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[Aslakson, Carl I. [1980] *Earth Measurer*. Excerpt from unpublished manuscript.]

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The Aftermath of War: Rockets, Reconnaissance, and the Velocity of Light

Return to Florida and Washington

I was flown back to Florida and shortly afterward to Washington to Group Headquarters. I considered that, before long, I would be sent back to the Coast & Geodetic Survey, but that was not to be. While I was completing my reports, I ran across a report of a new bombing technique that was to occupy me for a long time. It was the Shoran blind bombing instrument. When using Shoran, two ground stations called transceivers, for the fact that they automatically received and retransmitted a signal, were established at known positions. The aircraft also had equipment of this type with two channels to receive the retransmitted signals from each ground station. The operator in the aircraft, by keeping the retransmitted signals aligned on an oscilloscope with a signal pip of the outgoing signal by turning a device known as a goniometer, could actually read distance on a dial, the elapsed time being changed into distance by the goniometer. The actual theory and practice were far more complicated than this simple explanation, but that explanation will serve for this purpose. Thus, the distance from the two known stations to some target to be bombed could be computed, and when the distance on the dials read the correct figures, the bomb could be released.

The first time Shoran was used in Italy, a bridge was knocked out which had been bombed many times by visual bombing and still was undamaged. It was a coincidence that this happened because of two errors which compensated. For one thing, the Air Force personnel who made the computations did not know that there was such a thing as a geodetic datum and attempted to compute the distances as if both ground stations were on the same datum, which they were not. Then they made a second error in computation which exactly compensated the datum error. Finally, after making a number of misses after that, they had a British officer who knew something of geodesy make their computations and they began to have success in hitting their target. The Army Map Service had heard of the instrument and had already begun some tests of its use for photogrammetric use for positioning the aircraft when the pictures were taken. However, I dreamed up a different use which in the end proved very successful. I reasoned that if the distance between two ground stations could be measured simultaneously, we could actually measure the distance between two points on the ground by establishing Shoran ground station there and fly across the line between the two stations. Then if a recorder could be made which would automatically record the distances to each station at all times, the two distances could be added and the minimum sum distance would be when the aircraft was exactly on the line joining the two stations. Then the minimum distance sum, corrected for height of the aircraft and certain other corrections, could be reduced to an accurate distance. Thus, instead of mapping by triangulation or measuring all the angles of triangles we could measure all the sides of triangles. The process would be trilateration not triangulation.

Preliminary Investigation of Shoran Project

At the outset, it seemed to be a remote possibility that I could sell my idea to the Air Forces. However, it was surprisingly easy. I asked for a conference with the CO of the group. After I discussed the idea with him, he said "What do you want to do?" I told him that first I wished to go to the RCA Research Center in New York and discuss the idea with Stuart W. Seeley, who had invented and developed Shoran.

Second, I would like to discuss the idea with the Army Engineers at Wright Field because they had already conceived of its use for photogrammetry. Third, I would like to talk with the original Shoran bombing unit which was stationed at Eglin Field in Florida. To my surprise, he said, "Write your own orders."

For the next month I did little but travel. Stuart W. Seeley of the RCA Research at 711 5th Avenue in New York was immediately enthusiastic and said, "Why didn't we think of that in the first place? There is much that can be done to make the instrument more accurate." He broke out the drawings and schematic diagrams and started to tell me what could be done. I explained that the idea was in its infancy, but I would see him later.

The Army Engineers at Wright Field were also enthusiastic at the idea of using the instrument both for photogrammetric and for geodetic control.

The Shoran Squadron in Florida was receptive to the project. The CO gave me permission to talk to his officers and men saying that if any of them wished for a transfer to take part in the project, he would be willing to let them go. I returned to Washington with a number of names of officers who seemed bright and enthusiastic.

The upshot of the matter was that the Commanding Officer of our group took my report to the Pentagon; he came back with full approval of the project. In my report, I had stated that a good place to do the preliminary research was near Denver, Colorado, where we could put one station on Pike's Peak and one to the east. In a short time, the entire group had been given orders to move to Buckley Field, a few miles east of Denver. At the same time, the transfer of the Shoran officers whose names were in my report was requested. By late 1944, we were established at Buckley Field at Denver, and some simple missions of the line crossing method had been made. Results were encouraging, but it was necessary to await the development of the automatic recorder to try the technique. Minneapolis-Honeywell had been awarded the contract, and it was necessary to make a number of flights to Minneapolis and to other cities where some of the component parts were made. My new Shoran officers were Paul Jordan, Bill Adkisson, and Carl Jacobsen. There were others, but those named contributed most to the success of the project. A number of good enlisted men were transferred at the same time. Stu Seeley kept in close touch with us. At one point he had us fly to New York with the airborne instrument, and he spent a week in the laboratory working in his shirt sleeves with Adkisson and Jacobsen clearing up some bugs and suggesting changes in wiring, all at no charge to the government. On another occasion, he came to Buckley Field and he spent a week with us cautioning us not to reveal his presence in case his office tried to get in touch with him.

Our test stations were located on Pike's Peak, Colorado, near Cheyenne, Wyoming, Garden City, Kansas, La Junta, Colorado, and Imperial, Nebraska. The Pike's Peak station was at an altitude of 14,000 feet and the other stations varied from 4,300 feet to about 2,000 feet. It was fortunate that we had a station on Pike's Peak. Because of that, Stuart Seeley discovered a source of error that had to be overcome. The Pike's Peak station was visible from our airplane parking place on Buckley Field, and a series of discrepancies were discovered in readings from the Buckley Field point to the mountain station. It was a source of much investigation until Stu made the discovery that, when personnel were walking around the airplane, the readings were affected. He actually walked around the aircraft calling to the operator to call out the readings. The discovery was made

that the distance reading was affected by variations in the strength of the signal and that those variations were caused by interference between the direct wave and the reflected wave. With that discovery we were on the road to success.

The Discovery The The Assumed Velocity of Radio Waves Might Be Erroneous

We had been able to measure a number of lines between the stations mentioned above and also since they were tied to triangulation stations, we could compare Shoran measured distances with the computed distances. I noticed a startling fact. The error increased with distance, but in a most uniform rate. I was hesitant to suggest that we were measuring the velocity of radio waves but that possibility existed. At about that time, I read a news release about a claim being made by an English physicist, named Essen, that he had obtained a new velocity of radio waves, which was good news, for when I used Essen's velocity our Shoran measurements compared closely with the computed distances. However, much more research was needed before we could make the claim ourselves. For one thing, a method had to be developed that would eliminate the error we had discovered that was a function of the signal strength. However, we were sure that we were on the right track.

The Project is Almost Canceled

In 1945 the war had ended, and there was much talk of mustering many troops out of the service. Meanwhile, our Shoran detachment had been organized into a squadron designated as the 7th Geodetic Control Squadron. The Squadron had a commanding officer but he did not understand what we were doing and was not sufficiently interested to find out. Also, the Group staff never took an interest in the project. The result was that the entire project was almost dropped. I knew some high ranking officers in the Pentagon; one of whom was a scientist and had a PHD degree. I got word through the back door, so to speak, that our project was in danger of being canceled. A few days later the group commanding officer received a TWX that this scientist was coming to Buckley to investigate the project. The Group staff was frightened believing that a great "boondoggle" was uncovered and tried to keep the officers from the Pentagon from coming over to the headquarters of my detachment and talking to me. However, the scientist insisted and came to talk to me. I went through the whole theory of Shoran Geodetic Control with him, showed him the results we had gotten, the remaining sources of error which we had discovered, and the steps we were taking to eliminate them. He also saw the enthusiasm of the officers and enlisted men who were engaged on the project. It was obvious that he was impressed and, after an hour of briefing, he went back to the Group headquarters. He was there about an hour when I received a call from Group headquarters asking me if I could come over. From the Colonel down, they all fawned on me asking what they could do for me, and what we needed to make the project a success. That they had been told off immediately became apparent. I told them that we had made a requisition for some equipment from Wright Field which had been ignored. I also told them that many of our Shoran flights had been called off by the operations officer, who had no conception of what we were attempting to do. I listed several other cases of interference and received promises of no more interference. It was a remarkable about face and from that time on, we were VIP's.

We received a great deal of publicity after that episode. The Denver papers were full of interviews on the subject of Shoran. I was invited to give an interview on KOA, the NBC station in Denver. The Women's National Aeronautical Association invited me to give a paper at their annual meeting at the Broadmoor Hotel in Colorado Springs. I was their guest speaker there overnight and, when I tried to buy a drink at the bar, I was informed that they had instructed the bartenders that I was not to pay for drinks. At the banquet I sat at the head table next to the famous aviatrix, Mrs. Blanch Noyes. From time to time, the Denver Post would have a write-up on certain individuals which they called the Denver Post Hall of Fame and in the May 4, 1946 issue they listed me with my picture and had an interview. All in all, it was a heady experience to suddenly jump from boondoggler to a place of honor. The wraps had been taken off publicity for

Shoran because the war was over, and this new application of its use was greeted readily by the press. I was called upon many times to appear as a speaker at various scientific meetings and at business organizations.

Former Chinese General Recalls Visit at Buckley Field

In February, 1980, a geodetic colleague, Dr. Charles Whitten, who had been former president of the geodetic section of the IUGG attended a triennial meeting in Canberra, Australia. The mainland Chinese had a large delegation of approximately sixty in attendance. Upon his return he telephoned me and said he had been approached by one of the Chinese who had enquired about me.

This prompted me to locate the two news clippings from the Denver newspapers which are reproduced below.

Some time later following the move of our Wing to McDill Field in Florida, I was in Washington for a conference and Marian and I entertained General Chi-Cho Wang in our Bethesda home together with several other prominent geodesists. Of course, following Chinese custom, he insisted on taking us together with all the other guests to dinner the following night at a Chinese restaurant in Washington. There Marian experienced her first genuine Chinese food. She was astonished at the ability of the Chinese to utilize common ingredients and produce "squash" soup served at that dinner. In the usual manner, there were a total number of dishes to equal the number of guests present. Inasmuch as there were ten guests we were served ten different dishes exclusive of the rice. The dishes, in accordance with custom, were placed in the center of the table, and each guest served himself from those dishes. The Chinese tea was most delicious also.

It was strange to have him remember my name and recall our Denver meeting after a lapse of thirty five years. Our meeting in Chungking had been very brief. [Editor's note: the copies of the newspaper articles were not included in the autobiography. It appears that CIA met General Wang in China in 1944 and then again while at Buckley Field in Colorado in the late 1940's.]

The 7TH Geodetic Control Squadron Moves to Florida

The question arose immediately after the visitors from the Pentagon had left as to the best place to continue the research. We needed a lot of lines measured over water to investigate our solution of the signal intensity problem. I had already selected a Caribbean area which would make an excellent test of that theory. There we could also tie Cuba and some of the Bahamas Islands to the United States, something that had never been done. The upshot of the matter was that the 7th Geodetic Squadron was detached from the group at Denver and sent to McDill Field at Tampa, Florida, where we immediately were increased to full strength. Meanwhile, we had developed a method of correction of the measured distances for the delay caused by the passage of the ray through the atmosphere, where it was affected by the pressure, temperature and the humidity of the air. It was necessary to measure those three quantities, and I was able to get the cooperation of the Weather Squadron at Miami, known as the Hurricane Hunters to measure those quantities, whenever we flew a mission. Later our own planes were fitted with the instruments required for that purpose, and the measurements were made by our own planes after that.

For the time being, the signal intensity problem was partially solved by developing an instrument to measure the signal strength during a mission and creating a signal strength correction. This problem was later solved in a better way.

Phase III Shoran Project in Florida - Bahama - Cuba Area

The project flown from McDill Field in Tampa was designated as Phase III. For this project, there were four stations located at triangulation stations in Florida. Four unknown points were located in the Bahamas Islands, four were in Cuba,

and one was near the end of the island chain west of Key West, Florida. All lines possible were flown between all stations and were corrected by the signal intensity correction which we had derived. This was obviously a crude method of correction, and as stated above, a later method was devised to correct the lines. However, remarkable comparisons between the known lengths in Florida and the Shoran measured lengths seemed to verify the assumption made in Denver, that we were actually capable of measuring the velocity of Radio Waves.

In a paper I wrote for the Transactions of the American Geophysical Union entitled, "Can The Velocity of Radio Waves be Measured by Shoran", I quoted the figures obtained that now seemed to be verified from the other sources:

(1) By L. Essen in England using a small cavity resonator and,

(2) By Erik Bergstrand in Sweden actually using light in an instrument he called the Geodimeter. The various results all considered preliminary were:

Essen 288793 Kms. per second

Bergstrand 299796 Km. per second

Aslakson 299792.4 Km. per second

The previously accepted value of 299776 km. per second seemed to be proven erroneous. As a matter of fact, all three observers later closely approached a new figure of 299793 Km per second by more refined methods and, in addition, Froome in England employing a microwave interferometer obtained the same figure.

Needless to say, the work attracted much attention and was published in many languages throughout the world. It was even published in Russia and in Yugoslavia.

Personnel of 7th Geodetic Control Squadron

Certain problems were encountered in the make-up of the 7th Geodetic Control Squadron. We had no source of computers except enlisted men, and the Shoran computations were rapidly becoming more complicated all the time, as we refined the techniques. The problem had to be resolved by designing computation forms and directions to use them so that any bright enlisted man could use the forms. Thus, we had men with no more than a high school education who were making complicated least square adjustments and complicated weather computations without knowing the theory behind the design of the form. We were allowed to scan the records of any new men who arrived in the squadron, and if they had a high IQ, we asked for interviews with them. We would then take them through the various computing forms and show them the type of solution that was made in each form. After that, if they expressed a desire to become a computer, we would ask for them and in nearly every case they became good computers. Not only did they become successful computers, but most of the brighter ones eventually wanted to learn the theory and so took courses in mathematics to learn it. Esprit de Corps was very high. They were proud of what they were doing, particularly after they became known by the nicknames of "The Professors". In fact, they organized a league bowling team called the "Professors".

The entire squadron was proud of their work. The war was over, and almost everybody in the Air Force felt they were marking time, but our personnel felt that they were accomplishing something worth-while. I made a point of listening to any man of any rank in the squadron who thought they had a good idea, and many times good ideas emerged in this manner. If the idea was not practical, I would explain why I believed it was not, instead of discarding it off hand.

In September 1946, I was promoted to the temporary rank of Captain in the Coast and Geodetic Survey and therefore, adopted the rank of colonel in the Air Forces.

On one occasion, I received orders to proceed to Wright Field to attend a meeting of the American Society of Photogrammetry. No reason was given for the orders. You can imagine my surprise when I arrived and found my name on the printed program as one of the speakers on Shoran for geodetic control. I hurriedly got some material together and gave the paper as the program listed.

On another occasion, I was detailed to temporary duty in Minneapolis to visit Minneapolis-Honeywell, who were making some modifications in our Shoran Photographic Recorder. Enroute there, we ran into an overcast and the pilot should have obtained clearance to land elsewhere; however, he continued on. We were flying our Shoran B-17, and there were no deicers on the wings. Just out of Minneapolis, we ran into icing conditions and as we were about to land on the run-way, the controls froze slightly and the right wing dipped. It was at night, and we could not see the damage. The pilot gave the engines the gun and made a second pass at the runway. The previous attempt to land had unfrozen the controls and this time we made a landing. It was with an eerie feeling that we saw the result of our previous attempt to land. The tip of the right wing was bent up four feet. That plane remained at Minneapolis for three months while the wing was repaired. Another B-17 was sent to pick us up.

Shoran Conference at Tampa in August, 1946

By this time, Shoran began to attract wide attention. We were visited by Canadian geodesists who were about to put our developments to use to survey the northern provinces of Canada. A large conference was called in Tampa in late August which was attended by over sixty officers, scientists, and engineers representing all branches of the armed services. The following is a direct quotation of the McDill Fly Leaf, the base newspaper:

Shoran Conference Brings Honor to the 7th Geodetic Control Squadron

"When the conference ended on Thursday afternoon, it was the opinion of all present that the 7th had done a remarkable job thus far on their research on Shoran and its adaption to Geodetic Surveying."

Fame Is Fleeting

In spite of the successful conference, numerous changes had been made in the upper echelon at McDill Field, and, as usually is the case, all the new staff officers were unfamiliar with our work and lacked appreciation for the necessity of continuing close contact.

As a result, orders were written transferring certain of my key personnel, both commissioned and enlisted. The organizations to which they were transferred were routine and yet it was wrecking the 7th Squadron. At the same time, Admiral Colbert, USC&GS, also had orders cut for me to return to my service. The staff headquarters in Bolling Field was more aware of the value of our work than the staff in McDill Field. I was therefore called to Bolling Field for a conference with the Commanding General there. I was asked if I could not get my orders back to the C&GS changed to let me remain at McDill until I finished the project. That gave me the opportunity to say, "Probably I could get them changed, but it might not be worth while." When asked why, I explained about the interference with my key personnel and said that it would be impossible to complete the project if they were continually being transferred away. Right there the General composed a TWX to McDill ordering no more transfers of my personnel without my approval of the transfer. That was hard for the staff at McDill to take. My popularity with the general was low previously, but this was the nadir.

I flew back to McDill and upon arrival was met by one of my key officer mathematicians who told me he had received orders to report to Selfridge Field, a fighter base in Michigan. I did what the General at Bolling had authorized me and sent him a telegram telling of the transfer orders. Immediately, a TWX was dispatched to the General at McDill canceling the transfer and ordering no more transfers of the personnel of the 7th squadron without the express approval of the staff at Bolling Field. That of course made me persona non grata with General Hutchinson at McDill and he tried to berate me for not going through channels. I explained that had I gone through channels, it would have been too late to retain my officer.

The young aide to the general was a good friend and often entertained me by telling of the conversations that took place in staff meetings about that damned Aslakson. However, there were no more transfers. I completed my project and wrote my report in about two more months.

The USC&GSS LYDONIA - The Electronic Position Indicator

Almost immediately upon my return to the Washington Office, I received orders to report to the LYDONIA which was completing a hydrographic survey off the coast of Maine. As a result of my Shoran experience, my orders also included an investigation of possible errors in the Coast Survey designed Electronic Position Indicator which was being used in that survey. One month's work remained and then she was to go to Norfolk to be decommissioned.

It was an interesting month for me because of certain errors I discovered in the EPI. In her work, there was one place where she crossed the line between two stations. Examining the readings at those stations, I was able to prove that the EPI being used there had a definite error with distance which could either be a function of the velocity or of some component part of the EPI. I developed a set of tables to be used in completing the final report of the survey.

EPI In the Gulf of Mexico

In the autumn of 1947, I was attached to the USC&GS HYDROGRAPHER as Executive Officer. She was under the command of Captain Peacock and was based at first at Pensacola, Florida, and later at St. Petersburg, Florida. There was much to be learned about the EPI, which was being used for surveys in the Gulf of Mexico. In October and November 1947, extensive tests were run to attempt to find the source of errors. Some errors had not been suspected prior to the tests. It was discovered that certain errors were caused by the type of antenna used. This enabled us to adopt an antenna which produced no, or very little, error.

Later, it was proven that the velocity of the ground wave varied greatly over terrain of certain type from the velocity over sea water. This produced a very large error which could only be eliminated by using EPI ground stations at location where the entire path of the ground wave was over sea water, it being impractical to attempt to develop a different correction for various types of terrain.

When I arrived at the ship, I also found that it was customary to place buoys at various distances offshore and nose the vessel up to the buoys at various times during the progress of the survey to take EPI readings, keep a record of those readings, and thereby establish a "calibration point". Captain Peacock had simply been averaging the readings made at the "Calibration Buoys". It seemed more logical to establish the buoy coordinates by a least square adjustment using the differences in the readings from the various ground stations in the same manner as differences in a level adjustment are made, using differences in elevations. Such an adjustment was made by me assisted by Noble Martin who was enthusiastic about the method. In our report we listed the following sources as possible reasons for the errors, some of which had been investigated at length.

1. Personal equation of observer

2. Reading error
3. Directional effect due to the type of antenna being used.
4. Instrumental changes
5. Changes in meteorological conditions
6. Possible error as a function of distance

My changing our system of calibration to eliminate some of the above errors and by making the least square adjustment of the positions of the calibration buoys, we improved the quality of the survey a great deal. Our remaining time in the Gulf survey was routine. We changed our base to St. Petersburg and the ship's runs became greater, and we spent most of 1948 based there. Captain Peacock was retired in the summer of 1948 and Anderson assumed command. Shortly thereafter, I was detached and ordered to Washington. The reason for my detachment became evident upon my return. I was given a new set of orders to make a plan for completing the Alaskan surveys.

While on the HYDROGRAPHER in the Gulf, I loved to watch the play of the porpoises at the bow of the ship. One day, I watched a mother and her baby for a long time. The mother kept a straight course just in front of the bow. The baby, which was not over two feet long, kept pace with her but continually rolled over and under her coming out on her other side. They kept up this play for at least twenty minutes.

During my assignment on the HYDRO, I developed a serious inflammation of the sciatic nerve in my right hip and was sent to the Marine hospital in New Orleans for treatment. I had been there several days, most of the time in great pain, when one day as an afterthought I called the doctor's attention to several hard lumps or knots in my left hand. The doctor's face lighted up and he said, "That's Dupueytren's Contracture!" We will have to operate on that hand. It seems that it is an uncommon affliction, and there were many young interns there who needed to view such an operation. The upshot of the matter was that, in a very few days I was prepared for the operation. When I was wheeled in, the last thing I remember before I passed out was that I was in the "greenhouse", an operating room with a glassed-in balcony above which was lined with young doctors faces about to observe the operation. The operation was successful, and I never had a recurrence but, for nearly a week, the after-effects were serious and I was in great pain. I asked the doctor what the affliction was, and he brought me a book which described it. It seems there is no known cause. Knots form on the tendons and the only cure is surgery. The palm must be laid open and the knots excised.

Many years later, I had the same affliction on the right hand while I was in Washington, and I was operated on in the Bethesda Naval Hospital. This time the surgeon tried a new technique which was almost painless. He attached an evacuated test tube to the wound which kept the hand drained, so the swelling was kept down. The test tube was changed daily as it filled with fluid. However, the surgeon was somewhat testy, and his young assistants annoyed him so that he accidentally cut a nerve in the palm of my right hand. As a result, I have lost some of the feeling in the palm but that effect is not serious.

In the fall of 1949, we received a telegram that Dad had had a stroke at his home in Trevoise, Pennsylvania, where he was living with my stepmother, the former Agnes Arneson, whom Dad had married at our home in Bethesda, Md. It was a marriage which Marian had promoted because she liked Agnes, and she and Dad had been widow and widower for many years. Agnes was a second cousin of Dad.

Marian and I went to Trevoise, but Dad never recovered consciousness so that he could recognise us. He lingered in the hospital for several days, finally passing

away on January 15, 1949. We stayed there for the funeral. Arnold, my brother, and my sister Dorothy also attended the funeral.

Mr. Hossfeld, the president of the Hossfeld Universal Iron Bender Co. came as well. For many years prior to his death, Dad had sold the bender which was a most remarkable piece of equipment. Mr. Hossfeld thought a great deal of Dad and told us he was a remarkable man and a fine salesman.

Prior to the funeral, Arnold and I went to see the lawyer who handled Dad's business. We told him to turn over our share of the estate to our sister Dorothy who was divorced from George Loesch whom she married when we lived in Erwin, South Dakota. She had very little money, but she was a competent stenotypist and was on call enough to earn a fair living. The lawyer expressed surprise at our action. He said it was the first time he had ever known any relative to take that action in his entire career.

Dad was cremated and buried in the historic cemetery of the Norwegian Lutheran Church in Waterford, Wisconsin. A second service was held there. Mother was also buried there as well as Dad's brother Baxter. I was unable to attend that service but Arnold did.

Journey to Alaska - Report on Methods of Completing the Alaskan Surveys

Shortly after I returned to Washington, a meeting was held at the National Airport by representatives of all the mapping agencies of the Government. Representatives of the USC&GS, the Army Map Service, the Geological Survey, the U.S. Air Force and a number of officers of the General Staff were present. A decision had already been made to complete all Alaskan surveys by 1952. I was given the assignment of going to Alaska and making a reconnaissance. I was then to provide a plan for completing the surveys in the allotted time.

My orders were dated July 1, 1949. That meant I had only about three months of good weather to make the reconnaissance and a very short time to provide the plan. My orders were very liberal. They authorized me to use any method of transportation available. This meant commercial flights, chartered aircraft, regularly scheduled Air Force planes, or on occasion a special flight authorized by the Air Force. During the next three months, I used all four methods of transportation. My orders were extremely liberal. They authorized me to travel anywhere I considered necessary to complete my mission, stay as long as necessary, and to return when the mission was completed. I enjoyed my tour, although I had several close calls in that dangerous flying area.

On one occasion I was reconnoitering the Colville River Valley from Umiat, which had a small air strip, to the mouth of the river. I was using a Norseman bush plane which I had chartered at Point Barrow. At the mouth of the river on the Pacific side, I landed at Point Lay to contact a Coast Survey party in camp there. We landed on a soft sand beach. When we attempted to take off we had great difficulty in getting airborne because it was hard to acquire flying speed in the sand. After several tries we were airborne and we headed for Point Barrow on the Arctic Coast.

About fifty miles from Point Barrow, we received a radio message that Barrow was "socked in" and we could not land. We headed south to land once more at Umiat when suddenly a dense layer of clouds began covering everything in that direction. Only the tops of the mountains of the Brooks Range emerged from the cloud bank. The pilot was becoming alarmed, and he said, "Well, I guess the only possibility that remains is to head for the Brooks Range and pancake her down in the tundra. But with these small wheels, she is bound to flip over on her back and burn." That was a cheerful thing to look forward to, but we headed that way. Suddenly, below us, we caught a glimpse of running water through a hole in the clouds. That could only mean that we were over the Colville River. The pilot practically did a nose dive down through that hole in the clouds and came out about 200 feet above the river. It was in a canyon there with banks on either

side rising to several hundred feet. The canyon was also narrow and had many curves. My pilot recognized from the canyon that we were approximately forty miles below Umiat. The clouds were just above us, and we had to stay low to see anything at all. Also, there was thin fog clear down to the river. The pilot did some remarkable flying up that river. Suddenly, we saw the end of the runaway which was black asphalt through the fog ahead. We hit that runway, braking as soon as possible. When we stepped out of the plane, the fog was so thick we could scarcely see fifteen feet. We spent the night at Umiat and returned to Barrow the next morning.

On that flight, I had a wonderful view of the midnight sun. We had left Point Lay at 11:30 at night. The sun was still several degrees above the horizon. As we flew east, it dipped toward the horizon, but, because we were flying at 2000 feet, it was still high. It dipped toward the horizon and then started to rise again. By the time we turned south, it was rising at a rapid rate.

I had another close call when I caught a ride into Barter Island, where we had another C&GS party working. Barter Island is thirty minutes flight east of Point Barrow, and a weekly supply plane of the Air Force made a flight to Barter Island from Fairbanks, stopping first at Barrow. As we approached Barter Island, there is a cliff which parallels the beach and the line of the cliffs is aligned exactly with the air strip at Barter Island. The pilot was accustomed to lining up with the cliff below him to make his approach to the runway. It is very often socked in at Barter, but usually he could land with that approach, because he could get his drift in that manner. On the date I was with him, the low clouds were so bad that he made six passes before he dared to set down. After the sixth, he said the next would be his last as he had only enough gas to get back to Fairbanks. Well, he made it on the seventh pass, but when we landed it was hard to see how he did it as we could scarcely see 200 feet on the ground. He had been making those trips into Barter Island for two years and often in that manner. Yet in his trip the very next week, he struck a building near the runway and cracked up. Everyone aboard the plane was killed. It could very well have happened on the trip I made with him.

The airstrip at Fairbanks has a hill nearly 200 feet high just off one end of the runway. On one trip in an Air Force C-47, the pilot struck the hill with his wheels and bounced up, and, as he landed, he must have bounced up and down six times before coming to a stop. Thereafter, I carefully avoided flying with that pilot.

Many of my flights were on chartered "bush" planes. As a rule, they were amphibians with both wheels and floats although nearly all landings were on rivers. The most famous bush pilot in Alaska was Sig Wein, a pioneer in the business. I chartered him to make a flight east from Nome to check some hills for possible triangulation station sites. He regaled me with tales of the early days of flying in Alaska. All of those early flights were made with float planes, and the pilots took many chances.

Sig Wein owned the roadhouse. Private rooms were few in roadhouses, and the usual type of accommodations consisted of large bunking areas with two or three level bunks and no privacy. My room even had a chemical toilet. Sig Wein would not charge me for the room because I had chartered his plane. One entire wall of the dining room was decorated with broken propellers, mementos of various wrecks he had had. We flew over a small strip where he described how he often tried to land and at the last second would have to zoom upward to avoid a moose.

Shishmaref is a tiny Eskimo village about forty miles north of Nome. The only whites living there are the postmistress and her husband who runs a small general store. While I was there a dead killer whale was beached by the Eskimos. There was great excitement at the event. The Eskimos went out in "umiaks" which are the large family skin boats to tow it to shore and cut it up. That whale would provide meat for their dogs for the entire winter. The postmistress made

souvenirs by casting the reindeer lichen in plastic for use as paperweights and I purchased one.

In Nome in that year, it was said that one could still make moderate daily wages panning the beach sand for gold. If that was the case then, in 1979 with gold valued at \$350 per ounce it no doubt is a booming industry. Even then, they had begun to establish a system of steam pipes under the sand on shore to thaw the sand for working.

One interesting flight was out to Nunivak Id. which is a large island northwest of Kuskokwim Bay. The government maintains a large herd of reindeer on the island. It also has a slaughterhouse where the reindeer are butchered annually. Reindeer meat is sold in Seattle, and it is also sold to the Chicago, Milwaukee, and Puget Sound R.R. where it is featured in their diners. I have eaten it on the Milwaukee.

Once it was necessary to go to Air Force Headquarters at Anchorage to try to get transportation to Naknek, a post at the head of Bristol Bay. I asked to see the Commanding General, and, to my surprise, was immediately ushered into the office of General Hutchinson, my old base CO at McDill Field who had resented me greatly. He received me like a long lost friend. When I explained my mission and showed him my orders, he assured me that I could have any help he could provide. When I requested transportation to Naknek Id., he called the operations officer and ordered him to provide me with special planes whenever I asked for them. In that case, I was provided with a C-47 and crew to make the trip. The pilots and crew were delighted to go, as they had not visited that area. They asked if I could like to get a closer look at Mt. Iliamna, an active volcano which was near our course. We circled the volcano and had a good look at the crater. At Naknek, they were most hospitable as it was a lonely post with few visitors. They tried to get me to stay over one or two days and do some fishing. They promised huge trout over eighteen inches long. The plane crew wanted to stay. They said the trout could be caught as fast as one threw in the line.

On one occasion, I had to go to Ft. Yukon on the north bank of the Yukon River. It was supposed to be a regular commercial run, and the pilot said he would pick me up to go back to Fairbanks the next day. There is a roadhouse there with double deck bunks along one wall. There is no privacy of any kind. The landlady was most hospitable. She and her husband had the only private room. There was a scientist from Harvard staying there and I enjoyed talking to him. He had just found a large mammoth tusk sticking out from the river bank which the current had recently cut away.

I was stuck there for nearly a week due to weather because the plane could not get in. On the fifth day, two girls who worked on the base at Fairbanks had flown up from Circle for a look at Fort Yukon. They said that they had driven up from Fairbanks and their car was at Circle, and I could ride back with them. I grabbed the chance, flew back to Circle with them, and had a comfortable ride down the Yukon Highway with them to Fairbanks. It was the only trip I made by car during my whole time in Alaska.

I forgot to mention one humorous incident which occurred when I made the trip out of Bethel to Nunivak Island. A government veterinarian flew with me. As we were standing in front of a souvenir shop in Bethel, two tourists, who appeared to be old maids, were examining what appeared to be a cane made of ivory at the shop. The veterinarian was obviously standing there waiting for them to ask him what it was. Finally, they did and he said, "Madam, that is the penis of a walrus.", which it was.

On that flight to Nunivak Id., the veterinarian excitedly pointed out two of the rare whooping cranes below us in the tundra. Heretofore whooping cranes were supposed to breed only in the Northwest Territory in Canada.

To give some idea of my itinerary for those 2 1/2 months, I have taken my itinerary from my final report:

Aniak to McGrath along the Kuskokwin River

McGrath north to Ruby

Koyukuk river, Koyukuk to Bettles

Kobuk River, Kobuk to Kotzebue

Kobuk to Hughes

Umiat to Bettles via Anaktuvak Pass

Bettles to vicinity of Stevens

Fairbanks to vicinity of Stevens

Yukon River, Tanana to Stevens

Yukon Flats, Stevens to Fort Yukon and Circle

Porcupine River, vicinity of Fort Yukon to Canadian Boundary

Steece Highway, Fairbanks to Circle

Yukon River, Tanana to Fort Yukon

Porcupine River, Fort Yukon to Rampart.

That was indeed a thorough reconnaissance. There was very little of Alaska I did not see.

Another story I might mention was told me by a geologist. He had a headquarters near Anchorage and had found in an excavation near Anchorage a baby mammoth in the frozen permafrost. It had apparently never been thawed since it died, and the meat looked fresh. Just to say that he had eaten mammoth he actually cooked and ate some. He called it good to eat.

Another fact I found interesting was the bakery business of the landlady who ran the roadhouse at Fort Yukon. Just as the snows started in the fall, she baked up enormous quantities of bread and sweet rolls. These were buried in a box in the snow and kept frozen until sold. She charged \$1.00 for a dozen sweet rolls and 75 cents for a loaf of bread. The Indians bought them during the winter.

For several years after that stay at Fort Yukon, I received an annual card at Xmas time called "news from above the Arctic Circle".

Once at Fairbanks, I was offered a ride in a vehicle called a Penguin which the Army had for traveling over the tundra. It was supposed to travel across wet tundra and even through swampy areas. They bragged about it too much. On my ride, they got stuck in an area where it had melted too deep, and all it would do was to dig itself down deeper. I have a picture of me standing on the top waiting for a second Penguin to come and pull us out.

At the post exchange in Anchorage, I bought a fine little basket with a cover. It was made of woven baleen from a baleen whale. I thought the price was stiff, but I wanted it and bought it for \$15.00. In 1973, when Marian and I made a trip to Alaska, I saw some of these little baskets for sale. The price varied from \$150 to \$200. There are only two or three Eskimos who still make them.

One more episode occurs to me. This happened on the day I arrived in Alaska. I had brought two bottles of bourbon, which I had bought in Seattle with me. I first made a stop of one day at Anchorage. There were some Geological Survey men in Anchorage whom I was to contact. They came to my room and after a while I offered them a drink. I opened one of the bottles and we had a couple of

drinks. Then I recorked the bottle and put it in my luggage. The next morning on the flight to Fairbanks the reduced pressure in the air caused the cork to pop out of the bottle. When I entered the BOQ at Fairbanks to go to my room, heads popped out of all the other rooms sniffing the air. I had to get everything in my bag laundered to get rid of the smell of whiskey.

I finished my report in the late fall in Washington and was ready for my next assignment. It is interesting to note that my recommendations were all received well, and the surveys of Alaska were all completed on schedule by 1952.

Hiran Geodetic Tie Across the Atlantic to Canada

Following the last tests of the Hiran equipment and the issuance of the final report of the 7th Geodetic Control Squadron at Orlando, Florida, they considered themselves competent to undertake an important geodetic connection across the Atlantic to Canada via the Greenland Ice Cap. Unfortunately they had no competent geodetic supervision and were unaware of the necessity for controlling azimuth. In Florida, all measurements were controlled between adjusted triangulation positions and no such control was required. On the Ice Cap there was ample opportunity to make such azimuth observations if an adequate reconnaissance had been made. As a result, there was a wide azimuth swing on the Canadian end of the project and the results were useless. It was another example of the waste of the taxpayer's money through lack of fundamental knowledge by the armed services.

Hiran Conference at Orlando, Florida

While the European-Canadian Hiran tie was in progress, a large conference was held in Orlando, Florida, under the auspices of the Armed Services. The subject matter was to discuss a possible location of a guided missile range and a method of surveying it. The first consideration had been the Sea of Cortez or the Gulf of Lower California. This idea was vetoed by the Mexican Government which did not fancy the idea of missiles flying over their country.

The idea being considered was to locate the range from Florida in a southwesterly direction via the West Indies, the Windward, and the Leeward Islands. The British and the French had agreed to this, and the remaining question was as to the accuracy of the Hiran method.

My reply was that the accuracy obtained thus far was inadequate, but that we were fully aware of the necessary steps to be taken to assure the final accuracy. Had I been aware of the crude results of the Atlantic tie I would have been less assured. However, I definitely specified that adequate supervision of the project by a competent geodesist was a positive necessity.

As a result of that conference, Patrick Air Force Base at Cocoa Beach, Florida, was chosen as the headquarters of the Missile Range with the launching site to be located at Cape Canaveral.

Assignment to the Joint Long Range Proving Ground at Cocoa, Florida

In March, 1950 I received orders to report to the Joint Long Range Proving Ground at Cocoa, Florida. The assignment was for one month's temporary duty. Apparently, that was the result of my insistence on the need for adequate geodetic supervision. In one month I was supposed to teach the military all I knew about geodesy. The upshot of the matter was that after one month my duty was extended to a second month and at the end of that time to a third month. By then they had become aware of the need for a geodesist and my assignment was made permanent.

The decision had been made to base the Hiran Group at Ramey Air Force Base in northwest Puerto Rico. It was a good decision for that base was central to the area to be surveyed. I was pleased at the choice of Col. William Hunkapillar to be the Commanding Officer of the Group. Bill was a good friend who appreciated the

need for my assistance. As far as I am aware, he was the only man assigned to an Air Force Group who was not a pilot.

The base at Patrick did not remain a "Joint Long Range Proving Ground" for long. Because of the constant jealousy between the Air Force, Navy, and the Army, it was not long before it became an "Air Force Guided Missile Range". The officers of the other services remained but they were "advisers".

Reconnaissance for the Missile Range Survey

Upon my arrival at Patrick Air Force Base, I found it in a deplorable condition. Previously a Navy Base, it had been abandoned for a long time. Some of the barracks were very soon renovated, and the remainder of the repairs were begun. The former Officer's Club had the roof caved in, and, while that was being repaired, the Officer's mess and sleeping facilities were held in the VOQ (Visiting Officer's Quarters).

Because of the time required for the Hiran Group to become established at Ramey Air Force Base, I had adequate time to make a reconnaissance for the survey through the islands and decided to make the reconnaissance personally. The reconnaissance required the selection of the station sites and obtaining the permission of the heads of government on each island. An explanation of the reasons for the survey had to be given. Also, there were certain conditions to be fulfilled for the best reflecting conditions for the Hiran ray path. It was a project I felt I could not trust to flying personnel.

Early Work at Launching Site on Grand Bahama

During the reconnaissance period for the Missile range, the launching site on the northeastern part of Grand Bahama was being prepared. During that time a number of interesting incidents occurred.

On one occasion, I had some business at the site. This was before the landing field at the site had been built, and we had to land at the old strip at the southwest end of Grand Bahama where I was met by a truck. Shortly after we left West End, we came upon a small group of Bahamians on the road who asked for a ride. We obliged, and they climbed into the back of the truck and chattered merrily as they rode north for over fifteen miles. Finally, they asked to get off, and we stopped for the purpose. Inasmuch as there was no settlement near where we stopped, I asked them where they were going to walk to. Their answer surprised me. They had just wanted a ride and were going to walk back. It was the first ride in a motor vehicle that they had ever experienced.

A triangulation survey of the Bahama Islands was required, and I had arranged for a U.S. Coast & Geodetic Survey Party to be sent down to do that work. During the reconnaissance, it was necessary for some of the men to clear an area of low brush. Unfortunately, they did not know that that low brush was poison oak, a close relative of poison ivy, and several of the men were hospitalized for some time with a virulent rash.

On another occasion, it became necessary for me to confer with the chief hydrographer of a U.S. Navy hydrographic ship which was doing some surveying off the east coast of Grand Bahama. We flew to the landing field at West End, Grand Bahama, and enroute sent the Navy ship a radio message that I was arriving at West End. Shortly, we received a message that I would be picked up at West End by helicopter and taken out to the ship. They did so, and we flew out to the ship landing on their helipad. This was a new experience for me, and I enjoyed it. Our conference was that evening and I remained on the ship for the night, returning to West End in the morning. As we approached the field, we noted a large group of Bahamian natives near the landing field and the pilot said, "Watch me surprise them!" Whereupon he swooped down as if to land, but, just before touching down, he came to an abrupt stop in the air and then backed up for about 200 feet. By that time the Bahamians had become familiar enough with flying to think that all aircraft had to maintain a forward flying speed, and it was

inconceivable to them that an aircraft could actually fly backwards. It took some time for them to get over their excitement as they screamed, leaped into the air, and waved their arms in their exuberance.

Prior to the airborne reconnaissance, I established the sites for the first stations by traveling to them in a small sub-chaser which had been assigned to Patrick Air Force base and which was manned by Air Force personnel. We selected a number of the earlier stations in this manner and not without some difficulty. We first visited Great Abaco, and then selected a site for a station on Little San Salvador Island near the northwest end of Eleuthera Island. As I went ashore there, I saw a Helmet Shell (*Cassis madagarensis*) on the rocks. It had been dragged there by an octopus which was trying to consume the mollusk. An octopus poisons its victim, but so far the poison had not taken effect, and the octopus was suffering many cuts and abrasions on its arms from the radula of the helmet shell. The shell was in good condition, and I rescued it from the octopus only to clean it out to place in my collection.

As we left Little San Salvador, a severe northwest gale developed, and we had to take shelter. The only safe harbor was at Eleuthera in Rock Sound. I went ashore there for several days while the gale raged. The only place to stay was at the exclusive Rock Sound Club, where, even in those days, the cost was \$17 per day. My per diem being only \$7 per day, I was out of pocket \$10 for every day I remained there. When I filed my income tax, I deducted the extra cost with an explanation which was accepted by the IRS without question.

The gale began again as we left Eleuthera, and that little sub-chaser could only run before the wind, so we headed southeast. We tried to anchor at the south end of Cat Island, but it was too deep close to shore and the holding bottom was poor. While attempting to anchor, I scanned the terrain on the south end of Cat Island with binoculars and selected a tentative station site which later proved to be the final location on the island for the station.

With the gale continuing, we again ran before the wind in a southeasterly direction finally ending up on the south side of Rum Cay. There we attempted to enter a small bay, but found it too shoal and had to go back out to anchor. I then went ashore and hiked across the island to the north shore, a distance of about eight miles. The trail was rugged, the day was extremely hot, and we had no water to drink. Fortunately, we ran across a native who climbed a coconut palm and threw down several coconuts from which we slaked our thirst with its refreshing milk.

Enroute across the island I ran across a number of Cerion shells, a land shell with which I was quite familiar, but these were quite different from any I had ever seen. I later learned the reason. When Dr. Bartsch of the Division of Malachology had visited the Bahamas to study mollusks, he had carried Cerions from island to island to see if they would cross-breed. In fact they had done so, thereby creating a number of new sub-species much to the confusion of other scientists who did not agree with interference with the natural selection process.

The next morning the gale had abated, and, as we had selected a Rum Key station site at the northwest corner of the island, we took the little ship around the island. It was necessary to anchor some distance from shore, and we had a great deal of heavy equipment to land on the island. We contemplated a two day stay while we boated and rafted the gear ashore, but we got unexpected help. There were few natives living on the island, but nearly all of them must have come down to share in the excitement. I obtained plenty of assistance with a display of black magic. I had recently obtained a new pair of dentures, and I would pass my hand in front of my face and palm the plates and then grin at them with a toothless grin. Another magic pass and I would smile at them with a full set of teeth. I do not believe any of them had ever seen false teeth, and they first looked amazed and then whooped in excitement. They kept calling others over to see the magic. Possibly due to the entertainment they pitched in to help us, and we completed two days work in about three hours. They obviously

expected no compensation, but we delighted them by giving them a goodly portion of our canned goods stock which clearly satisfied them.

There was one drawback to that camp site which I was able to solve because of my experience in the Philippines. We were informed by the natives who assisted us that the nearest source of fresh water was a well two miles east of our campsite. However, I remembered that in the Philippines the Moros living on the small islands always had a sufficiency of pure water and learned that they were able to dig wells in the coral formed limestone within a short distance from the edge of the sea. I therefore selected a low spot back of the dunes in an abandoned corn field where I estimated we could strike water with a minimum amount of digging and instructed the boys to dig a well. It was not easy digging in that hard coral formed limestone, but at a depth of six feet the water flowed in as if from a spring. It was clear pure water, which had been filtered through the limestone, as all the salt had been filtered out by the limestone. During all the time Station Rum was occupied, there was a plentiful supply of water for the camp.

Our final station of that sea reconnaissance was Watling's Island, usually shown with the name San Salvador in parenthesis because that was the name given to it by Columbus. That was the first landfall of Columbus when he discovered America. A tall tree still stands on the eastern shore where legend says that Columbus made his small boats fast when he went ashore. It makes a good story, but I am somewhat skeptical as to the authenticity. However, a tablet marks the spot and tells the story.

For the air reconnaissance, I was assigned a Grumman Goose, an amphibian aircraft smaller than a PBY but larger than the Grumman Duck.

I spent one month flying from island to island. After I explained the mission to the ranking man on each island, we usually received hearty cooperation.

The preliminary arrangements had no doubt been expedited by a call we had made to the Governor General of the British Islands in Jamaica at an earlier date when I was accompanied by the British liaison officer at Patrick. We had been welcomed at the Governor General's residence where we had stayed over night, had had dinner and cocktails there, and a hearty breakfast served in our rooms on a terrace the following morning. The wife of the Governor was most charming, and I had long conversations with her. For dinner we had a mixed grill which included kidneys which I detest. Before realizing they were kidneys, I took some and ate them manfully.

The French were also cooperative, but we encountered trouble with the Venezuelans which I shall explain later.

The places I visited included the following: Panama where we contacted the Inter-American Geodetic Survey; Venezuela at Caracas; Trinidad; Tobago; Barbados; St. Vincent; Grenada; Martinique; Guadeloupe; St. Kitts; Grand Turk; Nassau; New Providence; Haiti; Cuba; Santo Domingo City in the Dominican Republic; Grand Bahama, Great Stirrup Key, Cat Island, Andros Id., Eleuthera Id., and Rum Key in the Bahama Islands; St. Thomas in the Virgin Ids.; and Puerto Rico.

Our reason for going to Venezuela was to obtain permission to include Aves Id. (Bird Id.) in our scheme. Aves Id. was a small uninhabited island southwest of Puerto Rico. A station there improved the scheme. The only evidence that human beings had ever visited the island was a small metal Venezuelan flag on a metal pole in the center of the island which was 1/4 mile long and about 150 meters wide. It was merely a strip of sand a few feet above high water.

After leaving Panama to fly east, we still had not received permission from Venezuela to establish the station or clearance to land. Therefore, we decided to by-pass the country. However our military attache at Caracas called us over the radio as we were requesting clearance to land and told us to land, intimating that

clearance was granted. Inasmuch as he was a full Colonel in the U.S. Army, the pilot who was a Captain felt obliged to obey, considering it an order. As we landed we were met by that Colonel and a Venezuelan Army officer in a jeep and were taken directly to our hotel.

The following morning our Ambassador called a meeting at our embassy and proceeded to raise hell. He stated that we were "smuggled into the country." He directed his remarks to me and the Colonel kept silent. When I had had enough, I broke in and told the true story. I told him the pilot asked my advice about landing and I advised against it. I said that the Colonel "ordered us to land", and then the pilot felt obliged to do so. I also told him I was not in the military services, but was a Coast & Geodetic Survey officer who had no authority over the pilot who was in charge just as the captain of a ship is in complete charge. The decision to land was solely the responsibility of the pilot and the military attache.

The Ambassador said no more, but the matter did not end there. Apparently the feelings of the Venezuelans were still injured, and about four months later a letter arrived at Patrick through channels from the State enquiring "why I had violated Venezuelan territory". Once more I described the circumstances, and that was the last I heard of the matter. I hope the Colonel received a reprimand for the trouble he had caused.

Upon returning from the reconnaissance, still without permission to install a station on Aves Id., I made two reconnaissance sketches, one of which contained Aves Id. and the other without it. This was forwarded to Venezuela with the comment that we would omit the island if they did not wish it located but that evidence existed that the island was far out of position. That statement later proved to be true, for it eventually was shown to be about one third mile in error. At any rate the threat to omit the island was effective, for we promptly received permission to include it in our scheme.

In Barbados we stayed at the best hotel for \$7 per day for a fine room and meals. That rate shortly afterward shot through the roof. It was spoiled by the oil field workers of Venezuela vacationing there.

In St. Lucia, I stayed at the Hotel Antoine, an attractive hotel high on a hill with a beautiful view of the harbor. Engaging in conversation with the landlady, I learned that the bookkeeper had some shells, and she asked me if I would like to see them. She called the bookkeeper who was a negress, and she brought out a shoe box containing some shells which we usually refer to as "beach trash". However, some were in good condition, and I saw shells which I recognized as new to me. I put aside about twenty shells and asked if she wished to sell them and how much she wanted. She amazed me by asking for 73 cents BWI (for British West Indies) or about 43 cents in our money. I gave her \$5 BWI, and she tried to give me more shells for my generosity but I declined.

Upon returning to Florida, I found a cone shell about which I was curious in Johnsonia, a Harvard publication on Malachology. It was identified there as CONUS dominicanus, Hwass. Johnsonia contained the statement "Harvard possesses but a single specimen of this rare cone, originally presented to us by Governor Rawson of the Bahamas." I had five, all in good condition, which at that time was the largest collection of that cone shell in the United States. The National Museum in Washington had one specimen, badly broken, and the Philadelphia Museum had none. In a publication which was published later listing shell values, C. dominicanus, Hwass was listed at \$200. Recently more have been found and the value has depreciated to \$15 to \$25.

I spent one Sunday on Antigua Id. in a nice hotel situated over a cove. I spent several hours in that cove and found a number of good specimens which were new to me.

The Surveying Teacher's Conference at Black Duck, Minnesota

In July and August, 1952, a National Surveying Teacher's Conference was held at Black Duck in Northern Minnesota. It was held at Camp Rabideau, a former CWA camp which was now owned by the University of Illinois. I received an invitation to give a paper on "ELECTRONICS IN SURVEYING." The Coast and Geodetic Survey issued orders so that my expenses were paid, and I took leave to attend the conference. Marian wished to go too, and, of course, that was at my expense. We both enjoyed the meeting, and Marian struck up a friendship with a number of the professor's wives.

The meeting was attended by engineers from all over the United States and Canada. My paper was very well received. A frequent comment was that it was the first time an important physical constant such as the velocity of light had been measured by a Civil Engineer instead of a physicist. That seemed to be a matter of pride to them.

There was a lake at the camp, and some of the hardy souls decided to go in swimming. Marian and I were among them. We put our hands in the water, and at the surface it seemed warm enough. Six inches down it was like ice water, and, when I dived in, I think I rose out higher than the wharf. That was enough for me, but Marian stayed in a trifle longer.

The Boiler Explosion

The meeting almost ended in tragedy. The camp had a large shower room and laundry which contained a 1000 gallon boiler which was fueled by a wood fire.

Professor McNair of Cornell University who was president of the conference had just arrived at a barracks building adjacent to the boiler room and had driven his station wagon up to the end door to take his baggage into the barracks. Several of us were in a nearby barracks which was to serve as the lecture room when we heard a loud explosion. We ran to the door and arrived there just in time to see that boiler, having crashed through the roof of the boiler room, still rising. As it reached a height of over 100 feet, it arched toward the end of the barracks where Prof. McNair had entered. We heard a second crash, and, running over, we saw that huge boiler resting on top of McNair's station wagon. Just moments before he and his young son had been in the car removing the baggage. They escaped death by a matter of seconds.

When the blast occurred, two men who were in that barracks were knocked down by the force of the blast. Another who was lying on a cot on the same side as the boiler room found a long piece of wood driven through the wall of the barracks. The point had missed his head by inches. It was most remarkable that no one was killed or injured.

Two years after the accident, the University of Illinois compensated McNair for the loss of his automobile.

Civil Engineering Conference in San Juan, Puerto Rico

A regional meeting of the American Society of Civil Engineers was also held in San Juan, Puerto Rico, to which I was invited to give a paper. I flew down by military aircraft. Marian and Tayloe, her sister, also decided to go, but they travelled commercially. My plane landed shortly after the commercial flight, so I was not there to greet them.

All commercial passengers landing at San Juan were greeted by a welcoming committee and offered a daiquiri, made, of course, with Puerto Rican rum. Marian explained her allergy to citrus fruit and asked for a small drink of straight rum. As she was holding it, she saw a bishop clad in his robes approaching and correctly surmised that he was an Episcopal bishop coming to greet her and Tayloe. As he reached them she held out her glass and said, "Bishop, won't you join me?" He replied, "I would be glad to if I were not in my robes." Just then, my plane landed and I found the two ladies talking to the bishop. The other

passengers saw an unusual sight as a bishop in his robes and a chicken colonel served as bell hops, carrying out the baggage of two ladies to a taxicab.

That was not the end of the rum episode. The ladies attending the meeting were given a tour of the island and one of the places visited was the Don Q rum distillery. Each lady was proffered a small souvenir bottle of rum. In the case of Marian and Tayloe, each received a full fifth of rum. When it was proffered, the young man said, "You are the best advertisement of rum we have."

When they returned to San Juan, Col. Hunkapillar told them that they would be unable to get their rum out through Customs. However, Jose Canal, the young Puerto Rican who was social chairman of the meeting and who had taken Marian and Tayloe on the tour in his car so they did not have to ride in the tour bus, assured them that he would escort them to the airport when they departed and assist them. He also told them to offer the Customs officers a drink in case they questioned the rum. However, they encountered no difficulty and departed with their rum.

Meanwhile, Colonel Hunkapillar, fearing that they would meet up with difficulty with Customs, had dispatched two more fifths of Don Q Rum to Patrick by one of his pilots. When I arrived at our house, they were found inside the door. Thus, the two ladies ended up with two full fifths of rum each, instead of one small souvenir bottle.

In their two day tour of western Puerto Rico, Marian collected some shells for me. The shells caused much more difficulty with Customs officials. When they stopped in Cuba, the Customs officials almost confiscated the shells. For a number of years, the export of certain species of shells from Cuba had been banned. The Customs men, not being conchologists, were not aware that the shells she had were not among the species banned from export.

The Missile Range Hiran Survey is Begun

After the completion of the reconnaissance, the Air Force Group in Puerto Rico began to fly some line crossings. For a number of lines the results appeared to be good. We made piecemeal least square adjustments to check the internal consistency, and, although the results were satisfactory, at the start I noticed that they had begun to deteriorate. Recognizing that something was wrong, I took the results to General Richardson and warned him that sufficient accuracy was not being obtained. I stated that I believe that the Hiran detachment should return to Florida, check their results against lines of known length, and investigate the source of the errors. This stirred up a tremendous storm, and ten or more officers and men from the group came to Patrick for a conference. I persisted in demanding a recheck and showed them the inconsistencies which were very apparent in the computations.

The upshot of the matter was that the technical Hiran personnel and the Hiran aircraft together with the ground stations were flown back to Florida. Basing on McDill Field, they spent eight months in the investigation. It was discovered that new and only partly trained ground station operators had actually changed some of the circuitry in the receivers. Each station was overhauled. Then the distances over fifteen geodetic lines between triangulation stations were carefully measured with the standardized equipment and the results agreed well with the geodetic distances. After that eight months of instrument refinement and retraining, the personnel returned to Puerto Rico and thereafter no difficulty was encountered. My insistence on the investigation had been vindicated.

Hiran Publicity

By now, I had published many papers and had given many talks. My papers had appeared in TRANSACTIONS, AMERICAN GEOPHYSICAL UNION; THE MILITARY ENGINEER; PHOTOGRAMMETRIC ENGINEERING, as well as accounts in many newspapers throughout the United States and Canada. Two notices had appeared in NATURE, the prestigious British publication for notices of new discoveries. I

had requests for numerous reprints from editors, scientists, and writers including Waldemar Kaemfort, the science editor for the New York Times. TIME magazine published an account of the new velocity of light I had obtained and headlined it, "HAIRLINE REVOLUTION". This annoyed me, for the discovery of a 1/20,000 error in the speed of light was by no means a small error. Three inches to the mile may have seemed small to the lay writer of TIME, but, had that error not been confirmed, it would have necessitated continual correction during the moon shots.

A clipping bureau, in an attempt to have me subscribe to their service, sent me a lot of clippings from newspapers and magazines. many of which I did not know existed.

I also started receiving letters from "kooks". One in particular was so weird that I still have it in my files. It was published by an organization which called itself, "THE INSTITUTE OF MAN". In an accompanying letter from the president of the organization were enclosed copies of letters which had been sent to Admiral Karo, C&GS, President Kennedy, and to Louis Carmichael of the Smithsonian Institute. Through some weird reasoning, they had "proved" that the Greek mathematicians, to escape persecution, had fled to this continent via England, Iceland, and Greenland. They were supposed to be the ancestors of the mound builders in the United States and of the Aztecs and Incas and the founders of those cultures. Because of much similar correspondence, I started a "NUT" file which was a good source of amusement.

Many scientists from foreign countries wrote to me. I received letters from Yugoslavia, Switzerland, Germany, Italy, France, England and Sweden. I had extensive correspondence with Bergstrand in Sweden who had invented the Geodimeter for measuring distance with infra-red light; with Essen in England who had measured velocity using a cavity resonator; and with Froome in England who used a microwave interferometer. They were all pleased to see their results confirmed by yet another method.

So many requests for talks poured in, that I was forced to decline most of them.

One of my papers attracted much attention. It was published in the MILITARY ENGINEER and was entitled, "USE OF SHORAN TO DETECT SURVEYING ERROR". As previously stated, the Hiran personnel, in rechecking their instruments in Florida, had flown a total of fifteen distances between known positions of geodetic stations. To one of those stations in Florida near Key West, there were five measured distances from established stations. The lines measured to that station were inconsistent with all the other lines. Upon investigation, I learned that that station mark had been reset from a reference mark. I made a least square adjustment of the network, and, as a result, I stuck out my neck a mile. I had predicted that the mark was reset in error. I predicted that the error would be .0067 statute miles (35.4 feet) in azimuth 39 degrees 45'.

The station was reestablished by the Coast & Geodetic Survey and the actual error was found to be .0069 miles, in azimuth 37 degrees. In other words, basing my prediction on 5 Hiran distances which varied from 86 to 320 miles in length, I had predicted the position error of that station within two feet.

Dr. John A. O'Keefe, Research and Analysis Branch of the Army Map Services, had a published comment on one of my papers which appeared in Civil Engineering which probably had a great deal of influence in causing my velocity measurement to gain recognition.

He stated, "THE SIGNAL STRENGTH ERROR WAS DISCOVERED WHILE EVERYONE BELIEVED IN THE ANDERSON VALUE OF THE SPEED OF LIGHT. THE AUTHOR COURAGEOUSLY INSERTED THIS CORRECTION IN THE CALCULATIONS EVEN THOUGH IT MADE ALL THE CHECKS WITH GROUND STATIONS WORSE AND REDUCED THE APPARENT ERROR TO 1/20,000.

HE REAPED THE REWARD FOR HIS COURAGE WHEN HE MADE THE DISCREPANCY THE BASIS FOR A NEW VALUE FOR THE VELOCITY OF LIGHT....HOW MANY OTHERS SINCE 1930 HAVE SEEN EVIDENCE THAT THIS VALUE WAS TOO SMALL AND HAVE BEEN AFRAID TO SAY SO."

The Exceptional Service Medal of the Department of Commerce

In 1952 I was notified that I had been awarded the Exceptional Service Medal of the Department of Commerce. The medal is the equivalent of the Distinguished Service Medal of the Armed Services. At an impressive ceremony in the Department of Commerce auditorium in Washington, the presentation took place. The medal and accompanying certificate were presented by the Secretary of Commerce.

On the face of the certificate which accompanied the gold medal, the citation read:

"FOR MAJOR CONTRIBUTIONS TO SCIENCE AND TECHNOLOGY IN THE MEASUREMENT OF DISTANCES BY ELECTRONIC METHODS."

The letter accompanying the citation contained the following:

COMMANDER ASLAKSON HAS PROMOTED THE ACCURATE MEASUREMENT OF LONG DISTANCES BY ELECTRONIC MEANS, AND DEvised METHODS AND PROCEDURES FOR AIRBORNE SHORAN DETERMINATIONS TO ATTAIN GEODETIC ACCURACY. HE DEVELOPED METHODS OF COMPUTATION FOR SHORAN TRILATERATION AND HAS STUDIED AND DONE EXTENSIVE RESEARCH ON REQUIREMENTS TO INSURE MAXIMUM ACCURACY ON SHORAN DETERMINATIONS. HIS STUDIES INVOLVED A NEW DETERMINATION OF THE PHYSICAL CONSTANT FOR THE VELOCITY OF LIGHT.

HE HAD WRITTEN AND PUBLISHED NUMEROUS ARTICLES ON LONG DISTANCE BY ELECTRONIC METHODS WHICH HAVE ATTRACTED INTERNATIONAL ATTENTION.

The Azusa System of Tracking Missiles

A new system for tracking missiles had been designed for the Air Force and it was installed at Cape Canaveral. Known as the Azusa system for the California City where it was developed, it was considered to be the last word in tracking accuracy. To measure the distance by the accurate radar involved differential readings from four radars installed at points at the ends of a cross, the distance between the radars being 50 meters.

In fact, the choice of distance was very poor. To measure and retain the extremely high relative accuracy required for distances of that length is nearly impossible owing to temperature changes and small seismic movements. When I asked the Air Force scientists why those distances were chosen in the design, the reply was, "Because it would be easy to measure." When I explained that had the distance chosen been 800 meters instead of 50 meters, it might have been possible to obtain and retain the necessary relative accuracy. They were astounded. By that time, it was too late to change the design of the instrument.

I felt it necessary to prove my point and arrange for the Coast Survey to send a detachment to Canaveral to make the measurements. Commander Phillips was in charge, and he spent almost six months measuring and remeasuring those distances and correlating the measurements with temperatures and other data. In the end, his work proved my point. Once more the Air Force wasted millions on a useless piece of equipment.

Phillip's work on that investigation was handled so well that he received an assignment of a similar nature in England. In the end, he acquired a fine reputation for careful studies of that nature, and he was awarded the Exceptional Service Medal for the following year.

Failure of the Early Inertial Guidance Systems

One of the early dreams of the Air Force was the use of inertial guidance which was thought to be the ultimate in accuracy for guiding missiles to targets over long distances. The System was based on the assumption that the direction of gravity could be accurately computed at any given latitude and altitude on the earth's surface or above it. What the Air Force did not know was that the direction of gravity or the plumb line varies from the theoretical value due to the irregular distribution of masses in the crust of the earth. These irregularities or deflection of the vertical are sufficient to cause considerable inaccuracy on guidance systems relying solely on inertial guidance, inasmuch as they vary irregularly over the earth as well as with altitude.

Once more, I sought a means of proving my point. I arranged to have astronomic parties come to the range and observe positions at many of the Hiran station sites. In addition, I found a method of determining the geodetic position of former astronomic stations by a photographic method in which Hiran was also used. I called this method the SCP (Shoran Control Point) method which I shall discuss later.

Using these data, I made a determination of the deflection of the vertical or the deviation of the plumb line at each station. Then by means of a least squares computation, I was able to draw contours of the geoidal undulations of the sea level surface of the earth over a wide area in the Bahama Islands.

The computation proved my point conclusively. A range mathematician, Dr. Ted George, a good friend of mine, used my computations at a staff meeting and convinced the local scientists that reliance solely on inertial guidance for missiles was fruitless because the values of the deflection of the vertical were not known with sufficient accuracy at a given altitude and latitude to be fed into a computer.

A paper on this subject was published in Transactions, American Geophysical Union in February, 1953. At a later date, I made a much more extensive investigation in a report I wrote for Aero Service Corporation of Philadelphia.

The SCP Method of Establishing Geodetic Control

During the progress of the Hiran survey of the range, the Air Force also made a photogrammetric survey of the islands. Additional control, other than the limited number of geodetic positions established at the ground station site, was required to control the photography. This gave me an opportunity to investigate a new method of establishing geodetic control in areas where a lower accuracy could be utilized.

I called the method I devised the SCP, for Shoran Control Point Method.

It consisted in flying over a point on the ground in four directions in the form of a cross with the camera and the shoran recorder operating at "runaway speed". Thus, there would be Hiran distances for each photograph. The point being photographed could be a house, a prominent rock, a sharp point of land, a lone tree or any object recognizable in all the photos. Then, the assumption that the camera was properly plumbed at the time the picture was taken allowed me to make a least squares computation of the Hiran coordinates of the point to minimize the accidental errors of the failure of the camera to be level when the exposure was made. The distances from the principal point of each picture to the point chosen to be located was scaled and used in the computation.

The SCP method was extremely successful and was used extensively later by Aero Service in the desert of Saudi Arabia and in the Peten jungle area in Guatemala. I published a paper on the method in Transactions, A.G.U. When the cost of conventional control is prohibitive, the SCP method proved to be very useful.

The 1954 IUGG Conference in Rome, Italy

In the Autumn of 1954, I received notification that I had been selected by the National Research Council to be a delegate to the International Union of Geodesy and Geophysics (IUGG) meeting at Rome, Italy. These are triennial meetings, I was most happy to accept the honor. My travel expenses were to be paid by the Council.

Marian also wished to go. Her expenses naturally were paid by me. Not having had a vacation in years, and, feeling that I could be spared for that short length of time, I decided to attend.

Our transportation to Europe was on the S.S. UNITED STATES, the beautiful ship of the United States Lines. My appointment arrived late and in one way that was fortunate for all the cabin class reservations in which the other delegates were traveling were taken. Thus, I was assigned to a first class state room. It was a large outside room with a huge bathroom, two large clothes closets, a very large stateroom with two huge double beds.

Traveling first class had one drawback. The first class passengers were very stuffy. One couple felt as we did and often sought our company. He was a wealthy oil tycoon from Texas and his wife was charming. We often had cocktails in their room before dinner. For many years we heard from them at Xmas time until his wife died a few years ago.

Another passenger, His Royal Highness, the Maharajah of Gaiwar of Baroda, also complained of the stuffy passengers. He told us he won the deck tennis tournament. However, it was by default. No one else entered.

On a few occasions, we sneaked down to the cabin class area to visit our friends. We could not often do this, for the practice was supposed to be forbidden.

On the trip to Europe the sea was very smooth and the passage was fast. We reached Southampton, England, in four days. While in England, I visited the National Physical Laboratory to call on Essen and Froome with whom I had had considerable correspondence. We were happy to meet personally.

Captain Hoskinson and Captain Roberts were also in London at the same time, as they were also delegates to the Rome meeting. One evening, the three couples were strolling about on Picadilly Square when a lady of the night approached me and was quite frank in asking for an appointment. I was slightly ahead of the others, and our wives were back of us looking in a shop window. I told the young lady she would have to request permission from my wife who was the smaller of three ladies. She passed by, and Elliot, who is somewhat a babe in the woods, said, "You spoke to her!" He did not understand what it was all about.

Holland - the Flower Auction - The Flower Festival

Crossing the channel, we first visited Holland stopping in Delft where I made some calls. Our room in the hotel in Delft was comfortable and quaint. The commode and wash basin were of beautiful Delft pottery. I am sure that by now some wealthy American had bought those fixtures and is using them as flower containers.

One day we were entertained at lunch by Dr. Roeleofs and his wife at a fine Dutch restaurant. Being unable to read the menu, Dr. Roeleofs interpreted for us. When he came to herring as an appetizer, we both assumed that it was smoked herring and said we liked it. When it arrived it was raw, but we swallowed it manfully as if we ate it every day. Later we saw people buying raw herring in the street stalls, having it scaled, and swallowing it like a stick of candy.

We left Delft for by automobile. Enroute our driver asked us if we wished to see the flower auction which was enroute. Of course we agreed, and we spent an interesting half hour at the auction.

The buyers were seated in a gallery of sloping seats in front of a stage on which carts filled with different kinds of flowers were carried. At each buyers seat, there was a key which he could press. On the stage there was a large clocklike device with a single hand. Prices were shown on the dial with the hand starting to move at the higher prices. As the auction of each kind of flower began, the hand moved rapidly from the high price toward the low. At the moment when a buyer was willing to pay the price, he pressed the button at his side. That stopped the clock, registered the price, and the type of flower. Everything proceeded at a rapid rate. The buyers were from many parts of the world, many from New York. We were told that almost as soon as a day's auction was over the flowers went out by air.

We then drove on to and arrived at our hotel. Immediately upon entering, the desk clerk said, "You do not have time to register! Register when you return!" When I asked, "Return from where," he replied, "Didn't you come here for the Flower Festival." That was our first news of that event, but, of course, we went. Seats had already been reserved in the grand-stand by our hotel, and they were good ones.

The event is an annual event, and we were lucky to arrive in time to see it. The pageant took place in the former Olympic Stadium with a huge and beautifully costumed cast. Both the semicircular ends of the stadium were a great mosaic of live flowers. We were lucky to be seated next to a Hollander who spoke perfect English, and he interpreted each event for us.

When the event was about 3/4ths over, a drenching downpour and thunder storm began. We were under cover, but the poor participants continued as if the sun was shining although they were drenched to the skin. Just as the pageant ended, the rain stopped. We departed to get a taxi to our hotel but could not find one as we were repeatedly shouldered aside for the few taxis available. Suddenly, I also realized that we did not even know the name of our hotel. At last we decided to try a street car as the crowd began to thin. Boarding one, I took out some change and held out my hand to the conductor. He selected the fare, I pocketed the rest and we headed toward what I hoped was the center of town.

We arrived at what I recognized as the railroad station which I remembered we had passed in our car as we entered . Grabbing Marian by the arm, we left the street car and hailed a taxi. I still did not remember the name of our hotel, but I pointed in the general direction. Shortly, I recognized our hotel which was not far away, and we got out. As I paid off our cab, I could tell from the look on the driver's face that he was thinking, "Just some more of those crazy Americans!"

Munich, Germany - Furstenfeldbruk Air Field

I made some official calls the following morning and we departed by train for Munich, Germany. The headquarters of our Air Weather Service was located at Furstenfeldbruk Field near Munich. Aware that we were arriving, our friends, Colonel and Mrs. Suggs whom we had known at Patrick, had urged us to visit them. Ralph Suggs was in charge of the U.S. Weather Service in Germany. We arrived on Sept. 5th and found that the Suggs had planned several fine trips for us. Unfortunately, just at that time General Moorman whom I had known in the Pentagon in Washington when I was in the Weather Service arrived to inspect the weather stations, and many of those plans had to be canceled to entertain the General.

However, we had one lovely trip to Obergammern where the Passion Play is staged. We were taken backstage and shown the costumes worn by the players. The mountain scenery on the drive was lovely.

On another evening, we went into Munich for drinks in the hall where Hitler staged his "putsch." Marian also had a trip into Munich one afternoon with Gladys Suggs and she found a most interesting silver wedding cup at an antique shop which she bought.

Zurich, Switzerland

We left Munich on September 11th, having had a fine visit. We drove there with our hosts, and it was a very beautiful drive. Enroute we passed through a short stretch of Austria, so we can say we have been in that country.

We spent two days in Zurich, and on the second day we took a long drive through the beautiful countryside to Lake Lucerne where we lunched and returned. Enroute we began to understand why countries avoid war with Switzerland. Far up in the mountains, there are manmade caves in which artillery is concealed which commands all the roads. The caves are obviously impregnable to bombing.

Swiss start their military training as young boys, and all able-bodied Swiss belong to the Army Reserve. They keep their arms and uniforms at their homes and can be mobilized at a moment's notice. The rifle training starts when the boys are very young. Our driver in his quaint way said, "Today is the shooting of the boys." In other words, they were firing on the rifle range.

When we were in Zurich, they still maintained those quaint enclosures of convenience where a man could attend to the call of nature on certain street corners or parks. It was surrounded by a wooden enclosure, and one could see the man's head above it and his feet below. It was not unusual for a man to ask his lady friend to wait while he entered. It seemed that it was unfair to the fair sex as there was no provision for women.

The IUGG Meeting in Rome in 1954

On September 13th we departed for Rome by train. Those wonderful Swiss trains are so well run it makes us regret that we (the Unions and the Government) have let our trains deteriorate as they have.

It was a great pleasure to me to find that news of my work with Hiran measurements had reached all the countries of Europe. Daily I was buttoned by delegates from many countries to enquire about Hiran. The fact that it had been sufficiently accurate to detect the velocity error was what seemed to impress them most.

Once more, I was approached by Virgil Kauffman, the president and principle owner of Aero Service with regard to joining his company. He told me that they had purchased some shoran equipment and already had some contracts for shoran controlled photogrammetry. I assured him that I was interested, but my services were needed at Patrick for at least six more months.

The location of the conference was in an elaborate group of buildings which had been built by Mussellini for International meetings of that nature. Long sessions were held daily, but, as is common in such meetings, the personal contact and exchange of views between the participants outside of the regular sessions were most important.

Scheduled Entertainment for the Ladies

There was an excellent schedule of entertainment for the ladies. Marian took in all the tours, and, as usual, with her close attention to detail, she was always near the front. If I wished to locate her, it was simple. She was never more than one meter from the guide, notebook and pencil in hand.

Several buses were available for the tours. The guide in each bus spoke a different language to accommodate the wives of the delegates from different countries. The guide for the English speaking group was a University professor and was very knowledgeable. As a result, many of the ladies from other countries who understood English crowded onto that bus, and it was always full.

On one occasion, the good guide was not available. Instead, an Italian woman, who gave every indication of being a Communist and showing a dislike for Americans, kept remarking, "You Americans send all your criminals like that Lucky Luciano over here." Marian waited patiently for some of the more senior ladies to speak up, and, when no one did, she could tolerate it no longer. She interrupted and said, "That is enough of that! We sent Luciano home! He was an Italian, illegally in our country, and we deported him!" Lady Bullard, the wife of Sir Bullard, an English delegate came over to Marian and said, "Good for you! I wondered why some of the Americans didn't speak up."

On visiting St. Peter's, it was interesting to note the Catholics bowing before the bronze statue of St. Peter and kissing the toe which was highly polished from that attention. Some, however, seemed to feel it was more sanitary to put their forefinger on the toe and then kiss their forefinger. The good guide provided some information which was apparently not common knowledge. He informed the ladies that the statue was actually a statue of Jupiter which the Catholics had installed in St. Peter's and renamed it St. Peter, ignoring the fact that it was of Roman origin.

On one weekend tour, no papers were scheduled, and I accompanied it. We visited the ancient Roman port of Ostia and later Anzio Beach, the site of the tragic landing in World War II. Ostia is no longer a port. Due to the uplift of the land over the centuries, it is several miles inland. There is a small museum there, and, as we approached it, I saw some land shells clinging to some weeds. They interested me more than the artifacts, and I collected several species, placing them in a plastic rain coat cover which I put in a plastic brief case provided for the delegates.

As we left Ostia for Anzio Beach, I was seated next to Mrs. Ross, the wife of a Canadian delegate. She turned to me and said, "Captain, did you lose something?" Holding up her hand, she showed one of my snails clinging to the back of her hand. Then she pointed to the ceiling of the bus, and I saw dozens of my snails crawling over the ceiling. They had crawled out of the brief case which had been placed on the baggage rack. As we bounced down the rough road, I spent the next twenty minutes picking my snails off the ceiling and putting them back in the plastic cover which I then secured more carefully. I collected more shells at Anzio Beach, but they were beach specimens and not mobile.

That episode was always brought up at future IUGG meetings which I attended and was always a source of merriment. I never lived it down.

Madrid, Spain

After leaving Italy, we flew to Spain and spent a short time there. In Madrid we stayed in a hotel which apparently was familiar with the dining hours of Americans, for they served meals at reasonable hours.

However, one evening we dined at a fashionable restaurant. We arrived at 9 PM, and the place had just opened and was devoid of other diners.

We finished our meal about 10:30, and a few dinner guests were just arriving. Again we ate out at a small excellent restaurant near the hotel. After we ordered, the waiter returned to the table and placed a small U.S. Flag in the center. Glancing around the room we noted that many of the tables had flags from other countries. Apparently, the waiters made a practice of guessing the nationalities of the different guests.

We ordered arroz con pollo or rice with chicken. When the dish arrived, the plate was surrounded by some small clams with attractive patterns. They were new to me, and I asked the waiter to take them to the kitchen, wash them, and bring them back wrapped up. At the moment he seemed puzzled, but when I explained that I was a shell collector he beamed. He was also a collector and understood. He shortly brought back my shells well cleaned and neatly packaged.

Portugal

Leaving Madrid, we hired a car and drove to Portugal. After some sightseeing in Lisbon, we drove west to the resort town of Estoril. We walked through the grounds of the casino there, and I collected some more land shells on the casino grounds.

We continued west, stopping briefly at the ancient Moorish town of Sintra. The town contains the palace of the old Moorish kings and is maintained in good condition exactly as it was in the days of the Moors. We were particularly interested in the enormous kitchen which occupied a room which must have been close to eighty feet long. In the center was an enormous conical fireplace where the food was cooked.

After collecting some more land shells near Sintra, we drove on westward to the extreme westernmost point of Europe. There was a restaurant there and we ate lunch. We then returned to Lisbon.

We did some shopping in Lisbon, and I purchased some charms for Marian's gold charm bracelet. The gold work in Portugal must be eighteen carat by law and is therefore often quite soft. Care must be taken at times to reinforce the wires which hold charms, or they might be lost. Marian also bought a flower tray about a foot long which was made in blue pottery similar to Delft. It had the figure of a mermaid riding a sea horse, and the tray itself was in the form of a stylized scallop. All we now have left is a photograph of that tray. We kept it on a table near our front door. One day an American primitive picture hanging above it fell down and broke it into hundreds of pieces. Marian liked it because she has a thing about mermaids, and the base was a shell so it seemed appropriate.

Paris and the Hotel France et Choseul

We next flew to Paris where we spent a few days before returning to the United States. We stayed at a quaint hotel called the France et Choiseul. We did not think much of the place, but later on the ship we learned that the "in" crowd considered it chic and many stay there. It was very old, and the rooms on the floors above the ground surrounded an open courtyard. It was originally built before the days of private baths, but now the rooms all have them. They converted bedrooms to bathrooms, and thus the bathroom is at least as large as the bedroom. It had all the fixtures of all European baths including the bidet. That appliance came in handy for me. It was a most convenient place for cleaning shells.

We ate at a restaurant where there were a number of different shells in the window. I ordered a number of each type and confounded the waitress by asking her to wrap them up instead of eating them.

When we checked out to take the train for Cherbourg, the concierge told us there would be some delay. Apparently we had to hold up our cab while they rounded up all the entire hotel staff. Practically the entire staff appeared at the door with our baggage. There was not enough bags for all of them, so in some cases more than one of them had hold of a single suitcase. Among those at the door were maids, busboys, waiters, and even kitchen help. Most of them we had never even seen, but they were all holding out their hands for tips. I solved the problem by handing the concierge a few bills and telling him to spread them around as he saw fit. Apparently the "in" crowd which had stayed there had spoiled them.

When we were in Paris, a recent law prohibiting the blowing of car horns in the central part of the city had just been passed. In lieu of blowing the horns, drivers let their left hand hang out of the car door. Instead of blowing their horns, they banged on the car door. I think horn blowing would have made less noise.

Again We Sail on the SS UNITED STATES

At Cherbourg we took the train ferry to Southampton, England, where we boarded the SS UNITED STATES once more.

Our smooth trip across the Atlantic did not prepare us for the return trip. We had thought that a huge ship such as the UNITED STATES would have little roll and pitch, but we learned differently. The weather was very heavy on our return, and we pitched, rolled, and tossed like any other vessel.

The furniture in the lounge had been bolted down to the floor, but at least some of the chairs were not secured. One afternoon, one lady who was sitting in a chair skidded forty feet across the lounge, striking a grand piano, and breaking several ribs. We later learned that we passed through part of Hurricane Hazel.

Marian, having learned what caused her allergies, was no longer subject to what before she had thought was seasickness. I had always been a good sailor, and we didn't miss any meals in the dining room, although frequently there were few there when we were. In fact, on one occasion our table steward almost lost his breakfast when Marian ordered herring.

One of the exotic dishes on the menu was "bird's nest soup". In Borneo I had seen huge baskets of the nests on the wharf waiting to be shipped and had noted they were full of feathers and other foreign matter. Therefore I had always refrained from it in the Philippines. Besides, it was too expensive for my purse in those days. That was a long time before, and this voyage I permitted myself to forget the feathers. We both ordered it and found it to be a tasty and delicate broth.

We had been seated at the table of the Chief Engineer. He was also a fourstriper and was most congenial. He took me on a tour of the engine room, and that huge power plant was well worth seeing.

Arriving in New York and clearing Customs, we took the train for Patrick Air Force Base and once more I got back into the harness.

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