was a very successful preparation. Twenty of our classroom were received, which was the best for any other preparation at this year. It is perhaps for this good preparation that I had the pleasure and honor to be a member of the "X" Family regrouping of former alumni of the Ecole Polytechnique. Then one year in Ecole Polytechnique, which was quite an excellent and bright period.

NEBEKER: 1938-39.

CHAPUIS: Yes. The first of September 1939, at the war declaration, we went to the army because Ecole Polytechnique was an army school, and then I trained six months in Fontainebleau.

NEBEKER: You were training to be an officer?

CHAPUIS: Yes. I was already considered an officer in Foutainbleau. I had the privilege to be in one special type of army, which was called "Artillerie Coloniale," which was to operate in foreign lands in connection with indigenous troops (which were partly black). I thought that General Headquarters could consider sending me to Lebanon. They had plans to make a big rush of French armies through Turkey to destroy all Nazi oil sources in Soviet Caucasia. But these were plans that were completely unrealistic! Instead, I was sent for training troops in southern France. At this time I had a team to control targets of three batteries of an artillery group.

NEBEKER: You were instructing?

CHAPUIS: I was instructing people who were butchers or bakers to use logarithms and firing tables.

NEBEKER: Yes.

CHAPUIS: It was a pleasure for me to be a teacher and to explain what was a logarithm, how you take the numbers and then transform them. They were quite good and rapid in calculations. Then came the end of the war. The Colonial Troops were then regrouped in this part of France where we passed together en route to Zaragoza. And then I had to take a second year at Ecole Polytechnique. From the twenty of my classroom in the preparatory school, only fifteen returned after the war, and five died during the battles of June 1940 and deportation. But that is another matter. And we had a second year of Polytechnique.

NEBEKER: So your military service ended in 1941?

CHAPUIS: Yes, or more exactly the end of 1940. Because you had German restrictions on the military forces of France, according to the Armistice Convention, the status of Ecole Polytechnique was changed to become a civilian high school.

NEBEKER: Right.

CHAPUIS: Then we had the second year in Lyons. At the end, within the range of choices decreed by your class rank, you selected one branch or another of activities. I went to telecommunications.

NEBEKER: What was your original intention when you started at the Ecole Polytechnique?

CHAPUIS: No idea at all. I did not know much at all of the vocation of an engineer. I wanted to be an economist, but then there was no economics program. Now there is. So I went into telecommunications. With telecommunications, in the Ecole Polytechnique, you study mathematical analysis, at which I was quite good. Analysis is important for telecommunications theory. Thus I went into the service of the French PTT (Poste, Telegraphe, Telephone; a state administration), what has now become "France Telecom." Then you have to pass two years of technical education in Ecole Nationale Supérieur de Télécommunications (ENST), which is comparable to the MIT program in communications science.

NEBEKER: Was it in 1942 that you chose telecommunications?

CHAPUIS: Yes.

NEBEKER: You immediately went into the service of PTT?

CHAPUIS: After two months of vacation at home. Then I went to the Ecole, which was in Paris. This was Occupied Paris and far from my family area, and I was literally starving. Of course we were French civil servants, but we were paid at a very low level, just subsistence. So I had two years in the ENST. At that time, since many military were off duty, instead of there being twelve or fifteen of us for the PTT in the ENST, we were about 150 alumni, with many officers from the French air force, army, or navy who went into electronics and later, some of them, into very good careers.

On the first of July 1944, I began my active service in the French "Long Lines." It was for me a very exciting period, but very hectic! The French long-distance cables had to be restored by the French Long-Lines teams when they were not

directly in the battlefields, according to an agreement between German and French offices. There was sabotage of the cables by the French Resistance. Cables were also destroyed by bombing of Allied planes of roads and railway tracks. Plenty of work to be done.

Thus I traveled with the cable repair teams. We used the trucks of the French Long Lines. It was good because we were allowed fuel to go to various places outside Paris, country places where we could also find some food. Sometimes, when we had finished restoring the cable, small armed groups of the Resistance would arrive, and we would tell them "OK, let us restore it. When we finish, one day later, you can come back and cut the cables again."

NEBEKER: You were traveling throughout Occupied France?

CHAPUIS: This was in '44, and since 1942 all of France was occupied.

NEBEKER: You were mainly in the Paris area?

CHAPUIS: I went north, near Flanders, also south near the Loire, and so on. At the end of July, after my first term with the cable teams, I went to Lyons to be at its main repeater station. That was a very bad journey from Paris to Lyons: it took two and a half days by train.

NEBEKER: Why so long?

CHAPUIS: Bombing. The train stopped whenever the planes came. Then we scattered into the countryside, then we returned to the train. Then I remember in Dijon we were parked quite a long time. I saw a train of people going to deportation. What could we do?

In Lyons I had also some narrow escapes. I went for liaison to Vichy, which was then one of the headquarters of French Telecom, and said, "What shall we do when the Allied troops come?" I received a very diplomatic note — this was at the time of Vichy government — telling me, "You restore the cables so we can get the connections from Lyons to Paris."

I've skipped many details. I came back, hitchhiking or walking, from Vichy to Lyons. Then I went to a subsidiary repeater station. Then a German team of Alpine Jaegers came through the repeater station and asked, "What are you doing here?" That morning the Resistance had come and, after firing, left some cartridges on the ground. Well, by chance I could speak a little German and got out of a very unpleasant situation.

Then in September I came back to Paris, where I spent three years at the headquarters of French Long Lines.

NEBEKER: That was in September '44.

CHAPUIS: Yes. I was in the office supply. I was a big boss. I could have made a fortune — but I didn't — because I received gas from the American Army and converted it into tickets for sending to the repeater stations. Then after one year I went to the transmission department, where we had to restore the repeater stations' equipment. Fifty percent of the repeater stations had been destroyed, totally or partially, especially by Germans when they had to leave France.

NEBEKER: So that was after the war?

CHAPUIS: In '45, yes. Another interesting story: On the 14th of July 1945, I was with a British major near Cherbourg. I discovered what is not very well known in the telecom history. It was the terminal station of the submarine carrier-telephone cable that was laid down at the same time that the Allies put an oil pipeline from England to Cherbourg. The telephone cable provided communications to the Allied headquarters network and also the French network. This cable is the first carrier-telephone cable in the world to have been laid across the sea.

We were working quite a lot with the British and Americans at this time. I was a civilian, they were Army Signal Corps majors. Later I had a colleague in CCITT, D.J. Dormer, a British engineer, who was in 1944 a Signal Corps major and in charge of the terminal repeater equipment of this cable. He told me the following: "We started from Liverpool, where I was with my team since June 15, and arrived on the first of August at the Cherbourg terminal. When we arrived there, we met another British Signal Corps engineer, who had also just arrived, also in duplicate, from another part of the UK, having the same terminal equipment in charge. He arrived at the same time as me. You see, army logistics is sometimes perfect and even chance is also quite efficient." That is only a small story for this first submarine carrier-telephone cable crossing the Channel, which was longer than 160 kilometers.

After three years in the transmission department, I was called to ITU (International Telecommunication Union) in Geneva, in what was called CCIF (F was for Telephony). It was the body which had been set up in 1924, at the time when Germany was quite important for Telephony and F was for Fernsprecher (German for telephone). Later, in 1956, CCIF merged with what was called CCIT, for Telegraphy. Then it became the CCITT, which died in 1993.

NEBEKER: Were you still employed by PTT?

CHAPUIS: No. When I moved to CCIF, I moved out of the French PTT and became an international civil servant.

NEBEKER: So you were being paid by the ITU?

CHAPUIS: Yes. We had quite a long time to get about the same pay that other people have in ITU and other UN specialized agencies.

NEBEKER: From that point on you worked in Geneva?

CHAPUIS: Yes. In France at that time we were no longer starving, but we had ration tickets for bread, meat, and so on. Geneva was like a paradise. Then I had a boss, who was a very clever man and a good boss at the same time. By the way, in 1949 when I came to Geneva, I took advantage of marrying and having a dear wife and a family. I used also these first years in Geneva to complete law studies (civil law and international law), passing at Grenoble University my law degree.

NEBEKER: To get the chronology straight. In September of '44 you went to Paris, to the Long Lines headquarters.

CHAPUIS: Yes, for four years, until October '48, when I started with CCIF. I married in January '49.

NEBEKER: Can you describe your duties at CCIF?

CHAPUIS: At CCIF in the beginning I was occupied with signaling. We followed with long-distance automatic (dial) telephone services, at the international level, i.e. switching and anything that was operation and planning. But that was very European. CCIF was nearly completely European then. 1960 was the beginning of the worldwide audience of CCITT and of a global communications network.

NEBEKER: That is, even though CCIF was nominally a worldwide organization, it was then mainly European?

CHAPUIS: Yes. CCIF was replaced in 1956 by CCITT, the merging of telephone and telegraph. Since you are an American, let me tell you that the position at that time of your State Department was "No merger. Telegraph is one matter, telephony another. You should not join these two matters which are different." However, the merger took place.

NEBEKER: I see.

CHAPUIS: AT&T, but not the U.S. government, was represented. It was, in fact, a very symbolic representation. Generally they sent, every other year, their representatives, sailing on the *Queen Mary* or *Queen Elizabeth* with their wives, staying eight days for the plenary meeting, and giving blessings to the passing of communications agreements. But they were very friendly. There were also representatives of the ITT, International Telephone & Telegraph. It was a multi-national company, which was considered by Americans as purely European and by Europeans as purely American. ITT had operating companies in Chile, Cuba, Argentina, and Mexico. So Chile, Cuba, Argentina, and Mexico were represented at all plenary assemblies of CCIF and later CCITT.

An anecdote from the plenary assembly in 1951 in Florence, Italy: the diplomatic consul from Argentina in Florence sent a nice invitation to the representative from Argentina, but he turned out to be a British man who did not speak one word of Italian or Spanish; because the consul did not speak English, the dinner was an uneasy affair.

In 1956 CCIF let the position to CCITT. Then we had a new boss, a former general director of French Telecommunications, Jean Rouviere. He had been in disagreement with one of his PTT Ministers, and he was not very happy to come, even if it was for a good salary and—contrary to his former assignment—he had not too much to do. He was a very bright gentleman and a perfect diplomat. We have to pay tribute to him for what he did to obtain a worldwide audience of CCITT.

The first sign was the first plenary assembly of the CCITT, which was held in New Delhi, India, 1960. Rouviere was a pure Frenchman and did not speak English. Even though my English was shabby, he took me as his assistant in a wonderful tour of discovery of telecommunications in the United States and Canada. That began in June 1958, and it was a tour of nearly three weeks.

We had plenty of technical visits. We went to AT&T headquarters, to Murray Hill and also to Holmdel. At that time, Holmdel was nearly nothing, just sheds across country fields, but with plenty of antennas and large parabolas dishes. We were received in Washington by the FCC and by the State Department. I went to Chicago to visit the impressive Western Electric factory. Very interesting. I kept a diary of what we did on each day.

Then, after touring the USA, we went to Canada. It was just after the opening in 1956 of the first transatlantic submarine

telephone cable. In Canada, they had about ten circuits to Europe, out of thirty-six telephone circuits through the first transoceanic telephone cable in the world. There was a lot of difficulty for them to cope with the rush of intercontinental traffic, now at affordable prices, for business and private customers. By 1960 telecommunications was global, and there was quite a lot of progress in studies. So we had plans for its signaling.

NEBEKER: You're talking about telephone signaling?

CHAPUIS: Yes. How could we merge signaling in the transatlantic cable between different systems in order that we could have operator dialing from the United States to Europe and vice-versa as well as, later, automatic dialing? At the same time we were quite open-minded in the CCITT, making studies of the problems of telecommunications in Third World countries. The agreement reached was that we had to do things for Third World countries, to have some "compendium" [?] if these countries didn't wish to be completely in the hands of only one company.

CCITT set up autonomous groups, "GAS groups" according to the French name, which were to make manuals for good techniques. CCITT was of course concerned with international connections, but in any international connection, there is a part for the international and another part for the national. All that determines the quality of transmission for the connection, a quality depending, inter alia, on the characteristics of the national telephone sets.

NEBEKER: I'd like to hear more about your own work at CCITT. You were concerned with signaling?

CHAPUIS: Yes. First, I did policy-making. I wrote the policy papers that were to be approved at the Plenary Assembly, saying that we had to make studies on international signaling and to receive the agreement of everybody.

We also had to consider the requests of Third World countries and to write some guidebooks for various matters of operation, especially switching and signaling. To chair the first GAS group, "National Automatic Networks," we had a very bright, young Australian engineer, Roger Banks. So after New Delhi 1960, we had the 1964 Geneva Plenary Assembly. Its GAS manual was considered unanimously as an excellent book and a model for other studies by GAS that were instituted for other disciplines.

NEBEKER: How important are these Plenary Assemblies for the policy setting of CCITT within ITU?

CHAPUIS: These are for determining the policies. The director presents policy papers, which can be slightly amended, saying what should be done for the next study period. For international subjects, you have eight to ten study groups which have definite fields of interest. They are the ones that propose questions for further studies.

NEBEKER: Are matters decided at the Plenary Assemblies? The study groups make certain recommendations, which the Assembly is then asked to approve?

CHAPUIS: Yes. These recommendations, once approved, are printed. A Plenary Assembly is rather formal. The work is performed by the study groups. They present reports. In thirty years I have seen only one case where a study group recommendation was not approved. Then, expressed as CCITT recommendations, they are published (in three languages) in various volumes of the CCITT book, a book the color of which—blue, green, yellow, etc.—characterizes the Plenary Assembly, which is held every four years. The work for the standards defined in the recommendations is performed during the four years' study period by the study groups, which met generally two or three times. Sometimes the study groups delegated questions to working groups to make more detailed studies.

NEBEKER: Was it often the case that European telecommunications engineers would have one view, and U.S. engineers another?

CHAPUIS: Sometimes you had clashes of opinions. But all the engineers were good friends. Keeping this friendship was mainly my duty in the meetings when I was acting as secretary and reporter. I had the awful duty of writing the report, and reaching agreement for the reports. I had often to ask the chairman, "Can you say again what was decided?" I put it in words. Then it had to be reviewed and was open to amendments.

NEBEKER: I read a journalist's characterization of discussions at the European space organization: he said typically the Scandinavian countries and England, sometimes with Germany, took one position, and France another.

CHAPUIS: Yes. We also had cases of this type. We had, of course, technical competition.

When I began my international career, the most important country was the United Kingdom. Between 1950 and 1957 I went to London every year. The UK was very important, the British were very pleasant, and we were often invited. Then there was a failure of British industry. They decided it was expensive to invite their fellows of various countries. We were never again invited to the UK. Beginning in 1958 I went nearly every year, for twenty years, to the United States. I discovered then that the leading country for telecommunications was no longer the United Kingdom, but the United States. After the war Germany was completely out. The French were not so good. The United States was very advanced. But for the Europeans, it was nearly a completely foreign world.

An anecdote about British engineers. I went to the headquarters of the General Electric Company.

NEBEKER: The British GEC?

CHAPUIS: Yes, we must be careful with names, because you have General Electric in the United States. The British General Electric (GEC) is a separate company, as is the German AEG, which means General Electric in German. And in France you the Compagnie Generale d'Electricité. All these companies have the same label, but they are completely different. It was in Coventry.

NEBEKER: I see.

CHAPUIS: I was lunching with the British boss of the company manufacturing automatic exchanges. He told me that he had been all over the world: South Africa, Australia, Argentina, New Zealand, Canada. But he had never crossed the Channel. He did not know what Europe was.

1956 or so was the first transatlantic telephone submarine cable. The transpacific cable, just after, was the link of worldwide communication. 1960 is a very historic turning point for the history of telecommunications.

NEBEKER: Because of these submarine cables?

CHAPUIS: Yes, you had telephone submarine cables with repeaters, which was made possible by transistors. That is the change which opened worldwide the telecommunications.

NEBEKER: So around 1960 you began getting a faster growth in international telephone traffic?

CHAPUIS: The rise was becoming exponential, with a growth of fifteen to twenty percent per year. In 1960 at CCITT we had international worldwide prospects, and we were also opening to the Third World and writing guidebooks which were called "manuals." We wrote a manual about what to do if you are to plan automatic telephone operation—the required telephone exchanges—in a country. Roger Banks, the Australian chairing the GAS group to write this manual, was extremely good, and that book in 1964 was a success. He was then selected to be the general director of a British manufacturing company of telecommunications equipment. After two years he had to return to Australia. He was too clever.

NEBEKER: Can you explain that?

CHAPUIS: Because the final results were perhaps not good. It was the time of the failure of the British equipment industry for telecommunications, after having led the world earlier. It was mainly due to the British Post Office. And the British Post Office (GPO), you will remember, was flawless. It's a very interesting story. There was a bright telephone engineer, T.H. Flowers, who we had seen very often in CCITT meetings. Later I discovered that he had been the man who built the Colossus. You have heard of the Colossus?

NEBEKER: Of course.

CHAPUIS: He was the electronics man for the Colossus, a computer-type equipment to decipher German cryptographic messages during the war. He worked on that. He was a very clever man. And in the British GPO later he was the proposer of time-division switching. But it was too early. It was at the time a failure.

NEBEKER: Was that his own proposal?

CHAPUIS: Yes. But it was too early. They had a prototype that didn't function well.

NEBEKER: Who made the prototype?

CHAPUIS: That is explained in my book. It was made by four or five companies with a joint committee. And, as is the case with many joint committees, everybody brought his own equipment. So it was terrific. They said, "Okay, it's just a prototype." But then they said, "We'll adopt it later, and for now we will continue with our standard type of switching equipment, the Strowger." Then the British industry lost its foreign customers: Australia, Argentina, and so on.

NEBEKER: I see. These other systems, the crossbar system and so on, were better in the 1960s than what the British were manufacturing?

CHAPUIS: Sure. The Strowger system was invented by Strowger in the 1890s. I went to a Strowger factory in India, where they were building the equipment by hand. That was fifty years past technically. It was completely displaced by the crossbar, which was a Swedish invention taken over by the AT&T people, and in the 1960s the crossbar was the leading switching technology.

NEBEKER: You acted as an assistant to the CCITT Director?

CHAPUIS: I was one of his three "Senior Counselors" directly involved in policy-making.

NEBEKER: You wrote many reports?

CHAPUIS: Quite a lot, but I was also launching the idea of an international planning of telecommunication routes. CCITT accordingly set up a commission for this planning. It was finally suppressed in 1985, and now everybody is doing their plans!

NEBEKER: I'm trying to learn what the different tasks were that you worked on.

CHAPUIS: I was assistant to the director in charge of telephone operations, in charge of telephone switching, concerned specifically with the problems of connecting the large diversity of national networks, each of which had its own signaling system. In 1960 we began designing international signaling systems.

NEBEKER: What years did you work on that?

CHAPUIS: I had to put a serial number on the different types of these international CCITT signaling systems. At a committee meeting, I said, "This old one will be Number 1." And now everybody is speaking of Number 7 signaling system.

NEBEKER: And when did that start?

CHAPUIS: In 1967 we still had a diversity of systems, and it was the time for Signaling System No. 5, which was used for transatlantic routes. You could dial directly from the States to Europe, and vice versa. It was a rather simple system. Then we designed System No. 6.

There are two different types of signaling. You have signaling directly on the circuit of the connection, and you have what is called common-channel signaling (C.C.S), where you have a special circuit for passing the signaling for a diversity of circuits.

NEBEKER: I see.

CHAPUIS: We had a first version of a No. 6, with a lot of controllers. This system was defined in 1968. Before putting in the system, we had an extended—maybe eighteen months—field test between the United States—not in Chicago but nearby—Australia, Japan, London, Frankfurt, Paris, and Rome. As an anecdote, I remember that we had to discover with the national systems to be tested the periods where people were not on duty, and we had a terrific frame where we registered the few days where everybody was able to work together!

NEBEKER: I'm curious about the nature of your work on these international switching systems. Was it mainly a matter of finding some sort of compromise system that could be used by all the different national networks?

CHAPUIS: I was not an inventor. Nobody was an inventor. The job was made by experts to build a completely new system, the No. 6 and it's successor, the No. 7

NEBEKER: Your job was more that of a diplomat?

CHAPUIS: Yes. One of the best diplomats I have known was G. Wallenstein, who was able to speak all languages, and who was very clever.

Have you heard of the very good Bell Labs engineer Charlie Clos? He lent his name to the topology of the non-blocking switching matrix inside office equipment: the Clos Network. Clos was a good man. After one meeting we had a drafting committee of three or four. For the British there was a Mr. Sam Welsh, who was a very strong character. Clos would say, "Okay! I shall not stay one minute more!" Mr. Chapuis was saying, "Okay, okay, come along." Finally we would have a whiskey bottle, and we could continue to work.

But the clash occurred, even if it was just a matter of drafting. But the decisions were finally taken, especially for system No. 6. We had also a lot of clashes on that one. Then it came to No. 7, which was discussed in a very closed group of "seven experts." Nobody asked to see them, and finally they presented their report, which was accepted. But that is completely the international way of life.

Consider, for instance, the "SHERPA" meetings working in preparation, or alongside, the G-7 meetings of the seven leading industrial countries. For the signaling system No. 6 field trials, I had to write the report. I said, "Gentlemen, you have spent so much money in all your countries that we must report, just like in an AT&T report ... blah blah blah blah."

And I wrote a good paper on these lines. Then the Australian came and said, "No, we cannot publish that because otherwise we shall have trouble with our finance office."

It is just like the story of the first ESS (Electronic Switching System). After its success, everybody was saying AT&T was wonderful. They have set up their first electronic switching system. They started at twenty million dollars (in 1950) and finished at 150 million dollars. Then they said it was the expenses for the prototype.

Cooperation with AT&T was always perfect. The trouble was that ITU was an international body, who had an administrative council that fixed budgets. Your State Department wished to pay the minimum. At the time of Rouviere, we tried to have a big overview of what should be the policy with the data and telegraph: it should be merged for with all of this telephony transmission. The U.S. State Department said, "No, no good." Europe and Japan said, "Yes." The merging of data and telephone finally took place harmoniously in the CCITT. "No comment."

NEBEKER: So that was from 1960 or even earlier that you started working on that sort of task?

CHAPUIS: Yes.

NEBEKER: Specifically with signaling systems?

CHAPUIS: Yes. Then I was head of the Department of Operations, and I also promoted economic studies, which was my hobby.

NEBEKER: What economic studies in the CCITT?

CHAPUIS: First we had to line up and modernize the antiquated statistics of ITU. We tried in a GAS [?] to determine the ratio of investment to operation expenses and so on. On my own I made some private studies, which were published. I sponsored a 1960 review by Huntley, formerly AT&T's chief engineer, saying that the capital value of the plant of AT&T, or of any good telephone company, is in the range of two or three times the value of its revenues. Why do you have this magic figure? We cross-checked it with the statistics we had in ITU for about twenty countries.

To account for it I made a theory. The theory depends on the length of time, a depreciation time of say twenty-five, twenty, or fifteen years for the equipment, that you have to use to determine the amortization of equipment. It is also masked by depreciation of money, and that gave rise to difficult computations. I also met a German engineer, Mr. Jipp, who was both a telegraph specialist and a distinguished economist. (As an economist, he had been very good with his own stocks). He made the classic comparison, which was new at the time, of the ratio of the telephone density ("telephone penetration") to GNP per capita. That, in logarithmic units, is a straight line. If you are on the straight line, you are just fine. If you are down, you have to do quite a lot. If you are up, you are spending too much. And I had the pleasure of christening the "Jipp Law" which has become a classical notion in telecom economics. Another matter we had, I was in charge of telephone operations.

NEBEKER: What period was that?

CHAPUIS: Oh, I was always jumping from one study group to another and to telephone operations. We had to adjust a very regulated and antiquated system. Before the opening of the submarine cable, transatlantic telephone was a luxury, you see. It had a very high price. You only had to say to an operator, "I wish to call Mr. Frederik Nebeker who is in Princeton, from Cannes." That was a luxurious service. It was a personal call. Then you had the collect call. All that had to be adjusted. Another matter, which is an important international one: when you do automatic dialing from the United States, before going international, you dialed zero-zero?

NEBEKER: Zero-one-one.

CHAPUIS: Yes. The official international standard should be zero-zero. From Switzerland you dial zero-zero. Then you dial what is a country code. You dial your "one" which is for all North America, covering Mexico and Canada; and you call 33 for France, 22 for the UK. We had to make the country code determinations. (I was fighting against giving France 22 instead of 33, because in France 22 is a joke. It's the police are coming. [Laughter] It is not a good number, so we picked 33). And then we put only one digit, 7, for all the USSR, which was clever because they haven't many telephones. The USSR was a union of many separate states, which have now become independent.

Then in 1964 we had the Plenary Assembly. We had a big clash for "code countries". For five days, engineers were not allowed to open their mouths. What should be the number for the German Democratic Republic (GDR)? And the Allied Powers said, "There is no German Democratic Republic. There is only one part of Germany which is occupied by USSR troops. So they are not entitled to have a specific country code." And then they called diplomats.

NEBEKER: What was the resolution on that?

CHAPUIS: I think GDR were given a number which would be used in special circumstances. And one year later, the

German Democratic Republic was considered a member of the United Nations, and there were no more problems.

Another anecdote on this mixing of diplomatic considerations and practical technical operations. Once I had a friend who was German, who had been fighting near Moscow, and who was never able to go to Moscow. We should have had a Plenary Assembly in '64 in Moscow. But the USSR people did not accept the kind of Chinese gentlemen who were considered by the United States and the United Nations. So my friend did not go to Moscow.

In CCITT study groups, we never voted. We arrived at consensus. Finally, I discovered the diplomatic definition of consensus, which was obtained after two months of discussions in the big international UN conference on human rights at Helsinki at the end of the 1970's: "Nobody agrees, but nobody is so strongly opposed that he would refuse." And that is the consensus definition that officially exists. I am afraid that now the consensus has begun to split, and you have American standards, you have European standards, you have Japanese standards.

When I retired on 31 December 1984, I was called by an American company to be their senior switching engineer in Riyadh, Saudi Arabia, for writing the specifications of switching for 500,000 lines. That was quite an experience because it was nearly the first time that I was a free man. All the while until then I was just a respectful servant of everybody else's opinions.

NEBEKER: And how long did you work on that project?

CHAPUIS: Twelve months during two years with a return every three months.

NEBEKER: You were organizing a switching system?

CHAPUIS: I was writing the specifications for what is called a tender, an offer to equipment manufacturers for an electronic digital system. At this time the ESS-5 produced in the Netherlands by Phillips was one of the competitor systems. You had ITT System No. 12 competing. You had also L.M. Ericsson, who finally got the contract, competing.

In Saudi they had a copilot to Saudi Telecomm, a Canadian team beside each Saudian. The Canadian group, later replaced by an Australian team, was provided by a large contract with Bell Canada. They were very much American-biased. Sometimes we had small internal conflicts: "No, it's not American standards. It's CCITT standards that are to be the basis for the specification tender, according to the Saudi instructions."

NEBEKER: That was for two two six-month periods?

CHAPUIS: Yes. My experience, though it was sometimes frustrating, gave me an opportunity to visit another new country. I have over the years visited many, many countries, in fact, nearly all countries in the world, except Israel, South Africa, Bulgaria, and Albania, and, of course, these new republics of the USSR. To make technical visits in these countries and also to meet many friends.

NEBEKER: In the long period you were with CCITT, you worked mainly as a diplomat, trying to reach consensus?

CHAPUIS: I tried to be such a diplomat. I do not know whether I succeeded. I nearly went back to the French administration, but they were in a ministerial changeover in the beginning of the 1970s just at that time. They would say, "Okay, you have a position." Then the boss would change, and I stayed in Geneva.

NEBEKER: So you were ready to leave ITU at some point?

CHAPUIS: Yes. I had three exceptional bosses. The first one, George Valensi, a very clever engineer. He was the inventor of a color TV digital system, which was quite good, but it had no commercial outcome. He was a bit difficult sometimes. The second one, J. Rouviere, was not only a diplomat, but also a wonderful speaker. He should have been a political man. Sometimes we were in conflict. Then there was R. Croze, who took the position for four years. He was a former General Director of Telecommunications of France. A very fair man, but a little less skilled in diplomatic relations. Then we had as director some administrative man, and that was the beginning of the CCITT death.. I then published two books after having submitted several papers.

NEBEKER: In what period was that?

CHAPUIS: From '76 to '84. Eight years. After I retired I meditated, and controlled things, but no more excitement.

NEBEKER: I see.

CHAPUIS: I will comment on mainly two points. One is 1960 equals worldwide telecoms. That is very important. Another top change is 1980, when all things become digital. That is again a matter of consensus. Everybody goes digital. 1980 was the digitalization of the world, of telecommunications, bringing data and so on, ISDN and all this business. ISDN was

a very interesting matter. AT&T people knew perfectly what was ISDN, but your State Department did not discover ISDN before it was published in CCITT. ISDN would have been much more rapidly introduced in the States if AT&T had been more behind it.

NEBEKER: I see.

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(m.hoffman@ieee.org)
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