appeared that Robles was slightly better, now the indication is the other way. So probably we will find the difference to be insignificant.

We have the written permission from the owner of Tabaco (a Mining Company) to use the mountain for an astronomical institution.

Since my return from Tabaco I have been in Santiago all the time. The interferometers arrived in good condition, also the microscope for the first one. Some minor changes are necessary. The reticle is no good, and we are trying to make a better one. The boxes need more handles in order to be able to fasten them more securely to the animals. One of the objectives or one of the flats is poor, giving a strongly astigmatic image. This is not fatal, but I am trying to correct the error.

Everyone here is very impressed by the appearance of the interferometers and anxious to be the first one to observe with them. If the spirit keeps up this way, I can retire soon.

Sr. Romero is leaving the Observatory. He has accepted a position in Temuco. This resolves a rather delicate personal problem, although I would have liked very much to keep him here.

March 24: At 9 a.m. we (Moreno, Torres, Barrera, Wroblewski, Valdivia, Stock) met Colonel Gustaves and Major MacAdams at the Los Cerillos Airport and started the trip to the Vicuña area in the DC3 of the U. S. Air Attaché. On the flight to the North we followed the entire Pan-americana at low altitude (500-1000 ft), thus having a close aerial view on many familiar places. In the Vicuña area we flew at an altitude of 10000 ft. "Cabeza de León" which appeared to be a good sized mountain if seen from Guasmayuca turned out to be quite small and rocky. It is detached from another somewhat higher mountain (2700 m) which has a very large surface. Small springs could be noted not too far down by the green trees. There was no road or trail leading into the area, except for one trail leading from a house in the valley to almost the top. This mountain (name not known so far) is about 10 km to the N from Vicuña. We will visit the site soon on foot.

We then turned to a plateau-like mountain, 2200 m high and 20 km SW from Vicuña, again a site difficult to get to on the ground. The mountain turned out to have a very large surface, similar to Tabaco. It is in a way similar to Robles, being far removed from the High Corallera, and consequently one may expect undisturbed atmospheric conditions. Several springs are at the foot of the mountain between 500 m and 1000 m elevation. This site will also be visited soon.

At this day the Vicuña area was entirely free of any trace of haze, and the visibility was perfect. Further to the South (between Tabaco and Robles) the haze began to be quite apparent again.

We reached Santiago again at 1 p.m. after four hours of flying.

STOCK REPORT NO. 4

We just returned from Vicuña, and there is a lot to tell. I hope to be able to get a complete enough story on paper. I don't have much time on hand, because I have to go to Venezuela for a few days. I expect to be back in Santiago on the 29th.

Very little has happened between the end of my last report and our trip to Vicuña except that the first interferometer was prepared for observing (this meant adding a few things and altering others). So I start with our departure to Vicuña:

April 7: Carlos Torres and Segundo Pratenas left Santiago by jeep for Vicuña, taking the interferometer, the Danjon telescope, camping equipment for two parties, etc. along.

April 8: Hugo Moreno and I left Santiago by LAN-CHILE Airlines for La Serena. There the jeep picked us up and took us to Vicuña. Total travel time from Cerro Calan to Vicuña was nine hours, including three hours of waiting periods at the Santiago and Ovalle airports.

In Vicuña we contacted immediately the carabineros in order to get in touch with Juan Leighton. He knows the mountains in the area better than anybody else. Juan Leighton was still recovering from an accident and not on duty. He will most likely be discharged from the service with the carabineros soon. This fact may be of particular importance to us, as will be apparent later. We met Juan Leighton at his house, and explained to him, which mountains we were planning to visit. The names of the mountains were actually determined later, anyway they are: Cerro Blanco (2800 m) to the N of Vicuña, and "Tololo" (2250 m) and "Moredo" (2150 m) to the SW of Vicuña. Cerro Blanco can be approached from a place called "El Sauce", and Tololo from "El Tambo". The latter is on the La Serena-Vicuña road, the first at the end of a jeep trail. We made plans for the next days as follows:

April 9: Visit to El Sauce and El Tambo to secure animals.

April 10-11: Cerro Blanco

April 12: recovery day at Vicuña

April 13-14: Tololo

April 15: return to Santiago

Juan Leighton was to accompany us the next day.

April 9: We picked up Juan Leighton at 10 a.m. and drove to El Sauce. The jeep road is about 15 km long and requires one hour of driving. El Sauce is at an elevation of 1300 m. Cerro Blanco is about 6 km further to the N beyond several ranges of small mountains. We climbed a nearby mountain in order to get a better view of the approach to the mountain, and then returned to El Sauce. The trip on foot took 2 1/2 hours. The time required to reach Cerro Blanco was estimated to 8 - 10 hours. Arrangements were made for four animals (mulas) for the next morning, three with saddles, and one for cargo. A man from El Sauce was going to accompany us on the trip.

Having completed our business at El Sauce we returned to Vicuña and then continued on the La Serena road for another 10 km to El Tambo. Here we contacted two men who were familiar with the Tololo area. To get animals seemed to be a problem at first, but this problem was soon solved in a very satisfactory way. We were referred to the "Hacienda Santa Adela". The administrator of the hacienda turned out to be a very helpful person. He assured us that three very good horses would be ready for us on the morning of the 13th. One more horse, and a mule had to be gotten elsewhere. On account of the large distance to be covered (40 km through uninhabited country) we preferred to take two men with us. Furthermore we had to insist on animals in first class condition.

When everything seemed to be O.K. for both trips we returned to Vicuña. There the interferometer had been mounted in the meantime in the backyard of the hotel by Carlos Torres, for practicing adjustment and observing procedure. The latter took a good part of the following night, with very satisfactory results though. The interferometer was to go up to Guamayuca the next morning with Carlos Torres and Segundo Pratenas.

April 10: Hugo Moreno and I left the hotel at 6:30 a.m. and arrived at El Sauce at 7:30 a.m. The animals were not yet ready so we had time to have breakfast with the people from El Sauce. At 9:30 our party consisting of three men and four mulas left El Sauce. At 12:00 we arrived at a little creek at the foot of Cerro Blanco. The creek begins at an elevation of 1400 m, and runs with 50 m³/day at this time of the year. It is supposed never to dry out completely even after a dry year. The water is clean and cool. We put a few bottles of fruit juice into the creek in order to have a cool and tasty refreshment when we came back. After a one hour rest we began to climb Cerro Blanco, mostly on mule, partly on foot leading the animal where we had to pass over rocks or other particularly difficult areas. There is no trail leading to the top. About halfway up was supposed to be another spring. At this time of the year it is nothing more than a muddy area without any running water. At 5:10 P.M. we reached the top and inspected it and its surrounding immediately, because not much time was left before sunset. The surface is flat, and has an area of about 250 m x 100 m. In addition there is a ridge about 20 - 50 m wide, one kilometer long, and 50 m lower than the top. The night was perfectly clear and calm. The moon was nearly full and showed no scattered light around it at all. The usual "thumb test" (covering the moon with the thumb on the stretched arm) had to be replaced by the "little finger test" and still did not show any brightening of the sky near the moon.

April 11: In the morning we waited until the sun was high enough for some panorama photographs. We left the top at 9 a.m. and reached the spring at the foot of the mountain after 2 hours 15 minutes. The water cooled fruit juice was still there, and was a most welcome refreshment. From the spring it took again about 2 1/2 hours to reach El Sauce, where we had left the car. Here we had to sum up our experience, and had to decide about future activities on Cerro Blanco.

The surface of Cerro Blanco is certainly sufficient for even a very large institution. Water is about as far from the top as on Guama-yuca. The amount is less though, but still plenty. The exact elevation is not quite clear yet. Maps are too inaccurate for this information. From the DC-3 we came to an elevation of 2700 m, while the small altimeter we carried this time (usually we carried a large and accurate one, but it was too heavy for this kind of trip) indicated 3000 m. We will send the small altimeter to a mountain of similar and known elevation in order to determine the scale error. A road to Cerro Elanco will be 10 - 15 km longer than one to Guama-yuca, most of the difference made up by the approach through a valley to the foot of the mountain. Cerro Blanco is supposed to be snow-covered for several months. This statement needs some checking because the people reporting this see only the southern slope of the mountain. At present the access to the top is very difficult, and almost impossible with equipment. In order to be able to visit the mountain again we asked the people at El Sauce to prepare a trail to the top. We paid a \$40.00 advance for this. The total cost is expected to be less than \$100.00.

Work on Cerro Blanco will probably make it necessary to establish an auxiliary station at the foot of the mountain, where the animals will be kept during the time the observers are on top. In a one-day operation, equipment and supplies can be brought to the substation. To take everything from there to the top may take one or two days, depending on the number of animals available. The site is sure worth such an effort, and we are prepared to do it.

We arrived at the hotel at 4 p.m. In the evening Don Fidel visited us and had dinner with us. We learned that Carlos Torres had not been able to go up to Guama-yuca the day before because of illness. He went up this morning. Also we advised Don Fidel to conclude the final negotiations about the purchase of four mules.

April 12: Visit to El Tambo to arrange for four horses, one mule, and two men for 7 a.m. the next day. In the evening we were invited for dinner by the local doctor (Dr. Diaz). Also invited was an officer of the carabinieri and the administrator of the hacienda Sta. Adela.

April 13: We left the hotel at 6:30 a.m. and arrived at El Tambo 20 minutes later. The horses were ready, but the mule and one of the men still had not yet arrived. This was a good opportunity for us to have breakfast at the hacienda, to which we were kindly invited by the administrator. At 8:30 everything was ready, and we started the longest trip we have made so far; 40 km had to be covered. The actual distance between El Tambo and Tololo is much less, but the easiest approach to the top by horse is from the south. For 4 1/2 hours we followed a dry river bed towards the south. It was hot and dry, and the vegetation of a desert-type. At the foot of Tololo, actually somewhat more to the south, we came to a little spring running with about 5 m³/day (elevation 1200 m). Further up the valley was a house with small fields around it, indicating that there was more water available. After a one-hour rest we followed the dry

river further to the south for a short while, and then took a very steep trail up to a pass 1750 m high. The horses did very well, climbing at a rate of 800 m/hour. It was then about 5 p.m., Tololo still being quite far, though not much higher. A much nearer mountain, "Morado" seemed to be even better suited than Tololo anyway, because it seemed to have a larger flat surface. Tololo has a large surface; however, it is inclined a little. The surface of Morado is level. In order to be able to make a better comparison between the two mountains we decided to use the one hour of daylight which was left then to get to a small peak midway between the two. There is no trail up there, and hence progress was very difficult. It had to be done on foot, leading the animals. At 6 p.m. we were on the little peak, and it became more evident then, that Morado (estimated elevation 2200 m) was the superior site. All mountains to the W are considerably lower (1500 m). The higher mountains in the E are far away. So this is a spectacular site, and as undisturbed by local effects as one can wish. The area on Morado seems to be of the order of 200 m x 500 m, the area on Tololo somewhat larger (however inclined by a few degrees). At night the effect of the slight increase of the haze layer towards the E was evident. Thus this site may be as much or as little affected by haze as the much higher Cerro Elanco. In spite of the fact that we felt more like a part of a horse than a human being we decided that this site was on our program. Again a base station will be necessary, probably at the house down below.

The first part of the night was partly cloudy, later it was clear. It was practically calm all the time, and not as cold as on Cerro Elanco.

April 14: At 8 a.m. we left the top of the mountain, and reached El Tambo at 3:30 p.m. after a nearly non-stop trip. After unloading the mules we drove to Vicuña, and later returned to El Tambo to have dinner at Sta. Adela.

April 15: Since the car had to be taken to La Totorita by Don Fidel in order to enable the Guama-yuca party to return, we took a taxi to the La Serena airport, and a LAN-CHILE flight to Santiago from there. It was 7:30 p.m. when we arrived in Santiago.

General Remarks

Observations on Tololo or Morado and on Cerro Elanco require a considerable change in our mode of operating test stations. Because of the large distances and steep trails the approach is no longer a one-day operation. Consequently visits to the mountains for short periods are no longer practical. Longer visits make it necessary to employ a supply party besides the observing party. This has already been done on Tabaco and Guama-yuca. However here the supply party consisting of 1 - 2 men and animals has to be available as long as the observing party is on the top or on the way to or from it. Furthermore we need good animals, and they have to be well taken care of. Since we are planning to work nearly continuously in the Vicuña area, it seems justified to take the following steps:

STOCK REPORT NO. 5

1. To purchase 2 - 3 good horses (about \$120 each) in addition to the mules we have already.
2. Hire a man permanently to take care of the animals, and of supplying the observers with food, equipment etc.
3. Change the observing party, consisting of two men, about every three weeks.
4. One vehicle will be stationed permanently in Vicuña.

(The above written on April 16, 1960,
the following on May 2, 1960.)

As you may notice I was not able to complete this report before my trip to Venezuela. Now I am back in our business, with one more adventure on my record. I saw a lot of Venezuela and visited a number of mountains. They were not as high and as far as those in Chile, but even more difficult to get to. The vegetation is the main problem there. I have now plenty of experience with the means of transportation in a jungle, and I am very happy that Chile is not like it. I also had to live through two revolutions, and that was no fun either.

I will be in Vicuña again next week, for some 15-20 days. Then a relief party will come up, and I will visit Tabaco with the second inter-ferometer (if it is ready by that time). Robles and Alto del Toro will be taken care of by other people.

We just returned from Guamayuca after a most unpleasant experience. I will come to that later on. Here is the continuation of my report:

May 13: We were unable to leave Santiago on schedule because of difficulties with the jeep. It needed repair on the springs. The ambulance is not available yet. So we finally got under way today at 11:45 a.m. Only Hugo Moreno was with me. A three-day visit to Guamayuca and a four-day visit to Tololo - Morado were on our schedule. We arrived at La Serena at 11:45 p.m. and stayed at the Hotel de Turismo.

May 14: We left La Serena at 10 a.m. A short stop at the Fundo Santa Adela in El Tambo was without success because the administrator was not present. We left word that we needed three horses later next week, and then continued to Vicuña, where we arrived at 12:15 p.m. In the afternoon we went to La Totorita to make the final arrangements for a trip to Guamayuca for the next day. Several days ago we had sent a telegram to Don Fidel, asking him to send the equipment up to Guamayuca prior to our arrival. The equipment had been left at La Totorita by Carlos Torres after his last visit. Unfortunately our telegram never arrived, and consequently the equipment was still at La Totorita. In order not to lose time we decided to hire two more animals and to try to get everything, that is equipment and us, up to the mountain in one trip. This would be tough for the animals and us, but did not seem to be impossible. Our four mules were down in the Elqui Valley and had to be brought to La Totorita this same day. Starting time from La Totorita was set at 7 a.m. the next morning.

The next thing to do was to prepare the trip to Tololo - Morado. We got in touch with Juan Leighton and put him in charge of this operation. He was to get six more animals for us, and have them ready for a six-day excursion at El Tambo in the morning of the 19th. He would also procure everything that was necessary for the animals if they were to stay on or near Tololo for such a length of time.

May 15: We arrived at La Totorita at 7 a.m. and found that the animals were not yet ready. Two of our mules ran away, and the men were after them. This was amusing but also annoying. At 10 a.m. everything was ready, and we started with five mules, one horse, and two men besides Hugo and myself. In spite of the extra heavy cargo we reached the top faster than ever before, that is after five hours. Usually it takes 7-9 hours to get the cargo up. This proves that our animals were in excellent condition.

Immediately upon arrival we began to mount the telescopes (interferometer and Danjon) and at nightfall everything was ready for observing. The animals were taken back down and were to come back early in the morning of the 18th.

The night was clear, and seeing conditions excellent. There was no haze whatsoever!

May 16: Guamayuca. Again a sunny and clear day and a good night.

May 17: In the morning at about 10 a.m. the tops of a few cumulus clouds showed up some 50 km to the south. A cold wind was blowing from the NW. The temperature which had been steady at 50°F all night, had dropped to 46°, and the humidity was rising. Although it was perfectly clear, it was evident, that the weather situation was different from what it had been the previous days. Then the daytime maximum was 62°F, with a humidity of 25%, and an afternoon breeze from the W. With our transistor radio, our latest acquisition, we got the weather prediction for Santiago. It was cloudy there at present, but expected to clear up soon. So we were not alarmed. However the temperature continued to drop, the humidity increased fast, the wind became stronger, and the clouds came closer (very slowly, maybe 5 km per hour). The afternoon news revealed that it was raining heavily in Santiago. By nightfall the clouds had reached the zenith, the temperature was down to 36°, the humidity up to 80%. It was evident that something was on the way, and fast. A steady wind of 20-30 m.p.h. was blowing from the NW. In view of the weather conditions we decided to dismount the equipment. In complete darkness, with a cold wind blowing, this was no fun. It took three hours before everything was safe. By that time (11 p.m.) it was partly cloudy over the entire sky. Later in the night low clouds began to form, indicating that rain was coming. We took as much into the tent as we could, and we tried to keep ourselves warm as best as possible.

May 18: At 6:30 a.m. it began to rain, and we were in dense fog. At 7 a.m. the two men arrived with the mules. Since the tent began to drip on the inside there was no point in trying to stay on the mountain waiting for better weather. So we packed up, took the tent down, and loaded the animals, everything with rain, fog, and cold wind. At 8:30 everything was ready, and everybody soaked. The two men took the animals down over the trail while Hugo and I took our usual shortcut to La Totorita on foot. Visibility was near zero, I had no compass with me, hence we had to follow our nose. Hugo and I disagreed a number of times by more than 90° as to which way to go. I was very stubborn and did not listen to him at all. Being completely wet and very cold I was in no mood for arguments. He had no desire other than to follow me. To Hugo's amazement after 2 1/4 hours of navigating downhill through dense fog we arrived exactly at the backdoor of La Totorita. But in what shape we were! We were completely wet from the top to the skin, and covered with mud. The soaked clothing was so heavy that walking was quite difficult. How glad we were to be at La Totorita at last. There we got quick help from Don Fidel. He is almost like a father to us. Hot tea and some dry clothing was waiting for us. Don Fidel is quite short. We must have looked like clowns in his pants. Being somewhat restored we drove to the hosténa, where the people there helped us to get off the rest of the wet clothing and to clean up the mess. Some strong drinks then brought back our spirits. Don Fidel promised us to take care of our equipment and get everything dry and ready for further work.

This may be an opportune time to point out to what extent we depend on the cooperation of the local people. Whenever we come down from Guamayuca, we are in a bad shape; either because of heat and dust, or because of bad weather. Always we are expected at La Totorita, and there we get every possible help. Also when we want to go up, we just give word to Don Fidel, and he prepares everything. Without him things would be very difficult if not impossible. This time he knew that we had to leave the mountain. So he sent his men up in spite of the adverse weather. The situation is quite similar on all the other stations. We can rely 100% on the people in the area. They are always prepared to help when help is needed.

In the afternoon we met Juan Leighton. Everything was ready for Tololo for the next morning. It was however necessary to postpone the trip by one day because we had to dry out equipment first. Also we decided to take three extra men with us, one to stay with us on the mountain for one night and one day. He was to help us to prepare the site and to erect the mounting for the interferometer and the weather instrument shelter.

There is at least one lesson we learned from our experience on Guamayuca: whenever we have an indication that bad weather is coming, we have to go down immediately. Equipment has to be packed and secured and to be left on the site. After that the observers have to leave the mountain. This is safer for personnel and equipment.

May 19: Today it is sunny and clear again. The cloudy period on Guamayuca lasted for maybe 30 hours. We also learned that precipitation on Guamayuca usually comes in the form of rain, only on occasion as snow. This time snow fell above 3000 m. This is in contrast to the Santiago area where above 2000 m precipitation always comes as snow, usually even as far down as 1000 m.

Tomorrow morning we shall leave for Tololo - Moreado. We expect to return five days later.

STOCK REPORT NO. 6

Thanks for your letter of May 23. It appears that our financial difficulties will be taken care of soon, at least for a while. As to my \$1000 advance to Sr. Padrós: it does not appear at all in Dr. Rutllant's accounting. The nearly \$500 in his last statement concerning the 13" shelter are for the sliding roof which has been built at this observatory. The \$1000 will appear in the next statement.

The recent earthquakes did not seriously affect Santiago although they were felt here quite strongly. We have not heard yet from Romero and his family. They are in Temuco where plenty of damage occurred. It is very gratifying to see help coming from the entire world including a large share from the U.S.

Hugo Moreno and I just returned from what we consider the most successful trip of our expedition. This is what was accomplished:

1. We occupied for the first time one of our new distant stations with all equipment for a number of nights (on Tololo).
2. We found excellent substitutes for Guamayuca. Tololo is large enough for our purposes while Morado is even larger. As a matter of fact it is the mountain with the largest surface on our program.
4. We found the best seeing we ever observed (on Tololo).

This is how it went:

May 19: Part of equipment and mules taken to El Tambo.

May 20: After completing some last minute preparations for the trip we left Vicuña at 9 a.m. for El Tambo. There our four mules and in addition two burros and four horses were waiting. Since all the animals were to be kept near Tololo during our stay up on top it was necessary to take food for them along also. In the semidesert area around Tololo no grazing is possible. The equipment to be carried consisted of: one interferometer plus steel-tube mounting, one Danjon reflector, camping equipment, food, and water. The total weight of the cargo destined for the house at the foot of Tololo was about 1000 lbs. Of this about 600 lbs had to go up to the top. Two men, Juan Leyton and Arturo Garrote, would accompany us to the top, then take the animals down to the house, and bring them back up three days later. We expected to arrive at the top the next day.

At 11 a.m. everything was ready, and we left the Fundo San Carlos (also named Santa Adela) in El Tambo. We first followed the same dry river we took one month ago, but after a few kilometers turned more towards the west along another river bed. After going over a pass (1300 m) we changed into still another river bed - also dry - in which the house was located which we were heading for. We arrived there at the foot of Tololo at 5:45 p.m. The place is called "Los Placeres". Its owner is Sr. Regelio Ramos G. (to be referred to as

Don Regelio). Los Placeres is at an elevation of 1300 m. The nearby spring runs at present with about 20 m³/day. Don Regelio was most cooperative and helpful. Not only were the four of us and our animals well accommodated for the night, he also promised us to accompany us to Tololo, and further to take us on a trip over to Morado. He knows every hill and valley in the area very well. He is the superintendent of the "Estancia El Totoral" to which the two mountains belong. Hence there will be no further problem in obtaining permission to investigate the two sites. The enclosed sketch shows the location of the two mountains and other points of interest. According to Don Regelio (and he turned out to be accurate in every respect) Tololo is somewhat higher and at the same time easier to get to. On the other hand Morado has a much larger surface. He also believes that it would be easier to build a road to Morado rather than to Tololo. In order not to make our work too difficult we decided to establish a permanent observing site on Tololo. If the results are promising, Morado will be compared directly with Tololo a number of times, but that is for the future. So the following plan was made:

1. to go with all equipment to Tololo the next day;
2. to observe on Tololo for two nights;
3. on May 23rd our two men will come with the cargo animals and take our equipment to Los Placeres. Don Regelio will come with our horses (borrowed from the Fundo San Carlos) and take us to Morado and from there down to Los Placeres.
4. Return to El Tambo on the 24th. The interferometer and the camping equipment will be left at Los Placeres. Carlos Torres will come during the next week and visit Tololo again with the interferometer. After that everything will be taken to Guamayuca.
5. During the time between our and Torres' visit Leyton and Garrote will make another trip to Los Placeres and carry food for the animals only. This will facilitate our future trips.

May 21:

At 10:45 a.m. our animal train minus one burro left Los Placeres. After one hour we reached a little spring (elevation 1500 m, 2m³/day) where our water tank was filled. Then the climb to the top began over a trail which was not particularly steep neither very difficult. At 1:45 p.m. we reached the top. The men helped us erecting the mounting for the interferometer and then left with the animals. At nightfall the instruments and the camping site were ready.

The very top of Tololo is not very large and quite rocky. The rocks however break very easily. Blasting will certainly create enough space for one large building. There is plenty of building space 50-100 m down towards the SE, in which direction the mountain slopes down gently for several hundred meters. Furthermore the mountain forms sort of a natural water collection area of nearly 1 km² on the top. Our observing site is about 20 m below the top.

Weather and seeing conditions will be summarized further down.

May 22: Tololo.

May 23: With sunrise we began to disassemble our instruments and to take the tent down. At 11 a.m. the men came with the animals and took charge of the cargo while Don Regelio took us on the trip to Morado. The trail is very difficult in places, making it evident that it would be much more of a problem to observe on Morado, but it certainly is not impossible. After about three hours we reached the top of Morado. The mountain can almost be described as a high plateau, being about 2 km long, and 1/2 km wide in places. Just like Tololo it is surrounded by almost vertical cliffs, dropping nearly 1000 m. After a short rest we took a very steep shortcut down to the valley, leading the animals for a good part of the descent, and reached Los Placeres in less than two hours. For going up and also for going down with cargo, a different path must be taken. One trip would last about five hours.

May 23: We left Los Placeres at 9:35 a.m. and reached El Tambo after five hours.

May 24: Return to Santiago.

General Remarks about Tololo and Morado

Tololo has an elevation of 2300 m (by altimeter). Morado is 80 m lower. However since much of the somewhat lower parts of Tololo would have to be used, for practical purposes both mountains have the same elevation. To the W and N the nearest mountains are about 600 m lower. To the S is another mountain of 2300 m at a distance of several kilometers, and separated by deep valleys. To the E is one mountain of maybe 2700 m at a distance of about 5 km, again beyond a valley. The High Cordillera is 20 km to the E. There is certainly no problem with drainage of cold air, or turbulence caused by nearby mountains of similar altitude (or higher).

The weather conditions we encountered were as follows:

1. daytime maximum 23°C
2. at sunset the temperature drops rapidly to 10°C
3. during the night the temperature rises slowly by 2-3°C
4. humidity is very low, less than 10% all the time
5. wind out of the N, with 0 - 10 mph. The wind came all the time as a steady stream with no apparent turbulence
6. no haze
7. seeing the best we have encountered so far. Most of the time seeing effects were below detectability (0'.3). The rings of Saturn could easily be separated at a zenith distance of 75°.

Whether or not these conditions are typical, that remains to be seen.

One interesting and unusual problem exists on Tololo: the mountain is famous for the puma, the mountain lion of the Cordillera. We have been warned by Don Regelio and Juan Leyton that these animals are dangerous. They advise us strongly to carry a shotgun. I am most hesitant to acquire such a device, because it may be more dangerous than the lions, but the safety of

the people and animals probably makes it necessary to have one. I hope that nobody will regard this feature as a disadvantage of Tololo.

A word should also be said about Cerro Blanco (2800 m). This site was selected in order to avoid the haze which exists during the summer. On the other hand we may expect rough conditions there during the winter. At present there is no haze, hence the other sites in the area will be superior. During the summer Cerro Blanco will have an advantage. The most important problem at present is to find out what the weather conditions are like on Cerro Blanco during the winter. For this purpose I will visit the mountain soon for a few nights without equipment. If I find the conditions reasonable, we will observe there also. Otherwise we will give up the site.

Here are a few other items:

The ambulance is ready to be picked up. Hugo Moreno is going to Valparaiso tonight and will bring it tomorrow.

The second interferometer is almost ready for observing. I will take it to Tabaco soon.

The shelter for the 13" still is not yet ready. The snow on Alto del Toro makes progress very slow.

Carlos Torres and I returned yesterday from another 18-day trip to Vicuña. I had been planning to go to Tabaco first but a number of reasons made me change the plans. Before giving you an account of this trip I have to tell you about the vehicle with which we have now one month's experience.

When I returned from Vicuña on May 26 I expected to find the vehicle in Santiago. It was not there. Actually very little had been done in this matter during my absence. So a telephone call was made to Valparaíso to our shipping agent. It was found that the vehicle was ready and waiting to be picked up. Hugo Moreno and a driver (Segundo Pratenas) went to Valparaíso on May 28 and brought the vehicle to Santiago. The transfer to Santiago was greatly facilitated by two facts: the recent earthquakes, and the Red Cross signs on the car. Everybody thought that the vehicle was on its way to the South, and the right of way yielded to it everywhere. To be out of gas and stuck in the middle of the main square in Valparaíso caused a spectacular traffic jam but no bad feeling.

A number of things were wrong with the car and had to be taken care of. The most annoying trouble was that the battery was continuously being overcharged and consequently boiling. The gas released in the process was very unpleasant. Then of course the Red Cross signs had to be painted over because we did not want to sail under the wrong flag. Also turn signals had to be installed, furthermore small lights up on top in front and back (this is required by law). Rear vision mirrors were also missing. And last but not least a thorough cleaning was needed.

The cleaning was done at the observatory, and a fairly good looking vehicle emerged during the process. Painting was next. Only the red crosses were painted over with a paint which does not exactly match the rest of the car. The result is amusing but good enough for our purpose. In this condition the car was ready to receive a Chilean license plate (ZK 517, San Bernardo).

After this the car was taken to a Dodge service station, a rather large outfit, in order to have the necessary repair work done, and to have the additional lights installed. There we got into some difficulties. The entire electrical system of the car is based on 24 V. There are no parts here on the market for that voltage. So all the new additions work on one of the two batteries only, that is with 12 V. The existing electrical system however cannot readily be changed. One headlight was burned out, and it was very difficult to find replacement. Segundo Pratenas spent half a day in Santiago before he found one in one place, and another elsewhere.

The work in the garage took three days. When everything was ready I asked to have one wheel taken off and the tire dismounted. I wanted to see in what condition the inner tubes were. After seven years they could easily be in poor condition. I was assuming that for a large garage this was a small job. How wrong I was. After two hours of hard work finally the inner tube was out. It was in good condition. After another two hours work for three men with all sorts of machinery they had to concede defeat. They were unable to mount the tire. The men suggested that we go to a nearby

vulcanization shop where they have much larger equipment for mounting tires. This we did. The "much larger equipment" consisted of a steel bar 1/4 inch thick, 1 inch wide, and two feet long, in the hands of a man who knew what he was doing. The job took three minutes. Dismounting and remounting a second tire took another five minutes. This is Chile.

Since I have been talking about the vehicle so far I may summarize the experience we had with it before coming to the report about the trip:

We first were somewhat scared because of the size of the truck, but now we are used to its dimensions. We realize that we cannot find anything better. The vehicle will go wherever there is enough space for it. The condition of the surface is unimportant. Sand, mud, snow, rocks, it makes little difference.

Also the vehicle is quite comfortable. It has De Luxe beds compared to what we are used to. The heating system is marvellous. Being a 1953 model it was apparently built for the "Cold War". It has sufficient cargo capacity for all our equipment. This was always a problem with the jeep. Furthermore the truck has many places inside where we can stow and lock away little things which we need on the trips.

A trip to Vicuña now takes 18-19 hours, with the jeep it took 16 hours. So the difference is small. Driving is more tiring because the vehicle is heavier. This is however more than compensated by the fact that one person can sleep in comfort while the other is driving. This was not possible before. In short we are very pleased with the car.

As a first test, actually before the repair work was done, I drove the truck to Farellones. There was no problem. In some of the curves it was necessary to back up, but this is easy enough. It was possible to come down all the way without applying the brake a single time.

So much about the vehicle. Here is the continuation of my report:

June 8: In the afternoon finally the vehicle was ready, and Carlos Torres and I left Santiago at 5 p.m. We planned a non-stop trip to Vicuña. However about 100 km south of La Serena we encountered dense fog and had to stop and wait for daylight.

June 9: At about 9 a.m. we reached La Serena. When we got gas there we noticed that oil was dripping out of a small pump next to the engine, and at a fast rate. The station attendant suggested to go to an auto mechanic a couple of blocks away. We went there and found the man. He looked at the trouble and told us that it was the oil pump which was leaking. A certain part was needed for the repair, and he did not have it. Neither did he expect that anybody else in La Serena would have it, but we should try. We went to a Dodge agent and asked for what we were told was missing. There were no spare parts for military special engines. The Ford people may have it, we were told. They in turn suggested Willys, and so on. When Volkswagen was suggested I gave up. Having the recent experience with the tire in mind I was looking then for the smallest auto repair shop in town. Maybe

there they can improvise something which will enable us to go on at least for a while. We found such a place and had the man look at the pump. He was quite amused when we asked him to repair the oil pump which in reality was the fuel pump. "No trouble" we were told. "A new washer is needed. That is all. Come back in half an hour and the car will be ready." This was good news, but we were cursing the other mechanic with all the vocabulary we had available. This kept us busy for a while, and then the car was ready and we could go on.

On the way to Vicuña we made a short stop at the Fundo San Carlos to see Don Alberto Cousiffo. He was not at home. So we informed the mayordomo that we wanted to go to Tololo in a day or two. We arrived at Vicuña at 1 p.m.

In the afternoon we went to La Totorita to inform Don Fidel that we wanted to visit Guamayuca again in about a week. We also unloaded the sky patrol camera there and asked José Tapie, one of the employees of La Totorita, to take it to Guamayuca the next day.

In the evening we met Juan Leyton and discussed our plans. A visit for three or four nights to each of our two mountains in the area was on the schedule. Juan Leyton told us that he and Arturo Garrote had made another trip to Los Placeres at the foot of Tololo during our absence. They made a depot of food for the animals there which will greatly facilitate our future work there.

June 10: El Tambo. Arrangements for the trip to Tololo for the next day.

June 11: In the morning we went to the Fundo San Carlos and had breakfast with the Cousiffo's. At 10 a.m. the animals were ready and we left for Los Placeres which we reached after 6 1/2 hours. Again we had two horses from the Fundo, two horses and one burro owned by Arturo Garrote, and our own four mules. At Los Placeres we were received with the usual hospitality, and we spent the night there. The night was completely cloudy.

June 12: In the morning the sky was still completely overcast and it looked as if it was going to rain, although there was no cold wind from the North which invariably goes with the precipitation. In spite of the doubtful weather situation I decided to go up. We left Los Placeres at 11 a.m., accompanied by our two men and Don Regelio and reached the top of Tololo at 2 p.m. By this time a cold wind was blowing out of the N, and it was snowing in the High Cordillera but not on Tololo. We erected the tent in a hurry, and then the men and the animals went back to Los Placeres. By 4 p.m. it began to clear up, and by 6 p.m. it was completely clear. We had barely enough time to get the interferometer ready for observing, leaving the adjusting of the Danjon telescope unfinished. The night was clear, and the seeing excellent.

June 13: A warm and sunny day. We kept ourselves busy painting the tube on which the interferometer was mounted, and also its four boxes. The

latter was somewhat inconvenient because these boxes usually serve as camp furniture. It was difficult to keep the wet paint in mind at all times, and so the inevitable happened: our blue jeans have now grey bottoms.

The 8 p.m. observation, with some clouds present, yielded rather poor seeing. A few minutes after the observation the sky was completely overcast.

June 14: All day partly cloudy, the following night also. We continued our painting job. Leyton and Garrote came up to bring us some fresh bread. They had been working on improvements of the path all day. We told them that we wanted to stay up for four nights instead of three because of the cloudy night we had.

June 15: All day partly cloudy but quite warm (70°F) as on the previous day. We had underestimated our appetite and were practically out of food. For a change we had plenty of water. It cleared up during the early evening. The seeing at 8 p.m. was again unsatisfactory, and again as on the previous evening a few minutes later the sky was overcast.

June 16: At 5 a.m. we began to disassemble the equipment. It was completely cloudy with fog in the valleys and occasionally also on the top. Also it was cold (38°F). At 8 a.m. the two men arrived with the animals. Torres and I left half an hour later on horse, leaving the men with the cargo behind. We wanted to get to El Tambo the same evening while the cargo was to arrive in the afternoon of the next day. We reached Los Placeres after a little over two hours and made a short stop there. Don Regelio told us that he has two saddle mules, one with saddle, for sale. We need such animals because we cannot always count on the horses from the Fundo, which so far we borrowed free of charge. On Guamayuca we had to use rather poor animals for ourselves. So I told Don Regelio that we would buy the mules. This would also be of an advantage if we have to take people up who are not accustomed to horse riding. A mule is a much safer animal in the mountains. We also discussed the possibility of erecting a small but solid shelter on Tololo, not much larger or higher than the tent. This would be better and safer for the observers, and it would also enable us to leave equipment on the mountain. Such a shelter seemed to be a simple and inexpensive proposition. So we asked Don Regelio to give Juan Leyton the necessary instructions to purchase and transport the material that was needed. Most of the material will of course be stones collected on the top.

The trip to El Tambo from Los Placeres took nearly six hours, and we arrived at 6 p.m.

The night which we spent in Vicuña was completely clear.

June 17: The animals arrived at El Tambo at 4 p.m. We picked up the cargo and took it to La Totorita in the truck. The animals were taken to Vicuña the same evening.

In Vicuña we met a surveyor from Norway who was acquainted with a road construction engineer from La Serena. This man could give us an estimate of the cost of a road to Tololo and Guamayuca. The Norwegian was going to ask him to get in touch with us.

June 18: Social obligations which begin to be a rather heavy burden. All the important local people want to invite us and want to talk to us. We are already too well known in the area, and with our new vehicle we are even more conspicuous than we were before.

June 19: We left the hotel in Vicuña at 8:30 a.m. and arrived at La Totorita 30 minutes later. Leyton and Garrote were already waiting for us. At 10 a.m. we started the trip to Guamayuca. Near the top one of the mules slipped off a rock and rolled quite a distance down the mountain, losing the cargo on the way down. The animal got back on its feet on time while the cargo (the Dajon telescope) was caught by a rock. No serious damage resulted, only a one hour delay. In spite of this mishap we reached the top after 4 hours, 15 minutes, faster than ever before with cargo. This proves that our two men have more experience with this kind of work than the people we have employed so far.

The weather had been poor again all day, not far from raining. So we erected the tent in a hurry and left the equipment in the boxes. The boxes were placed around the tent as an extra protection against the wind.

The night was cloudy throughout, and a strong wind was blowing (25 mph), and it was raining for a while.

June 20: All day cloudy, but dry most of the time. Again we occupied ourselves with painting the interferometer mounting. Also we began to prepare a new camping area a little further down where we would be more protected from the wind. José Tapia came up early in the afternoon and we explained the function of the sky patrol camera to him. He will keep it running, and also the thermo-hygrograph, as he has done already for some time. Late in the afternoon Leyton and Garrote came. They had been working on the trail in order to make it easier and safer for the animals to bring the cargo up. We informed the men that we wanted to stay up for four nights because of the clouds.

The night was cloudy and it rained again.

June 21: The bad weather continued through the day. It was raining most of the time, confining us to our sleeping bags and making outdoor cooking quite difficult. The tent was doing quite well in spite of the wind.

The night was poor again with plenty of rain.

June 22: Rain all day. In the afternoon the wind became very strong (35 mph) and suddenly the water began to pass through the tent, soaking everything inside in no time. We had no other choice but trying to

get out of there as quickly as possible, leaving everything behind. It was not even possible to take the tent down. We got on our way taking only a few things along. It was then 4 p.m. We took the path down instead of our usual shortcut. The path was now so greatly improved that we made our way to La Totorita in less than two hours. Needless to say that we arrived completely wet, just as we did a few weeks ago. This time however we had our truck there with its effective heating system, and also with dry clothing. So we could restore ourselves quickly. Hot tea from La Totorita then did the rest.

June 23: It cleared up during the morning, and the weather was warm and sunny again, as it is normal for this area.

Our two men went to Guamayuca to get the equipment down, and we picked up our things at La Totorita in the evening.

June 24: In the morning Mr. Zoltan Timkovic, the road construction engineer from La Serena, came. He is of Czechoslovakian origin, has studied in Germany, and has been in this area for eleven years. He will accompany us on our next trip to Tololo and Guamayuca.

At 5 p.m. we left Vicuña for Santiago. Near El Tambo we met Leyton and Garrote. They had already purchased the material for the shelter on Tololo for some \$30, and were going to take it to Los Placeres the next day.

June 25: Arrival in Santiago at 11:30 a.m.

This brings you up to date again. There are many general remarks still to be made but there is no time for those now. I will leave for Vicuña again tomorrow (June 29), this time possibly for one month. I expect to be back in Texas on August 4 or 5. I think it would be very important to have a meeting of everyone concerned with the Chile project soon thereafter, because the continuation of the seeing program depends very much on the result of such a meeting.

If I find some time in Vicuña I will write to you from there.

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Of course we had to make all the arrangements for transportation for him in advance, particularly because he was not familiar with the area. The plan was that he would go to Vicuña on July 3 by train and stay at the hosteria. Juan Leyton would contact him there and take him to Guamayuca the next day. If possible, Don Fidel should accompany him then because he knows the mountain better than anybody else.

On the way to Vicuña, we stopped at El Tambo and informed Don Alberto about our plans. At the same time, we left the interferometer there. We arrived at Vicuña at 2:00 P.M.

We went to La Totorita and to El Tambo to organize our trips to the mountains. A complication arose from two facts: there was no feed for the animals left at Los Placeres, and Juan Leyton had to go to La Serena within a few days for a physical checkup. This meant primarily that different arrangements had to be made for Mr. Timkoviç. The new plans now were: Torres and I would go to Guamayuca on July 2, as was planned before, with Leyton and Garrote. The two men would then use the next three days to take some feed to Los Placeres. Then, on July 6, they would get us down from Guamayuca. In the meantime, Don Fidel would take care of Mr. Timkoviç, including procuring horses for him. On July 7, the whole party would leave for Tololo. A substitute man for Leyton would go with us and would take Mr. Timkoviç back to El Tambo after two or three days. Juan Leyton would come to Los Placeres alone after his return from La Serena, and join our party again. We planned to return to Vicuña on July 12. The trip to Cerro Blanco was to follow immediately thereafter.

According to the above schedule, this was the day we wanted to go up to Guamayuca. Leyton and Garrote were supposed to take the animals to La Totorita very early in the morning and expect us there. The weather, however, looked quite poor in the morning. Because of some unpleasant experiences in the past, I had arrived at the conclusion that we should try

June 29: Carlos Torres and I left Santiago at 1:30 p.m. in the ambulance. The plans for this trip to the north were:

1. to observe on Guamayuca and Tololo,
2. to take Mr. Timkoviç to both sites in order to get estimates for the cost of the roads,
3. to take the second interferometer to Tololo,
4. I intended to make another trip to Cerro Blanco in order to see what it is like there during the winter. Again, as on our first visit to the site, I was not planning on taking telescopes up to the mountain, only weather instruments. Since only Hugo Moreno was familiar with the area besides myself, I preferred to take him along on that excursion. However, he was not available at the moment. We decided that Carlos Torres would accompany me to Tololo and Guamayuca and return to Santiago after that. Hugo Moreno would come to Vicuña on time to make the trip to Cerro Blanco with me. Our time was somewhat restricted by the fact that Dr. Epstein was expected in Santiago on July 20. He wanted to visit Tololo and Morado, and H. Moreno and myself were planning to accompany him.

June 30: In the morning, we met Mr. Timkoviç at La Serena and discussed our plans with him. Things were a little complicated because we wanted to combine his visit to the sites with our regular observing program. Of course for him there was no need to be on the sites for three or four nights each. It would even have been rather difficult for us to accommodate an extra person on the mountains for several days. It seemed preferable that he would join us on Guamayuca for our last night there, then travel with us to Tololo and be there with us for the first night only.

July 1:

July 2:

to avoid being on the mountains during bad weather periods. I changed my mind on this point. For a number of purposes, it will be useful to know what it is like up there when the weather is bad. This we can find out only by being there. We just had to be better prepared to stay through a storm. For exactly this reason did we want to have a solid shelter built on Tololo. Construction on Guamayuca is more difficult because the rocks are not as suitable for it as those on Tololo. Incidentally, this applies to Cerro Blanco also. Two things were necessary to make a bad weather session on Guamayuca possible:

1. a better tent. We ordered a double tent in Santiago which had to be made to our specifications. It arrived a few days later, a monster weighing 70 lbs.
2. a new camping site had to be prepared a little below the summit to the south, where we would have some protection from the wind. This meant moving several tons of rocks and sand. This job would keep us well occupied and warm for several days.

Under the circumstances, particularly this being my last opportunity to get to Guamayuca before my return to the U. S., I was tempted to go anyway. However, Juan Leyton came to the hotel just when we were ready to leave and advised us to wait. Of course, he was right when he pointed out that we needed dry weather at least while erecting the tent. And he and Garrote were not very enthusiastic about getting thoroughly soaked once more. If we would go up, they would have about ten hours ahead of them without any protection from rain. The animals were still in Vicuña but ready to be taken to La Totorita. At about 10:00 a.m., Leyton came again and said that the weather had sufficiently improved and we could give it a try. I did not quite see the improvement, but took his word and we went to La Totorita. Loading the mules takes about one hour. When this preparation was completed, the preparations for a rainstorm were also completed and a heavy downpour began, with even one lightning and one thunder, the first one to be

experienced by many of the inhabitants of the area. Thunderstorms are practically absent in Chile, although they are very frequent just 50 miles to the east on the other side of the Andes. In this kind of weather, we could do nothing but return to the hotel and wait for the next day. Needless to say that our intricate planning seemed to collapse. If we could go up the next day, there was still one possibility to save the issue, and that was if Leyton and Garrote could make the round trip to Los Placeres in two days. This they did as will be seen.

July 3: Luck was with us, and the weather was good. There was fog up to 1200 m, but above it was perfectly clear. Torres and I arrived at La Totorita at 9:00 a.m. and we left from there after one hour. We reached the summit in 3½ hours. This was record time.

In the afternoon, cloud caps formed over the mountains above 2000 m, occasionally releasing some precipitation in the form of snow or rain. It cleared up in the evening, and we could observe all night. The seeing was disgusting (up to 3").

July 4: In the morning, Jose Tapia came up and helped us all day preparing the new camping site. It went faster than expected, and we were able to transfer our tent to the new site the same day. Another small tent was erected in place of the old one. It was needed for Mr. Timković and Don Fidel whom we expected later in the day.

In the afternoon, we observed a fascinating spectacle: ten condors were circling around the mountain. Usually, there are only two of these giant birds on Guamayuca. We did not know the significance of this accumulation, but we were told later. When a storm is approaching, the condors from the higher mountains seek shelter in the lower ranges. Some people attach a superstitious significance to the appearance of a large number of condors, and this theory worked out in this case also, as shall be seen shortly.

July 7: We made the usual trip from Vicuña to El Tambo by car and from there to Los Placeres by animal without any noteworthy incidents. Mr. Timković was with us and a substitute for Leyton.

July 8: At 10:30 a.m., we left Los Placeres, reaching the summit of Tololo at 1:15 p.m. Don Ragelio was with us again. He and Mr. Timković left the summit after about one hour to inspect other parts of the mountain. Mr. Timković planned to spend the night at Los Placeres and to inspect different approaches from El Tambo to Los Placeres the next day.

The shelter has been completed since our last visit. It is a primitive structure, made of rocks and wood. Its inside dimensions are 2.0 x 2.5 m and is nearly 2 m high. Total cost so far: about \$100. It serves its purpose very well and is quite an improvement over the tent.

The night was clear and the seeing excellent.

July 9: All day clear and warm (72°F). After the 8:00 p.m. observation which gave good results, a cirrus cover formed. The cloudy period lasted for two days.

Don Ragelio and Juan Leyton came up late in the evening to see the moon and other objects through our telescopes.

July 10: All day partly cloudy and windy (up to 20 mph), the following night also.

July 11: With sunrise, we began to pack up. Leyton and Garrote arrived at 11:00 a.m. with the animals, ready to take our things down. Torres and I went down on foot, taking a shortcut to Los Placeres over a path which is unsuitable for mulas. We reached Los Placeres in 1½ hours.

We discussed a number of improvements to the shelter with Don Ragelio. The wind was blowing dust and sand

Fog developed again over the mountains, and it was unusually cold (32°F). It was to stay like that for the next two days.

At nightfall Mr. Timković and Don Fidel arrived, bringing with them two horses. One belonged to Don Fidel, the other to one of his friends. Don Fidel took them a little down the mountain to a rather steep area and tied them to some bushes. So far, we have never kept animals there overnight.

As already remarked, it stayed cloudy all night.

July 5: The first thing we discovered in the morning was that one of the horses was dead, strangled by the rope with which it was tied to a bush. A horse is not a major investment (about \$80), nevertheless, it is a depressing experience to lose an animal in this way. As the reader may already have guessed, the subject of the condors was brought up again in this connection. To satisfy more realistically thinking people, the bad weather had arrived also and it was snowing. From the weather forecast we picked up with our radio, it became apparent that the situation would not improve within the next 12 hours. So I decided to pack up and go down later in the day, observing for a while how the weather developed. Mr. Timković and Don Fidel left the mountain on foot in the morning. Jose Tapia came up and took the one remaining horse down. We left the larger tent erected and put everything inside. The temperature had gone down to 29°F and it was so humid that ice crystals were forming on everything, even inside the tent or on our clothing. We found this rather unpleasant and were glad to go down. At La Totorita, we met Mr. Timković and Don Fidel again who, in the meantime, had made an extensive tour of the entire mountain.

July 6: Leyton and Garrote who returned from Los Placeres the previous day went to Guayayuca to bring the equipment down. At the tope, there was about 10 cm of snow and the snow extended down to about 1600 m.

The day was perfectly clear.

through the many cracks and openings in the walls. Mud plastering inside would eliminate this problem. Also, we would like to have a door, and wooden benches which can also serve as beds. The cargo arrived at 3:00 p.m. Most of the equipment was to stay there for the next observing session. Some parts of the interferometer had to be taken back to Santiago for some alterations.

July 12: With hardly any cargo, the trip to El Tambo could be made in a relatively short time, actually in less than 5 hours.

In the evening, Hugo Moreno arrived at Vicuña by train. In order to receive him in proper expedition style, I sent two mulas and a burro to the station to take him and his little suitcase to the hotel which was only three blocks away.

July 13: Carlos Torres left Vicuña for Santiago by train and air while Hugo Moreno and I went to El Sauce to initiate our excursion to Cerro Blanco.

The road to El Sauce, about 10 km long, in a very miserable one. It passes through a number of areas covered with large boulders. The primitive jeep track was made a number of years ago for we don't know what purpose. The track is in many places too narrow for our truck; nevertheless, we got through unharmed.

The primary interest I had in this visit to Cerro Blanco was to get an impression of the winter weather conditions. In particular, the maximum and minimum temperature, the humidity, and the wind velocity were of interest. All but the wind velocity could then be compared with the recorder data from Guayauca. In order to get the maximum temperature during a one-night visit, it was necessary to arrive at the top not later than 3:00 p.m. From our trip in April, we knew that it would take about 8 hours from El Sauce to the summit. Hence an early start was necessary. Also, I was nearly definitely decided to put this site on the observing program upon my return from the U. S. This required the erection

of a shelter on the top and I wanted to assign the location for it. We made our plans as follows: Hugo Moreno and I would come again the next afternoon with the truck while Garrote would bring the animals. We would stay overnight in the vehicle and start the next morning at 5:00 a.m. One man from El Sauce agreed to accompany us. It should be remembered that after our visit in April we asked the people from El Sauce to make a trail to the top of Cerro Blanco, and we paid them in advance for this job (\$40). We were assured now that the trail was completed, and that our payment was sufficient. We convinced ourselves later that the trail really has been built.

We had Garrote with us, and on the way back to Vicuña the three of us worked for several hours improving the road by removing large rocks at the narrowest places of the road and by filling in holes.

July 14: As planned in the afternoon we went to El Sauce. The weather was good as it had been during the past days.

July 15: We did not get started quite as early as intended, but we got on our way at 5:40 a.m. It was clear when we started; however, soon clouds began to form over the mountains, and by 7:30, we were in the fog. I had not seen this kind of weather development yet and hence did not know what to think of it. Our companions were not certain either. This type of cloud and fog usually goes with precipitation but, in general, it is preceded by a high cloud layer and a temperature drop, and accompanied by a cold wind from the north. All this was lacking. The frequent night and morning fog is always confined to the low valleys. Here we were already at 1400 m, and in addition, the fog started to form first on the mountains and later in the valley. We reached the foot of Cerro Blanco at 8:00 a.m. and decided to wait there for some time and see how things developed. About one hour later, the fog broke up for just a short moment, showing deep blue sky above. We concluded that we were in an unusually high ground fog and got on our way again. When we were nearly halfway up, being in the fog all the time, it began

to snow and soon rather heavily. The darkness of the fog also left no doubt that we had quite a pile of it above us. There was no other choice than to turn back. Precipitation continued all the way, changing into rain at 1600 m. At 3:00 p.m., we arrived at El Sauce, all of us more or less soaked. It continued to rain in the entire zone until the evening. Overnight the clouds disappeared and the early morning hours of the next day were perfectly clear.

The failure of this excursion was a disappointment. There seemed to be one more chance and that was at the end of the month, right after the trip to Tololo with Dr. Epstein.

July 16: Visit to El Tambo where the plans for our trip with Dr. Epstein had to be prepared.

July 17: In the morning, we visited La Totorita. At 4:00 p.m. we left Vicuña, headed for Santiago.

July 18: Arrival at Santiago at 8:00 a.m.

July 20: Dr. Epstein, who was in charge of the Yale-Columbia Seeing Expedition in South America, expressed his wish to see the Tololo-Morado area. He arrived at the Santiago airport at midday coming from Argentina. In his letter, he specifically stated his desire to go to the north as soon as possible. We took this literally and started directly from the airport, Hugo Moreno and myself accompanying him.

July 21: We came close to La Serena at 1:00 a.m. and stayed there for the rest of the night, using the comfortable sleeping facilities of the ambulance. At 9:00 a.m., we reached La Serena. There we discovered that the vehicle was losing oil at a fast rate. We have had this problem before. As a matter of fact, this very defect was supposed to have been repaired a few days ago in Santiago at the Dodge Service Station. The

same repair has also been done at La Serena some time ago at a very small shop. We went to that same place again and, sure enough, it was the same trouble again that has been repaired already twice. Repair was done promptly and it seems this time with a more lasting effect.

In the meantime, we looked up Mr. Timkovič to find out how far he was with his reports on the roads. It was finished and already on the way to Santiago. Some more details were, however, still to be discussed.

When the repair of the vehicle was completed, we continued our journey, arriving at Vicuña at 1:00 p.m. There, we were presented with a rather serious problem, namely shortage of feed for our animals. Due to the unusually cold and dry winter, grass and alfalfa was not coming up yet and all farmers were holding onto their supplies in order to be able to feed their own animals. This concerned in particular our main supplier, the Fundo San Carlos. There, they had just increased their stock and were now in serious trouble themselves. This problem had to be taken care of immediately because it could make our future operations absolutely impossible. We drove from one farm to another collecting negative answers everywhere. Finally, we had luck at a place called "Punto Azul", two miles west of El Tambo, and secured a promise for 1.5 tons of hay.

The plans for the next days were as follows: The next day, we wanted to take Dr. Epstein to La Totorita from where one can get a very good distant view of both Tololo and Cerro Blanco. The following three days would be occupied by a trip to Tololo. We were going to spend one night on the mountain and take only the 8" reflector with us. Dr. Epstein planned to return to Santiago afterwards, while Hugo Moreno and I wanted to make another attempt to get to Cerro Blanco.

July 22: Visit to La Totorita. At that occasion, I asked Don Fidel to erect a little structure on Guamayuca which would just be large enough to hold our equipment, thus enabling us to leave it there in a safe

place. It is supposed to have the size of a dog house.

July 23: Departure from Vicuña at 9:00 a.m. Arrival at Los Placeres at 4:30 p.m.

July 24: As usual, it took us about three hours to reach the summit of Tololo. The night began partly cloudy. It cleared up for several hours later on and Dr. Epstein had an opportunity to estimate the seeing conditions through the 8" telescope. Although conditions were slightly below the Tololo average, he commented that the definition of the images was of high quality.

July 25: Return to Los Placeres via Morado in approximately six hours.

July 26: Return to Vicuña.

July 27: Dr. Epstein left Vicuña by train. H. Moreno and I went to El Sauce to spend the night there and to try Cerro Blanco the next day, again.

July 28: This time we were more successful. We left El Sauce at 7:00 a.m., taking Garrote and another man along, and reached the summit at 3:00 p.m. The trail was indeed in very good shape now with the exception of the very highest part. Even so, it is a tough trip. The weather was perfect all day, the temperature as high as in the summer. On the way, we met a man who was out to warn the people in the area that a mountain lion (puma) has been seen. Later we saw the footprints of the animal ourselves. He also told us that the unusually warm weather was the sign for a coming earthquake. He turned out to be wrong at that, to my greatest satisfaction, because I had the nerve to tell him that these things have nothing to do with each other. The temperature on the top at the time of our arrival was 55°F. There was hardly

any snow, only a few patches in the shade of rocks. Our men were apparently far more impressed by the lion's footprints than we were and took a number of precautions. A large fire was kept burning all night. Furthermore, the animals were placed in a circle around us. They would notice an unwanted visitor long before we would. Conditions were so pleasant otherwise, that we did not even find it necessary to erect the tents. We just slept under the open sky in our sleeping bags. In the evening, cirrus developed and increased in density steadily through the night. It was calm all the time. The temperature dropped to 32°F by morning. We left the mountain at 8:00 a.m. It was cloudy all day long and it began to rain just when we reached El Sauce after a five hour trip. There was a somewhat unpleasant surprise waiting for us: the battery in the truck was dead. The front compartment cannot be locked and apparently, some children entered it and turned the headlights on. Unfortunately, I had the car parked with the front pointing uphill. A gravity start in reverse turned out to be impossible. So, we summoned all the manpower we could get and succeeded in turning the vehicle around. Starting was no trouble then. However, there was a good chance that the engine might stall on one of the many difficult passages on the road. If this happened, we would most likely be in a place where gravity would be of little help. Therefore, I asked one of the men from El Sauce to accompany us on his horse. He could summon help or take the battery to Vicuña for recharging, if this should be necessary. However, we got to Vicuña without further trouble.

July 30: Some more feed-shopping was necessary. We got the promised 1.5 tons and I instructed Leyton and Garrote to take all of it to Los Placeres during the next ten days. At 4:00 p.m., we left Vicuña for Santiago.

July 31: Arrival at Santiago at 8:00 a.m.

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by Jurgen Stock

August 3: Departure from Santiago at 1:25 p.m.

August 4: Miami, Dallas.

August 5: Arrival at the McDonald Observatory at 4:00 p.m.

September 29 Departure from Santiago at 10:20 a.m. in the truck with J. Quezada, one of the observatory drivers. Overnight stop 30 km south of La Serena.

September 30 Arrival at La Serena at 8:00 a.m. I wanted to see Mr. Timkovic, but he was not present. I left a note for him asking him to call me at Vicuña. On the way to Vicuña, we stopped at the Fundo San Carlos where I met Don Alberto Cousiño. Arrival at Vicuña at 10:15 a.m.

Carlos Torres arrived at Vicuña at 1:00 p.m. after a five-night stay on Tololo. During this observing period, he found the best seeing conditions encountered so far in the expedition. In fact, for a good part of the time, no seeing effects were noticeable at all with our equipment (with $Z \leq 60''$). During two or three of these nights, the wind was from the south, in which direction there are some nearby mountains of about the same elevation as that of Tololo. Yet, there was no noticeable deterioration of the seeing. Apparently, the turbulence created by wind of low velocity (≈ 5 mph) has only a negligible effect. This confirms my own previous experience and contradicts that of others.

A rather serious situation has developed in the Vicuña-Ovalle-La Serena area. Due to the unusually low rainfall in this area, (the rainfall was about normal in the Santiago province, although it arrived late, and was above normal farther south) no grass is growing on the mountains. The valley itself is not affected by the drought because enough snow fell in the High Cordillera, but here unusually low temperatures, in particular a heavy late frost (September 23-24), caused considerable damage. The inhabitants of the mountains live primarily on goats. They are now unable to feed their animals and have to sell them at ridiculously low prices. The farmers in the valley have incurred heavy losses in their tomato and orange production, the two most important products of the zone. We are affected by this situation in a number of ways. Mulas and horses are available at reasonable prices because the owners cannot feed them. This will make it easy for us to find the animals we need, but to feed them will be a headache. Jobs are scarce, the unemployment is

high. This enables us to choose the two new men for our team with care. Whenever I come to Vicuña, people are there waiting for me and asking for a job. It is very unpleasant to have to turn down these men who are greatly in need of work. I would like very much to help, but the interest of the expedition comes first. Consequently, if I have jobs open, and that is often the case, I have to look for men among those people on whose faithful cooperation we depend; that is, the people from Los Placeres, from El Sauce, and from El Churcal (at the foot of Cerro Blanco).

The problems to be solved during the next few days were these:

1. To buy eight more animals and three or four saddles. I had already bought one new saddle in Santiago, and I wanted to try it out before I ordered more from the same place. Carlos had already investigated the possibility of purchasing animals suitable for our work (tame, and used to the mountains). Two mulas were offered at Rivadavia (30 km up the Elgui River), two mulas and a horse at Vicuña, two mulas at Los Placeres, and four mulas and a horse at a place between Los Placeres and Andacollo. Leyton and I had to look at all these animals within the next few days.
2. To find something to feed our animals with. All possibilities were already exhausted with the exception of two, a farm near Rivadavia, and Punta Azul. If neither of them has hay available, we will have to send a truck to Los Andes (near Santiago) to get some and bring it to Vicuña.
3. To find two reliable men to work with the second team. Carlos and Leyton recommended two young men from Los Placeres. I had met them a number of times and also had a good impression of them, so we are going to try them out.
4. To have a shelter built on Cerro Blanco. Since the shelter on Tololo was built effectively and at low cost, we decided to ask the same carpenter again, a man from Los Placeres. We would get two men to help him from El Sauce.

5. So far, we used to keep our animals in a small enclosed pasture (in Spanish, "portero") at the Fundo San Carlos, when they were not out on a trip. For that, we were charged 10 cents per day per animal. By this time the ground was completely bare, and we just had to find another portero. Otherwise, the animals might jump over the fence and search for food on their own. They usually wind up in the corn fields, to the delight of the farmers.

6. Since there is a possibility that Cinchado may be taken into consideration, I was interested in making a trip to it.

To fulfill this program, we plan to allow the next three days for mula and hay shopping in the valley, and then make a three-day trip to Los Placeres. From there, I wanted to make the excursion to Cinchado, while Carlos and Leyton would go after the five animals on the way to Andacollo. On this occasion, we could also buy the two mulas from Don Ragelio, and make the necessary arrangements with the two new men to join our outfit. After this trip, the activities on Cerro Blanco had to be started with all available forces.

October 1

A trip to Rivadavia brought only partial success. The two mulas we wanted to see were in the Cordilleras and were expected back in three or four days. We asked to have them sent to Vicuña after their return. Also, no hay was available at the moment, but we were promised the entire next harvest which was to come by the end of the month. This promise was very valuable to us, because it meant that we only had to get over the next four weeks; after that we would be safe.

Inquiry at Punta Azul was equally unsuccessful, as far as our immediate needs were concerned, because the administrator was not present. We were told, though, that plenty of dry hay was in the barn. We only had to keep trying to get hold of the administrator. This turned out to be quite a problem. Unfortunately, the hacienda has no telephone.

Mr. Timković came to Vicuña to see me. I had two problems for him: (a) A revised estimate of the cost of the Tololo road was needed, based on specifications given to me by

Mr. Baustian at Tucson. I received the new estimate a few days later. The total cost came to 253,000 Escudos, as compared to 323,000 Escudos from the first estimate (Note: 1.05 Escudos = \$1.00 U. S.). (b) Improvements on the road to El Sauce were needed to make our work on Cerro Blanco easier and safer. Sr. Timkovič was taken to El Sauce in the jeep of the Santiago Observatory. (Carlos came to Vicuña in this vehicle) to look over the situation. He informed us two days later that the improvements which were needed could be made within a few days at a cost of about \$200. I asked him to go ahead, and apparently he got the work started right away. At least we soon heard rumors that "the astronomers" had definitely decided on Cerro Blanco and were already constructing the road. This confusion suited us quite well and we left it at that.

October 2 Another trip to Punta Azul was unsuccessful; neither did we buy any animals.

October 3 The administrator of Punta Azul still had not arrived yet, but at least we got a few bales of hay, enough to make our planned trip to Los Placeres possible.

In the afternoon, we bought two mulas and one horse in Vicuña. The horse in particular turned out to be a good buy. I decided to reserve it for myself, and I gave it the name "Scipio." The man from whom we bought the animals agreed to keep them on his pasture until the next morning when Garrote would come to take them to El Tambo. We had just opened a joint bank account in Vicuña, and Carlos paid the man with a check. This was the first check he has written in his life, and he made an error in writing it. Because of this error, we were going to see this check soon again.

The plans for the next day were: Garrote would bring the new animals from Vicuña to El Tambo, while Carlos, Leyton, and myself would go there in the truck. We wanted to leave El Tambo not later than 8:00 a.m.

October 4 Carlos, Leyton, and myself left Vicuña at the scheduled time. To our surprise, we found one of our new mulas near town tied to a pole. No trace of Garrote or the other mula and "Scipio". Neighbors told us that Garrote had passed there much earlier with only two animals. He was unable to find the other mula. The previous owner went after it and found it. He was supposed to take it to El Tambo (Garrote told him to do that) but this

appeared too long a trip for him and he left the animal all by itself just out of town. He was lucky that we had not left yet. Fortunately, we had a saddle in the truck. This made the transfer of the animal to El Tambo a simple matter, Leyton riding it. At El Tambo, we found Garrote, who was happy to know that the missing mula was coming, because two more were missing at El Tambo. Two mulas which we had bought at Los Placeres several months ago had gone over the fence of the portero and disappeared. Most likely they were on their way to Los Placeres, looking for food there. This turned out to be true.

While we were loading the pack animals, an unexpected visitor came from Vicuña by taxi. It was the man from whom we bought the animals the day before. He was angrily waving the check which he was unable to cash because of the aforementioned error Carlos made. A person like him could never afford to use a taxi. He figured, though, that it was our fault that he was in trouble, and that we would have to pay for the taxi. So he came in that way, bringing some friends along to let them enjoy the ride, too. Remembering what had happened this morning, I was prepared to teach him a lesson. I gave him a new check, but I told him that I would pay for the taxi only if he pays me for the time we lost this morning, because he let our mula run away, and then did not bring it to El Tambo. I got even more annoyed when I found out that he was asking for 2.00 Escudos for the taxi, while the driver was charging only 1.50. In view of my anger, and not knowing how much I was making per hour, the men preferred to pay the taxi and vanish quickly. I gave him a name under which he is now known in all of Vicuña, namely "Don Taxi."

It was 12:00 a.m. when we finally got on our way, and it took us six and one-half hours to reach Los Placeres.

October 5 In the morning, the valley in which Los Placeres is located was filled with dense fog. Of course, it was not possible to say how high the fog was. Carlos, left with Leyton and another man to look at the five animals. We were told that these five animals have always been together. The horse carries a bell, and the mulas are used to follow its sound. Such a team would be quite useful for us. We expected Carlos back in the late afternoon.

Don Ragelio, Garrote, and myself went on the trip to Cinchado. From Los Placeres (1250 m) one has to go first over a pass at 1600 m. Shortly before we reached the pass, we found ourselves rather suddenly above the fog and we saw Tololo in front of us, surrounded by an ocean of white clouds. This

sight was certainly worth a color slide and I reached for my camera. This photograph was never taken because the whole phenomenon just vanished in front of our eyes. By the time I had the camera ready. This took only seconds--the fog had disappeared. Many square miles of dense fog had turned into an absolutely clear atmosphere within certainly not more than ten seconds.

Coming down from the pass, we reached a spring called "La Junta" (the junction). La Junta is located at the junction of two valleys. The spring is at an elevation of 1400 m and runs with 20 m³/day. There is a group of houses near the spring, and some irrigation is being done. La Junta can be reached from Los Placeres in one and one-half hours. There is no trail from La Junta to the top of Cinchado. We just went cross-country over very rocky and steep terrain and reached the top in another one and one-half hours. With cargo, it will take at least twice the time.

Cinchado is about one km long, on the average fifty m wide, and quite rocky. The rock is of the same type as that on Tololo. The Ovalle-Hurtado road is not very far, but at an elevation of 500 m, while Cinchado is 2050 m. A road to Cinchado connecting with the Hurtado road would have to be blasted for a good part of its length, since it has to pass through many practically vertical cliffs. A connection to the more distant Vicuña road may well be less expensive.

It should have been mentioned before that La Junta is located in a valley separating Cindiado and Morado. Therefore, the spring, probably the best in the entire area, can serve both sites.

We arrived at Los Placeres at 4:00 p.m. and were waiting for Carlos. It got later and later and he did not arrive. We were worried and I was somewhat annoyed also because I had strictly forbidden any travel at night. Finally, at about 10:30 p.m., we heard a distant bell ringing, approaching slowly. This, of course, was the leading horse of the team Carlos had bought. What a surprise when they arrived with just the three animals on which they started out. It turned out that two of the five animals were not suitable for us, and the owner wanted to sell the lot only. So Carlos did not buy, but Leyton stole the bell!

October 6 Return to El Tambo practically without cargo in three hours fifty minutes. Another call at Punta Azul was without success. The administrator was out as usual.

October 7 Needless to repeat, that we again had no luck at Punta Azul. However, we found two good porteros near Vicuña, where we can leave the animals when they are not out.

It appeared as if I could handle the work for the next week without Carlos, while he would be needed almost continuously as soon as the double-observing begins. So I decided to send him to Santiago, and he left right away.

My plans were:

Leyton and Garrote had to make a trip to Los Placeres the next day with all animals carrying a cargo of hay. They should return the following day, bringing with them the two new men from Los Placeres, and the carpenter, and, at the same time, also one more mula. Then the entire force would go up to Cerro Blanco. Two more men from El Sauce were to be added to help with the construction of the shelter. Five people including myself would stay on the mountain for six days, the remaining three would keep the mountain party supplied with food, water, etc.

In the evening, we finally got hold of the administrator of Punta Azul, and he agreed to sell us five tons of hay.

October 8 In the morning, the deal with Punta Azul was concluded. Leyton and Garrote with eleven animals took one ton of the hay to Los Placeres the same day while I returned to Vicuña.

October 9 In the afternoon, I went to El Tambo to meet Leyton and Garrote; however, they did not arrive. Late at night, I gave up waiting, wondering what may have happened.

October 10 The two arrived early in the morning. They gave such a confusing explanation for their delay that I still don't know where they spent the night. Nevertheless, I was glad that they were back unharmed. With them were the three people I expected and also the new mala from Don Rangelio.

Two more mulas were sent to me from Hurtado and, upon Leyton's recommendation, I bought them on the spot. With these, we had two teams of eight animals each and one spare.

A lot of shopping had to be done. It never occurred to me before that eight men eat such a lot during one week! And, as we found out soon, what we bought was not even enough. Also, all the building material for the shelter had to be purchased.

When we had everything together, two things became apparent: We could not carry everything in one trip, and also we could not get to the top of the mountain in one day. Hence, we had to plan as follows: Everybody and every animal would make the trip to Cerro Blanco during the next two days. As much cargo as possible had to be carried. Overnight stop at El Churcal at the foot of Cerro Blanco. After that, three men would return with all animals to Vicuña and pick up the rest of the cargo. The cargo had to be divided so that the most important things went up first, such as my telescope, the big tent, the building material needed in the beginning, and half of the food.

In the afternoon, I met Mr. Timkoviç. He informed me that the work on the El Sauce road was almost complete. We made a short inspection trip, and, with the exception of a few minor details which will be taken care of, everything was to my satisfaction.

October 11

Part of the cargo left Vicuña by mula with Garrote, Anano Ramos, Manuel Ramos (these are the two new members of our team), and the carpenter. Leyton and myself went to El Sauce in the truck. There we joined the rest of the party and proceeded to El Churcal with six men and sixteen animals. Two more men and three animals from El Sauce were to follow us early the next morning. We got to El Churcal quite early and had plenty of time to establish ourselves for the night.

The spring at El Sauce was running with 200 m³/day.

In our cargo we also had eight bales of hay. This turned out to be unnecessary. We were offered the use of a good portero at a rate of thirty-five cents per day per animal. When living on dry food, the animals cost nearly 1.00 Escudos per day each, so this was a good deal for us. Nevertheless, we did some bargaining and got the rate down to thirty cents.

October 12

At 8:00 a.m. the two men from El Sauce arrived and at 9:00 a.m. the whole caravan got under way. We reached the summit in three and one-half hours. Leyton, Garrote, and M. Ramos returned with the animals to El Churcal; the rest stayed on the mountain. We had only fifty liters of water with us. This is very little for five men, if pots and pans and hands are to be kept

clean. I asked Leyton to bring fifty liters up every day. Garrote and M. Ramos had to return to Vicuña to pick up the rest of the cargo. It was also obvious that we needed a lot more food.

Conditions were very pleasant on the mountain. The temperature at 2:00 p.m. was 20°C., and it was calm. The visibility was unlimited.

We erected the base of the telescope, assembled the instrument itself, and erected the tent. This took care of the rest of the afternoon. The first half of the night was clear, and the seeing conditions like those we are used to on Tololo. Also there was little or no wind. At 2:00 a.m. some cirrostratus developed, covering up to three/eighths of the sky. It disappeared again at 5:00 a.m. The minimum temperature, essentially the temperature of the entire night, was +8°C.

During the first hours of the night there was thin haze over the Elqui Valley, with a top at 1800 m. Tololo was clearly above it. It is more difficult to judge how high the haze is around Guayayuca because it is seen projected against a mountain of the same color and a similar profile (Peralillo).

On this trip (as well as on the trip to Cinchado), I used a different altimeter than before. This one belongs to the Santiago Observatory. It is supposed to be accurate, but it gives values which differ by ten percent from the other one. The other one checked out well a number of times between McDonald and sea level. Anyway, with the Santiago altimeter Cerro Blanco is 2770 m, and El Churcal, 1560 m. Tololo would come out as 2160 m. I am expecting a new and better altimeter which should settle the question of elevation.

October 13

During the day, particularly in the afternoon, haze developed to nearly the same extent as we saw it in February. The haze over the ocean reached more than 3000 m. Its density decreases towards the mountains. Near the coast the top seems to be considerably lower, climbing up again towards the mountains. With sunset most of the haze over the land disappeared, the "soup" over the ocean remaining unchanged.

With the binoculars, we could observe the activities down at El Churcal. We noted that twelve animals arrived there in the afternoon from Vicuña. They, of course, were ours, bringing building material and food. We expected them on the mountain the next day.

With the lunch, we consumed the rest of our water. It is an uncomfortable situation when one is not absolutely sure that more will come soon. However, Leyton came with fifty liters in the late afternoon. Knowing now more accurately what the daily consumption was we asked him to keep us supplied at a slightly higher rate. The water supply is done in the following way: We have two twenty-five liter milk cans. These when full make a reasonable load for one mulla. On the top we have a fifty liter storage tank (on Tololo also).

The construction of the shelter made good progress, but it also became apparent that seven to ten more days would be needed for completion. The three men working on it volunteered to stay on the mountain until the shelter was finished.

The night was clear throughout with no haze on the mountain (apparently the same on Tololo), but much of it over the valley. The seeing was good all night.

October 14 Almost the entire trail from El Churcal to the summit can be seen from our campsite. We entertained ourselves for hours watching the cargo coming up. It arrived at 3:00 p.m. with building material, food and water.

The night was again clear and free of haze (Tololo also) but "very windy" (four to eight mph).

October 15 In the morning, an unexpected visitor came; a man from a place near Cerro Blanco. He talked very little, so at first we did not know what he wanted. He seemed to like our food, our campfire, and the radio, but not so much the work we were doing. That is to say that he kept himself at a safe distance while we were working, and came very close during meal times, and he could eat a lot. Most of his scarce conversation consisted of the repetition of one and the same sentence, referring to some goat. It became obvious that he was nuts and extremely lazy, but a good eater. He was supposed to bring some goats back down which were up

on the mountain. The animals were not very far, about half a kilometer, but that was too far for him. He also did not dare to show up at home without the animals. So he decided to stay with us.

In the evening when everybody went to sleep, he made himself comfortable next to the fire, apparently to spend the night there. When I went out for the midnight observation, he was gone. I felt quite uneasy because one never knows what a person like that might do. In the morning he was there again, and it turned out that he had crawled into the bed of one of the other men, of course without being invited. After breakfast he left without saying a word.

The night was clear, and mostly calm. The seeing was perfect. There was no haze anywhere except for the soup over the ocean. Ground fog came up the valley over night, reaching Vicuña at 2:00 a.m.

October 16

Garrote and M. Ramos came to bring water. In the afternoon two men of the construction team went down on foot to a small spring at 2150 m for a Sunday afternoon clean-up and shave. They returned four hours later. One man had to go down to El Churcal on foot to get some straw which was needed for the plastering. He was expected to return the next morning with Garrote.

The night was clear and absolutely free of haze. It was rather windy (up to seven mph) and the seeing not as good as during the previous nights. In this one might want to see a correlation between wind and seeing. It is, however, not as simple as that because the last observation (at 4:20 a.m.) showed the best seeing and the highest wind velocity of the night.

October 17

Since Carlos was supposed to come to Cerro Blanco two days later and nine people were going to stay on the mountain anyway, there was no need to disassemble the telescope or to take the tent down. Hence only little packing was to be done before we were ready to go down.

An involved plan had to be made to take care of all necessities for the next few days. The complication arose from the following reasons: (1) I insist always that nobody ever travels alone or stays alone overnight at one of the stations, otherwise if somebody breaks a leg, it may easily take several days before we find out and can summon help.

(2) Food was running low on the mountain. It was barely enough for four people for two days. (3) Two men wanted to stay on the mountain. (4) Two more men with two mulas were needed on the top to bring water several times a day from the upper spring. The water was needed for the plastering. (5) I had to get to Vicuña as fast as possible in order to have enough time to prepare for the next trip. (6) My baggage had to be brought from Cerro Blanco to Vicuña the same day. Things worked out the following way: A. Ramos and three left the mountain on foot at 8:00 a.m., reaching El Churcal in 1 hour and 45 minutes. At the same time, Garrote, A. Ramos, and O. Araos (from El Churcal) went up with four cargo animals, carrying water and feed for the two mulas which had to stay on the top. Garrote came down again with two cargo animals, being accompanied half of the way (to the upper spring) by two other men. From there to El Churcal he went alone. There A. Ramos was waiting for him, while Leyton and I had already left for Vicuña. We arrived at El Sauce after another one hour and fifty minutes. On the way Leyton rescued a goat which had climbed a rock several days ago and which was unable to find the way back. From El Churcal to El Sauce we came by a different trail which turned out to be better and shorter than the other. At El Sauce we tied our animals to a tree where Garrote would find them later on and take them to Vicuña while we went in the truck. We reached Vicuña at 2:00 p.m. while Garrote arrived at 10:00 p.m.

Carlos was expected in the evening but he did not arrive. He came the next day. The plans for the next week were to start the double-observing program. For this purpose the animals had to be divided into two groups of eight each, with Leyton in charge of one group, and Garrote in charge of the other. The division was not quite as simple as that though, because we had one mula more, and because I want to use Scipio always, no matter where we go. Most likely Carlos will pick one animal for himself also. Apart from this everything turned out to be very simple because Leyton prefers Tololo, and Garrote prefers Cerro Blanco. I was afraid that both would prefer Tololo, and that would mean to shift them around every once in a while in order to treat them equally. Fortunately this is not necessary. Actually the two men began a sort of a friendly competition each one praising "his mountain". Both put an enormous effort into improving the living conditions on the sites, each one trying to beat the other. If this keeps up we will soon have castles with all conveniences. The two new men also found their partners in a natural way.

This is: M. Ramos is working with Garrote, and A. Ramos with Leyton. In the future the two teams will work absolutely independently except that I am setting the schedule (or Carlos if I am not there). For the first double-session both teams had to leave Vicuña on October 19. The Cerro Blanco party with or without Carlos had to arrive on the mountain the same day because food was urgently needed there. It was not necessary to arrive on Tololo on the same day also, but if the weather was good I wanted to try it. Observations were to be made every clear night at 9:00 p.m., 11:00 p.m., 1:00 a.m., and 4:00 a.m. Furthermore, on this first trip we wanted to try out some primitive methods of communication. Every night at 8:00 p.m. a big campfire was to be made to let the other party know that the site is occupied. And, we wanted to find out whether signals in morse code with flash lights would come out clear enough over that distance.

October 18

A seven-day trip with several people takes a lot of preparation. It is not only the food that has to be bought. On each trip some items get lost or break and have to be replaced. Another big item is shoes for the mulas. They need new shoes about every two weeks. Leyton takes care of this, either at Vicuña or at Los Placeres, wherever he finds an opportunity to do it. Shopping is not as easy as in the U.S. There is, of course, no super market. Bread has to be bought in one store, meat in another. We may find potatoes in one vegetable store, but have to go to the next for tomatoes, and to a third for oranges. Eggs are often difficult to find. Furthermore, meat and bread are not available every day. We found it more convenient to take flour to Los Placeres and have bread baked there. So it may easily take more than a day to do all the shopping that is needed. Since Carlos was not there, I had to take care of both teams. Fortunately he came at noon and could take over his share.

October 19

There was still a lot to be done for both teams. Carlos left with his team directly from the hosteria at 11:00 a.m. I do not know yet whether he arrived on Cerro Blanco this same day. The Tololo party was ready at noon and Leyton, Leyton, Jr., and myself went to El Tambo in the truck. There A. Ramos was expecting us with the mulas and Scipio. At 1:00 p.m. we left El Tambo and reached Los Placeres

after five and one-half hours. It was too late then to go up to Tololo. Since it was completely cloudy, this was not necessary anyway.

October 20 The weather continued to be poor, and it looked as if it was going to rain. So we waited. Don Ragelio went up to Tololo in the morning to change the paper of the thermo-hygrograph. He returned in the early afternoon and told us that it was snowing in the Cordillera, but that it was quite peaceful on Tololo. This was good enough for us, and we started with the two Leytons, A. Ramos, and myself. We arrived at the top at 5:30 p.m. It was still completely cloudy. The temperature was +50C with a wind of five mph from the north. Leyton Sr. and A. Ramos left soon, while Leyton Jr. and myself established ourselves for the night. I had the Leyton boy with me because he seemed to be quite intelligent, and I wanted to find out whether we could train him as an auxiliary observer. This would give Carlos or myself an occasional opportunity to leave without interrupting the double-observing program.

We found plenty of food in the shelter, left by Carlos after his last trip. However, we also discovered that mice had been taking a bite of almost everything, particularly paper. This meant that most of what we found had to be discarded. On the next trip we have to bring up a strong wooden box to keep provisions and mice apart.

The night was poor throughout, with occasional light snowfall. The temperature remained at +50C all night. The wind was continuously from the north up to fifteen mph.

At 8:00 p.m. we lit a big campfire, and Cerro Blanco responded promptly. The flash light signals turned out not to be very clear, even with binoculars. Maybe we shall have to bring the 4-inch telescopes to observe the signals.

October 21 The whole day was cloudy and cold for this time of the year. At times it was snowing in the Cordillera, but there was no precipitation on Tololo.

The campfire communication worked well again, and this time the flashlight signals were also clear enough.

The entire night was partly cloudy, but mostly good enough for spectroscopic work.

October 22

The weather was just as bad as the days before. Leyton and A. Ramos came up to bring water and fire wood. We have nearly exhausted the supply near the camping site. Since we have men and animals at our disposal with little else to do, I prefer to have some fire wood brought up from below rather than to leave the summit completely bare.

In anticipation of an anemometer which should come soon, we made a trail to the very top of Tololo where the instrument has to be installed. Also we erected a base for the theodolite which will serve as reference point for the triangulation of the mountain. More such bases on various points of Tololo still have to be made. Leyton and A. Ramos left at 5:00 p.m.

The weather was even worse than before. The humidity climbed to 96 percent and the temperature dropped to +20C. There was a layer of broken cirrus above, some haze at our level, and ground fog in the valleys. From midnight on, we were in the fog.

October 23

The fog stayed all day. At 6:00 a.m. it began to rain, a very fine and penetrating drizzle. It was difficult to get a fire started, but once this was accomplished it was not too uncomfortable in the shelter, certainly far better than in a tent.

At noon, A. Ramos came to bring water. (I didn't like the idea that he came alone.) He told us that it was raining heavily at Los Placeres. Don Ragelio was happy we only in an indirect sense. It is difficult to say how much rain fell on the mountain. It penetrated the sand by about one cm. At 1:00 p.m., the rain ceased, and everything began to dry quickly in spite of the dense fog and 96 percent humidity. At 6:00 p.m., the fog broke up, and half an hour later, it was perfectly clear, with a few patches of fog in the valley. However, a cold twenty mph wind from the northeast began to blow. Soon, new cirrus came from the north (quite unusual; it usually comes from the southwest), and the entire night remained partly cloudy to cloudy, and wind and cold. However, the humidity dropped to 48 percent with a temperature of -1°C.

At 8:00 p.m., we gave our usual fire signal, but no reply came from Cerro Blanco. Probably they had left the mountain during the day because of the adverse weather conditions.

October 24

With sunrise, it was still partly cloudy (three-eighths cirrostratus). The day was mostly clear but cirrus kept coming and going. The temperature continued to be far too low for this season ($\sim +4^{\circ}\text{C}$), and the humidity stayed high (>50 percent).

Don Rangelio came in the morning and I showed him where the other base points for the triangulation were to be erected. He agreed to watch our equipment when neither Carlos nor I are on the site. This enables us to leave the telescope mounted all the time. Thus we may at times gain an extra night of observing.

A. Ramos and another man from Los Placeres came and helped us with further site improvements.

In the evening, the humidity rose again and cloud formation followed. The whole night was partly cloudy, three-eighths on the average.

October 25

At 6:30 a.m., Don Rangelio arrived to take me down over a new path he has prepared. Leyton, Jr., stayed on the mountain to wait for A. Ramos and the mulas to come down with them. We reached Los Placeres in one hour and ten minutes on foot. At present, the new trail is not suitable for the mulas to go up with cargo. Some more work will be done on it to improve it.

We had been planning to go to Vicuña the same day. However, the Ramos family had prepared a little fiesta and invited us to participate. To refuse was impossible. Chilean fiestas are always an all-day affair. So I agreed to delay our departure until 5:00 a.m. the next day. Thus we would still have the whole day available in Vicuña.

The day was perfectly clear and warm, and so was the following night. We have had this kind of luck many times before.

October 26

Leyton and I left at 5:50 a.m. and reached El Tambo in three hours and fifty minutes. Leyton, Jr., and A. Ramos followed with the cargo two hours later.

I continued this report on Tololo and completed it in Vicuña. Today I am going to Tololo again, and Carlos to Cerro Blanco. Our first double session was a success

in the sense that the organization worked, but a failure because of the weather. Nevertheless we have a comparison of bad weather between the two stations, and that may be useful too.

Probably Dr. Rutllant will come to Vicuña for a few days early in November. At that time we will make a schedule for your visit.

I have to finish because Scipio is waiting.

CHILE SITE SURVEY REPORT NO. 10
by Jurgen Stock

was well below normal (+4°C instead of +12°C), and the humidity was high (sixty percent). It was absolutely calm. A few small patches of clouds formed later for a while. Then, clouds were absolutely stationary, indicating that it was calm higher up, also. The night was perfectly clear later on, but the seeing poor, with 2" images.

October 27 Trip to Rivadavia to make sure that the hay we have been promised was coming. Everything seemed O.K.

Plans for the next few days: because of the complete failure of our last session, we decided to repeat it, that is, Carlos was going to Cerro Blanco again, and myself to Tololo. Because of Dr. Rutllant's forthcoming visit to Vicuña, we had to cut the session short by one day.

October 28 After the usual last minute preparations, which took a good part of the morning, we finally got to El Tambo, and started from there at about 1:00 p.m. Nothing seemed to go right this day. Usually the animals find the trail themselves and go all the way to Los Placeres without further encouragement. This time, after we put them on the beginning of the trail, they spread out in all directions. Some followed another team of mulas instead of following Scipio, others went back to El Tambo. We spent more than half an hour to round up our team again. Then one mula decided to go to sleep in the middle of the trail with cargo and all. We put a quick end to the sleep, but to get the animal back on its feet was more of a problem. I thought the mula was sick, but Leyton said that it was all just pretense, and, he was right. He finally got the animal up again with rough methods which I don't want to describe, and everything was O.K. thereafter. Actually, the mulas were somewhat nervous after this and were running faster than usual. So we made Los Placeres again in the usual five and one-half hours.

I have the reputation that I always bring clouds with me when I come to Tololo. So far, this has happened practically every time. The nights since my last visit to Tololo have been perfect. However, the same mechanism of unknown and mysterious nature began to work again and it clouded up overnight.

October 29 The day was completely cloudy, though not cold. We went up to Tololo in the morning. Don Ragelio has spent the last two days up there, and he did a lot of work. The five base points for the triangulation were ready, and also a hole (in plain rock) for the mounting of the second telescope. A. Ramos stayed with me while Leyton and Don Ragelio returned to Los Placeres.

The cirrus began to disappear during the afternoon and, with sunset, it was practically clear, although the temperature

At 8:00 p.m., we gave our fire signal with a fifteen m vertical flame. Reply came not only from Cerro Blanco, but also from Los Placeres.

October 30 During the day, the temperature rose to +17°C, almost the normal high, and the humidity dropped to twenty percent. At 3:00 p.m., a strong wind from the west (up to twenty-five mph) began and lasted for two hours. It was clear until the afternoon, when high cirrus developed and covered two-eighths of the sky.

In the late afternoon, the Ramos family came to pay us a visit. They brought a cake with them, and we furnished what else was needed for a party. Everybody seemed to have a good time. A view of the moon and Saturn concluded the pleasant day.

The cirrus disappeared during the first hours of the night, but a strong wind (ten mph) from the northeast kept blowing. Seeing was very poor with 4" images. It improved during the night, but did not reach normal standards. Haze was present in the valley, but not noticeable on Tololo; neither was it noticeable on Cerro Blanco. Guamayuca, however, was with haze. It seems that the haze is denser and higher over the Elqui Valley.

October 31 This day was nearly a repetition of the previous one as far as meteorological conditions are concerned, that is, warm in the morning, some wind in the afternoon, and cirrus later on. The clouds disappeared soon, and it was already clear for the 9:00 p.m. observation. There was thick haze in the valley with a well-defined top at 2100 m. Tololo was above it by a good margin and, of course, Cerro Blanco even more. However, Guamayuca was inside of it. The entire night was calm. During the night, the humidity dropped from seventy-two percent to twenty percent, while the temperature rose from +10°C to +11°C. The haze in the valley disappeared overnight. Seeing was good, though not the best we have seen here.

During the day, two boys with two dogs came up. They were looking for goats. I gave one of the dogs some bread, and, as a consequence of this, the dog recognized me as his master from then on, that is, the dog was following me all the time, day or

night. Thus, we had one eater more, but we did not mind that-- we rather appreciated our new companion.

November 1 For several hours, we carried the theodolite all over the mountain, measuring a network of points. This network will serve as the basis for a 1:1000 map of Tololo.

The day was several degrees warmer than the preceding ones, and no cirrus developed. In the evening, there was the haze over the valley again, of about the same height and density as the night before. Seeing was good in the beginning; it deteriorated somewhat later when the temperature began to drop. The humidity rose at the same time. Nevertheless, the haze disappeared, but ground fog came instead, reaching El Tambo at 5:00 a.m. and Vicuña somewhat later. This phenomenon occurs frequently during the winter, but is supposed to be absent from October until March.

In the evening of the previous night, Carlos had a surprise for us: he came up with two large campfires. Tololo just had to beat Cerro Blanco. So we prepared four fires. At 8:00 p.m., we started one, and Carlos replied with two. Then we started the other three. After a while, Carlos came up with one more, but anyway, we won.

November 2 After the last observation, we began to pack up, leaving the telescope mounted. At 5:40 a.m., we left on foot, reaching Los Placeres in one hour and ten minutes. On the way, we met Don Ragelio, who was going to change the paper of the thermograph (one day earlier than scheduled because he had to go to Vicuña the next day). After breakfast at Los Placeres, J. Leyton and I left and made El Tambo in three hours and thirty minutes, record time so far. The cargo was to follow in the afternoon.

November 3 Trip to El Tambo to pick up the cargo which arrived from Los Placeres the day before. Mr. Timkoviç came and delivered the estimate for the Cerro Blanco road. It turned out to be twenty-four km long, at a cost of \$150,000. Cerro Blanco is less steep than Tololo and has less rock. Therefore, the cost is considerably lower.

Carlos returned from Cerro Blanco in the early afternoon and left for Santiago shortly thereafter for one week.

November 4 We bought a branding iron in the form of a star. In the morning, we went to Miraflores to mark the animals of the Cerro

Blanco team, and in the afternoon, to El Tambo to mark the Tololo team.

November 5 Trip to La Serena to have the truck serviced. New spark plugs and new contacts are needed, but neither of these are available in La Serena. It is even doubtful that they can be found in Santiago.

November 6 Car wash in the Elqui River. We have not done this for many weeks. The doors and windows of the truck don't close tight and, therefore, a lot of dust enters. Thus actually a frequent cleaning is necessary.

November 7 Trip to La Serena with J. Leyton to pick up Dr. Rutllant at the airport. He arrived at noon. We went to the Hostería de Turismo in La Serena where we were invited for lunch. On the way to Vicuña, when we were just leaving La Serena, I noted that the oil pressure was going down. When we passed the airport again, the pressure reached zero. A check with the oil stick showed that there was no oil in the motor, but plenty of it was anywhere else under the car. Fortunately, we had an extra gallon in the car. This was just enough to get us back to a service station in La Serena. A good size leak was found. New parts were needed for the repair. These had to be made because there are no spare parts for this type of vehicle in Chile. Consequently, we had to leave the truck in La Serena for a number of days. We hired a taxi (\$15) and got to Vicuña without much delay.

Dr. Rutllant felt that he could make the trip to Tololo in one day without staying overnight at Los Placeres. We planned to do this the next day, and to spend two nights on the mountain. For the return trip, we planned again one day only.

November 8 We left Vicuña at 6:30 a.m. by taxi, and El Tambo at 8:00 a.m. on horseback. The trip to Los Placeres took five hours. From there we started again at 4:00 p.m. and reached "Tololo Castle" in less than three hours.

The day had been perfectly clear (this weather persisted for more than a week already) and a typical Tololo night was to follow, that is: absolutely calm, clear, and with a pleasant temperature. The seeing, though, was a little under Tololo standard.

November 9 A warm day with very little wind. The night was like the previous one except that the seeing was now very good also.

November 10 At about 6:00 a.m., Leyton and A. Ramos came with the animals. Soon, Dr. Rutllant and A. Ramos left on horseback, while Leyton and I cleaned up the place and then went down on foot. We reached Los Placeres in fifty-five minutes, the horseback party in a little under two hours. After breakfast, we went to El Tambo. From there, we were taken to Vicuña in the truck of the Fundo San Carlos.

November 11 Lunch at the Fundo San Carlos. After that, Dr. Rutllant, J. Leyton, and I went to La Serena, by taxi again. Dr. Rutllant returned to Santiago by air. We picked up the truck, which was in working order again though not functioning too well.

November 12 All day desk work to get the reductions of the seeing observations up to date, and to calculate the coordinates for the network of points on Tololo.

November 13 More desk work, and preparations for the next few days. Carlos arrived in the evening from Santiago.

November 14 Carlos, D. Ramos, and myself went to Guamayuca to change the film in the sky patrol camera. On this occasion, I borrowed a horse from a lieutenant of the carabinieri. It is a very well-trained horse, and I would like to buy it for myself, if it can be used for trips to the mountains also. The horse has never been in the Cordillera before. We started on horseback directly from Vicuña, reached La Totorita in one hour and fifteen minutes, and the top of the mountain in another two hours and forty-five minutes. This is the fastest trip we have ever made. I was very satisfied with the horse, although it gave all signs that it was not used to climbing mountains. When we changed the film, we noticed that the old roll was completely used up, for how long, we do not know. So we may have lost a couple of weeks or more. This is not important because I was in the area all the time and have my own weather record. The return to Vicuña took three hours.

November 15 Another double session was to be started this day. Due to a lot of work we have been doing during the past few days, preparations were not yet finished. I did not get started for Cerro Blanco until 11:00 a.m., and Carlos left even later for Tololo. However, he had to reach Los Placeres only (with cargo, one cannot make the top in one day), while I wanted to reach the top the same day. Scipio was sick, the horse of the lieutenant too tired, so I used a mule. Leyton, Jr. accompanied me while Garrote and D. Ramos took care of the cargo. We (Leyton, Jr. and myself) drove to El Dain. There we waited for the cargo animals, and then went ahead again. We

reached El Churcal in two hours, and, after a one hour stop there, the top of Cerro Blanco in another two hours and forty-five minutes. It was 7:00 p.m. when we arrived. On the way, we passed the upper spring which we had cleaned recently in order to take drinking water from there. However, the water was so dirty that we drained all of it. Somehow Garrote had guessed that and picked up water at El Churcal right away. The cargo arrived at 8:00 p.m.

We had barely time to get the 8:00 p.m. fire going. Carlos was not on Tololo yet, but the people of Vicuña like to see our fire also, so we had to make it.

After his last visit, Carlos had dismantled the telescope, actually against my advice. He even packed it the way we do for mule transportation. It is not difficult to assemble the equipment at night; however, to adjust it is a problem. One has to find a star without a finder on a telescope with a small field and high magnification, and this two times, one time for each side. This is particularly difficult because the telescope extends in a direction vertical to the line of sight. Thus, one has nothing to point with. After one hour, I found one image of Sirius, but at midnight I still did not have the other. I had used up my entire vocabulary of strong words, including some new ones I learned from Leyton, but it did not help, and I gave up. Since it was practically calm, I could do image motion measurements with one side and thus save the night. The seeing was good. There was absolutely no haze (the flashlight test is very sensitive in a dark night). Tololo seemed to be free also, but Guamayuca not.

It was the first time I saw the completed shelter on Cerro Blanco. The first one was started while I was there the last time. The structure collapsed during the construction, and D. Ramos decided to make something entirely different. No rocks were used. The walls consist entirely of wooden poles, branches, and mud plastering. The roof is made of tarred, corrugated cardboard. The structure is considerably larger than that on Tololo. It has three by four m inside dimensions. Furthermore, it has a stove inside. We all like it and maybe we shall have the shelter on Tololo replaced by a similar one.

Except for some occasional cumulus formation over the High Cordillera, the entire day was cloudless. Haze formed during the afternoon, climbing to well over 3000 m in places, but apparently not near Cerro Blanco. Maximum temperature was +13°C, maximum wind in the afternoon, ten mph west.

November 16

Garrote came in the afternoon to bring fresh bread, and to take the water cans down in order to bring water the next day.

The night was clear, calm, and free of haze throughout. Guamayuca was again with haze most of the time, Tololo apparently not. Seeing was very good until the very end of the night, when the temperature began to rise sharply, and the seeing deteriorated.

The time permits to bring up another subject: During the past few weeks, a lot of improvements were made on the roads and trails we are using. Because of their poor condition, we have had a number of small accidents. So far, no serious injury or damage of equipment has resulted, but this was only our good luck. Since we have now enough people available, I decided to have the trails improved to a safe condition. The work was (and still is) carried out as follows:

1. The road from San Isidro to El Daín and El Sauce. We drive the truck on this road when we work on Cerro Blanco. Garrote, H. Moreno, and myself did some work on this road in July. In October, Mr. Timković removed some of the very sharp turns on this road. Now, four people from El Sauce are removing the scattered rocks from the road and are filling in holes. The work is almost finished and the surface is in very good condition. We have invested about \$350 on this nine km road.

2. The trail, El Sauce-El Churcal. This trail is dangerous in many places. We no longer are using it and, therefore, no work is being done on it.

3. The trail, El Daín-El Churcal. This trail is generally good, but has a few bad spots. O. Araos from El Churcal is working on it.

4. The trail, El Churcal-Cerro Blanco. The first two km of this nine km trail are old and were in very poor condition. They have recently been improved by O. Araos and S. Araos from El Churcal. The remaining seven km of the trail are new. They were made for us in May by the people from El Sauce. Very little remains to be done here. Garrote will take care of that.

5. The trail, El Tambo-Los Placeres. This twenty-five km trail is generally good, but has some bad and one very dangerous part. Here H. Moreno and his horse went downhill by some fifty m one time. Don Ragelio and M. Ramos are working on a bypass now. For the first five km, the trail follows a dry

river bed and is full of stones. A. Ramos is cleaning a trail there.

6. The trail, Los Placeres-Tololo. Most of this trail is new. It was made by Leyton, Garrote, and Don Ragelio and is in good condition.

7. The footpath, Tololo-Los Placeres. This path is meant for coming down on foot only. One can save one hour this way. The path is new and was made by Don Ragelio. Some work still remains to be done.

8. The road, San Isidro-La Totorita. This road is kept in good condition by Fidel Cortez, the owner of La Totorita.

9. The trail, La Totorita-Guamayuca. Most of this trail was made for us by Fidel Cortez and later improved by Leyton and Garrote. No further work is needed.

November 17

Differences between successive days as far as meteorological conditions are concerned are very slight. This day, the maximum temperature was 20°C higher than the day before. Everything else seemed to be the same, that is, wind, haze, etc.

Garrote and D. Ramos came in the morning from El Churcal with water. They painted the roof of the shelter with a mixture of sand, cement, and water. The roof, consisting of black tarred cardboard, got quite hot in daytime and thus it was uncomfortable inside. The "paint" should reduce the effect, and, at the same time, make the shelter more fireproof. After that, we played dominoes with self-invented rules for a while, and then they helped us prepare the campfire for the signal. They made a dam of firewood, fifteen m long, one m wide, and 1.5 m high. The fire was to be started from both ends at the same time.

At 8:00 p.m., we started a little fire, and reply came from Tololo and from El Churcal. At 8:30 p.m., we started the big fire. It must have been quite a sight from the distance when the entire dam was in flames. We could distinguish features one km away, illuminated by the fire.

The night was calm and seeing effects were almost undetectable. A little haze was present, but only a few meters thick. One could see the flashlight beam break off abruptly about five m above the ground. It may have been smoke from the fire. There was a very gentle air stream from the south, and the site of the fire was in that direction.

Another interesting observation is this: from a number of observations on Tololo and on Blanco, it seems as if the very best seeing occurs with this very gentle stream from the south. So far, I have no explanation for this, and, of course, the relation is not yet safely established.

By C. D. Shane and N. U. Mayall

1960 CHILE TRIP

1960 December 1-2. We left Miami for Santiago at 9:30 P.M. via L.A.N. Chile. Although this is rated as a tourist flight, the service is first class and is superior to that on many U.S.A. first class flights. There are stops at Panama and Lima. After leaving Lima the flight is over water until the coast of Chile is reached at La Serena. La Serena and Coquimbo are located on a bay resembling Monterey Bay but smaller, with Coquimbo occupying the position corresponding to Monterey and La Serena that of Watsonville. From the plane we could identify Guaymas and Cerro Negro but not Tololo or any of the other peaks we were interested in.

The flight to Santiago is over mountainous country, arid in the north but less so as Santiago is approached. The view of the Cordillera is spectacular with the group of Mercedario and the peak of Aconcagua the most outstanding mountains. Farther north the mountains are about as high, several over 20,000 ft., but not so rugged or so snow covered.

We arrived in Santiago about 5 PM and were met by Dr. Rutllant and Carlos Torres, who helped us through customs and immigration. We were taken in the Chile Observatory's new Chevrolet pick-up to the Carrera Hotel in the center of the city. This hotel is the best in Santiago and is run in first class American style.

After getting settled and purchasing some Chilean money (\$1.00 = 1.05 Eo) we set out under the guidance of Rutllant and Carlos to purchase some necessities. I bought a pair of hiking shoes, 16.50 Eo, and a pair of jeans, 6.60 Eo, while Nick bought shoes and socks. I also had my sunburn medicine, 95% alcohol and 5% tannic acid, made up at a pharmacy.

We returned to the hotel and had an excellent dinner at the roof restaurant. In Chile the normal dinner hour is about 9 PM or later. The evening was clear and warm with a fine view of the city and Cerro San Cristóbal in the near distance.

November 18

More cumulus developed than the days before, also more haze. One streak of cirrus, practically stationary, was visible all day long far to the south. A few small "tornadoes" passed over the mountain. They have a diameter of a few meters only, roar like a jet, and lift a lot of sand and dust. One passed over the shelter and the outdoor kitchen, depleting us of all our paper, but with no further harm.

The night began with a seven mph wind from the north and poor seeing (1'5). The wind increased during the night, and the seeing got worse (up to 3"). During the second half, the wind speed was fifteen to twenty mph and no seeing measurements were possible. One could only see that the images were poor. The relative motion of the two images could not be measured because of the vibration of the instrument.

November 19

At 6:00 a.m., J. Leyton, Jr., and I left the mountain on foot, going practically straight down without a path. We reached El Churcal in one hour and five minutes. On the way, we met Garrote and D. Ramos who were going up to get the cargo. At El Churcal, we found our animals saddled. One hour and forty-five minutes later we were at El Dain. There we left the animals and continued to Vicuña in the truck. We arrived at 10:15 a.m.

NOTE

In report No. 10, the mountain referred to as Cingdiado is Cinghado.

Report No. 2a should be considered as report No. 1 and report No. 2b should be considered as report No. 2.

had spent a year at Harvard and several years completing his education in France. He had never farmed before acquiring the Fundo, but is attempting to apply improved methods, and in particular to improve the condition of the local inhabitants. He is extremely anxious that we should locate near Vicuña because of the good he is sure it will do the community. He is much interested in aviation and is taking flying lessons at La Serena.

We continued on to Vicuña and registered at the hotel. This small hotel has eight or nine bedrooms with a large lounge, bar, dining room and other auxiliaries, as well as a pent house over the central portion for the manager. It is located in the midst of an attractive garden, with apricot and avocado trees among others. The construction seems quite good and it could be bought, I am told, for about \$40,000 from the hotel chain that owns it. If, as is almost certainly not the case, we should want a headquarters in Vicuña, it would be ideal. The manager, Sr. Salvo, is stingy in the extreme so that the hotel does not attract much business. Stock, who keeps a room there permanently, says that he is the only guest much of the time. He has a hard time getting hot water. The proprietor cuts a small paper napkin into four parts for economy. He pays Henrique, the waiter, 2.50 E^o per month and expects him to live on tips. The cook and maid are paid, I understand, 5.00 E^o per month each.

When we registered, the hotel was being operated for a few days by the proprietor's brother-in-law, a much more acceptable manager. After lunch we shopped for hats and finally purchased strange looking but adequate caps.

The town of Vicuña is neatly laid out rectangularly like a typical small Latin American town with the houses against the sidewalks and central gardens and patios. There are some large places set in the centers of adobe walled gardens. There is a large and well kept central square or plaza on which faces a large church, a shabby city hall and the new handsome bank building. The stores are ill-stocked and scattered. Shopping is difficult. Refrigeration is practically unknown. The water supply, taken from the river, is impure. The Vicuña electrical service is intermittent, and it called V. C. because it is neither direct or alternating current.

Stock told us of the financial problems and the inadequate flow of cash, so I wrote a letter to Miller describing the situation and making recommendations.

December 3. After breakfast Nick and I were taken to the airport by Rutllant and Torres where we took the L.A.N. Chile plane (DC 3) for La Serena. After a stop at Ovalle we arrived between 11 and 12 and were met by Stock and Juan Leyton, Jr., who had come down from Vicuña 40 miles by taxi to meet us. The rather ancient taxi is the only one of three in Vicuña that Stock would trust to make the distance. The cost of the round trip was 18 E^o.

We left for Vicuña over the road that follows up the Elqui Valley. The first few kilometers are paved with some bad spots, but by far the greater portion is rough dirt and gravel. The hills are barren of most vegetation, but with a lush growth of cactus resembling some types of Arizona cactus, but more thorny.

We stopped at the Fundo San Carlos, about seven miles from Vicuña and there saw Arturo Garrote and David Ramos, who were taking care of our animals, horses and mulas.

Garrote is a very dark, slender young man with fine sharp features, a pleasant smile and a sense of humor. He lives in Vicuña, and is in charge of the transportation and maintenance for one of the sites.

David Ramos is a brother of Don Ragelio; he is older and quiet, but very efficient. Don Ragelio is the manager of the large estancia that includes Tololo and Morado, and has his home at Los Placeres.

We called on Don Alberto Cousino, the owner of the Fundo San Carlos, near the village of El Tambo. The farm is located along the south side of the Elqui valley and extending to the Elqui River, below the upper of three irrigation ditches. It looks very fertile and well kept. Don Alberto was presented with it a little over a year ago by his mother, a wealthy French noblewoman who lives in France. It is said to have cost about \$100,000 and comprises several hundred acres. The buildings are well kept and freshly painted, and, in particular, those of his employees contrast markedly with the normal slovenly homes in the valley.

We were shown into Don Alberto's study, which was well furnished with some antique furniture, and noticed on the wall a picture of Cambridge, Mass. Presently Don Alberto entered. He is a slender young man of handsome features and courteous manner who speaks English fluently and French even better. He

December 4. Stock arranged by phone with an amateur pilot of the flying club in La Serena to fly up to the Vicuña airport and take us over the mountains we were interested in. He arrived in a four-seater Stinson about 10 AM, we crowded into the plane and flew around the tops of Tololo, Morado, and Blanco. They looked much as I had pictured them from the photographs. We were back about noon.

In the afternoon Nick and Stock went for a two-hour horseback ride, but I slept because of illness. By the time they were back I was better and rode with Stock for about an hour.

December 5. Though we were to have started from the Fundo San Carlos about 10 or 11 AM, we did not get away till slightly after noon. I was coming down with a cold and so viewed the trip with some apprehension, but after that day the cold quickly vanished.

Nick and I were given horses instead of mulas. Stock rode Hannibal. Garrote, Don David and Leyton, Jr. rode mulas and there were two pack animals. Leaving the Fundo, the trail led up the Quebrada San Carlos for a mile or two, then branched to the right up a fork, which it followed for two miles or more. Then up a branch to the left. The quebradas support a sparse vegetation among the boulders and sand. Occasional bright green pepper trees relieve the appearance of drought. The adjacent hills support a heavy growth of cacti, including a barrel cactus similar to that in Arizona. We stopped for lunch under one of the few trees large enough to cast shade. We continued up the branch and finally climbed over a fairly high pass, the one where Hugo Moreno had rolled down with his mula. After descending the other side of the pass, we traversed hilly country for several miles till we came to the quebrada leading up between Tololo and Morado. Looking down this quebrada we could see a farm in the distance, located at a spring. The farms at these rare springs are almost always marked by a few tall poplars amongst the other greenery.

We continued up the quebrada for several miles, passing a farm temporarily abandoned by some of the Ramos family who had taken their goats into the Andes because of the drought. Above the farm we could see temporarily abandoned and partly sand-filled irrigation ditches, which are only used in years of better rainfall.

We reached Los Placeres about 5 PM and were welcomed by Don Ragelio and his family. Apart from a temporary muscular soreness, neither Nick nor I were the worse for the ride.

Los Placeres has been occupied by the Ramos family for two hundred years. It is part of a 200 square mile estate which contains a number of oasis farms like Los Placeres. The new proprietor shows little consideration for his tenants and they have a hard time. Don Ragelio administers the entire estate, collecting rents, and seeing that the owner's orders are carried out. For payment he is granted the use of Los Placeres rent free.

The establishment is centered about a spring which flows about 2500 gallons per day. It comes up in the bottom of a pond that at present takes two days to fill and then is emptied to irrigate the orange, apricot, fig and other trees as well as a small garden patch and a little green pasture. Water from the pond is used for domestic purposes. The pond is inhabited by ducks, and invaded by all the domestic animals. I suspect it may be used for bathing.

The buildings, numbering 5 or 6, are mostly made of mud with roofs thatched with reeds. One of them, the kitchen, is of stone apparently set in a clay mortar. The floors are dirt. There are no windows or at least none with glass. There is a dining room made of a light frame of poles with sides of reeds and a light roof of brush. For sanitary purposes the entire Andes are available.

We were escorted at once by Don Ragelio into the dining room, where a table was spread with an immaculate tablecloth, the floor was freshly sprinkled with water and there were two or three benches with bright colored and clean cushions on them. The brush roofing was obviously freshly gathered and much of the reed thatching was freshly prepared in our honor. After a brief conversation through Stock as interpreter, we were shown to our bedroom. It was partitioned off from a larger room by means of paper, wrapping and illustrated newspapers. The walls and ceiling were completely covered. There were three bedsteads spread with blankets, clean sheets and bed covers. There was a washstand with mirror, towel and a new cake of soap. It was obvious that the Ramos family had done everything in its power to make us comfortable.

We were served a very good dinner, and were waited on by two very nicely dressed girls of the family. They had even provided boiled water for Nick and me. Don Ragelio, Nick, Stock, Leyton, Jr., and I ate together. Apparently owing to some kind of a caste system, Garrote and Don David ate separately.

plateau and especially the small quebrada should provide a very satisfactory air drainage at night.

Garrote watered the animals at a small spring perhaps 1000 feet below the summit and Don Ragelio departed with one or two of the pack mules for Los Placeres.

After supper the men gathered firewood and made a bonfire on the summit which was lighted at 9 o'clock and answered by another fire at Los Placeres.

The usual afternoon clouds had formed on the high cordillera but instead of retreating at sunset they spread westward so that the sky was partly cloudy the whole night. Nevertheless we were able to examine the seeing with the interferometer. Nick and I were much disappointed in the optics of the instrument, though this should not interfere substantially in measuring the large-scale seeing. My own estimate was that the mean variation in separation of the images was about 1.5 corresponding to 1.0 images at the altitude observed, which was greater than 45°.

Stock will bring the optics with him to Tucson for testing when he comes in March.

To the extent that my superficial examination of Tololo is meaningful, I would consider it highly satisfactory, subject only to the weather and seeing conditions being good enough. There is room on the north ridge for three or more telescopes, almost unlimited room for auxiliary buildings, probably good air drainage and a generally pleasant outlook.

December 7. Don Ragelio arrived about 6 AM. After breakfast we started for Morado. I think Garrote went down directly. The rest of us started along the ridge toward Morado. Before we reached the low point, Nick's horse, Cuno (Cradle) skinned its leg while being led over a rough place where we had to walk. At the pass it was decided to let Leyton, Jr. take Cuno directly back to Los Placeres and Nick took Leyton's mule. We climbed steeply up to the Morado plateau. This area is much flatter, more horizontal, and larger than the Tololo plateau and the north edge has several good locations for telescopes. There is one especially on a large rounded outcrop that would probably take a 125-ft. dome. Nick seemed more favorable to Morado, but I am not confident that the air drainage would be adequate and an inversion might build up over the plateau. From the aesthetic point of view I prefer Tololo. Morado would be supplied by a spring in the quebrada between it and Cinchado.

Leyton, Jr. set up Stock's radio, which was much enjoyed by the family. I slept very well. Next morning we had a well-served breakfast of fruit, boiled eggs and the inevitable Nescafe. Nick and I took photographs of the farm and the family. Don Ragelio put on his best jacket and his manta for the purpose.

Don Ragelio is a powerful and impressive character. He was not sent to school but as a boy he taught himself to read and write. He secured a piece of newspaper and would ask passers-by who could read to tell him the meaning of the printed words. He borrowed from his mother's treasure box a letter which he copied on a flat rock and asked visitors the meaning of the words. It turned out that this letter was a love letter. When he had a start he bought a second-hand book and progressed with it. He is highly respected all over the territory. At the annual Christmas celebration in the nearby mining town of Andacollo, which is visited by people from all over Chile and even Argentina, he is the second in charge.

If it were not for the employment the site survey gives the Ramos family, the two recent bad years would have compelled them to abandon their farm and seek work in the towns. Don Ragelio is anxious to have us locate on Tololo. If we do we shall, it is true, take over their spring, but he and members of his family will have steady employment with us.

December 6. We started up Tololo in the middle of the morning, accompanied by Don Ragelio. The trail continues for a considerable distance up the quebrada. At one point there is a fairly hopeful-looking spring. Presently the trail turned off to the left and climbed steeply up the side of the mountain, reaching the sloping plateau after an ascent of 2000-2500 ft. After crossing the plateau and climbing a few hundred feet up the ridge on the north side, we came to the hut near the summit.

The hut is made of the flat volcanic stone characteristic of the mountain, and is large enough for two beds and a little gear. We had lunch cooked by Leyton, Jr. and afterward Stock and I explored the plateau. It is bisected by a quebrada sloping to the south and leaving the plateau through a sharp, rocky gorge. The east side of the plateau is suitable for any reasonable number of buildings, while the west side is equally satisfactory in this respect and in addition can provide an adequate airstrip. The general slope of the

We started down from the west side of the plateau and after traversing a very rough trail for some distance we dismounted and led the animals down a steep slope nearly to the quebrada above Los Placeres. We arrived at Los Placeres in the middle or late afternoon. Stayed over night as before.

December 8. Left for the Fundo reasonably early with Marina Ramos, a daughter of Don Ragelio, who used Garrote's saddle. Garrote used a pack saddle. Arrived at the Fundo in four hours. Stock had to remain and see about transferring animals and gear for the trip to Blanco so he asked Don Alberto to take Nick and me to Vicuña in his pick-up. Don Alberto was agreeable, claiming he had business in Vicuña. We bathed at the hotel in cold water.

December 9. Took it easy in Vicuña, explored the town, did laundry and rested. The regular hotel manager, Sr. Salvo, is back.

In the evening Stock gave a very fine dinner for us. The quests were as follows:

Sr. and Senora Alberto Cousino. The latter is most attractive, speaks English fluently, was educated in Kentucky, and is cultivated and gracious.

Dr. and Senora Diaz. Dr. Diaz speaks English fairly well, has a lively sense of humor and is said to be an excellent physician. His wife is quiet and handsome.

Mr. Alcayaga. The tomato king. Makes a very large income from his early season tomatoes. Has lived in New York and is fluent with English.

Don Fidel Cortes. Owns and operates La Totorita ranch. Very wealthy, but not educated. He takes care of the camera on Guamayuca that records cloudiness.

Don Ragelio and wife and two daughters. Don Ragelio did not want to come at first because he thought he would not be dressed properly and would not be at home in the company, but consented when Stock said that L. specially wanted him. He came dressed in his black jacket with white buttons, his wife and daughters were well dressed and they participated well in the discussions insofar as the language barrier permitted.

Before dinner he took a Pepsi Cola and when asked if he did not wish a pisco sour he said "no" because if he drank he might not behave well.

Senora Cousino made it a special point to bring the Ramos family into the conversation.

The dinner was excellent and the conversation was lively. We broke up around midnight.

December 10. (Saturday) Started for Cerro Blanco. Took a badly broken-down taxi (Model A) to El Dain about 5 miles northeastward out of town. It was the only one whose driver would undertake the road, which was, however, owing to our recent work on it, fairly good. We waited for the animals being brought by Garrote and Don David. Leyton, Jr. had preceded us much earlier.

The trail led up a small quebrada, then over a rather high pass. Passed the grave of a man (drunk) who had been killed from falling off a mule. We were followed for some distance by a boy who was herding goats. Descended from the pass along another quebrada till we met a larger one up which we ascended, passing a farm which is occupied in winter by the residents of El Churcal. We passed another grave, this time of a man who had been killed by a shovel in the hands of another (drunk). We continued to climb, passing between lava outcrops, arriving at El Churcal around noon. Leyton, Jr. was to have had a signal fire on top of Blanco, but he was about half-way up the mountain while there was one on top made by Don Orestimbo Araos from El Churcal.

El Churcal is located at the upper end of what looks like a mile long lateral moraine. It has a good spring feeding into a large stone tank from which water is drawn for irrigating the garden, which contained poor cornfield, and a larger pasture or hay field enclosed by a stone fence. This year water is scarce and only a fraction of the area can be irrigated. In fact, some of the corn is drying up.

At the house was a silent and stupid looking man and a bright and friendly woman who offered us lunch. We had some very good plums and bread. The standard of cleanliness was much below Los Placeres, but our hostess did the best she could.

The interferometer belonging on the mountain had been sent to Santiago for repairs or adjustment so we could not test the seeing. The night was mostly fine and clear with little or no wind and temperature around 50°F. There were, however, some clouds about 3 AM which departed later.

According to Stock's records to date, the weather on Blanco is more severe than on Tololo, but the seeing is better. From the aesthetic point of view, Tololo is more attractive.

Stock had contracted my cold and was pretty uncomfortable.

December 11. We left early, watered the animals at the spring about 2,000 feet down and Mick and I led our horses down the steep part. Arrived at El Churcal about 10 or 10:30 and rested for 1-1/2 hours. Had lunch consisting of more plums and good cake that had been baked by the lady of the place. Then continued on to El Dain which we reached before 2 PM. The taxi was awaiting us and we continued on into Vicuña.

December 12. Stock had trouble finding a taxi to take us to La Serena because the best one was out of town on another mission. He finally found the third one which we had not yet used. Another decrepit model A. By driving carefully and nursing a transmission knock, we reached La Serena and called on Timković, the road engineer. He told us that he had purposely added a certain pessimism factor of about twenty percent to his road estimates. We discussed how we might arrange to have him build the road. He said that if we planned to let the job out on a bid, a complete and expensive survey would be necessary, whereas if he did it on a cost plus profit basis, this would not be necessary. He would make the necessary survey as he went along. I suggested that we might set up a sum of about 15 or 20 thousand dollars and let him start with this on a cost basis and when that sum was used, we could then extend it, if we found the work and cost satisfactory. We would, of course, have to have our own inspector on the job. He said he had just such an arrangement in mind. Timkovic impresses me very favorably. He seems able and businesslike. We had lunch at the hotel and took the plane for Santiago and registered again at the Carrera.

December 13. We went out to the Observatory and spent much of the morning discussing the administrative and financial problems with Rutllant and Stock. It was agreed that the existing situation when Stock has advanced \$2500 of his own money, Carlos Torres \$800 of his and with about \$1000 of obligations would have to be remedied promptly. It was proposed a) That the advances be made larger, say \$10,000 instead of \$5,000, b) Stock submit his statements more promptly, c) Rutllant send more frequent though perhaps smaller claims to Chicago, d) Stock employ someone from the bank in Vicuña to keep his accounts and do his financial work.

We discussed with Rutllant the operating arrangements when AURA takes over.

Cerro Blanco is of granite, practically all sand and boulders on the surface lying at the angle of repose. It rises four or five thousand feet above El Churcal. It joins on to Cerro Negro to the southeast with only a small dip between the two. Cerro Negro is about 11,000 ft. high and is of dark lava. In addition to the lateral moraine referred to above, there is the appearance of other glacial till in the neighborhood.

We left El Churcal after an hour or two and started up Blanco. The trail leads diagonally up toward the north along the west side of the mountain till it comes to a very steep deposit of sand and boulders. It then zig zags up this stretch for nearly 2,000 feet and then back toward the south where it passes a spring. Stock estimates about 50 gallons per day for the spring, but I think it is much more. If my estimate were not so discrepant with his, I would say 1,000 gallons per day at least. We passed the spring without watering the animals and continued over generally less steep territory till we reached the top. There Leyton, Jr. and Don Orestimbo greeted us with the news that our water supply of about 17 gallons had been stolen. Garrote then rode down to the spring and brought back 1-1/2 gallons, which was enough with what we had carried to provide for cooking and drinking, but not for washing either ourselves or our dishes.

Don Orestimbo is a cheerful and friendly person, something over sixty years of age, and was dressed in clothes so patched that I doubt if any of the original material remained. His only shoes were falling to pieces. Stock told me that once when he walked with Don Orestimbo for some distance, the latter went barefoot to save his shoes and had to stop frequently to remove the thorns from his feet. He rents El Churcal for a certain amount plus half the crops he produces. He works for us improving the trail, etc., and thus gets a certain cash income.

Blanco is about 9,000 feet high and is the culminating summit of a ridge joining Negro to the south. The top consists of sand and boulders with ample room for telescopes and other buildings. We do not have at present any way of knowing how difficult it would be to get building foundations. Stock had a mud hut built on the mountain. It is larger than the stone one on Tololo, but in my opinion not so attractive. Perhaps I am prejudiced because the air leaked out of my mattress during the night and let me down on the hard boards.

There is a fair shrub cover on the top, consisting of a brush belonging to the pea family known as Barilla, perhaps four or five feet high with dead branches lying around the base in each clump. To have an excellent bonfire, one only needs to touch a match to the dead material and the fire lasts several hours

I proposed to Rutllant that the University of Chile might rent space at the new Observatory on Cerro Calán (in the suburbs of Santiago) to AURA and use the money thus received to pay visiting astronomers to lecture in the University. I think Rutllant looked favorably on this proposal.

In the afternoon we investigated the possibility of a U.S.A.F. plane to take us to Copiapó. The A.F. attache, assistant attache, and the Ambassador were all in southern Chile. The navel attache, Lt. Com. Pruhm, was not very cordial but did direct us to the U.S. Air Mission. Col. Case was most helpful and said that if there was authorization for us to fly in A.F. planes, he would have us taken to Copiapó in a DC 3 he was sending to La Serena the next day. We went back to the embassy and located an A.F. sergeant who found the authorization in the files. It was arranged, therefore, that we would go the next day.

Late that afternoon, Rutllant took us out to the new national observatory. The buildings are nearly complete except for the domes. The establishment will be convenient and spacious. Probably the "seeing" will be poor since the observatory is on a low hill (Cerro Calán) rising out of the valley floor, but some astronomical work can be done conveniently near the headquarters and that is the main thing for training purposes.

December 14. Stock, C. Torres, and I went to the airport for the trip to Copiapó. Nick had picked up the cold, so stayed at the hotel. The plane crew consisted of Maj. Torres, Maj. Newsom, a Chilean Air Force officer, and a sergeant. There were several passengers aside from ourselves including two civilians. We stopped at Ovalle and La Serena where all the passengers except ourselves left the plane. We then continued north to Copiapó. The country north of La Serena quickly becomes even more arid, so that almost no vegetation is visible. The amount of haze also diminished perceptibly. We spotted two suitable looking mountains, each over 8,000 feet. One was near Copiapó, but we could not discover any water. The other in latitude -28°15' (approximately) had two springs in a quebrada at the base, four or five thousand feet below the summit. It also had a road to a mine near the summit. Carlos Torres was to visit the neighborhood of these sites starting December 17 to get further information.

We returned to La Serena for a very good lunch at the airport. We picked up the passengers and returned to Santiago.

December 15. In the morning, Nick and I went back to the old observatory and looked at the instruments. The 24-inch Grubb refractor looks satisfactory and Rutllant says it is a good telescope. The 12-inch has a poor lens, but the mounting by a German firm looks excellent. With a good apochromatic lens, no doubt excellent double star work could be done.

In the afternoon, Stock, C. Torres, and I rode with Hugo Moreno to Alto del Toro. Nick was still suffering with his cold. The road ascends the valley of the Mapocho River, then up a tributary and climbs by means of 32 hairpin turns up to Farallones, a ski resort. Just before reaching Farallones, we left the car and followed a trail along the ridge to the west for about a mile up to the summit known as Alto del Toro. Here there is a small comfortably furnished house and a shelter for the 13-inch Texas telescope, which H. Moreno is planning to use for photometry.

The location is spectacular with a close view of some of the high Cordillera, including one glacier bearing mountain. Unfortunately, the mountains were mostly covered with clouds so that only glimpses of the view could be had. Alto del Toro was one of the sites considered in the earlier stages of the survey.

We had a rather wild ride back with Hugo Moreno at the wheel.

December 16. With Rutllant, Nick and I called on Rector Millas of the University. It was a more or less ceremonial call with not much business transacted. We brought up the matter of customs duties on our equipment. Rector Millas suggested lending it to the University of Chile for limited terms and then renewing the loan from time to time. We did not think much of that plan.

We then called on Prof. Carlos Ruiz Bourgeois, head of the legal department. He was most helpful and thought there would be no problem about getting legislation to exempt us from customs duties. I suggested that AURA indicate what it wants, transmit its ideas to the NSF, whose counsel would give these some legal form, and that Luton with NSF counsel visit Santiago and take up with the University of Chile authorities the exact form of the legislation. This latter step should not be taken until we are permanently in business.

We called on Miss Malena Saavedra, counsel for the American Embassy. She also was cordial and cooperative. Her only suggested change from the foregoing proposals was that perhaps legislation would take too long and an executive decree might be simpler. We prefer the legislation.

After lunch, we prepared a statement for the press and then called on Dr. Heilmairer of the Catholic University. He took Nick and me to Cerro San Cristóbal. It was interesting to see the old reflector which is apparently being kept in good condition, but is very little used.

In the evening we attended a banquet given for us by Dean Carlos Mori Ganna, of the school of Physical and Mathematical Sciences. The dinner was at the Union Club, a most elegant establishment occupying its own large building in the center of

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the city. In addition to Nick, Rutllant, Stock, and myself, there were seven others representing mathematics, engineering, and the physical sciences. The dinner was excellent and the company good. The department heads present were young and seemed alert, competent, and enthusiastic. They made a good impression on both Nick and me.

December 17. With Rutllant's guidance, Nick and I shopped in the morning and then took the LAN Chile plane for Miami.

NOTE

Both Nick and I feel that Stock is doing an outstanding job under extreme difficulties. He deserves all the support we can give him. Someone at Kitt Peak, probably J. Miller, should be assigned the special task of following his work, and seeing that his needs are met promptly and as fully as possible. Before we left Chile, we made out a list of things to be done as soon as possible for Stock. All these are being attended to, insofar as funds and our unofficial status permit.

Dr. Rutllant devoted a great deal of time toward making our trip profitable and pleasant. We are deeply indebted to him.

The last section, pp. 36-37, "News from Vicuña," is out of chronological order; it should precede the section beginning February 21 on p. 32.

Carlos Torres' Reports are "unedited," rather than "unabridged."
p. 29. last line, "hungary" should read "hungry."

p. 19. paragraph 3, line 5 should begin, "1:5" not "0:5."

p. 26. last paragraph, line 3, should read, "measuring 3 x 4 m inside."

p. 37. paragraph 2, line 2, should read, "the part of one of the employees."

CHILE SITE SURVEY REPORT NO. 11
by Jurgen Stock

1960

November 23 Our departure from Vicuña was characterized by a number of circumstances which deviated from the usual:

- (1) Our truck was out of order. We had it in a garage, but we still did not know what was the matter with it. So both teams - Don Carlos to Cerro Blanco and myself to Tololo - were leaving directly from the hostería.
- (2) Scipio still had a sore back. Therefore I was going to use my own new horse later to be named "Hannibal". I had taken him to Guamayuca before and was very satisfied with his performance, though he is not yet used to a narrow trail or a rough surface and has still a lot to learn.
- (3) Pluto, the dog of the hostería, was to go with me. There was wild speculation as to whether he would follow me all the way, and whether he would be able to make this long trip. I was confident that he would follow but had my doubts about the condition in which he would arrive.

At this occasion I might again introduce our staff in order to be able to refer to them in the future by their first names. Here they are:

<u>Name</u>	<u>Residence</u>	<u>Profession</u>
x Carlos Torres	Santiago.	astronomer
x Juan Leyton, Sr.	Vicuña	policeman
x Juan Leyton, Jr.	Vicuña	-
x Arturo Garrote	Vicuña	-
x Rangelio Ramos	Los Placeres	-
x David Ramos	Los Placeres	-
x Anario Ramos	Los Placeres	-
Paúl Alquinta	Vicuña	-

Those with an x in front of their names are permanently employed. The others work only for us when needed. In addition, we employ on occasion Orosimbo Araos from El Churcal, Humberto Izola from El Sauce, and Hermegildo Ramos from Los Placeres. A few more persons work for us but on rare occasions only. Therefore, there is no need to mention their names here.

At 11:00 a.m. we had all the animals ready for departure in front of the hostería. There must have been about a dozen of them. In addition, we had all the guests and the personnel of the hostería and people from Vicuña as spectators. Pluto was as usual at the gate waiting for my signal. I mounted my horse and called him, and he was immediately on my side. So we left, Don Carlos and Don Arturo to one side, and Don David, Pluto, and myself to the other. Don David remarked that Pluto would go with us only to the end of the block. There he would wait until we were out of sight and then return to the hostería. I was more confident, and sure enough the dog followed us all the way to El Tambo. He got himself into plenty of trouble with other dogs along the way. I had to dismount a number of times to get him out of mischief. He was suffering from the heat and bathed himself in every canal we passed.

In El Tambo I was invited for lunch by Don Fernando Cousiñe, Don Alberto's brother. Pluto refused to stay alone outside. So what else could I do than to take him with me to the dining room. It was probably not to my host's liking, but Pluto behaved very well.

In El Tambo Don Anario joined our party with some more mulas loaded with hay. We also carried a one-gallon bottle of water with us. We do not need water for ourselves since we are used to heat and dryness, but we were thinking of Pluto. For the first hour everything went fine. Pluto was going left and right of the trail, ahead of us or behind, putting his nose into almost anything just like dogs do. However, more and more he began to be interested in shade rather than in new things. Finally, he went just from shadow to shadow and he began to fall more and more behind. At last he went under a bush and began to cry, even with tears. Don Anario and I turned around and called him but he would not come. We gave him some water, out of Don Anario's hand, because he could not take it directly from the bottle and we had no other container. This got him on his feet again. We did not give him as much water as he wanted in order to make him follow the bottle if he did no longer want to follow us. This worked O.K., and with half hourly drinking stops we got him all the way to Los Placeres. It took us over six hours. At Los Placeres Pluto found immediately the barrel with the drinking water and to my embarrassment put mouth and feet into it. Nobody seemed to mind but myself. There and during the next days Pluto would not leave me out of sight. Apparently he was afraid that I might leave him behind. At night he slept on the second bed in the room which Don Rangelio prepared for us.

November 24 In the morning Pluto seemed to be all right and anxious to go. Nevertheless, we took the precaution of carrying water for him as the day before. We reached the top in about the usual time. When we opened the door of the shelter, Pluto went right in and under a bed. This was probably the coolest place for miles around. We examined him carefully and found that his feet were bleeding at various spots. Don David prepared a cure out of water, salt, and some herbs, and applied it frequently during our stay on Tololo. The cure turned out to be effective.

Don Anario took the horses and mulas back to Los Placeres. Most of the animals were to be taken to El Tambo the next day. Here I might explain why this was necessary: When we have an animal on the pasture at El Tambo it costs us 30 cents per day. At Los Placeres we have to feed dry hay which is expensive to start with and which we have to carry there. At Los Placeres one animal costs us about \$1.50 per day.

There is another factor, though, which works against the one just mentioned. When I send Don Anario to El Tambo with animals, of course he winds up there. Since he is then away from home, I have to pay him. At Los Placeres I don't pay him because he is then at home, unless he is working there for us. The same applies to Don David. So when one of them stays at El Tambo it is practical to leave them with some work to do. At present this is simple because the trail from El Tambo to Los Placeres still needs plenty of improvements.

The weather was typical for this time of the year: clear in the morning, hazy in the afternoon with clouds over the cordillera, and clear again at night. The relative humidity stays between 30% and 70% all the time, with a maximum in the late afternoon and a minimum at night. The diurnal temperature range is 5 - 8° C.

The night was clear and free of haze but the seeing not at its best. The relation between the variation of the humidity and the seeing seemed to exist.

November 25 In spite of the heat Don David and I were working outside all day with the theodolite and tape measure to get the first contour lines for a map of Tololo. We started with the very top which has a lot of structure. Therefore, progress was slow. Pluto accompanied us all the time, although he was suffering a lot from the sun. We prepared many shady places for him. The sun is very strong

and wind almost absent. Therefore, it feels quite uncomfortable during the day on Tololo. The air temperature actually is not high and it is pleasant in the shade if one can find some.

The night was like the previous one except that the seeing was a little better.

November 26 More work with the theodolite. The first contour lines began to take shape.

The night was again clear, the seeing like on the night before. In the morning low fog formed in the valley as far up as El Tambo.

Of the 24 night hours of this three-day session, 16 hours were calm, 2 hours with a 2 mph wind, and 4 hours with a 5 mph wind.

During this session we have been quite luxurious with fires. On the first night we made two in order to signal in this form to Don Carlos that Pluto had made it. On the last night we made a full dozen of fires. It was a marvelous sight for us and for Cerro Blanco also.

November 27 In the morning Don Ragelio came, and we all went down on foot. Somebody from Los Placeres came with a mula to pick up our baggage.

The main subject of discussion at Los Placeres was the forthcoming visit of Dr. Shane and Dr. Mayall. It was interesting to see that everyone of us looked at the event from a different point of view. For me it meant that this is the first time that competent people will look at the work I have been doing by now for well over a year. For Don Ragelio and his family, it would mean a drastic change in their living conditions (to the better, of course), if Tololo or Morado would be chosen as the site for the future observatory. He knows that he cannot influence the data we are gathering with our equipment. However, he wants to make the visit to Los Placeres as pleasant as possible, hoping that this may help matters. He knows that Los Placeres is a rather primitive place, although he has only Vicuña for comparison. He does not even know La Serena. He has a notion that the standard of living in the States is considerably higher than in Vicuña. However, he does not realize of what order of magnitude this difference is. The big question for our staff was: Will we be able to get them

there. If they are in as good a condition as Dr. Rutllant, who visited us recently, there will be no problem. However, they remember well another visitor who only barely made it, and with a lot of suffering. In addition to the long and strenuous trips on horseback, there is the problem of the usual sickness caused by the water. It can make things very uncomfortable. We can help in these matters a little but not much. Of course, our visitors will have two of our best animals and our best saddles. We will see to it that they do not consume any unboiled water. This is about all we can do.

Under the circumstances, it was difficult to make a detailed program for the visitors. We decided to take them to Los Placeres first. When they are there we shall know whether we can do a full program, that is: Tololo, Morado, and Blanco. If we have to reduce the program, we can decide that upon arrival at Los Placeres. This meant that we had to be prepared for a variety of schedules. Food and water had to be deposited on Tololo and Blanco. Also, a sufficient number of people and animals had to be available everywhere to meet any situation. In order to have all animals in good condition, we had to break off our activities a few days ahead of the arrival of the visitors.

We made a tentative program assuming a trip to all three sites. Since it was carried out almost exactly as planned, there is no need to describe it here.

At 10:00 a.m., Don David, Pluto, and I left Los Placeres. The trip was uneventful, and we reached Vicuña after 8 hours. Pluto did very well but collapsed at the gate of the hostería. He had to be carried into the building. He was completely exhausted, and his feet practically without skin. I sent for a veterinarian right away.

November 28 The final verdict about the truck was that part of the crankshaft was worn out. The entire motor had to be sent to Santiago for repair.

Don Carlos arrived from Cerro Blanco. He informed me that the adjustment of one side of the interferometer was very poor and changing with the position of the instrument. I decided to send the equipment to Santiago for an overhaul.

November 29 Telephone calls to Santiago to find out who would repair the motor. I was told that I can get spare parts from the U. S. Army via the Instituto Geográfico Militar in Santiago.

Juan Leyton, Jr., went to Cerro Blanco to get the telescope. He returned the same day.

November 30 Don Carlos left for Santiago. The motor was ready for shipment. I examined the interferometer from Cerro Blanco and found that one objective was loose. I was able to tighten it on the spot and, therefore, saw no further need to send the equipment to Santiago. However, one adjustment screw was broken. Carlos took the part with him to have it repaired at the observatory shop in Santiago.

December 1 Trip to El Tambo.

December 2 Telephone call to Santiago to make sure that the visitors had arrived and to find out when they would come to Vicuña. I was told that they would arrive at La Serena by air the next day.

December 3 Since the truck was out of order, we had to go to La Serena by taxi. All taxis in Vicuña are bad or worse. There are four of them. We picked the best and newest one, a 1938 Chevrolet, and hoped that it would be able to make the 130 km round trip. We, that is Juan Leyton, Jr., and I, went to downtown La Serena first and then to the airport. La Serena was, as usual, with a cloud cover. The plane arrived on time, and we took Dr. Shane and Dr. Mayall immediately to Vicuña. At El Tambo our staff (minus Juan Leyton, Sr., who was still in Santiago for a medical treatment) was expecting us, and most of our mulas were too. Now that the visitors were there, more definite plans could be made for the next two days. The next day, a Sunday, would serve two purposes: The visitors will have a chance to learn to know Vicuña, and we shall find out how they get along with a horse. Meanwhile, Don David and Don Anario will take the entire cargo with the exception of our personal effects to Los Placeres the next day, and to Tololo on Monday. There they have to prepare everything for the visit, clean up, erect the tent, etc. They have to return to Los Placeres on Monday, and Don Anario has to take most of the animals to El Tambo the same day. On Monday we would come to Los Placeres ourselves. Future plans depended on the saddle sores to be developed on this trip.

We also paid a brief visit to Don Alberto Cousiño. He informed us that it would be possible to hire a small

a great disappointment...not for us but for the colleagues and wives at home who were seeing our visitors in distress on horseback and with such saddle sores that they had to sleep standing. In this connection, I am thinking in particular of one good friend of ours who may soon enough find himself on a mule. We put the visitors on Don Arturo's horses "Cuna" and "Coralito". They show more eagerness to go and are easier to steer and to stop than a mule.

The people of Los Placeres had gone far out of their way to welcome us. They had thought of everything. I hardly recognized our room. Don Ragelio had modified the rather primitive quarters into a place which even Americans would find acceptable. Food was at its best, although the visitors' appetites were absolutely inadequate. And, of course, there was always cool boiled water at hand.

Don Ragelio would be worth a chapter in these reports. He is, and everyone who knows him agrees, an impressive and unforgettable character. I may write more about him some other time.

This day's trip was short and also disappointing. On the top of Tololo we found everything well prepared. The house was clean, the tent erected, food ready, etc. Later in the afternoon Dr. Shane and I took an extensive walk over the mountain, distributing imaginary buildings as we went along.

Most of the animals stayed on the mountain with us. Don Arturo took them to "Las Nipas", a spring not far from the top, where they could take water. Then they returned to the top where we had hay for them. Besides the visitors and myself, Juan Leyton, Jr., and Don Arturo stayed on the mountain overnight.

A number of times I have made remarks about the perversity of the weather. Here I have to do it again. We had more than a month straight of clear nights. This day the cloud formation over the cordillera began as usual, but later in the day, rather heavy cumulus towers appeared which sent cirrus-like streaks toward the ocean. I had never seen this type of cloud development before and did not know what to make out of it. In any case, it resulted in a partly cloudy night. Apart from that, the night was, as usual, warm and calm. Breaks in the clouds permitted us to demonstrate the technique of our seeing observations.

plane for the next day and to fly over the sites we were interested in. He gave me the address of Kenneth Engle, a pilot from La Serena who works for the Mina El Romeral.

We arrived at the hosteria de Turismo in Vicuña at 2:30 p.m. It seems that the hosteria made a good impression. At least both Dr. Shane and Dr. Mayall expressed that they would not mind spending some time there.

In the evening I called Kenneth Engle and made a tentative appointment for the next morning. The actual time of our flight had to be left open because it depended on the fog condition at the La Serena airport. Mr. Engle promised that he would call me before he takes off from La Serena.

Mr. Engle called at 10:00 a.m. I had some difficulty in finding a taxi. So the plane was already in when we arrived at the Diaguítas airstrip. We flew first to Tololo and Morado and then to Blanco. I have flown over these mountains before, but then I did not know them yet. It was very interesting for me to fly over them again now when I know them so well from the ground. The flight took over one hour.

After lunch we took Dr. Mayall for a "ride". In order to demonstrate the climbing ability of our animals we went to the "Cerro de la Virgen", a little hill at the edge of town. From there one has a very good view of Vicuña and its surroundings. Things worked better than expected; and we, as well as Dr. Mayall, were convinced that there would be no problem in getting to Los Placeres. The trip took about one hour.

After that it was Dr. Shane's turn. We made a different tour, crossing over to the other side of the river. I was tempted to cross through the river on the way back but Don Arturo was against it. So we returned via another bridge. Again horse and rider got along fine with each other.

Some last items had to be bought in the morning, for instance, caps for Dr. Shane and Dr. Mayall. We all were disappointed that they did not buy Chilean sombreros. They could have made quite an impression with those back home. Then we went to El Tambo by taxi. There the long haul to Los Placeres started. The trip turned out to be

a great disappointment...not for us but for the colleagues and wives at home who were seeing our visitors in distress on horseback and with such saddle sores that they had to sleep standing. In this connection, I am thinking in particular of one good friend of ours who may soon enough find himself on a mule. We put the visitors on Don Arturo's horses "Cuna" and "Coralito". They show more eagerness to go and are easier to steer and to stop than a mule.

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December 7 Don Ragelio came early in the morning to guide us to Morado. We left soon while Don Arturo took the baggage directly to Los Placeres. The trip directly from Tololo to Morado takes two hours or a little more. The trail is in some parts in very poor condition. One stretch has to be done on foot leading the animals. Here Dr. Mayall's horse cut its leg on a rock, and I sent it directly down to Los Placeres while Dr. Mayall continued on the mula "ré Con Leche" (tea with milk). The color of the animal justifies this by no means unusual name.

We spent about one hour on Morado. There we decided on a seeing observing site. We did not pick the best site but the fourth or fifth best site. If this one turns out to be good, the others should be good also. I instructed Don Ragelio to place the base tube for the telescope at the chosen site. I also asked him to make a good direct trail Los Placeres - Morado as soon as manpower was available. Then we returned to Los Placeres over the steep short cut, doing a good part of it on foot.

December 8 The return to El Tambo was uneventful. There Don Alberto was kind enough to take Dr. Shane and Dr. Mayall to Vicuña in his pickup while the rest of us continued on horseback.

December 9 This was primarily a day to rest and to prepare for the trip to Cerro Blanco the next day. In the evening we had a dinner to which we invited all our friends of the area. We also invited Don Ragelio and his family. They had to be in El Tambo this day anyway, so it did not mean a long extra trip for them. They were most hesitant to come. They were afraid that their clothing might not be adequate, and they probably have never before participated in such an event. Nevertheless, we persuaded them to come and they consented. To make sure, I asked Don Alberto to pick them up on his way to Vicuña. In a short speech Dr. Shane explained the present situation of our program. Don Alberto translated the speech into Spanish.

December 10 It was difficult to find a taxi which would take us to El Daín. The road has a very bad reputation. Apparently the story had not yet gotten around that we recently improved it. Finally we located an old Ford named "Voy y Vuelvo" which took us to El Daín. Juan Leyton, Jr., had left long before us on horseback to arrive on Cerro Blanco before us in order to prepare everything. He was supposed to give a smoke signal upon arrival on the top.

At El Daín we had to wait for awhile before the animals came. Then we got on our way to El Churcal. On the way we noticed two smoke signals from Cerro Blanco, one on the top, the other about halfway up. The interpretation was difficult. It turned out later that Juan Leyton, Jr., was halfway up and Don Orosimbo Araos from El Churcal on the top. We reached El Churcal in two hours. The difference between this place and Los Placeres is striking, and this in spite of the fact that El Churcal has about twenty times more water than Los Placeres. Nevertheless, we made use of the hospitality of Don Orosimbo's wife and had lunch there. Then we proceeded and reached the summit in a little less than three hours.

Here unpleasant news was awaiting us: The water tank was practically empty. The 50 liter tank was located outside. I have given permission to the people of the area to use some of the water, but for drinking only. Up to now there was no evidence of excessive use. Seldom somebody comes up anyway. In view of this distressing fact, I decided to keep the tank in the future in the house and under lock. For the moment the only thing I could do was to send Don Arturo with all available bottles to a spring about 500 m down. The water from the spring is very muddy. Therefore, we always use water from El Churcal. But now it was not possible to get water up from there on time.

The weather was against us again. In the evening the flashlight test showed plenty of haze. Only on Guamayuca have I seen it before in such concentration. Nevertheless, Dr. Shane and Dr. Mayall indicated that it did not appear very hazy to them. I regret very much that I was not able to show them on a moonless night how clean the atmosphere usually is. Later in the night it clouded up and stayed cloudy until the morning.

December 11 We had kept the animals on the mountain and thus could get an early start in the morning. We stopped again at El Churcal and then went on to El Daín. There the taxi was supposed to pick us up at 2:00 p.m. We were just coming over a pass when the taxi arrived, one hour ahead of time. We got there half an hour later and returned to Vicuña by car.

December 12 Again it was difficult to find a taxi to take us to La Serena. Three of the four Vicuña taxis were at Andacollo,

the fourth difficult to locate. Juan Leyton went all over town on his bicycle before he found it. The vehicle had some engine trouble, and we were not at all sure that we would get to La Serena on time, but we made it. At La Serena we had lunch with Mr. Timkovic at the Hotel de Turismo. Many problems of our roads were discussed. In the afternoon we left La Serena for Santiago by air.

Our stay in Santiago was, in contrast to our activities in Vicuña, a rather civilized affair. I shall report only on those events which have a direct connection with the seeing expedition:

December 13 We were interested in flying over the Vallenar - Copiapó area to see whether suitable sites might be found there. The U. S. Air Attaché has taken us a number of times on such flights. However, as a consequence of an accident, the U.S.A.F. has put strict limitations on civilians who could be carried by military aircraft. A special permit is now needed. Dr. Shane told me that this permit had recently been granted. In the morning we went to the Air Attaché's office to see whether a flight could be arranged for one of the next days. The Air Attaché and his staff, however, were out of town with the plane and not expected back for a day or two more. We were referred to the U. S. Naval Attaché. He could not help us directly but sent us to Col. Case of the U. S. Air Mission. There we were received with enthusiasm and any possible help was offered. A flight to La Serena was scheduled for the next day anyway. If we could present the above mentioned permit, this flight could easily be extended up to Copiapó. If we could not locate the permit as quickly as that, Col. Case suggested to apply for one by cable. As soon as a positive answer arrived, he would arrange for a special flight for us. We returned to the Air Attaché's office, where the permit was quickly found. By telephone, final arrangements for the next day were made with Col. Case.

December 14 Unfortunately, Dr. Mayall was ill and could not participate in the flight. So only Dr. Shane, Don Carlos, and I went to the airport, where we arrived at 7:30 a.m. The takeoff was delayed by about one hour. The plane landed first at Ovalle and then at La Serena, where all passengers minus ourselves got off. Then began the special flight just for our purposes. On the map we had located four areas where the "foothills" of the Andes reached the 2000-3000 m level. We have now enough experience to know what kind of a topography we have to look for in order to find good seeing conditions. On the way to the north we located a number of possible sites. Near

Copiapó we turned back in order to take a closer look at two of them and then to return to La Serena. Our first candidate was Cerro Checo de Plata, about 25 km southeast of Copiapó. Its structure seems to be ideal, being well separated from all neighboring mountains.

Surface is plentiful. We could not detect any evidence of water, but mining activity was apparent; in particular, one mine had a road leading about one third up the mountain. Cerro Checo has an elevation of 2407 m. Our second candidate was a mountain some 50-60 km northeast of Vallenar. Again structure and surface were adequate. Water seems to be available at the foot of the mountain, and a road at least gets near it. However, the next town - Vallenar - is rather far. We do not know yet the name of this mountain. Its elevation is also near 2400 m.

Since Cerro Checo de Plata is so near to Copiapó, it is simple enough to find out what it is like. We decided to send Don Carlos there as soon as possible to take a closer look. For the other mountain we have to wait until the truck is working again.

The return to Santiago was uneventful.

December 15 In the afternoon Dr. Shane, Don Hugo, Don Carlos, and I made a trip to Alto del Toro. It was the first time that I saw the 13-inch telescope mounted there. Unfortunately, the pier was not well made and had broken into pieces. This meant that the telescope had to be taken down again. Otherwise, everything was in good order.

December 17 Return to Vicuña, by air to La Serena, then by taxi. Don Carlos went to Copiapó the same day.

(See Appendix A for Carlos Torres' account of his first trip to Copiapó.)

December 18 Preparations for a trip to Cerro Blanco.

December 19 We got a late start and, of course, started on horseback directly from Vicuña. We arrived at the top of Cerro Blanco late in the evening. I immediately began to assemble the telescope but did not succeed in adjusting it. Therefore, this night passed without observations. The night was clear and practically calm. There was no haze either.

December 20 An uneventful day. Adjustment of equipment was completed. The night began partly cloudy. It cleared up at 10:00 p.m.

The seeing was very good then. In the morning a 15 mph wind began, and I could not measure the image motion. The image diameter indicated very poor seeing. Fog came up the valley and reached Vicuña.

- December 21 Don Orosimbo and Don David came with our animals in the afternoon and stayed overnight with us. The night was clear, with good seeing and moderate wind (3 - 8 mph).
- December 22 We left all together shortly after the last observation. This time I wanted to take the shortcut directly from Cerro Blanco to Los Porrotos, bypassing El Churcal. During the winter, El Churcal is not occupied. Don Orosimbo and his family stay at Los Porrotos then. He offered us a room there where we can stay overnight and another one where we can store hay. I wanted to look at these two rooms. Don Orosimbo accompanied us as far as Los Porrotos. There is still plenty of work to be done on the shortcut, but it is worth it. The room we can use to stay overnight - actually those who stay with our animals while we are up will stay there - is practically bare of furniture. It also needs a lot of DDT. We will clean up the place, get rid of the bugs, and put some furniture in. The storage room can be used as is.

From Los Porrotos, Don David returned to Vicuña directly with the cargo while Don Arturo and I followed a quebrada which leads directly to El Tambo. Mr. Timkovic has looked at this quebrada also and suggested it as an alternative for a road via El Dain. A road is easy to make in this quebrada. It would be bulldozer work all the way. There is only one problem: to cross the Elqui River. Mr. Timkovic proposed a causeway (I am not sure that this is the right expression. Anyway it is a road leading right through the water); but I rejected the idea. The Elqui is not like many of the rivers in the West of the U. S. which run high for a few hours only after a storm. The Elqui draws from the snow of the High Cordillera. When it runs high, it does so for many months. There is no flood control anywhere. Thus, we might find the observatory cut off for a considerable length of time. The trip from Los Porrotos to El Tambo took three hours. The trail is not very good and gets lost in places. It is used very little. There is a house about halfway. It is abandoned because the nearby spring dries out.

From El Tambo we made a rather fast trip to Vicuña, which we reached in one hour and five minutes.

- December 23 Another trip to El Tambo to give two mulas some medical treatment and to keep Hannibal working. This time we made the trip in 55 minutes one way.
 - December 24 Again El Tambo with the same purpose as the day before.
 - December 25 Don Arturo and I had planned a pleasure trip on horseback starting early in the morning. He did not show up, and I did not go to his house because I did not know what or who held him back. He came in the afternoon with a bad cold. He had been in bed all morning.
 - December 26 Don Arturo and I left Vicuña at midday, myself again on Hannibal. We had very little cargo with us since this was going to be a short trip. One member of the Ramos family accompanied us on one of our mulas. Don Regelio had no animals for the transportation of his family or himself since he sold most of them (to us) and sent the others to the cordillera where they would find pasture. The trip from Vicuña to Los Placeres took seven and a half hours. It was the hottest day I have experienced here so far and certainly no pleasure to travel, neither for us nor for the animals.
- Los Placeres was practically deserted. Most of the people were at Andacollo to participate in a religious festival which consists primarily of pagan ritual dances. Incidentally, Don Regelio is second in charge of the entire fiesta in which thousands of persons from all over the country and abroad take part. He and his family were expected at Los Placeres the next day.
- December 27 The day promised to be at least as hot as the previous one. In view of this I decided to postpone our departure until 4:00 p.m. Since there was moon during the first half of the night there was no problem bringing the animals back down at night.
- At 3:00 p.m., the Ramos family began to arrive one by one, most of them on foot. They were all very exhausted from the long walk and the heat.
- At 4:00 p.m., we left, taking Don Anario with us to return with the animals. In spite of the high temperature in the valley, we proceeded fast and reached the summit in two and one fourth hours. The conditions were very pleasant there, with a temperature of 21° C and 30% humidity. The transparency was perfect.

At this time of the year the weather appears to be the same every day, always clear, warm, and with little wind. However, from the thermo-hygrograph, it becomes evident that things are variable. The temperature shows little difference in its behavior from one day to the other, but the humidity does. From the records, I saw that a few days ago the humidity practically reached the dew point a number of successive nights. The nights were clear, though. I regret that I was not up on the mountain during that time to see what is happening then. Now we seemed to be in a rather dry spell.

At 8:00 p.m. a rather strong (10 mph), dry, and warm wind from the south began and lasted all night. The temperature remained fixed at 20° C, the humidity at 22%. Seeing was bad with 1.5 images all night.

December 28 This day was just like the previous one. The maximum temperature is reached at about 10:00 a.m. Then a slight breeze sets in and the temperature ceases to rise. This breeze is absent during the winter. Thus the maximum temperature turns out to be nearly independent of the season, being about 18° C during the winter and about 22° C during the summer. This refers to clear weather periods only. The minimum temperature varies more, being about 8° C during the winter, and about 16° C during the summer.

In the evening, the 10 mph wind from the south came again and the seeing was, if anything, worse than the night before.

December 29 Weather conditions again like on the days before. Since I had to be in Vicuña the next day, I decided to leave the mountain in the afternoon and stay overnight at Los Placeres. A one-day trip from the top of Tololo is possible and was going to be common practice in the future. However, the heat spoke strongly against it. Also I wanted to have plenty of time on the trip in order to compare a map made by the Instituto Geográfico Militar with reality. This could have made some longer stops or some side trips necessary.

At 1:00 p.m. Don Anario came with mulas to pick up our baggage. We all left at 3:00 p.m., Don Anario over one trail on horseback, and Don Arturo and I over another trail on foot. We reached Los Placeres in two hours.

December 30 We left Los Placeres at 8:00 a.m. and reached Vicuña in a little over seven hours.

December 31 The hosteria was practically deserted. Even the Salvo family was absent. I invited the Leyton and the Garrate families to the hosteria in the evening. The bar was out of almost everything. One bottle of Coca Cola and two or three bottles of soda water was all that could be offered. In addition, the waiters were waiting for us to leave so that they could go to a dance. We left the place in disgust. Don Arturo invited us to his house where we awaited the arrival of the New Year in a very pleasant way.