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Dear Dr. Tracey:

Thank you very much for giving me a copy of the rough draft of the paper on the early days of electrical engineering and television at K-State. I was not at all familiar with the beginnings of the department.

As one of the three living individuals who were active in the earily days of television at K-State, I can possibly supply some information that was not available to Professor Jorgenson, since he was not directly connected with the television work.

Professor Kloeffler was a strong advocate of communications. His expertise was in telephony, but he saw the great impact radio had made and he was sure that television would make at least as great an impact. However, I doubt that he, or any of us who worked on the project, envisioned the great impact that it has made.

In late 1930, Kloeffler wrote me a letter asking that I return to K-State and said that he planned to start a program in television. I was to design and construct a television receiver, and would be employed by the E.E. department. I was in Salina after dropping out of school in one of my several displays of aversion to studying - I much preferred to listen to short waves and build receivers. Kloeffler and I had become good friends in 1928 while I was enrolled at K-State, and earning part of my expenses by servicing radios and refrigerators for a Atwater-Kent and Kelvinator dealer.

H. H. Higginbottom had been employed by C. Francis Jenkins who was operating an experimental television station in Silver Springs, Maryland. Because of the 1929 depression, Higginbottom had been released and was hired by Kloeffler to build a television transmitting station at K-State. Higginbottom reported for work in September of 1931.

L. C. Paslay was also a victim of the depression at General Electric, where he had been employed for several years. Paslay was very knowledgeable in the field of electronics, and was employed as an assistant instructor in the E.E. department.

The design of the receiver was pretty much a "seat of the pants" affair. K-State, at that time, did not possess an adequate audio or radio frequency generator. We also lacked a vacuum tube voltmeter. I selected the superheterodyne design over the tuned radio frequency, and this was a departure from the usual practice in late twenties and early thirties. The receiver was completed in the summer of 1931. In 1931 only experimental television transmitters were on the air. Three differant scanning disks were in use; the 45 hole three spiral rotating at 900 rpm, the 48 hole rotating at 900 rpm, and the 60 hole disk rotating at 1,200 rpm. Pictures were received as soon as the receiver was completed, but it was evident that the noise level, in the engineering building, was very high. The 60 hole disk was designed to run at synchronous speed with the power line frequency, and it was evident that the frequency control of the K-State power plant was not adequate. The receiver was moved to my apartment which was near the corner of 17th and Laramie. Dean Seaton mentions this receiver in the May, 1932 edition of The Kansas Industrialist.

The noise level in my apartment was low, and pictures were received from several stations in New York, Chicago, Silver Springs, Maryland and occasionally from Florida and Southern California. It is believed that these were the first television picture reception in the state of Kansas. The Kansas City Star carried a short notice of this reception in the early fall of 1931. RCA and CBS operated transmitters in New York City, and I reported to them regarding my reception of their pictures. Both were surprised that their pictures were being received so far from New York. CBS sent me a sheet each week listing the time and type of program to be telecast, and asking for a report. I remember one evening they televised an eclipse of the moon taken through a telescope. Fully half of the moon was eclipsed in the picture from New York, while in Manhattan, Kansas the moon appeared to just be touched. I began to realize what a wonderful thing television could become. In the September 10, 1972 issue of Life magazine they cover the early days of television. Quoting from page 68: "RCA engineers in a mid-Manhattan studio trained their arc lights on a papier-mache statue of Felix (the cat),picked up the reflections on a battery of photoelectric cells and sent his likeness whizzing all the way to Kansas". It was the K-State receiver that picked up Felix's image - I got to know him well.

When I started on the receiver, Kloeffler asked me to prepare a paper on the design. The paper was to be presented before the convention of the American Institue of Electrical Engineers held in Kansas City, Missouri. The convention featured a number of papers given by student electrical engineers from universities throughout the United States. What is essentially the paper I presented in Kansas City, was published in the Kansas State Engineer in late 1931 or early 1932. The very abrupt ending was caused by the time limitation placed on the last several speakers. Many more

papers were submitted than had been expected. The first five or six speakers used more time than planned, so the following speakers were alloted considerably less time. I had hoped to go into the receiver design more fully, and make a few comments on possible future developments. It was obvious that television needed many more scanning lines, but there seemed to be no easy answers. Mechanical scanning was reaching its limits; what we really needed was another method of scanning. More scanning lines means higher modulation frequencies resulting in greater bandwiths. It was evident that television transmitters had to go to higher carrier frequencies. I also suggested the use of single sideband to reduce the bandwidth required. The K-State paper was the only paper presented that did not deal with electrical power.

Following the October meeting in Kansas City, Kloeffler felt that we should get the receiver on campus, where it would be available to visitors. The location chosen was the old serum plant located on a hill behind the stock pens. The location was ideal as far as noise level was concerned, and the building was supplied with power from the university power plant; though the building had been abandoned for several years. The interior consisted mainly of animal stalls, but there was one room that probably had been an office. The door to the room could be locked and it had a fuel-oil heater. My only means of transportation was by foot. I can remember many a cold winter night when I trudged up the hill to the Engineering building, through the campus and up another hill to the serum plant, and then shivered while I waited for the oil heater to start.

The signal level received, at the serum plant, was excellent; the picture quality ranged from good to terrible. The problem was ghosting due to multipath reception. The image quality would vary from minute to minute; while at other times it would stay good for an hour or more. There were nights when the ghosting was so great that it was useless to operate the receiver, and there were a few nights when there seemed to no ghosting. The receiver was quite sensitive and New York was received as early as 2:00 pm in the fall and winter months; this reception was usually quite good. In 1931, the television stations did not transmit any audio except for station identification; the audio was carried by a regular broadcast station. Two receivers were required, one for audio and the second for visual. One of the Chicago stations had a weekly program with a doctor talking on various medical problems. The man's voice was carried on one of the regular Chicago stations, and was easily received in Manhattan. New York audio was not as consistently received.

My experience, at my apartment, showed that the Kansas Light and Power Company operated their systen at a frequency that was quite close to the systems serving Chicago and New York. The synchronization was not perfect and the received image would drift slowly across the screen. By removing the mask from the neon tube, two inages could be seen. I would watch one and when the image drifted to one side I would shift my eye to the other image. This seemed to be a small price

to pay to see something the same instant as it was happening in New York. The power frequency problem, at the serum plant, was solved by having the university power plant "float itself" on the Kansas Power and Light line that was available for use in an emergency. The K-State plant would adjust their alternators so that they did not give or take appreciable power. On my treck to the serum plant, I would stop at the K-State plant and tell them that I was on my way to the serum plant; the operator would then parallel with Kansas Power. This system worked very well with one notable exception. One night the operator paralleled with Kansas Power, but he noticed that that he was putting out large amounts of power. He tried slowing the speed of his alternators, but his load remained constant; it seemed that anything he tried did not help. About 20 minutes later a Kansas Power employee rushed into the K-State plant and wanted to know what was going on. The breakers in one of his substations had blown and would jump out in his face every time he tried to close then. It was obvious that K-State was supplying power to the northwest part of Manhattan. The Kansas Power employee returned to his substation and phoned the K-State power plant, and on a signal K-State dropped the load and Kansas Power picked it up with only a few seconds of interruption in power to northwest Manhattan.

L. C. Paslay was put in charge of the design and construction of the K-State television transmitter. He was assisted by Higginbottom, E. F. Peterson, Merle Burgin and myself. Kloeffler told me that K-State was the first university in the United States to receive a television transmitter construction permit. The transmitter went on the air in the summer of 1932. We were joined on the air in early fall by Purdue. The first antenna used at K-State was a horizontal zepp. The broadcasts consisted of printed cards, or simply one of us sitting on a chair and, perhaps, pretending to be studying. The method of "pickup" used in the early thirties required that the subject being televised be in a dark room, and lighted only by the pencil of light from the scanning disk; this is described in my article published in the K-State Engineer. Today the subject is brightly lighted. The scanning pencil of light produced a stroboscopic effect, and Higginbottom described an amusing incident that occurred while he was working for Jenkins. They were attempting to televise a lady playing a harp. The stroboscopic effect made the modes of vibration of the harp strings visable. The young lady played just one chord, when she gave a little shreek and stopped. She said that it looked like she was playing a bunch of snakes, and she couldn't continue.

Shortly after we went on the air, Kloeffler and I went to Junction City to check on the picture quality. Kloeffler was horrified at the K-State image - there were so many ghosts that the image was barely recognizable. The ghosts moved around slowly showing that they were caused by the propagation path. We had to be putting out strong vertical signals to produce so many ghosts so close to the transmitter. A letter was written to the U.S. Bureau of Standards, asking for

their advice. The Bureau had few ideas, but did suggest that we try a vertical antenna. The university did not have the money for a steel tower, so Paslay designed and built a wooden tower. The tower was made conductive by tacking a copper wire along each of the four sides. The vertical antenna did reduce the ghosting. Paslay has a brilliant and inventive mind and he made many improvements in the transmitter and scanner area. The problem of generating many scanning lines was not solved until the development of the iconoscope by Zworykin. The scanner problem at the receiving end was solved by developments in the cathode ray tube.

Kloeffler was anxious the advertize the television work at K-State, so higginbottom and I visited a few of the larger towns in Kansas. Two attempts in Topeka were flops. We had been invited to give a demonstration before a group of doctors - the first trip was before the K-State transmitter was on the air. Five of the doctors had visited me at the serum plant, but on a rather poor night with considerable ghosting. Higginbottom gave a talk explaining how television worked, and I was to show pictures. I checked the reception but it was poor, so I switched to a small closed circuit film unit that we carried with us. We had just one film which was a cartoon with the character always shown in silhoutte. It made an excellent demonstration film. The title was "Fat Fanny Farmer Falls Fast And Furiously".The cartoon character was a very heavy woman skating on a pond, and finally falling and breaking through the ice. One of the doctors asked how the flat plate neon looked. I removed the mask but struck the top of the tube breaking the tube. I dug out my spare but it too was defective - so no show.

The second Topeka try was before a teachers convention; the K-State transmitter was now on the air, and we were going to televise pictures from K-State. Higginbottom gave his talk while I watched the K-State picture which was quite good. The program was at 11:00 in the morning so we had no ghosting problems. Just before the teachers were to file past the receiver scanner, K-State went off the air. The station returned in a few minutes and several of the teachers got to view the image. Once again the station left the air, but returned again in a few minutes. K-State left the air once more, but did not return. A phone call to Paslay revealed the source of the problem. A laboratory class was working in the electrical engineering lab and some kept blowing the breakers, knocking the transmitter off the air. After the third time, Paslay had tossed in the towel. Such were the trials and tribulations of the very early days of television at K-State, but it really was fun.

I must apologize for writing a "book"; it certianly was not my intention when I started this letter. It seemed that one thing always led to another. I do hope that a small part of my long-winded letter will be of some interest.

I will always be thankful to Kloeffler, dean Durland and Kerchner for their constant prodding and encouragement. I doubt that I would have ever returned to school, if Kloeffler had not written me and asked that I return. I did not begin to study until I started in graduate school; suddenly it became easy to make an A. Perhaps, I had finally grown-up, or possibly my marriage to my high school sweetheart had an effect. I did not get to finish my graduate work because of the depression. The depression had hit Kansas by 1933, and the university appropriation was cut 25% and the instructors were to be cut only 10%. This left Kloeffler little money to pay the graduate assistants. We were cut 50%, and I did not have to money to continue.

I have always been thankful that K-State had instructors who were willing to show a personal interest in a student. It was for this reason that my wife and I set up our scholarship program at K-State.

Sincerely,

Walter