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U. S. Naval Observatory
Oral History Program

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A. H. Mikesell
Signature

18 May 1990
Date

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3 August, 1988

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Date: 3 August 1988
Place: Baltimore, Maryland - IAU Meeting
Interviewer: Steven Dick

Mikesell: Do you, by the way, have either maps or pictures of the Naval Observatory grounds as it was after 1900?

Dick: We have a large photograph collection. I don't know if we have any particular to that. Why?

Mikesell: It was just interesting, the number of out-buildings there were and what different out-buildings did. Many of them were unoccupied in '36, and with my master key, I would go in, exploring what was inside. There were Peter's photo labs down next to where he'd set up the 10-inch and the 26-inch mounting. Those are underneath the building that the Almanac office in in - Building 52.

Mikesell: Right. They were all razed during the war, when Building 52 was put up to bring in the instrument shops.

Dick: I generally proceed chronologically from the beginning. Usually the first question I ask, just to make sure, is when you were born, where, and your parents' names.

Mikesell: I was born in San Diego on January 28, 1914. My father was Wilbur Beery Mikesell, my mother Hespra Hougham.

Dick: How do you spell the middle name of your father?

Mikesell: Beery. He was a cousin of the famous movie actor of the '20s. Noah Beery and Wallace Beery were both cousins.

Dick: Where was your early education?

Mikesell: Fresno State College at Fresno, California, and then University of California Berkeley. I left there in '36.

Dick: Did you get a degree in astronomy there?

Mikesell: No. I majored in astronomy, took three years, without

a degree. Grabbed the job and came up.

Dick: Were there any astronomers there who were particularly influential in your astronomy?

Mikesell: My particular instructors were C. D. Shane, and, of course, Armin O. Leuschner, Stirla Einerson, Tracy Crawford. I think Trumpler was the most influential. Really I only had him for about a year or two. He had just come off the mountain from Lick when they ran out of funds, and they put him down there.

Dick: Do you remember where you got your first interest in astronomy?

Mikesell: Oh, yes. That was about eighth grade. Yes, eighth grade, when I went back to Fresno from Eugene, Oregon. I knew I was interested in astronomy, because I went through all of the astronomy books in the Fresno Public Library, through Duncan's Astronomy at some edition then, and I revelled in Bell's book on the telescope, which was in the library there. That was the same library that William Saroyan writes about when he writes his tales of growing up in the San Jaquin Valley. He was also in Fresno, but he'd gone through about five years ahead of me, or a little longer than that. He also went to Berkeley.

Dick: Then you went on to college. You say you were there for three years.

Mikesell: At Berkeley.

Dick: How did you find out about the job at the Naval Observatory?

Mikesell: That was simple. Nobody had any jobs then. There weren't any jobs for astronomers anyplace in the country in 1936. The U.S. Civil Service announced an open examination. In those days, that meant registering for the exam and then taking this examination, which an examiner would get out of a sealed envelope and hand you. You'd sit down and write it up, put it back in the envelope, and then he'd send it in to Washington for grading. Leuschner pointed out that this was an opportunity for any of these students. Lawrence Aller had already gotten promise of a fellowship at Harvard. Gordon Wares had a promise at Yerkes of a

little support. Dan Popper could care less. Horace Babcock could care less. Horace had a bachelor's from Cal Tech and was busy getting his Ph.D., and he knew what his subject would be, and he was going straight forward. History relates what his degree was. He was doing radial velocities utilizing the Crossley 36-inch.

Lawrence and I and Gordon and perhaps one or two others, several of whom have died, went down to the post office in Oakland, took the exam. As an interesting point, although there was no question Lawrence was ten times as bright as I was, he got a much lower grade, which shows something about both the Naval Observatory that created the exam, and what the questions were in the exam. C. B. Watts wrote the exam.

Dick: This was not a civil service exam, then.

Mikesell: This was a civil service exam.

Dick: But it was particular to the Naval Observatory?

Mikesell: Absolutely. I told you a moment ago that times had been very hard, and if we are to believe Hellweg [Superintendent of the USNO at the time], he had saved the Observatory, but he had agreed that everybody would accept a cut in pay. So everybody took a 15% cut. Times were hard enough that people like John Willis figured he would soon be out of a job, so he went out on the road toward Frederick and bought himself a farm, which, if he had saved, would, of course, have made him a multimillionaire several times over.

Dick: This was later, you're talking about.

Mikesell: No, he bought that in about '33 or '34, right when it happened, and moved out there to a farm. The highway to Frederick then was such that that meant he was out, for practical purposes, to hell and gone. He lived out there, though, Willis did, until he left the Washington area. As I say, he sold it much too soon. He sold his farm at a loss, whereas if he had kept it, he could have sold it, because it's underneath the National Bureau of Standards now.

Dick: (Laughs) I see. It would be worth a lot. Let's go back

to the exam. These people who you were talking about, they were all graduate students with you, is that right?

Mikesell: We were all graduate students together.

Dick: And you all went down at the same time to take this exam.

Mikesell: That's right, in the room together.

Dick: So they wanted a job at the Naval Observatory, then?

Mikesell: Well, there were no other jobs. Leuschner explained to every one of us, individually and collectively, that he thought it would be always a good idea for a graduate student to go out in the real world and work a little bit. The only real world was, indeed, the Naval Observatory then; that was the only thing that could approach the National Observatory and remained so until Kitt Peak came along.

Dick: You went to the Naval Observatory, and other people didn't. Why was that?

Mikesell: One of the other people finally did. I went there because I rated number two in the scoring. You had to get a percentage grade of 75 to be considered, according to civil service rules, and when they first graded the papers, there were two people in the country that got over 75. One of them was William Markowitz, and I was the other one. William had just gotten his degree at Chicago. The civil service told the Observatory they had to do something about the grading, because there wasn't enough people that had passed. About 20 people had taken the exam. So they reworked it, and then they included in there a chap, he came along about the number-three grade then, and I was trying to think of his name. His brother is more famous in astronomy than this fellow was. I'll think of it. His brother, in the '30s, was famous for meteorites. [Lloyd R. Wiley]

Dick: So it was Leuschner who knew that there was a job opening.

Mikesell: He saw it, yes. In other words, the announcement must have gone to every department of astronomy in the country.

Dick: Right. Was there only one opening or more?

Mikesell: They were going to have three openings, which is one of the reasons they had to regrade it. So they had to get at least three people passing the exam. Well, they ended up with more than three, because John Irwin went there under this same exam. John Irwin had taken enough units in astronomy at Berkeley to qualify for the job in terms of their requirements for something like 12 or 24 college units in astronomy before you could even take the exam. John, although he was an engineer by degree from Berkeley, from the School of Engineering, he had been interested in astronomy enough to take extra units. So he had it. When they regraded, he qualified. But the first three people were Markowitz and me and [Lloyd Wylie], a very famous name.

Dick: And the third name that you can't remember, did he go to the Naval Observatory?

Mikesell: Yes, he went into the 9-inch transit-circle division under H. R. Morgan. Somebody then resigned or moved out, and so within a year there was another vacancy, so they immediately reached onto the roster and took John Irwin. He went into H. R. Morgan's division and worked alongside of Pat Scott, who eventually became head of that division.

Dick: These three openings, do you know why the Naval Observatory suddenly had three openings at that rather depressed time?

Mikesell: Sure. Congress and the Navy--the Navy, conceivably because Hellweg made a good enough story. In fact, after this famous incident of Hellweg versus FDR, Hellweg, I was told by other officers, had a high reputation down in Main Navy. Navy was still a very closed club prior to World War II. There weren't many naval officers extant in all, and everybody knew everybody. A very tight community.

Time Service at the Naval Observatory always had five young naval officers. These were chaps, three of them, if not four, were fellows who had completed their first tour in the Navy as ensigns and just been made lieutenant (junior grade). Then there was always a senior chap who might be a lieutenant. That would

make four, and sometimes there were five.

Dick: I know you were in the Time Service for a while, and I wanted to ask you about that. First, the famous incident that you just referred to about Hellweg, this occurred before you actually went to the Observatory.

Mikesell: It occurred in 1933. That's when that Collier's article came out.

Dick: Can you tell me what you know about this incident, what the circumstances were and Hellweg's role?

Mikesell: I know the article. I read that. This was an article telling about the government waste in Washington, D.C., and the new administration was going to sweep this clean and get rid of all this waste.

Dick: The new administration being Roosevelt.

Mikesell: Correct. "As an example of the waste, look, there is the U.S. Naval Observatory occupying all those acres of beautiful land in the heart of the District of Columbia, with nothing but a decrepit old telescope and one old astronomer that goes up there and looks through the telescope at the sun, and as it becomes noon, he yells, 'Time!' That is thereby setting time for the nation."

Dick: Do you know who wrote this article and what year it was?

Mikesell: 1933 is the year. I don't know who wrote it. It would be one of their hack writers, of course.

Dick: And this is Collier's magazine.

Mikesell: Collier's magazine.

Dick: What happened after that article came out? Did somebody in Congress read it?

Mikesell: The article was to justify the action which the Navy had been instructed to do, which was to wipe out the Observatory and make the land free for real-estate development.

Dick: So something had happened before this article was written?

Mikesell: With the new administration, the Navy was ordered to get rid of the Observatory so that that land could be given to friends of the new administration. I mean, this happens in Washington, you know, all the time. Even from across the country I've watched it in the last administration.

Dick: So the Collier's article didn't set the whole thing off. The Collier's article just added fuel to the fire.

Mikesell: This was to justify it. After that, then Congress wouldn't be able to say no.

Dick: So what happened then?

Mikesell: Hellweg immediately, with this article in hand, went down with the article and with the instructions from the Navy to proceed to disband the Observatory. He went down to the President, asked for, and got, a personal interview with the President. I am quoting Hellweg. The President heard Hellweg say that they should not be closed down, and then the President said, "Look at what you've got there. It's not worth saving." Hellweg said to the President, "Mr. President, that is all a lie!"

And, said Hellweg, the President got very red in the face, he sat back and looked like he'd explode, but he didn't. He said, "Go and work something out." So Hellweg went back to the Navy with that verbal command, and the Navy said, "Well, we're going to cut your budget, in any case."

So Hellweg went back, and the first thing they did was to not fill the next three vacancies. Those are the vacancies of which I am one person. The next thing they did was to ask everybody to give back 15% of their pay. I went to work in July '36. I must have taken the exam probably in April. By the end of '35, the Observatory had won permission from the Navy and Civil Service to replace the vacancies which had been developing, not only in those succeeding years, but there had been vacancies already existing in '33. They were to be allowed to fill them. This time they were going to fill them at astronomer grade.

Previously, you see, in the '30s, there were three levels of government employee. The worst was the blue collar. For example, a messenger at the U.S. Naval Observatory would get $750 a year starting salary as a blue-collar worker. Then there was the CAF, the non-professional people, and they were a grade above that, whereas I was coming in as a professional. The bottom grade of professional was a junior astronomer, a junior whatever, junior statistician, physicist, and so on. I was a junior astronomer, and that was $2,000 a year.

Dick: Who fell in the second category, then, under the professionals? Were those computers?

Mikesell: Well, the chief clerk was one. The chief clerk in a crony-ridden establishment like the Observatory was the most powerful person on the place. He had command of everything. But he was non-professional; he held his job by longevity. He had entered the government service right out of high school, and presumably the only qualifications he had was he never got into trouble and he stayed alive.

Dick: Who was this when you came?

Mikesell: A fellow by the name of Dickey. A very interesting fellow. I got my first raise because Dickey liked me. When the Naval Observatory got a little bit of money that they could do with what they liked, they decided they would give administrative raises amounting to $100 a year to six people. Dickey picked me as one of the people.

Dick: When was the clerk position wiped out? There's nothing by that title there now.

Mikesell: No. You have your chief administrative assistant, at least when I retired. The chief clerk sat in that post or in that room. There was no scientific director. Because of the machinations within the Observatory, they had arranged for the head of the Almanac office to be called Director of the Almanac office and to be given one grade higher than the heads of any of the observing divisions. Now, this was something which I understood was worked out by Hellweg and Robertson running a shenanigan together.

Dick: Robertson being the Director of the Almanac office.

Mikesell: He became the first director, yes.

Dick: He became the first director?

Mikesell: Yes.

Dick: As opposed to the first superintendent.

Mikesell: He was the first director of the office. Well, the superintendent is something else. The superintendent is the Navy-appointed representative, and it was always a captain grade.

Dick: Right. But in the Nautical Almanac office before they had what was called a director, they had a head.

Mikesell: You can find that in the Almanac, he'll be listed, and you'll see what his title was and when it came. Initially, he was at the same level as the head of each of the observing divisions. You see, before then there were the professors of mathematics, and Simon Newcomb was a professor of mathematics. He writes about his life, by the way, under the book, *Reminiscences of an Astronomer* . That was one of the books in the Fresno Public Library, believe it or not, which I read with interest.

Dick: Before you came to the Observatory?

Mikesell: Oh, when I was in the eighth grade. That was part of getting into astronomy. I met the Newcomb children and grandchildren at the time that we decided a new building, the Simon Newcombe Laboratory. They had a show there.

Dick: Were some of his children still alive at that point?

Mikesell: At that point, yes. After all, Simon died in 1910, the same year as Mark Twain.

Dick: You say you came to the Observatory, then, about 1936. Can you describe what the Observatory was like then, as far as organizational setting? First of all, what were the divisions?

Mikesell: The Almanac office, of course, and then the Time Service. I'm thinking of these in terms of just geography. Then the 9-inch division already had its offices over in what we called the Clock House, which is the little house between the two transit houses.

Dick: Right. Center of the circle.

Mikesell: Yes. Lloyd R. Wiley was the third man that came on with us. And C. C. Wiley, you see, was his older and far more well known, far more successful brother, who had a university job in Iowa or some such place in the midwest. Clayton C. Wiley. Then Lloyd R. was this relatively quiet, relatively timid brother, but he had a Ph.D.

Dick: What division did he go into?

Mikesell: Morgan's 9-inch transit-circle division.

Dick: How long did he stay at the Observatory?

Mikesell: Good question. I have to think of this in terms of WWII. I think he was there until WWII, and probably when the war was over, I think he got a teaching job someplace. Kind of a nondescript job, but it got him out of Washington.

Dick: Let's go back to the organizational setup. We had NAO, we had Time Service, 9-inch.

Mikesell: NAO, you see, was on the east side of the entrance hall of the Observatory, occupying all the space down to the library. Then on the other side immediately was the Time Service.

Dick: On the northwest side, then?

Mikesell: Northwest side. We had just the one large room. I guess we went down to the elevator. There was a museum underneath the 12-inch telescope in the rotunda, and the museum on the ground floor. I'm insecure on what was on the south side across from the Time Service.

Dick: How about the 6-inch division?

Mikesell: That was upstairs.

Dick: You came into the Equatorial Division. Where was that?

Mikesell: No, I came into the 6-inch division. I went to work with Watts.

Dick: Oh, you first came in the 6-inch division?

Mikesell: Yes, on July 27, 1936. I showed up for work. At least if that was a Monday, I showed up on Monday.

Dick: So the 6-inch was a separate division from the 9-inch.

Mikesell: Oh, yes.

Dick: So there were those two, Equatorial, Time Service, Nautical Almanac. Wasn't there some kind of nautical instrument division at that point, the chronometers and all?

Mikesell: That was the museum. The instrument shop was the ground floor of the rotunda underneath the 12-inch refractor. The second floor was the museum. The third floor was what paperwork archives, lined with wooden cabinets. You'd pull out the drawers, and here would be Simon Newcomb's computations, Hill's work, and everything else.

Dick: Do you know what became of that?

Mikesell: Obviously some of it got bundled up and, I think, sent down to National Archives. You said Library of Congress a moment ago. But National Archives should have boxes and boxes of paperwork.

Dick: They do.

Mikesell: When Clemence and Woolard were reworking the solar system, then they sought and pulled out all that material, all of the old material, and recomputed it. They found Newcomb's mistakes and all sorts of things. One thing that had just been terminated the same year I went there was the computing division. That had been on the south side opposite the Time Service.

Dick: That had been under Eleanor Lamson until the early '30s, and she died suddenly from a heart attack, I believe. Who took over from her, do you know?

Mikesell: It was terminated. Her people, all of whom were working as CAF grades, were promoted to P1.

Dick: What does CAF mean?

Mikesell: Clerical Accounting Fiscal. White collar, but sub-professional.

Dick: This was the second category.

Mikesell: This is your second category.

Dick: P1s, then, were professionals.

Mikesell: Professionals. Everybody of importance in the government at that time was in the P Series. They had already been taken out at the start of the Roosevelt Administration, been taken out of patronage. So we were free from patronage requirements. When Truman came in, and then especially under Ike then patronage was re-instituted for some of these grades, which, by that time, had been called GS. Everything was consolidated under GS.

Dick: Where did these computers who turned into P1 grades go?

Mikesell: Pat Scott was one of them. Sylvan Bestul was another. Norwood Adams was another. Another one was an engineer, and I was thinking his name here a couple of days ago. After the war, he took an early retirement down to Florida and lived on many years.

Dick: It wasn't Lyons?

Mikesell: U. S. Lyons might have been one of Miss Lamson's slaves.

Dick: These people were farmed out to different divisions, were they?

Mikesell: Yes, they were moved out. I guess Bestul went to

Watts. Whittaker was with Watts. This engineer, whose name I can't quite recall, was in Watts' room. All of us slaves were in one big room up there on the second floor, on the south side facing the flagpole. The flagpole had just been hit by lightning a couple of weeks before I showed up, pieces were lying around, and they hadn't installed a new one yet. You'll find the old pictures show the flagpole is actually a mast from a sailing ship with a joint in the middle where you put the top mast onto the bottom mast, possibly even a crow's nest halfway up and all that. It had been hit by lightning, and the pieces were lying around. You'll find them all. They're all listed in the American Ephemeris and Nautical Almanac, because that takes care of the whole organization at the professional level at the Observatory. All the professionals are listed.

Dick: So that pretty much covers what divisions were there then. This nautical instrument division, you say it was located on the first floor.

Mikesell: No. It was on the second floor over Time Service. That was under the hydrographic office, and it wasn't part of the Observatory, but it was housed on the Observatory. It was manned partly by officers with civilian help, but they were not in our system at all. They had offices and worked up there. Normally, a higher-ranking officer, like a commander, would be in charge, and that held through until after the war.

Dick: How about the chronometers? Were they under the Observatory?

Mikesell: Time Service. They were basically handled by a warrant officer who had a desk in the Time Service. That Time Service room was full of desks. There's now a partition that runs down there. Imagine it without the partitions. There was the large room with the desks occupied by these regular line officers, and then this one warrant officer, who was just a genuine Navy professional, normally didn't talk much. Then there was an intermediate room in which were the clocks that handled the time-signal business. There was one pendulum clock on the wall. I think it was a Howard pendulum clock. By the time I got in there, already by '36 there were two crystal-powered clocks.

Dick: Quartz-crystal clocks.

Mikesell: Quartz-crystal clocks, one of them with a system that had been bought from General Radio and was running with a General Radio crystal, which I finally sent back to General Radio for their archives, because it was the first one they made, and it was also the first crystal-controlled clock that the Naval Observatory had. Then there was the synchronous motor, which Sollenberger had designed and the instrument makers had made up with switching system for sending out the signal. There was also an old chronograph. You've got pictures of all of this in your archives, of the setup of that room. That was the middle room. Beyond that was a little closed room backing up to the elevator, tightly closed room, with a balcony, so it was split into two levels. In that room was both a refrigerator and an oven, because every chronometer had to be rated at three temperatures, and every chronometer had to be wound every day. Every worker in the Time Service drew a Saturday and a Sunday duty on occasion, and had to wind all those clocks.

Dick: I know you didn't go into Time Service until a few years later.

Mikesell: That's right, it was several years later. First went in the 6-inch, and then I got moved over to the Equatorial Division at the time that the chap who had been Ritchey's observer and assistant in getting the 40-inch going, Malcolm Browne, left. He was sick and tired of the Observatory and the Navy, and with some friends, had some notions of electronics gear, so they set up a shop in a garage, which eventually was taken over by Bendix. Malcolm Browne stayed on with Bendix through the war and did very well. I overlapped Browne, and he talked to me quite a bit about his experience. So that occurred, I guess, probably about August of '37.

Dick: When you went to the Equatorial Division.

Mikesell: Right.

Dick: So you were in the 6-inch division, then, for about a year.

Mikesell: Yes.

Dick: And what were your duties in the 6-inch division there? Did you observe?

Mikesell: Oh, yes. Every member observed, including Watts.

Dick: Watts was the director then?

Mikesell: They didn't call him director, of course. There was only one director at the Observatory. He was the chief, I guess, of the division. I think he was division chief. So he had the title. He could write "chief" after his name.

Dick: Who else was in the 6-inch division at that point when you came?

Mikesell: Certainly Whittaker was. G. C. Whittaker was there. I'm trying to recall this. I shouldn't tell you at all, because it is in American Ephemeris and you can see it so easily.

Dick: Yes, I can check that in the publications. As far as the work that you did, was that both observing and doing reductions?

Mikesell: Absolutely. All those reductions were done by hand. We had some computing machines called Millionaires, wonderful ones. I could have bought one for five bucks when they were finally put out, but I wouldn't have had any place to put it, because a Millionaire was this long, this wide, this thick, and weighed 50 pounds.

Dick: Two or three feet long?

Mikesell: Three feet long.

Dick: And weighed how many pounds?

Mikesell: At least 50. All of them stood on legs, so you put your legs underneath them.

Dick: These were entirely mechanical devices.

Mikesell: You turned a crank. Some of them had electric motors connected to them, with a belt. The motor was mounted

underneath the back, and the belt ran up. On the crank with which you set position--these were true multiplying machines, by the way. The first IBM multiplying computers used Millionaire principle, if not, indeed, Millionaire parts, to become true multipliers. They were not sequential adders like Marchants, Friedens, and Monroes. We had all of those machines there, too.

Dick: At the same time, Marchants, Friedens, and Monroes?

Mikesell: Yes. All of these.

Dick: What was the difference? One technology didn't supersede the other?

Mikesell: Marchants, Friedens, and Monroes all worked on the basis of sequential addition and subtraction for their multiplying and dividing. They were not good as adding machines, by the way. For that we had Burroughs, wonderful old Burroughs, because those were parallel working machines. They were ten columns. You punched in a ten-digit number and you added instantly--plunk!--ten digits. That would have taken nine strokes to have added with any of those sequential adders. That would have been many different exercises. The Millionaire was no good as an adding machine at all, but is fantastic as multiplying and dividing or squares and square roots. You've seen the tricks.

Dick: Yes.

Mikesell: Because we had to, of course, reduce positions to apparent place at instant of observation, normally using the Bessel's day numbers, aA, bB, cC, those would be beautifully done with things like Millionaires, and they rigged up some jigs using wooden blocks, because, of course, your a's, b's, and c's would remain the same, independent of star position. So you'd have them. You could see the computing sheets and there would still be plenty of them around on the grounds with long forms, a column for each star, and everything done, little numbers there. Everything had to be done twice, so one of us would do it, then somebody else would along and put a dot next to every number that was checked. So every individual entry, even the little hundredth of a second of arc. A declination was always--the units was hundredths of seconds of arc. RA was thousandths of a second of time. Most of the items that would be

put in coming off the various tables would be in that last decimal place. That number would be put in, and somebody else would check that number.

Dick: Was the circle data from the 6-inch at that point photographic? Watts later developed that.

Mikesell: Watts was dreaming about that. As Watts would say, "I wake up in the middle of the night and I lie there awake and amuse myself by thinking about the things." That's the way he worked out all of his problems. As you get older, you'll discover why an older person, in the middle of the night, the brain is more active because the circulation is better, the blood is good, and the food has been digested. Everything is running at a higher level, so you're much more intelligent then. He took advantage of that, and he made a big point when he did all that.

Watts was kind of an interesting character. He would go through the motions of being a friend, but when he decided that he wanted to do something dastardly to one, he didn't know how to speak to the victim or to explain anything to him, so suddenly the victim found himself with a knife in his back from this very sweet guy, Watts, whom he had trusted. He was not straightforward.

He evoked quite a bit of loyalty. You'll find that Julena Steinheider, now Duncombe, was certainly one of his absolute, most loyal fans. She was the first of the women to show up, when they needed to increase manpower and nobody was available on the register on account of war and post-war situations.

Remember, on account of Robertson, the Observatory set up two administrative, or advisory to the superintendent, bodies. The papers at the Observatory said the superintendent had all authority and absolute authority, but out of a tradition going back before Simon Newcomb, there was a council of the professionals to advise him. When Robertson was deemed by Watts to be such a scoundrel, Watts worked out a deal to get a separate council set up. I forget the terminology they used for these two groups. There was the one group which included Robertson, and always the assistant director of the Almanac office, also, and then the other group, which was only the heads of the observing divisions.

Dick: There was something called an Administrative Committee.

Mikesell: Yes, that was later. That was the group which worked with these four observing divisions and which, insofar as it could, worked around Robertson. As Robertson moved into his dotage, Hellweg always used Robertson's patronage, because Robertson had very good connections on the Hill. Robertson had come from New York, so Royal S. Copeland was his senator. If Robertson didn't like something, he trundled himself, not by phone, but right down to Copeland's office. I picked this up because I dated the assistant librarian, a girl by the name of Marion Lokes from Philadelphia. She married a chap named Brown, who is in Superior Tubing Company in the Philadelphia area. She was out of Smith College or someplace like that, a fantastic gossip. Grace O. Savage was the librarian, loved to think that she ran the whole Observatory. She would have all Observatory parties for the professionals on the staff, all the people that were on her good list.

Dick: What does this have to do with Robertson?

Mikesell: It's how I could find out what particular machinations were going on, because this assistant librarian would keep very good connections with female typists upstairs, who read all of the correspondence, quoted it liberally to their friends down in the library, whom I happened to be dating, and who loved to have somebody to tell it to. (Laughs) So I would hear all sorts of weird things.

Dick: Robertson left in about '39, so you overlapped by maybe three years. Did you have any direct interaction with him, or was this all second-hand?

[End Tape 1, Side 1. Begin Tape 1, Side 2]

Dick: Talking about Robertson.

Mikesell: Yes. He immediately hunted me out and explained to me that I had been his personal selection to go into the Equatorial Division.

Dick: Robertson did?

Mikesell: Yes, Robertson came and told me that. He explained that while Watts had not wanted to get this 40-inch, he, Robertson, had been very concerned that the Observatory get it, and his idea was that we would set it up here and then we would get it moved to a good climate. Then later on in the late '40s, when I was on the site testing committee, Robertson looked me up again to say, "This is just what I intended all along. We will now get a good site, and we will put the telescope there."

There were some funny internecine politics at the time that Watts was anticipating retirement and H. E. Burton was retiring. So Watts told Adams that he proposed that Adams be put in charge of the Equatorial Division after Burton retired, and that then to get rid of the 40-inch and essentially close down the 26-inch, because these were things that didn't relate to the true mission of the Observatory, which was to run transit circles.

Dick: This is Watts' opinion now?

Mikesell: Watt's opinion, told to Adams.

Dick: In the late '40s or so?

Mikesell: The late '40s. Adams and I were driving around the countryside, looking at prospective sites, because the Observatory had been ordered by Tydings' wife to vacate that site so that they could put a hospital on it. Tydings was Chairman of the Joint Armed Forces Committee in Congress. So this was a command of the Navy, and at first we were told to vacate immediately, and then Watts, especially, got the superintendent to insist on having time to move the Observatory in an orderly fashion to some other place. So we set that up.

Dick: We've jumped ahead ten years there, though. You went from the 6-inch to the Equatorial Division in 1937.

Mikesell: Robertson looked me up and he said that he was the one that had gone to the superintendent and told him that I should go there because I was the bright young man needed to make the instrument work.

Dick: Why did you go there?

Mikesell: Well, I was offered the job of jumping from 6-inch over there, and I was getting awfully tired of adding these tiny numbers, the aAs, bBs, cCs, etc.

Dick: What instigated that? Was it Robertson, do you think?

Mikesell: The thing that instigated it was Malcolm Browne's leaving. So there was a vacancy over there, which was directly related to the 40-inch, but U.S. Lyons, who had been in the Equatorial Division before then, if he had been in Miss Lamson's group, which I suspect is the case, then he had been shoved on over there and he had seniority on me. So he was the titular person in charge of the 40-inch. He was given that instrument in his charge. Since there was a vacancy from Browne's going, I was moved over there.

Dick: Wasn't Burton the head of that division, though?

Mikesell: Yes, H. E. Burton was the head of the division.

Dick: But he did not have much to do with the 40-inch?

Mikesell: He had nothing to do with the 40-inch.

Dick: Why is that, as head of the division? (Laughs)

Mikesell: Well, because he didn't know anything about it. His interest only was in attempting to observe some double stars with the big Repsold micrometer on the 26-inch. He was, by the way, Robertson's man.

Dick: Burton was? In what way?

Mikesell: As Robertson was looking for votes on the grounds to do whatever Robertson thought should be done, Burton was the chap whom Robertson could count on. On account of that, Robertson always would drop over every day and spend maybe an hour in Burton's office. There were two offices in the 26-inch building. The one on the east side was the one that Burton occupied, and Robertson would walk into the hall, go in to see Burton, and they'd close the door. Then Robertson would stay in there for an

hour.

Dick: Who was on the west side?

Mikesell: On the west side would be Lyons and me.

Dick: That's where I am now. You can come visit me there and you'll know where it is.

Mikesell: That's a good place. That's a room with history. Incidentally, have you ever found the book which gives the log of the pay to the carpenters who did the fine carpentry on that building?

Dick: I don't believe so, no.

Mikesell: It's a shame. It's around there someplace. They got 12.5 cents an hour, which means they were extraordinarily highly paid. This was in 1895.

Dick: Why do you say the room is a room of history? What else happened in that room?

Mikesell: No, nobody was murdered, as far as I know. (Laughs)

Dick: Who was in the office before? Was it used as an office before you were there?

Mikesell: I assume so. It had been used right along. As you know, Robertson arranged so that Ritchey could have space on the Observatory grounds to build the 40-inch. That's the south transit building.

Dick: This would have been before you came.

Mikesell: Before I came, although everything was still there. His machinery and tools were still there in '36.

Dick: In the south transit building adjacent to Building One?

Mikesell: That's right. Just beyond the round rotunda underneath the 12-inch.

Dick: And what became of all that equipment that was in that building?

Mikesell: Anything that belonged to Ritchey, he sold off for cash. He had to go to Congress to get an extra appropriation to kind of bail him out. He had used his original appropriation for buying tools with which he could finish up castings and make small parts and all.

Dick: And he went back to Congress. Did he get another appropriation?

Mikesell: He sure did. He got an extra $15,000, which was something in that era.

Dick: Apparently it was Robertson who was instrumental in getting the 40-inch, is that right?

Mikesell: Very much. Robertson and Hellweg, especially. Pollock was the guy that started it. If you had the correspondence--and I've seen the correspondence--Pollock wrote to all of the astronomers of note in the country, Henry Norris Russell and Schlesinger, of course, and Frost at Yerkes. This was late '20s.

Dick: This was the beginning of what is called in the annual reports as the modernization program.

Mikesell: Correct. Have you read Russell's article on the 40-inch in *Scientific American*?

Dick: Henry Norse Russell wrote an article on the 40-inch?

Mikesell: He wrote a monthly article in *Scientific American* back in the '20s. Every month. It's worth looking up, and the Observatory has all those. You don't even have to go to LC [Library of Congress]. I read about it with great fascination, because I was 13 years old then, or 14. Ritchey had been there, had produced this lovely brochure showing the 300-inch on the rim of the Grand Canyon. You've seen that brochure, have you? It's in the library. In color. He had copies, so he gave a copy to every member of Congress. Hellweg came on after Pollock.

Dick: Freeman. There was somebody by the name of Freeman.

Mikesell: There was Freeman in there. I guess Freeman was the guy who wrote the letters, and Pollock was his successor. Then Hellweg. There was somebody between the guy who wrote the letter and Hellweg.

Dick: I believe Pollock was first, then Freeman, then Hellweg.

Mikesell: Okay. Pollock wrote the letters, got back the response, encouraged them to go after a reflecting telescope of size and a good photographic camera of large size, something larger than these six- and eight-inch aperture things that Harvard and others had. This was kind of the consensus that came in, also from Mount Wilson and others. Our Berkeley friends were very sympathetic, because under Leuschner, of course, classical astronomy was very much the thing at Berkeley, and U.S. Naval Observatory was the only place.

Dick: The Berkeley people were consulted? Leuschner was consulted?

Mikesell: I'm sure he received a request, and certainly whoever was director at Lick had. I don't think it was Wright at the time; it might have been Aitken. Probably was.

Dick: When you came to the Observatory, this idea of this being sort of a modernization program, did you have the feeling . . .

Mikesell: I came after it had been, of course, worked on.

Dick: Right. But did you have the feeling that the Observatory was in the process of modernizing?

Mikesell: No, no, that didn't happen until Eckert came, because on account of my 6-inch transit-circle division, believe me, the crunching of numbers would be where the modernization was at. Already, for various reasons, there were too many problems that I could see at once with the 40-inch to count it good modern. Then to see that in the 40-inch what Ritchey had done was to just Chinese the 60-inch at Mount Wilson, he obviously just took the same drawings and changed scale to create the 40-inch.

Dick: Wasn't the Ritchey-Chretien system a different . . .

Mikesell: That's in the optics. I'm talking about the mount. The optics is the least of that telescope. The mount was where it was really at. Ritchey's concern was to get the optics going, but from the Navy's point of view, they were buying a good mounting. They took the optics sort of for granted.

Dick: But wasn't it the optics that was supposed to be the original part? It was supposed to have a large coma-free field.

Mikesell: Oh, yes, yes.

Dick: But you say there were problems. What were the problems with the 40-inch?

Mikesell: Partly because, you see, when was the 60-inch built? 1915. So you come 20 years later and don't take account of any of the engineering advances in the era or consider any of the other possibilities for mountings, and already we had Warner and Swasey's examples. By '36, the McDonald Observatory had been founded, and they were just taking delivery on their 84-inch there, which was dedicated, I guess, in '38.

I spent that summer of '36, up until July 27, at Yerkes Observatory, so I was talking to McCarthy and all the other guys there. It was my first chance to meet Perkins himself, of Perkins-Elmer, who came there because he was providing some of the optics for use in the McDonald Observatory, and they were building their Schmidt cameras. This was going to be the first application of Schmidt cameras to spectrographs on the McDonald equipment. On account of Struve, spectroscopy was the primary importance at the start of that whole thing. So I enjoyed looking over all the plans. There were books and books of plans. There was a lot to go, and then to go to the Observatory and see Ritchey's business.

From Ritchie's point of view, the mounting was the least of it. He had to deliver a mounting, so he had to get that over with as quickly as he could, because he was concerned with the optics. He wanted to get his notion of optics out and prove it.

Dick: This was, if not the first, the second Ritchey-Chretien system.

Mikesell: Yes. It was conceivably second. There was that 20-inch for the Paris Observatory, but it had never done anything. It had never worked.

Dick: So this was the first operational one.

Mikesell: As distinct from, say, Bernard Schmidt's, his telescopes worked from scratch.

Dick: I wonder why the Observatory went with such an unproven telescope.

Mikesell: It was because of Robertson and Hellweg. Ritchey was a persuasive talker. I listened to Ritchey just a little bit, and he wouldn't have known who I was, but I was around on several occasions. Robertson went hook, line, and sinker. Hellweg had the notion that he would make admiral on the basis of that telescope, which was why he was so extraordinarily bitter when the mirror fell, even though the mirror fell because it was his fault. I don't know if Malcolm Browne still remembers this or not.

A year ago January, John Hall got Malcolm Browne to come to Tucson to the AAS meetings, and when John gave his very lovely succinct story on the 40-inch and on Ritchey-Chretiens in general, then he introduced Malcolm Browne in the audience. He was up front. For some reason or other, I didn't get up to see him again after that. I have been much too involved since to follow up, but I would have liked to have looked up Malcolm and talked with him and found out how much he remembered.

I came on while his fingers were still pretty raw from rescuing that mirror. He was so bitter, because it happened in the morning. He had to come back after getting his hand dressed down at the Navy dispensary in the Old Navy Building in the Mall, temporary World War I buildings, now gone.

Dick: You're saying that Brown was bitter?

Mikesell: Bitter because he came back from that, the pain was now in, the shock had worked off, and he had these four fingers crushed, and they'd merely been wound up by the Navy orderly,

pharmacist's mate. Now they were throbbing. Hellweg stands him up in his office and dresses him down before the mast in the standard Navy way. And it was Hellweg's fault that the accident happened.

Dick: How is that?

Mikesell: They were in the bit of trying to take care of the mounting of the mirror, which was a solid flat-back piece of Bureau of Standards glass. Ritchey had not done a good design on the support of the mirror. At a number of points they were having trouble, which I can recall, and they are in the notebooks which may or may not still be extant. I thought the notebooks had been sent to Flagstaff along with the telescope.

Dick: No, we have some of the notebooks, at least some of them.

Mikesell: Okay. Do they include the names, for example, of Louis Bramer as one of Ritchey's assistants?

Dick: I don't remember.

Mikesell: Yes. That's when Louis Bramer first got the notion of coming out with Questar. I once sat with Louis Bramer for six hours, without a recorder, and listened to him recite what his experience had been working at the Naval Observatory under Ritchey as a volunteer assistant.

Dick: Is he still around?

Mikesell: No, he died of throat cancer, a chain smoker.

Dick: But he was the originator of Questar?

Mikesell: Absolutely. That's a whole other story itself. If you've got the notebooks, you'll find Bramer's name listed there. He was there three or four months.

Going back, then, originally, this rather persuasive guy, Ritchey, came in and was brought in to Hellweg by Robertson. I don't know what angle Robertson was involved in. Maybe he just found a fellow blowhard in Ritchey. Anyway, he brought him in to Hellweg and said, "Here is the guy who will make us famous and

will fulfill the requirements that have been set to us on all of these things." Hellweg was convinced. Watts was very bitter, because Watts and Morgan and Sollenberger were kept out of this arrangement and merely invited in, then, to be told this was what the Observatory was going to do.

Dick: How about Burton, head of the division?

Mikesell: Burton, you see, was Robertson's man. So that didn't mean anything. Watts talked to Burton.

Burton was an easy-going weather-vane sort of a guy, very soft-spoken, spoke very, very slowly, very, very deliberately. My gracious, you know, to describe Burton: every division got parceled out some of the letters from the general public to answer. The Time Service would get them, and Sollenberger would go through those in a hurry. Sollenberger would share these with everybody in the office and usually toss them on somebody's desk to answer, so any one of us would get a whack at answering whatever letters would come in. Sollenberger would save the juiciest ones for himself, and he would rewrite anybody's. Watts always did his own, but he turned them out with dispatch in a hurry. Burton would get these, and there wasn't a single letter he would get that he didn't look at and stare at and read over and puzzle over, and then he'd start writing an answer. It would take him two days, literally, to work up an answer to one of these. When I was in his division, I would get a chance to look at his answers, which 100% missed the point of the original inquiry. (Laughs) They answered something else that the person hadn't asked. They were long, rambling things.

So Stet would work on Burton to get him to go along, because there was no question that Burton was part of this rump committee that Watts had set up to go against the other guys. But Burton would have had no say in the decision. The decision was given to the superintendent by Navy, and by this time, the superintendent had outfaced Roosevelt. People told me, various guys that I bumped into from out of Main Navy, would tell me right up to the time that Hellweg finally retired in about '46, '47, or '48, that he was well thought of down in Main Navy, well thought of. He wasn't seen as the blowhard that he was deemed by me and, I guess, every other one of the professionals.

Dick: You said it was Hellweg's fault that the 40-inch was damaged.

Mikesell: Yes, because after they had made the whole thing and tried to use it, they weren't getting good images. At first, it was deemed figuring errors, and Ritchey struggled with those and worked at refiguring on small scale in a way that Ritchey was certainly an artist at, probably unquestionably good. You have to remember that the secondary is awfully active in RC design. So the figuring could be done on either element, as well as the spacing that's fantastically sensitive on this. So there are a number of parameters, as well, of course, as the centering. You've got centering problems with an RC, which are deadly. All of these are parameters to be dealt with.

Finally, it was pretty much agreed between Ritchey and Malcolm Browne that it was the back support system. Malcolm, as an engineer, went to work and redesigned it. At one stage his drawings were around in blueprint drawers, where we had complete blueprints for the 40-inch, as well as for the 26-inch, the 15-inch.

Dick: We still have those, I think.

Mikesell: Great. They'll go to pieces, so I hope they've been microfilmed.

Dick: Not yet.

Mikesell: Oh! That's why I bought that microfilm camera way back 30 years ago.

Dick: Well, if they have, I haven't seen the microfilm.

Mikesell: I might have it. But anyway . . .

Dick: You were saying why it was Hellweg's fault.

Mikesell: Yes. He did have A.G. Ilse, who was the head instrument maker, with one assistant, Wirtz, in the shop, go to work and make new supports, which I think are still being used. Then they were having to tune those, because these are counterweight supports, levers and counterweights, so you've got a matter of needle-bearing pivots. Those had to be kept free, not seizing,

and the counterweights had to be tuned all over the thing. A lot of room for adjustment there. There was room between the mirror and the cell, about an inch all the way around, and a strap was thrown around the mirror, which was given, I guess, two or three straps which were brought in U shapes. There had been three, as I now think of the engineering of such a thing, so that no matter how you're tilted, the mirror is held with correct alignment. Then these back supports. In the process of tuning them, they were having to lift the mirror out of the cell to get at the supports, because there's no way to reach them, really, from the back, although there are a lot of holes there. They still had to lift it out.

So they would lift it out and do their work, put it back in, working without silvering at the time, because he could also work front surface if he wanted to, so he hadn't silvered it yet. Then they'd do a night observing, so they'd make their observation on the stars. We had no flat to work against, so you'd do a night's observing whenever the next clear night came along. Then lift it out again and readjust. This was going on, quite a round of this.

Hellweg was up there one day. The lift they used was a spreader of two-by-eights, beautifully shaped up. (We had a very good carpenter at the place. He had Parkinson's Disease, but he would hit that nail square every time. I never saw him miss a nail.) Then it had been neatly dressed with shellac and varnish. It came down with these two vertical pieces, two-by-sixes, tapered so that it could slide into that space between mirror and cell. Then a turnbuckle up above tightened up, which would pull these things in, clamp on the mirror. Then with your overhead hoist, it would lift this out, move it over to one side, and set it down.

Hellweg came up there and saw them doing that, and said, "You guys don't know anything. That's no good. That's not the way to do it." I'm quoting Malcolm Browne. Hellweg's manner had a flourish to it, and he was impressive--6'4", very tall guy, terrifically erect, nose way up in the air. He stomped in, in a Prussian style. He never walked casually; he marched. Very impressive. So he said, "You've got to put a piece of cardboard between the wood on each side of that and the glass so that you've got something resilient that you're binding against the

glass, instead of just that hard wood, Douglas-fir wood." So regardless of what Browne might think, Ilse said, "The orders have been given." So he put the cardboard in, and, of course, that slipped. That slipped.

Dick: Was Hellweg actually there when the accident happened?

Mikesell: Oh, no.

Dick: He just gave the orders.

Mikesell: He gave the orders that it should be done. It's just like the reason you can't find a lot of materials there. "Has anybody used these records in the last year or two?" "No, Captain." "Get rid of them!" They allowed me to go along on one of the inspections, and they were starting to give that order with regard to some of the equipment, because they were going through the equipment storage space, and he reeled off this use. I said, "Very good, Captain, but you see the fire extinguisher there? That hasn't been used in the last few years either." He said, "Oh, okay, you may keep them." That was the last inspection I was allowed to go along on.

Anyway, that was how it came to fall the next time, then, they lifted. That was solely due to the cardboard. Malcolm Browne was well aware of it and very bitter about it. It was Hellweg who ordered the cardboard. It did fall then, and Hellweg took no responsibility for its having fallen. Anybody, certainly in retrospect, could see that the cardboard would make it fall, that there was no way this kind of clamp would work if you put cardboard in there. The reason that it worked was because the glass was rough-ground on the edge and the wood bit in just enough to hold 640 pounds. So that was when Browne decided he was going to leave. He did stay on for another year and made the first legitimate astronomical observations and published them, but he had decided then he was going to leave.

Dick: This all happened just before you came?

Mikesell: Just before I came.

Dick: So you've heard this from Browne himself.

Mikesell: From Browne, as Browne was passing over the wand to me. Lyons was a very, very ineffectual sort of a person.

Dick: Where was he at this point?

Mikesell: He was my superior, senior to me in a year or two, and that made him boss. So he was a difficult person to be under, because he was not bright. All he could do was to take some orders that somebody gave him, normally Burton, who was no brighter.

Dick: And Burton never had anything to do with the 40-inch, really?

Mikesell: Not a thing. I never saw Burton set foot in the building. I don't think he ever did, and I don't think Watts did, either, because Watts hated it so. Watts despised that.

Dick: Was it because he wasn't involved in the project, or was it because he thought that this was not an instrument that the Naval Observatory needed?

Mikesell: The latter was what he said. Absolutely. He was very outspoken on that and he got Morgan, who was very, very bright, but politically very ineffectual, and Watts was always having to brace up Morgan. Watts and Sollenberger were pals, and both of them were reasonably bright. Sollenberger, of course, was considerably brighter than Watts in some ways, certainly in terms of human relations and politics.

Dick: When you took Browne's place in the Equatorial Division, what did you do?

Mikesell: Started immediately. Our assignment was to make observations with the 40-inch. Browne had suggested some programs--satellites, specifically, satellite observations, Neptune, Uranus, especially. The first Mars satellite observations were taken with the 40-inch, you may recall, and those plates were around at some stage. Bevan Sharpless worked them up and was the first one to come up with this.

Dick: Secular acceleration.

Mikesell: Right, which the science writers in the Soviet Union said it indicates that it's a burned-out space vehicle. And that just annoyed Clemence no end. Clemence was extraordinarily restrained in his comments--extraordinarily restrained. He once rendered his dictum in terms of an old New England statement, "Better to be silent and deemed a fool than to speak and remove all doubt." He functioned that way, and he got to the National Academy of Sciences, our first Naval Observatory man in there in decades, on account of that. Of course, he was extraordinarily bright and the best expositor I have ever seen. Well, in the first place, because he wouldn't speak. When he did speak, he knew everything about a subject. But what he had was a fantastic skill, then, of making it perfectly plain and clear to any other reasonably intelligent ordinary mortal. He was fantastic. The most complicated matter in celestial mechanics, he could make clear.

Dick: Let's just close out for a couple of minutes by going back to the 40-inch. How successful would you say the 40-inch was prior to the time that, say, John Hall came in '48? Can you summarize what was done?

Mikesell: The telescope was actually successful, but it was not given things to do to prove its success. No attempt was made, before Hall, to use it on axis work such as spectroscopy or photometry. John Willis was put on the 40-inch. After I left, John Willis was sent over there from the Time Service.

Dick: When was it that you left the Equatorial Division?

Mikesell: I would say '38.

Dick: So you were there for maybe a year or two?

Mikesell: Something on that order, yes. Then I was moved over to the Time Service and put almost ten years in on the Time Service. At the time I was there, Clemence was moved from the Time Service to the 9-inch division.

Dick: We'll have to get into all that another time. Back to the 40-inch. You're saying that Willis came in after you. What did he try to do with the 40-inch?

Mikesell: He was told to do a bigger program, in the first place to see if it can be used for trigonometric parallaxes. So he ran some tests and he announced that, yes, in his opinion, it would work for parallaxes.

Dick: Whose idea was this to use it for parallaxes?

Mikesell: The Astronomical Council, in thrashing around to come up with something. Willis was an extraordinary bright guy, but had no stick-to-itiveness. He would get an enormously bright idea and work like a demon on it for six months, and possibly very effectively, as he did on the subject of atmospheric refraction, and he certainly did in analyzing the errors in the field of the 40-inch. So they ordered him to start a parallax program with it. They didn't tell him what stars to go after or anything else, but just a general parallax program, I suppose in the McCormick, Allegheny, Yale philosophy. So he said, "All right. If I'm going to do that, I have to have all of these plates."

Willis was the first guy to demonstrate that it wasn't necessary to have a curved plate in the field. He felt that he could use a flat plate in the field, with no correcting lens, and get an adequate size field. It wouldn't be a degree and a half, which the curved plate would give, but five-by-seven plates would give you about at least 4.5-inch field, which would be on the order of three-quarters of a degree, and the images would be much better than with any of these refractors, even with reflectors.

Dick: At this point, using a reflector for parallaxes would have been an innovation?

Mikesell: No. Van Maanen was doing it with the 60-inch. My last scientific director at the Naval Observatory, Strand, went back and looked at Van Maanen's work and discovered that Van Maanen's work was very sound, far more sound than the astronomical scuttlebutt had said. Everybody had said that using a Cassegrain telescope was impossible because of this alignment problem. Van Maanen insisted it was good and had made all of these plates and published all these observations, but nobody would use them because of the given opinion, until Strand looked at them and said, "My gosh, they're all right."

[End of August 3, 1989 interview]

Interview Number Two with Alfred Mikesell
Date: 4 August 1988
Place: Baltimore, Maryland - IAU Meeting
Interviewer: Steven Dick

Dick: Yesterday, as you say, we were just talking about the 40-inch and your work on the 40-inch.

Mikesell: I think that John Willis had taken over.

Dick: Right. He took over when you left.

Mikesell: Yes.

Dick: Which was 1938. I think that's what we decided yesterday.

Mikesell: I'm not sure just when I left. Yes, I think so. I went to the Time Service. Clemence went to the 9-inch Division.

Dick: From where?

Mikesell: Time Service. He'd had ten years in the Time Service at that stage.

Dick: Willis took over your position in the Equatorial Division. You were saying that he was put onto a parallax program.

Mikesell: Assigned it by the Astronomical Council.

Dick: And made use of flat plates, instead of curved plates.

Mikesell: He demonstrated that the thing could be made to work with flat plates.

Dick: What happened then?

Mikesell: He said, all right, if he was going to do a program, he had to have 120 dozen of these plates. I was trying to recall

real quick what emulsion they were. I was sitting in with the working group on photography today and going over in my mind, again, the emulsions. I don't remember what it was, probably an E emulsion like 2E or something.

Dick: Those he had gotten from Eastman, I guess.

Mikesell: Those were from Kodak. The people in charge of purchasing, cut him back, knowing a little bit about Willis and a little bit about the life expectancy of photographic plates. So he bought only 30 dozen that first time, or took delivery of 30 dozen. I suppose 29 dozen of those plates hung around until they were finally thrown out as not even worth the glass.

Dick: What's the reason for that?

Mikesell: Willis was not a person to pursue something which got dull and routine.

Dick: But if he was tasked to do this, didn't he sort of have to do it?

Mikesell: Well, I suppose you might say so, but the Observatory wasn't a place that would fire a person for not doing it, at least at his level. He was a P-3, at least, by then.

Dick: Fairly low level.

Mikesell: No, fairly high level. I was P-1 still.

Dick: So did he start the parallax program at all?

Mikesell: That's an interesting question. You might be able to find, amongst his old papers, which at one stage were in a file cabinet that I left behind when I retired . . .

Dick: We have a few, I know.

Mikesell: Yes. He might have made up an observing list. I doubt that he started it at all. I don't think he selected any stars nor got into doing it, because he would have gotten diverted very quickly on something else.

Dick: What did he get diverted to, do you know?

Mikesell: He was hot and heavy on his theory of refraction, and this was a successful accomplishment of his. He was one of these self-made mathematicians, but a very good one. H. R. Morgan, who was perhaps our most highly qualified astronomer on staff around that time--at least Struve told me he was when I went from Yerkes to the Naval Observatory. He felt that Morgan was.

Dick: Otto Struve was at Yerkes at that time.

Mikesell: Yes. He had taken over a year previously as director. He was the one that Frost rescued from Crimea back at the end of WWI and brought to Yerkes.

Dick: Struve's opinion was that Morgan was . . .

Mikesell: Probably the astronomer of worth at the Observatory. He felt that Watts may be all right. He knew about Watts. He felt Morgan was the best one.

Dick: Did he know about any other astronomers there?

Mikesell: He knew who was there and he didn't think anything of any of the rest of them. He wouldn't have known anything about Sollenberger. Sollenberger's applied astronomy wouldn't have touched him. Willis, because of his poor stick-to-itiveness and publication record and so on, would not have been particularly known.

Dick: You mean he didn't have much of a publication record at that time.

Mikesell: True. Or at any time. I don't know if he ever published his work on refraction. It got handed around a lot and was used. For all I know, it's used yet by transit-circle people, but his work on it was handed around in manuscript. I was trying to think of what else he did. He was the first person I know of to take photographs in Kodachrome of the moon in eclipse, using the 40-inch and pieces of Kodachrome supplied by National Geographic, with whom we always had very pleasant working relations with their photo department.

Dick: Did he stay in the Equatorial Division, then, and work?

Mikesell: Yes, he stayed in the Equatorial Division as his base, I think, from then on until he left the Observatory in about 1944, pulling out with him all of his retirement investment and everything else, and went to--was it Minneapolis?

Dick: Milwaukee.

Mikesell: Milwaukee or Minneapolis. I forget. Where White was located.

Dick: What company did he go to work for?

Mikesell: White. What were the initials? E.O. or something. After the war, they were famous for having made a little stereo camera, "Stereo Realist," a camera about so big that used 35-millimeter film, copies of which are still extant all around. In fact, I saw one pictured in a current number of Popular Photography in the history of photography department.

Dick: Why did Willis leave in 1944?

Mikesell: He was essentially asked to. He, as I say, would get involved on anything, and he had come up with this idea of a pendulum astrolabe, doing all the things of a prismatic astrolabe, but easier, without any artificial horizon, no mercury dish or anything. Originally, he was attracted by the notion of using a mercury dish because of the success of that in Ross' PZT, which was the only PZT we had at that time, the original Gaithersburg PZT developed by Frank E. Ross for the Geodetic Survey. Willis had been one of the people, along with Sollenberger and Clemence, who had adapted the PZT for time observations. Previously, the PZT was only for variation of latitude.

Dick: Whose idea was it?

Mikesell: To change over?

Dick: Yes.

Mikesell: I would be put to it to say. Willis and Sollenberger

certainly lunched together, talked together. Willis would roam all over the grounds and talk at any length to anybody that would talk with him, and if anybody would drop in to talk with him, he would set aside anything he was doing and talk for hours. Clemence, of course, was just as bright as the rest of these boys on these things. It's one of the questions you can put to Sollenberger. It may be in the literature. There was a publication in which they announced that this was being done. I think it's an article in AJ. It would be around 1934 or '35, because it was first done in '34, that they really were making observations and specifically working them out.

Dick: How did Willis get involved with the PZT -was this before he was in the Equatorial Branch?

Mikesell: Oh, my, yes. The PZT was part of the Time Service at all times.

Dick: Right. This is around '34, so Willis was in Time Service at that time then, I guess.

Mikesell: No. Where would he have been? He might have been in Morgan's division. He certainly wasn't in Watts', because Watts wouldn't have had anything to do with him that close. Watts didn't mind him being on the grounds, but Willis was too unorganized. He might have been in Time Service for a while. People could be moved around amongst the divisions very simply and readily.

Dick: That seemed to happen a lot more back then than it does now.

Mikesell: It was very easily done, yes. The Observatory was small, and there were, at most, six people in a division, normally only three or four in one of these observing divisions. It was easy to decide there was a vacancy and move somebody over. This took care of personalities, amongst other things. If the director of one division found he was having trouble with a personality, somebody else would say that they'd take him.

There was, of course, strong feelings of anti-Semitism on the Observatory grounds, very strong. So Markowitz's coming was a real problem. Markowitz is a Polish Jew in background and a

somewhat strong personality, not necessarily abrasive, extraordinarily bright, and facile in language. Watts certainly wasn't going to take him, and H.R. Morgan wasn't going to take him, two people with vacancies.

Dick: Why was there anti-Semitism at the time?

Mikesell: I don't know that. I mean, that's part of our culture. Sollenberger, who had his own prejudices, was very delighted. He said, fine, he would take him. So although Sollenberger may not have been slated to have one of these new three people, he got one, and he got, of course, a very bright one. Sollenberger was able to get along with Markowitz. Markowitz was always pushing, but Sollenberger, in his own way, could be just as bright. Markowitz, by the way, was pretty bright, especially bright, with Sollenberger to ride herd on him. Markowitz could come up with clever new ideas, and Sollenberger would take these very seriously and review them carefully. Lots of Markowitz's ideas were put in their place and not anything done with them, because Sollenberger could see what was wrong with it or why it wasn't going to work, and he could see it on very important rational grounds, which were very convincing. The two of them as a team were tremendous, because Markowitz could spin off bright new ideas at a great rate, and Sollenberger was very good at reviewing them and canvassing them.

Clemence would have been just as good and, on occasion, was, but Clemence had less patience. He was more busy in his own thoughts and his own affairs, especially from 1936 on, when I watched him in action.

Dick: Let's finish up with Willis. You said that he was asked to leave. Why was he asked to leave?

Mikesell: By 1944, Willis had gotten involved with this pendulum astrolabe, which was being manufactured by White. Then as White manufactured them, they were not able to work. They were shipped back to the Naval Observatory's instrumentation group, which was not part of the Observatory at all, it was part of the Hydrographic Office, but it was on our grounds down there in '52, and Willis would be spending all of his time down there working with these astrolabes to adjust them, to get them going, partly because, I think, they were Willis' baby and partly because he

found them very interesting. Most everybody was delighted to have him do that, especially White, since they would then pass acceptance when Willis got done. But people at the Observatory perceived that this was, indeed, a threat to the organizational stability of the Observatory to have, by that time, a P-4--I know he was at least a P-4 then in rank. A division head was P-6, essentially the highest level available, ordinarily, except that the Director of the Almanac Office was P-7.

Dick: How did this affect the stability of the Observatory?

Mikesell: Well, if your people can be raided freely to work on things not in any way connected with the Observatory, then anybody during war years, when skills were required all over the country, anybody could come in and grab somebody off. This would become very disrupting to any ongoing program. The Observatory was working hard to make sure that all the draft boards knew that its work was essential to the defense effort and the war effort.

Dick: So this pendulum astrolabe, then, was not something that the Naval Observatory wanted to use.

Mikesell: No, it wasn't for the use of them; it was the Hydrographic Office.

Dick: Was it Willis' idea originally?

Mikesell: I think it could have been his idea originally.

Dick: And he gave this idea to the White Company to implement it?

Mikesell: Probably the first prototype was made in the instrumentation group down there on the Observatory grounds, and when it looked like it could work, then they wanted a lot of them made up. Then they contracted it out, and White got the contract.

Dick: What was the Hydrographic Office going to use that for?

Mikesell: Their radar-based stations all over the Pacific--in fact, all over the world. The Hydrographic Office was sending out surveying groups. This was during the war, all over the war,

to fix positions. Some of the equipment of the Observatory was taken out of its storehouse. We had a fair number of small astronomical transits in the sense that you've seen the pictures of them, two vertical arms sitting up here, then a good horizontal axis, then a three- or four-inch telescope with a right-angle eyepiece and a little micrometer down at the eyepiece, and this thing pivoting around just like any transit circle, only compact, and these things were portable, could be put into a couple of boxes about so big, weighing not more than 200 or 300 pounds, and made out with cast iron bases. The Observatory had quite a number of them, because they were always sent off to eclipse-observing stations. They could be used to establish both time and latitude.

Dick: Were these the ones that originated with the transit of Venus? They were portable broken transit instruments.

Mikesell: Some of them went back to the transit of Venus. This is true. All the transit-of-Venus equipment was intact. Then they'd been bought since then for various expeditions. We had some that had been made up as recently as 1930, Fauth instruments, as well as some made by that Washington instrument-maker who made the 12-inch. What was his name?

Mikesell: Saegmuller.

Mikesell: Saegmuller. Right. The Saegmuller transits.

Dick: These were for the Observatory?

Mikesell: These were Observatory equipment. Right. With the war and the Navy's need for these, these were released by the Observatory and loaned to the Hydrographic Office. Furthermore, Observatory personnel wrote up instruction manuals for the operation of one of these latitude-longitude stations. Raynsford was the name of the chap in the 6-inch Division I couldn't recall yesterday. He retired relatively early. He was an engineer and he helped write it up, so that was written up in the 6-inch Division.

Dick: Let's finish up with Willis.

Mikesell: This has to do with Willis. These astrolabes, of

course, a prismatic astrolabe would work, but the optics on a prismatic astrolabe are more difficult to come by in a hurry, like during the war. Then the prismatic astrolabe would be much clumsier than the things that Willis had designed essentially out of this need. The Observatory could loan a half a dozen of these, and after that, you needed 50 more.

Dick: So it was over this issue that Willis left in 1944.

Mikesell: Yes, over the diversion of his time. So the Astronomical Council, presumably Watts, preeminently, gave an ultimatum. He either had to quit that and concentrate on some work relating to the work of the Observatory, the programs of the Observatory, or quit the Observatory. He said, "Well, I'll quit the Observatory," and White instantly took him on.

Dick: But why Watts? Because his supervisor at that time would have been Burton in the Equatorial Division.

Mikesell: Yes, but Burton wasn't going to be a powerful supervisor--not at all, in fact. Burton would have been a member of the Council, Watts would have said, "Now, this is what's going to have to be done," and Burton said, "Well, umm, uh, umm, I suppose you are right, and I guess that is so." So Watts, who knew Willis well, would have said to him, "Okay, here's the way it is." And Willis said, "I quit." As I say, he even pulled out all of his retirement pay, which everybody thought was being kind of silly. Then he went on up and joined White's business and, for the balance of the war, did anything that he could for White.

Dick: Then what became of him?

Mikesell: The last time I saw him, I suppose, was about '48. I think I was in a AAS meeting, and here was Willis. He was going around demonstrating Stereo Realist cameras, which I suppose he had helped White develop, and now he was helping sell them. The last I knew, he had gone to Florida.

Dick: You're reasonably sure that he's not still alive, so I shouldn't try and track him down?

Mikesell: Oh, by all means try to track him down, but I'd be surprised if he was.

Dick: The last you heard, he was out in the Milwaukee area?

Mikesell: His age certainly was comparable to Sollenberger's. No, the last I knew, he was down in Florida. , he had moved to Florida. That's the last I heard of him. Sollenberger should know, and Siantha Whittaker would know.

Dick: I believe Whittaker has died.

Mikesell: Whittaker died a long time ago, but Siantha is very much alive, his wife. She was about 17 years younger than Gerald, and she, of course, knew all of this gang very well. The last I knew, she was still quite in touch with Paul Sollenberger. While she would never be in touch with Willis as via Paul or collateral sources, she would know if Willis were still alive or when he died. I would think he had died. Almost certainly he would not have made obituary columns in things like *Sky and Telescope*. Astronomers at Yale knew him well on account of his work with refraction and other things. Ray Duncombe just might know about Willis; one could ask.

Dick: Is it true that his wife also worked at the Observatory as a computer or something?

Mikesell: Oh, yes. This gave rise to a very curious story of its own right--the first women to come on the Observatory staff. This happened after the war. The Observatory had vacancies and they were having no luck finding men to fill them, so the Astronomical Council said, "Well, we'll accept women if they're in any way qualified." Civil Service said, "Okay, we can come up with some women," and offered the names of three women. Julie was one.

Dick: Julie Steinheider--Duncombe later.

Mikesell: A Miss Brown was another, and I forget who was the third. I don't think McGregor came at that time. Two of these women, at least, were going into Watts' 6-inch Transit Circle Division, and the understanding was that they would not work nights because they felt it would be immoral for women to be alone amongst the equipment at night.

Dick: Was that a sincere feeling, or was that discrimination, do you think?

Mikesell: I don't know where the feeling was. Discrimination was definitely involved. They felt that the women didn't have the abilities that would be required to observe nights. Ray Duncombe, by the way, when he first came to the Observatory, spent some time in Burton's division and got out of it as quickly as he possibly could. He got started in an investigation of personal equation because he was doing some observing on objects that Burton was doing, and they weren't coming up with the same numbers. Burton said to him, "When you get more experienced, your numbers will be more like mine." Ray had no trouble perceiving that the trouble lay the other way, and then he looked it up and he ran into this whole story out of the Greenwich Observatory, where the astronomer Royal had to let go of a man who always came up a second different from him. You know that story. So Ray investigated this matter and wrote up the story, because his experience bumped into the same thing when he had to deal with a fuddy-duddy like Burton.

Dick: Back to the women in astronomy, though. Willis would have been before these other women.

Mikesell: Oh, yes. Willis was gone by the time they came aboard. Willis was one of the vacancies, of course, that had to be filled, to bring us back up to strength. Watts was delighted to fill his vacancies with people that would be number-crunchers. The number-crunching, by that long, slow, tedious process, persisted until at least 1950.

The little odd story--you asked about prejudice. There was the evening that I was staying on late in the Time Service downstairs, where I could see people walking up toward the front door if I didn't have my head on my work, I happened to glance out and saw a young woman coming in at about 15 minutes past quitting time, entering the Observatory. Without listening to the exchange out in the hall, it hit me that this young woman was somebody that Watts was interested in. So I picked up the phone and dialed him. I think I caught him at home. He lived on the grounds then. He was in one of those houses that had been taken over by officers since then, over near what used to be the old boiler plant--may still be.

So I said, "Oh, Watts, did you know that your Miss Brown is a Negro?" And he said, "Oh, no! She couldn't be! Oh, my goodness! Oh, my! What a mistake. Oh, dear me." She "couldn't be" because she had a master's degree from Brown University, this magnificent school in Providence, Rhode Island, which was Clemence' alma mater, with a tremendous reputation as a school of mathematics, which was Clemence' master's degree. Smiley was still there in charge of astronomy and had given this lady a terrific recommendation as one of his superb students.

Dick: But she was hired.

Mikesell: By that time, she was definitely hired. You bet your boots! Civil Service was color-blind.

Dick: Her name was Miss Brown?

Mikesell: Miss Black. She was Miss Black. I don't know her first name. So he took her on, and after she'd been there a little while, they got into the next Astronomical Council meeting. I'm quoting Sollenberger now, with whom I was still attached. Sollenberger reported that they got around to this matter of these two female hirees, how they were making out. "Watts, how are your women?" "Very well."

Somebody kind of teased him a little bit about one of them being black, and he says, "Oh, that was a terrible mistake. That was just too bad." And he went on, said Sollenberger, for almost five minutes over what a mistake it was that they had hired this woman. Then finally, as they were leaving the subject, the superintendent presiding over the meeting said, "Well, how is she doing on the work?" "Oh, wonderful! She's just superb." And Sollenberger said, "The low-down so-and-so."

Dick: Did she stay long?

Mikesell: She stayed about a year and a half, and resigned in order to take a job at a school in New Orleans, Louisiana, I think. At the end of the year, she applied for being reinstated at the Observatory. This was permitted to her. The rules of Civil Service permitted straight reinstatement as soon as there was a vacancy available. This person was at the top of the list

within the period of time equal to the time they had been employed before. So she had worked two years, say, and she had two years in which to apply for reinstatement. The Observatory did, indeed, have a request in to Civil Service, so her name was immediately handed up. They refused to take her back on essentially Watts' statement. Of course, Sollenberger, who was just as prejudiced but acted differently, wasn't going to take her into his place, so she was never retaken. In fact, it stopped all hiring at the Observatory for several years until her name disappeared off the Civil Service list. All the hiring stopped.

Dick: As far as women go, of course, as computers, women must have been around at the Observatory for quite a while, because there was Eleanor Lamson and her crew of people.

Mikesell: Yes.

Dick: But not as astronomers.

Mikesell: A number of women in the Almanac office, but not in the observing divisions until then. From then on, there were women in the observing divisions, and eventually they allowed the women to observe.

Dick: This came about because of the lack of available men.

Mikesell: That was all. Of course, the fundamental reason about the Observatory with regards to blacks was that, in the first place, the Navy has always been a deep southern organization. It's always been opposed to blacks being in the same positions as whites. At the Naval Observatory, all of our clerical help were white women who had been born and raised in the Carolinas. So the women on board, with the exception of the librarians, who had normally come out of the northern parts of the country, the women secretaries, clerks, were southerners.

This was a deep and serious thing. Sollenberger was raised in South Bend, Indiana, and had worked at the Studebaker Works until he came to Washington. He said, "I would sit at a table with a dog rather than with a Negro."

At the end of the war and for a few years thereafter, the

Observatory tried to operate the cafeteria, a full-service cafeteria. They had two separate rooms, two separate steam tables, one for the black people on the grounds, and one for the whites. When, for economic reasons, it was necessary to put those together, Sollenberger had made me to be chairman of the committee to run the cafeteria, and I had to preside over some of these meetings. Our then-manually operated telephone operator was an elegant woman from South Carolina, a very sweet, very nice, always very elegantly gotten up and elegantly mannered--and a snoop, as most telephone operators had been--but she was always a friend of mine, and I made a point to make sure that she was. She sat on the committee representing the CAF people. She said to me at the end of one of these meetings, "Mr. Mikesell, nobody thinks more highly of the Negroes than I do, but you must understand, Mr. Mikesell, they are not human beings. They are not!"

Dick: Of course, the discrimination was widespread back at that time.

Mikesell: It is now, too, I might add. It's not so apparent. Anyway, so this meant that Miss Black didn't have anybody to talk to. There were no other black women on the ground force at all. There were black men, lots of them, most of the messengers, most of the guards, all of the grounds workers. None of them was ever able, for some reason or other, to get promoted up to be one of the skilled crafts, no matter what they had done or how long they had been on the Observatory. Our superintendent of grounds, after Gringras, was always white and always from the South. His role was shared by a military opposite, who was sometimes a jg, sometimes a full lieutenant, usually a full lieutenant. I don't think ever a lieutenant commander, but anyway, an Annapolis man. So this was a shared opinion that blacks could be truck drivers, they could handle goods on the grounds, they could be messengers and guards, of course, gate-keepers.

A little personal aside, a funny story. I came from the far West and out of a relatively democratic family. I had a mother who was, for reasons I've never fathomed, violently anti-Semitic, but barring that, I could say I came from a democratic background. I was bothered in a hurry by what I bumped into in the social setting at the Observatory. One of the things that was explained to me by Whittaker and the others that took me out

to lunch on the first day with the Observatory, Whittaker, Sollenberger, Clemence, rarely Willis--he always brought lunch from home--but an interesting group, Markowitz and Sylvan Bestul. We'd run around someplace to lunch. There was a half-hour lunch break, and nobody could go off the grounds and get lunch in half an hour and get back, but nobody cared.

But they explained that some of the messengers, especially, who were making salaries like $900 a year, would borrow money from us. And sure enough, before I'd been there very long, about one week after my biweekly paycheck, I was hit by a messenger named Fraction. Fraction had ten children and they were extraordinarily well educated. Finally, they went to college of all sorts, became nurses and things. I doubt that Mrs. Fraction worked. So this had to be done. He lived downtown, someplace on Capitol Hill, where lots of the blacks lived then in an area known for its alleys of Washington, which were black alleys, no indoor plumbing, no indoor electricity. Some of our janitors who lived in that area came to work reeking of the kerosene that they could buy for six cents a gallon, which provided them heat for cooking and lighting and so on. Then these alley dwellings used common outdoor toilets and common outdoor water hydrants for their utilities. That's in the shadow of the Capitol. That's all gone nowadays. They were famous, those alleys of Washington.

Yes, he borrowed, and I gave him small amounts like a quarter or something. But within less than a month, it suddenly hit me that there was one thing that I could do to appease my sense of democracy--that was an acquired word, not one I knew at the time--and yet not get me in trouble with my contemporaries. Amongst all of us on the staff, amongst all of the professionals, we addressed each other by last name. All of the other help referred to us as "Mr.," regardless of degree. Markowitz was "Mr." and so was--well, H. R. Morgan was a fairly lofty character, so he was probably addressed as "Dr." There were not many Ph.D.s in 1936 on the Observatory staff, one reason for Struve's feeling. Lloyd Wiley, of course, came with a Ph.D., and so did a couple of other people who stayed around not too long. But with the exception of H. R. Morgan, these other people were addressed as "Mr."

Anybody that addressed me as "Mr.," I would use the term "Mr." back to him. So Whittaker would say, "Hey, Fraction, get me

some pencils and paper." And I would say, "Oh, Mr. Fraction, would you please, the next time you come by, leave me off some pencils and paper?" This difference. I didn't know that there was anything meant about it, and I didn't think anything about it. I found that almost immediately I got into the habit of this. It worked with the chaps that mowed the lawns, all the guards, all of the enormous black staff on the grounds. If they said, "Mr." to me, as they all did, I said "Mr." back to them, to every single one of them.

It wasn't until we were actually into the war and on the long schedule, and I happened to have a cousin visiting me in town, and I asked him to wait out in the hall for me as I got done working in the Time Service. He laughed as we were leaving the Observatory, driving away. He said, "Well, that guard out there is quite a character. He spoke well of you. He said, 'Oh, that Mr. Mikesell, he is sure one democratic man.'" That's the first time I heard the word, and I still didn't know what it meant until there was the day that Rhynsberger said to me, "Hey, how much is Fraction into you?" I said, "Huh?" "Well, how much do you think he's borrowed from you by now?" I said, "Oh, well, not more than I could afford." He said, "Well, I think he's into me over $1,000 and maybe several thousands by now."

I said, "Well, that's interesting." I knew what Fraction's salary was, by the way, and I knew what Rhynsberger's and my salary were. We all knew these things. There were many thousands of dollars of difference there per year. But when I walked away and thought about it, I realized that from my first month at the Observatory grounds, no one had ever asked to borrow a cent from me. Nobody was into me for anything, not a cent.

Then I realized other things. By that time I was already in the problem of being in charge of moving equipment, delicate apparatus, boxes of records and things. The people from the 9-inch Division got moved out of the clockhouse over into the main building. It was wintertime. These big, long sheets of records of star observations done with pen and ink, ink that came out of a bottle, now a fountain pen--no ballpoint pens yet--being moved over there. The boxes, somehow or other, slipped and fell, scattering the stuff in the snowdrifts. Nothing like that had ever happened to any of the work that these fellows were doing for me.

Or there was the time they were painting over the old 9-inch telescope, and they were painting the roof of the building. A bucket of paint fell off the trestle and spilled all over that instrument. Nothing like that ever happened to my equipment.

Dick: Let's finish up?

Mikesell: Willis. Nothing was done on the telescope. I gave you the little anecdote about Watts' notion of the destination of it. I was working with Pat Scott at the time, F. P. Scott. So when I got back from that particular run with Adams, where he gushed over his prospects for becoming in charge of the Equatorial Division, as Burton went on his way, Scott and I had spent many an hour, long after quitting time, talking about many things relating to astronomy and the working of the Observatory, working with the IAU--astronomy, in general--astronomical standards, meridian-circle work of all sorts. Scott was a self-made man, but he was totally into it, totally immersed. I came back to him with feelings of disaster over this proposal. Scott accepted my point of view, or shared it, or something. Anyway, instead of proceeding as Watts had suggested, they did, indeed, do a talent search and came up with John Hall.

Dick: We've jumped ahead a little bit here.

Mikesell: We've jumped to 1948.

Dick: Yes. Let me finish up with the Equatorial Division. There are a couple of people I'd like to ask you about. You've already mentioned Burton. He was the head of the division when you were there. Would you say that he made any scientific contribution during his years there?

Mikesell: I can't imagine a one. He went through the motions of observing double stars. At the time, I guess, Captain Freeman had asked the astronomers of the country about things, they said there was a great need for the observations of visual binaries, but only the very close ones were really important, the ones with conceivable periods. Burton decided that that was too demanding and tasking a chore, so he decided the only ones he would take were stars with separations of five seconds or more.

Dick: Quite long periods.

Mikesell: Well, he argued that the seeing in Washington was just too bad to worry about things like that. This big micrometer, this Repsold filar micrometer, which was an amazing elephant that had been made in accordance with somebody's specs . . .

Dick: You think it was not a good micrometer?

Mikesell: It was terrible. It was just an enormous gadget. I wanted to put other equipment on the back of the 26-inch, and Burton said, "Oh, no. Once we've gotten this micrometer on, we dare not take it off. It's too heavy. It would hurt the micrometer." Anyway, I spent every clear night working to establish the orientation of the lines to get my parallels.

[End Tape 1, Side 1. Begin Tape 1, Side 2]

Dick: You were discussing Burton's work.

Mikesell: He might make observations of as many as three stars, and then he undertook to make some visual observations of planetary satellites on account of the discovery of the Mars satellites. Satellites were important, so he had some satellite records he had made. I don't know if any of these things were published. He would sit around all night long. There was no question he spent every night, clear or cloudy, at the Observatory until the middle of the night, and I suppose he always went home about 1:00, and then he would show up about 11:00 the following morning, and spend the rest of his time answering letters from the general public.

Dick: Someone else who was in the Equatorial Division, I believe, when you came was Raynsford.

Mikesell: No, I don't think he was Equatorial, was he?

Dick: According to my notes, he was. What can you tell me about Raynsford? Was he at the Observatory long?

Mikesell: He had been in Miss Lamson's group. He was one of those. If I've gotten my name recollections correct, he was up

in Watts' place in '36 when I went there. We shared the office, and that was Raynesford. He took an early retirement from out of wherever he was. If he was in Burton's group, he made no impression on my memory.

Lyons was, unquestionably, until into the war. Then he left the Observatory for the wartime effort. His hobby had been cryptography and he pursued that hobby as a reserve officer, probably in Army.

Dick: And returned to the Observatory?

Mikesell: No, never came back to the Observatory, as far as I recall.

Dick: How about Lucy T. Day?

Mikesell: She was in there all the time. She'd been in there for quite a long time.

Dick: She did the solar work, didn't she? The solar photographs.

Mikesell: She did solar photographs. What else did she do? She was certainly available as a computing assistant to Burton. She probably would assist him on anything he asked of her. She presumably was in charge of any photographic chores that were bandied about, but mostly she was working on the solar records.

Dick: Why was the Observatory involved in solar photography at that time? Do you know what the rationale was, why the Navy was interested?

Mikesell: Historically, it started as soon as the Observatory was set up in the area. The first solar photographs that I recall having seen, certainly I saw some back in the '90s and these would have been taken by Peters. Then by 1910, they were into a regular solar observing program. This was before the IAU, of course. As soon as the IAU was formed, it commended the Observatory for making regular, consistent photographs. But the group that we were really linked with was the Swiss, who, of course, headed up the international effort. Wasn't it at Berne? I'm having to look way back. The Wolf numbers, for example,

these came out of headquarters there. Our data went to them.

Dick: But why was the Navy, in particular, interested in this as a project? Did it have to do with communications and sunspots?

Mikesell: Good question. Communications, of course. The Navy didn't get into short-wave, you know, until after WWI, but they started this photography series before then. We had the lenses. You probably have found the pictures of the house that Lucy Day worked in, where her office was. The solar telescope was attached to that house. If you look up the pictures and find them, that's on the site of the present Simon Newcomb lab.

Dick: Right. I'm pretty sure I've seen those pictures.

Mikesell: That house had to be razed. The house had been built at the same time as the 26-inch building, or soon thereafter, and the same time as the photography building down where Building 52 is, and where Peters had his base, because he was the photographer at that time.

Dick: Did you overlap with Peters at all?

Mikesell: No. He'd been gone six years, at least, probably by 1929 or '30.

Dick: He was the person who was mainly involved with photography, I guess, at the Observatory.

Mikesell: He was the official photographer. Every eclipse expedition, he would go along from whenever it started.

Dick: Do you think his photographic work made a significant contribution to astronomy? How well was Peters known outside the Observatory?

Mikesell: I don't think he was known at all. He did run off some photographs using those twin lenses that he made up and mounted in the old Clarke 26-inch mounting. One of those twin lenses was refigured by Lundin, as I commented to you, and not the other.

Dick: What was he doing, taking star fields?

Mikesell: Star fields, as far as I can recall at this stage. I knew his pictures were around. I've handled some of those eight-by-ten plates.

Dick: Yes, we still have those.

Mikesell: Incidentally, at one stage we had one full copy of the so-called Harvard Sky. You know what those were? These were eight-by-ten plates taken by students at Harvard on their survey cameras. These were cameras with lenses about that big. The whole camera is about this long, and on eight-by-ten plates. It fell the lot of graduate students to keep two or three of those cameras going all night long every clear night at Harvard. They had reasons that you could think of, no objective prism or anything. There were people at Harvard who searched these plates for comets, for example, afterwards. Whipple was one. Cunningham was famous when he was at Harvard, before he went to Berkeley, for grabbing up these plates as soon as they were developed in the morning, and searching for objects. But this meant they had one whale of a lot of plates and they made them available to observatories around the world as a Harvard Sky. They covered the Harvard visible sky.

Dick: But the Naval Observatory never really had any kind of a program like that. It seems like they sort of dabbled in photography and never really made a big contribution.

Mikesell: Right. So I don't know what was the logic behind Peters. You can look back in AJ through those years, which would be from, say, 1915 on. The new Warner-Swasey mounting came in '97 for the 26-inch. Peters must have taken over and utilized the old mounting certainly before 1910, and he would have been the one who started making those sun photos. Why? It would be nice if you could find out--you'll find it in the reports of the superintendent to the AAS, which were published at one stage in Popular Astronomy annually, and then in AJ they would be published.

Dick: People like Frank Schlesinger, you know, were getting involved in photographic astrometry in 1915.

Mikesell: It happens that I have in my briefcase a copy of a

letter from Frank Schlesinger to one of the professors of mathematics at the Observatory, discussing this. I don't know how it came into my hands, but presumably in some pile of papers that was being thrown out, I lifted it and brought it along to give to you. Of course, it shouldn't go into the trash out of my belongings. I don't have a key to the room, or I'd scoot up and get it, but we want to make sure that it gets handed to you.

Dick: Okay. So there was interaction with Schlesinger, but it seems to not have had much effect at the Observatory.

Mikesell: Oh, there was lots of communication, because Morgan, who was around at that time, was, as we said, a recognized astronomer, probably more recognized even than Schlesinger for a while. Yes, there were communications all around. Communication was very good. Watts certainly was in communication with people all over the country.

Dick: But still, the photographic program at the Naval Observatory doesn't seem to have gotten off the ground, at least prior to the 1930s. Even, we were saying, with the 40-inch, they tried the photography, but if I remember what we were saying yesterday--

Mikesell: No one picked it up and did anything seriously with it. No serious program was undertaken. Here was a wide-field camera, and nobody felt inspired to do more than take a few "gee whiz" pictures with it. Certainly right away, Willis did take some "gee whiz" pictures, but then right away stopped worrying about evacuating plates, which we bought already cut for us by Kodak.

Dick: You said yesterday that Hellweg intended this to be a real feather in his cap, or in the cap of the Observatory, yet he was there through 1946 and didn't seem to press the 40-inch program.

Mikesell: I'm sure he pressed it. It was always pressed via somebody like Burton and Lyons, totally unimaginative and possibly totally untrained and uninterested people, and certainly people that didn't want to get out and work hard. Lyons wasn't going to allow anything to be done that he wasn't there overseeing, and Burton certainly didn't care about anything.

Dick: So Hellweg was undoubtedly disappointed with the outcome.

Mikesell: None of the other people were going to help, except to the extent of sending Willis over to see what he could do with it, and he did, indeed, do some things right off. He did, indeed, get those photographs of Mars, which do, indeed, show Phobos and Deimos.

Dick: But there was Sharpless.

Mikesell: Well, I don't know who took them, whether it was Bevan that took them or Willis. Sharpless worked them up, no question about that.

Dick: Did you know Sharpless?

Mikesell: Oh, very well, because Sharpless was one of the people in the 6-inch Division. In fact, my desk was right next to his. So I knew him, and he was probably part of the luncheon group. He was a very smart cookie, by the way.

Dick: How long was he at the Observatory?

Mikesell: Until he died, but he ended up his years manning the Richmond station for the PZT.

Dick: Oh, he did?

Mikesell: Yes. That's where he died. When I knew him in '36, he already suffered bad migraine headaches on occasion at a time that nobody knew anything about migraines at all. They don't yet, maybe. He also then began to suffer asthma. By 1948, his asthmatic condition was so bad that he was going to have to get out of the climate at the Observatory. He considered applying to NOTS at China Lake, with the assumption that the beautiful dry climate there would be perfect for him. So the Navy flew him out to NOTS to look the situation over and vice versa.

Dick: That's some kind of a naval station, I take it.

Mikesell: Yes. Naval Ordnance Test Station, China Lake. John Irwin spent his last years working for the Navy there, his last years at Cal Tech. China Lake was started by Ike Bowen and his group out at Cal Tech. John will regale you with stories of

testing rockets there at China Lake. John had the first house built, because he was in charge of work there, and then that house became the commandant's house when the Navy took over the whole China Lake establishment from Cal Tech.

Dick: Sharpless was sent to China Lake.

Mikesell: Sharpless went there and he said he got off the airplane there and he looked around. He said, "You know, you can look off there and you see a mountain and it's 40 miles away, and it looks as clear as anything." I said, "Better to die in the East than to have to suffer living out here."

As soon as he could, he came back. Of course, at that time they had no housing for his wife and family, and he already felt that he had to have his wife along with him at all times. He didn't want to be separated from his wife. If the Navy took him out there, he'd have had to live in bachelor officers' quarters.

Dick: But by '49, the Richmond station was open, so he must have gone to Richmond shortly afterwards.

Mikesell: In '49 it was open, and he went down there, I think, almost immediately. Sollenberger took him on and sent him down there with the hope that the asthma would allow him to work.

Dick: How long was he there, then?

Mikesell: Sollenberger thought highly of Sharpless, and Sharpless was, indeed, a capable guy. When I got to the N.O. in 1936, he was laughing about the fact that he had gotten in very bad with Hellweg and there wasn't going to be anything that he could do. In fact, when a promotion came up that he should have had, Hellweg said, "Never will that man get promoted."

Dick: What was the problem?

Mikesell: There had been an eclipse. The Observatory always sent an expedition to every eclipse, and this one was at Tin Can Island, if you have ever heard of that. That was about 1934 or '35. Sharpless was elected to go along as the junior astronomer or, by that time, maybe a P-2 astronomer, to help out on the eclipse. Somebody else was senior, Watts or--no, there was

another astronomer who had left before I got there, who ran that eclipse expedition. Sollenberger was in on that one to Tin Can Island. I guess he would have been the astronomer in charge. Sharpless' one assignment was three chronometers, which he should have been chained to. He had to hand-carry those three chronometers, which were going to be the source of time. The ship put out to sea from San Diego, and when the smoke and cheering had cleared, the chronometers were still on the dock and Sharpless was on the ship.

Dick: Oh, no! What did they do?

Mikesell: I don't know what they did about that. Who could care less about those silly chronometers? In real term, of course, they were meaningless, but to Hellweg they were everything; they were the whole purpose of the whole expedition, because the reason the Observatory had given for it was to get more accurate timing in order to better define the position of the moon.

Dick: I was going to ask you, just like I asked you why they did solar photography, why did the Navy and the Naval Observatory sponsor that?

Mikesell: That was clear-cut. The orbit of the moon has always been very troublesome. None of these eclipses ever came off within seconds of prediction at that time, the orbit was so poor. They were still using Hill's orbit. Clemence hadn't yet done his work of rechecking Hill's orbit and finding the mistakes.

Dick: G.W. Hill, you mean.

Mikesell: Yes. So they attempted to get these data for bettering the whole matter, and it is a good, valid purpose. This was the reason time was so important, but they already had good radio.

Dick: By that time, yes.

Mikesell: The whole Pacific Basin was blanketed with our signals.

Dick: Anyway, Sharpless was in trouble with Hellweg over that.

Mikesell: From then on, there was nothing he could do right. Hellweg would retch every time he'd see Sharpless, and it was unfortunate that their offices were both on the second floor of the main building.

Dick: What else was Sharpless known for? There was the work on the secular acceleration of Mars. How did he become involved in that, do you know?

Mikesell: He got moved over to the Equatorial Division. You were asking who else was there. I was remembering now that Sharpless spent some time there.

Dick: He was moved there from . . .

Mikesell: He was moved there from probably the 6-inch Division. Why Watts sent him over there, I don't know.

Dick: He became interested in the moon and observations?

Mikesell: For all I know, he may indeed have taken the plates. I don't remember who took them. I could hope that those observing books are around or could be found.

Dick: I believe they are.

Mikesell: They would show whether it was Willis that took them or Sharpless. I think Willis was there at the time and Sharpless was there. Probably Watts sent Sharpless over, hoping that he could get a little bit of useful work out of Willis. This could have been well Watts' view on that particular shifting around. Also, I think Sharpless found that he couldn't handle the observing on the transit circle; that's exhausting work, very lively work in those days. The photographic recording wasn't there yet, although Watts was working on it hard. I suspect that this was for physical disability reasons that he sent Sharpless over to the 26-inch, but he almost certainly, in the back of his mind, hoped that Sharpless would get Willis to do something useful.

Dick: They did get some plates then, which he used as a basis for his acceleration.

Mikesell: Yes. Have you seen those plates?

Dick: I believe I have.

Mikesell: Pull them out of the file, look at them, and say to yourself, "Now I want to come up with some good data on the positions of moons of Mars." You'll see what a challenging position it is. We pulled them out when our present program-- what's his name? Oh, golly, I worked with him hard to get that going. He went out and took plates of the 40-inch at Flagstaff.

Dick: Pasque?

Mikesell: Dan Pasque. I worked with him hard, because we had to start from scratch. The plates he needed didn't have halation backing, which was an absolute essential.

Dick: The plates that who needed?

Mikesell: Pasque. So I had to draw them back, go all the way back to Frank E. Ross' book of 1916 on how you get rid of halation on plates.

Dick: Going back to Sharpless' Mars work, was this a very surprising thing to Sharpless, to find this secular acceleration? Do you remember talking about it?

Mikesell: I don't hear him making a big thing out of it, no. You read his paper, he doesn't make a big thing out of it in the report. He puts it in there.

Dick: But it is something that has been confirmed subsequently, isn't that right?

Mikesell: I'm not sure it has.

Dick: I think there's still some controversy over it, probably.

Mikesell: These observations are so difficult. I think this is the reason that Sharpless probably didn't attach too much to them himself, although he didn't allow that to show in his published report. Clemence, I know, didn't think anything of it. He was a little bit disgusted that as much was made of it, because he felt

that there were not enough data by far.

Dick: Who made so much of it?

Mikesell: Mostly in Europe and Soviet Union, other astronomers who weren't really familiar with the initial data or problems of getting these data.

Dick: What else did Sharpless work on? Do you recall anything?

Mikesell: At this stage I don't, no. Nobody was allowed, of course, to observe on the Repsold micrometer, except with Burton's supervision. That was when the occasion of Duncombe was over there, and I don't know whether Ray--I don't remember where he was based. It may have been in the Almanac office before he left for Yale and his Ph.D. But he was just interested in making such observations. Part of the way of getting the observations was to take transits of the drifting star over the wires that Burton carefully measured the intervals of. These were the occasions where, as Ray said, he would come up earlier than Burton; how was it that he could err on the side of anticipation?

Dick: You were only in the Equatorial Division for a couple of years, but you've given me an idea of what it was like there. There are a couple of names we've mentioned that I'd like to ask you a few more things about. Of course, we've mentioned Hellweg. What's your assessment of Captain Hellweg, who was the longest-running superintendent there since Matthew Fontaine Maury, 16 years, I think?

Mikesell: I guess he was a nuisance in some ways, but Watts and Sollenberger said that they felt they had no problems getting along with him. They saw how he thought about things, and they worked to meet his expectations on life.

Dick: What were his expectations? You mean he had different standards?

Mikesell: When he said something should be done, then it was to be done. Nobody was to drop a disk. When he said it's to be picked out of the cell, you're not to drop it on the steel floor.

Dick: Right. Even if the method was questionable.

Mikesell: Even if it was his method that made it fall.

Dick: Did he consider himself a scientist?

Mikesell: Oh, absolutely. He insisted that with the scarce money to send people to the IAU meetings in Paris in '34, that he should be one of the U.S. contingent to go, and that the Naval Observatory should use some of its very scarce funds to send him. Then he insisted that somehow or other, the Navy take along his son, who was as big as him physically, but certainly a worthless galumph if ever there was a glad-handing, happy-faced, happy-go-lucky guy, 6'6" tall and 250 pounds.

Dick: Did anyone else think of him as a scientist, or was that just his own opinion?

Mikesell: That was just his own opinion, no question.

Dick: Apparently he wrote some articles on the Time Service and that sort of thing.

Mikesell: Absolutely. Sollenberger wrote them, and Hellweg signed his name. He said, "As the superintendent of the Observatory, I order you to write this. Then since I am the superintendent, I sign it."

Dick: Didn't Sollenberger object?

Mikesell: He was amused. He didn't like it, of course. Sollenberger was delighted that Hellweg took an interest in the Time Service, and it meant that when Sollenberger wanted to buy a crystal clock from General Radio, Hellweg said, "By all means do it right away." So the first one got bought. So Sollenberger was willing to put up with all sorts of things.

For example, Hellweg wrote to the Franklin Institute with regards to one of their medals and said, "Look at this wonderful invention I made of this quartz-crystal-controlled time-transmitting clock," which Hellweg had done absolutely nothing about, except to sign the chits for buying the metal that Sollenberger had cut up in the plans, that Sollenberger had conceived of and drawn up. So Hellweg decided that he had

invented it. At the last moment, somebody in Philadelphia--they were quite willing to give him the metal--and at the last moment, somebody asked around a little bit and discovered Sollenberger. They came down very discreetly and interviewed Sollenberger, and discovered the story about it. So Sollenberger got a medal, too. So Sollenberger had to go up and sit alongside of this four-flusher, who talked so grandly. Sollenberger said, "For the things I get out of this, I'm very willing to keep my mouth shut."

Dick: Hellweg, of course, had saved the Observatory from oblivion under Roosevelt.

Mikesell: Maybe. He said he had. But he also said he had invented that crystal clock, which actually, of course, was invented by [W.P.] Marrison of Bell Labs.

Dick: Do you mean there's the possibility that the whole Roosevelt thing did not happen?

Mikesell: Very, very possible. Very possible.

Dick: But there should be some way to check that in the records.

Mikesell: I'll give you 50 bucks, 50 against 5, that you can't find it. That there isn't really any independent record. All the Roosevelt Administration records are at Hyde Park in the Roosevelt Library, and we know the time, the first year of the first term. We know the season. The Collier's article would be the easiest thing to hunt, and my memory could be so poor that it could turn out to have been Liberty rather than Collier's. Did you know there was a magazine called Liberty?

Dick: No, but I have heard Collier's name in connection with this before.

Mikesell: They were both below Saturday Evening Post in status at the time.

Dick: Let me ask you about one more person before we go on to your Time Service years, and that is Robertson, who left the Observatory. We mentioned him a little bit yesterday, but he left the Observatory in 1939, which would have been just about

the time you were going into the Time Service. What is your assessment of Robertson as a scientist?

Mikesell: Apparently he was not worth anything as either a scientist or administrator. He tended to have reasonably good assistant directors. His assistant director in those late '30s, when I went in there, Hamilton, was a very quiet gentleman, but he was probably the person pretty much in response. Miss Lewis was in charge of all the eclipse work.

Dick: Isabel Lewis.

Mikesell: Isabel Lewis. She was very good. Charlotte Krampe was a number-hacker working with Lewis. I don't know that she was anything as a scientist, but she was a responsible person. We mentioned Perez Fish.

Dick: How did Robertson get to be Director of the Nautical Almanac Office?

Mikesell: By machinations, I was told, but I never found out. I don't know. Hamilton was the assistant director, a very quiet, subservient sort of chap who would sidle into Robertson's office and make his report, and Robertson would chew him out. He would then sidle out and run things. But all Robertson had to do was sign chits, and these various people did their jobs. Draper was amazingly good, even though he was always running off to prove something different about Euclid's fifth postulate and writing books on the subject. But nonetheless, he was capable.

Dick: Which Draper was this? Glen Draper?

Mikesell: Is that his first name? Could have been.

Dick: He actually wrote books?

Mikesell: Yes, proving various things.

Dick: Was he a good mathematician?

Mikesell: Yes, yes. He would get into serious arguments with Clemence, who was a confessed mathematician, and Sollenberger, who was an extraordinarily good self-made mathematician, who

would tackle anything and master it that he got interested in.

Dick: Sollenberger?

Mikesell: Sollenberger, yes. So Draper would be getting in lunchtime arguments with Sollenberger and Clemence, and Draper was always against general relativity, so he was trying to find other explanations for things. But his work in the Almanac office was solid. When Eckert came aboard, Eckert thought that maybe Draper was a crackpot, but very soon Eckert put him in charge of large units of affairs, and Draper moved rapidly into the machine age, which Eckert required of absolutely all of the employees. Everybody had to move into the machine age or retire. Perez Fish retired, Hamilton retired.

Dick: How about Frank Ross? I believe you mentioned Ross to me yesterday. Was he the one who was edged out by Robertson?

Mikesell: Way back. That was in the teens. That was way back.

Dick: Even before Robertson became director?

Mikesell: Oh, yes, yes. They were both at the same level back then.

Dick: And what is the story?

Mikesell: I don't know the details of the story. I just know that there was skullduggery on Ross' part, and Robertson did something very unprofessional, as well as just humanly wrong. This made Ross look bad, or else Robertson took credit on something Ross was doing and took the full credit for himself and wouldn't allow as how Ross had anything to do with it. Ross just said, "Nuts to you," and left. Absolutely. That happened way early on.

But after that, Robertson, with the same kind of machinations, given rather quiet and subservient people in the office, he just slid himself right on up. As far as I can tell, he had no merits, no abilities. I don't know that he ever did anything. Because of his titular role, he could get on to any commission of the IAU that was formed, and I don't know that he ever did anything of any quality anyplace.

John Hall talked to him way after Robertson's retirement. Robertson would come around, hang around, and talk to anybody who would listen. John was interested in history and talked to him some. He may have a better assessment, although John came in too late and didn't have to be around watching the guy in operation.

Dick: Why don't we go on, then, to the Time Service. I think it was about '38 or '39 when you went into Time Service from Equatorial Division. Sollenberger would have been the director at that point.

Mikesell: He was the head.

Dick: Who else would have been in the division?

Mikesell: Sylvan Bestul was in there. Markowitz, of course, had been in there from '36.

Dick: I have a name here of Sharnoff. Would he have been there?

Mikesell: Sharnoff was another one of those computers in Miss Lamson's group, who got a P-1. They all had to take what was called an unassembled exam to prove that they were capable of filling the role, and they all took that and passed without any trouble. Probably he was. I think you're right. Sharnoff was in there, and then Sharnoff moved from that division to another one, and I don't know which one it was, probably Almanac office. You'd have to check. There again, the fly pages on American Ephemeris are going to be a good guide.

Dick: When we talk about Time Service, I tend to divide things into finding the time, keeping the time, and transmitting the time. So can you tell me, when you went into Time Service, what the situation was, as far as finding the time?

Mikesell: By that time, they were absolutely dedicated to the use of the PZT. The old altazimuth was still in place. This was a 5-inch instrument.

Dick: The altazimuth.

Mikesell: It had a housing on the north side of the clockhouse.

Dick: What was that instrument used for, by the way?

Mikesell: Time and latitude.

Dick: The altazimuth was?

Mikesell: Yes, yes.

Dick: Do you know what became of that instrument?

Mikesell: It was thrown into storage. At the time that the storage was cleared out, a lot of the instruments were thrown into the garbage. There's a possibility that was sent down to Smithsonian. Debbie Warner would know if it got down there. She grabbed as much as she could. I surreptitiously snuck some things over to her, literally midnight acquisitions. She drove by the Observatory on her way home, and I r her just inside or outside the gate, moved a box from my auto r into her auto.

Dick: So as far as finding the time, then, the PZT had . . .

Mikesell: As far as the crew at the Observatory was concerned, it had proved itself. I think they had already made their first publication on that matter in AJ. They were fully committed to it from then on.

Dick: Who was developing the PZT at this time? Who was working to make sure that it did work properly and that sort of thing?

Mikesell: That work had been achieved. We had a working instrument, and we all took turns using it. Every one of us spent nights on it, from Sollenberger right on down, including all of these officers who were sent into the Observatory and spent their time there in the Time Service, helping to man it. So everybody shared in running the PZT.

Very quickly, a number of us knew all about how it worked, so any instantaneous repairs we could accomplish. As you know, making contacts, working a key, was a crucial part of its functioning for purposes of time, so that was a little contact mechanism that could go out.

Dick: Was there a chronograph at this time?

Mikesell: Always a drum chronograph. That was part of using it. The first thing you'd do when you went in there, you had to slide back the roof. It was a building with roofs that slid all the way off, if you wanted. Then you had to go down and skim a scum off the top of the mercury, because we always put a little bit of tin in the mercury to make it a little more viscous. So you'd skim the mercury off. Then there was a focusing rod hung down inside the tube, and you would work the leveling screws on the mercury until the contact was made between the tip of the rod and the mercury, which would sound a buzzer. At some stage, one had to load the plate-holder; that was done in the basement of the main building when I first went there. We went downstairs in the basement and loaded it.

There was also the job of cutting the plates, because after a little experience of trying to get the plates one and seven-eighths square from Kodak, we gave up and bought eight-by-tens and cut them ourselves. I already knew how to cut plates; I had learned that at Berkeley. Anyway, we'd have to cut up these eight-by-ten plates into these little oddball squares. John Willis had made up our measuring template for cutting, and probably had established a lot of those routines. He was certainly in on the conversion of the PZT and its use.

Dick: Who did the reductions? Did you all take part in the reductions?

Mikesell: Every one of us. For example, when we'd get done working in the evening, we were expected to finish reducing. No, we didn't. We would bring it over, and the first man in the next morning would develop the plate taken the night before. Then it would be measured up immediately.

Dick: This was some kind of a measuring engine.

Mikesell: Just a standard little Gaertner single-screw, very small, single-screw measuring engine, and run these things off.

Dick: Once you had the time, then we come into the keeping of the time. I take it that the clocks then would be these--

Mikesell: There were eight stars to a group. On any one night, you'd observe two groups, so a full observing would be 16. Then normally there were a couple of extras added to the list for one reason or another, such as precession, so there might be 18 or 19 stars.

Dick: How many plates would this be?

Mikesell: One plate. All of these observations would be on a plate. If you were having a little bit of trouble with the images overlapping, it was taken care of by juggling the starting time slightly. The old PZT would actually start sometime within two seconds after you gave the start signal to it.

Dick: What was the procedure in going from sidereal time, then, to a mean time which would be kept with the clocks and transmitted?

Mikesell: Whenever it was done, it was done thoroughly manually. This was done on the drum chronograph that was operated in the clock room in the Time Service.

Dick: In the main building.

Mikesell: In the main building, that intermediate room. There were three rooms between the entry and the elevator, and this was the smaller middle room with clocks all around the periphery of it. When I first went there, there were, by that time, the so-called phonic clocks, synchronous clocks.

Dick: What did you call them?

Mikesell: Phonic. That was the original term for a synchronous.

Dick: I've never heard that term.

Mikesell: That's the original term. Marrison's original article refers to it.

Dick: Whose article?

Mikesell: Marrison. The quartz-crystal-controlled clock was developed simultaneously in Germany and in the United States at the Bell Labs. There's a very famous article by W.P. Marrison, describing the whole thing at Bell Labs, about 1929 or '30. Then out of something like the fur Physique, the German version came. That was at the German equivalent of the Bureau of Standards that they developed theirs.

Dick: You are talking about the quartz clock now, but what was the standard clock at the time when you came into the Time Service? The master clock, so to speak.

Mikesell: The master clock would have been, I think, still the mean of the Shortt free-pendulum clocks. The Observatory had four of them put into the vault of the clockhouse. They depended upon the mean of a number of those.

Dick: So the Rieflers were not being used anymore at that point.

Mikesell: Oh, no. The Rieflers were hopeless.

Dick: Were the Rieflers still around?

Mikesell: Oh, yes. Yes, indeed.

Dick: But not being used in any sort of way?

Mikesell: The last Riefler had to be stopped. Who designed the clockhouse? Was that Watts?

Dick: Probably so.

Mikesell: Or his predecessor, who was--who was Watts' predecessor with the 6-inch transit circle?

Dick: There was Harkness.

Mikesell: No.

Dick: Eichelberger?

Mikesell: No, he was one of the professors of mathematics.

Dick: But he was involved with the 6-inch for a while.

Mikesell: Yes, but he wasn't Watts' immediate predecessor. Watts did his apprenticeship under this guy.

Dick: J. C. Hammond.

Mikesell: Yes. Probably Watts was in on it. When they built the clockhouse in the basement--temperature control was the idea of the basement--and they put a pier of marble on each of the four sides.

[End Tape 1, Side 2. Begin Tape 2, Side 1]

Dick: We're talking about the Shortt clocks down in the clockhouse. There were four of them down there?

Mikesell: Yes. That's what I said. But maybe three. I was saying that there were these four piers along the sides, and they put there the first two Shortt clocks, when they took delivery on them. The first bills of sale for buying the Shortt clocks were very interesting, and they were there in the files, at least Watts' files or Sollenberger's--Time Service files. I read through them once with delight.

Dick: I hope they're saved somewhere.

Mikesell: I doubt it. They had the Shortt clock of this new delivery about 1932, for example, on the east wall, and there was a Rieffler left standing, mounted on the pier on the west wall, which was across the room ten feet or so. These marble piers were run about six feet down into the ground, with oversized holes, surrounded by soft sand, just allowed to sit there and carry the clocks.

Dick: Originally the Riefflers, or was this built for the Shortts?

Mikesell: Built for clocks--period. Pendulum clocks. They had the Rieffler going there originally, one on the west pier and then one on an angular pier next to it. Then they got in these two new Shortts, put one on the northside pier, one on the east pier.

The one on the northside pier had a very good rate, nice, straight. The one on the east pier had a wave to its date, and it took them three months before they discovered that that wave was the beat frequency between that clock and the Rieffler. So they instantly stopped the Rieffler and the wave went out and it went straight. That record is amongst the records that probably went down to Archives. But it's a very beautiful graph.

Dick: How was the Rieffler affecting the Shortt?

Mikesell: Coupling through the ground. Those pendulums are heavy and they couple, despite the fact that they're mounted on three-ton blocks of marble that are surrounded with sand, not making solid contact with the concrete floor of the room. Have you been in the clock room?

Dick: Oh, yes.

Mikesell: So that was the end of the Riefflers.

Dick: So the Shortts came to the Observatory, then, in the late '20s, early '30s?

Mikesell: It was about 1932, '33. Shortly before I came.

Dick: So when you came, the mean of those were the standard.

Mikesell: The mean of those were the standard, yes. Our crystals were not that good then. We depended upon these clocks, and then it was just easy to compare them on the drum chronograph with the time coming off. You'd read those. Those can be read far better than to a tenth of a second on a drum chronograph for your second ticks are about that far apart. You can read up any number of them. You can read up 50 of them or 100 of them. This is, of course, the work of these naval officers to lay down the ruler and then call these things to a companion alongside. Then somebody has to add all these things up and take the mean and make the reductions. That would be the transfer.

The other people who were also observing time were the transit circles. Each of them were producing indications of time out of every observing tour. There were always clock stars during every transit circle tour.

Dick: Was that used by the Time Service at all? The PZT took over entirely.

Mikesell: Entirely. We were well aware of the others, and inter-comparison was always done, but for all practical purposes, it was these Shortts. We got at least a third, and the history will tell if we got more than three, but I'm sure we got a third Shortt clock.

Dick: What can you tell me about the origin of the crystal clocks at the Observatory and how that developed?

Mikesell: I don't know the real story of how Sollenberger and, almost certainly, Willis, would be the two co-partners on that. They were real buddies socially, as well as in work situation. The Observatory was regularly getting the Bell Systems *Technical Journal*, in which Marrison's article appeared. It was regularly getting Electronics magazine. There were any number of guys around the Observatory reading all of these avidly. Sharpless was among them. Willis would have read something, and Sollenberger was certainly reading it with interest. So Marrison wrote, extolling this. They could read the German publication, with the Germans extolling it. In 1934, they got the Navy to buy Marrison's system from General Radio. General Radio provided them with an X-cut crystal about so long.

Dick: Four, five inches long?

Mikesell: About four inches long. It worked inside a cute little box which was surrounded with heating elements, put inside another oven, which was surrounded with heating elements, and we had two thermostats and a couple of thermometers coming out to make sure we could monitor all these, because the thermostats had to work relays, ordinary old cheap relays. The length of that General Radio crystal produced a 30-kilocycle oscillation, fundamental frequency, and they had multivibrators, either two or three stage, standard triode tubes. These were four-tube setups. Originally there was one rack panel for each multivibrator in a scheme, and it ended up at 1,000 cycles per second, or 1,000 hertz. You couldn't run multivibrators comfortably as high as 1 to 6, with those old triodes and have the whole system track well. However, a constant voltage for the vacuum tubes, the

oscillators, and the multivibrators was supplied essentially by batteries, which rode on line. So in a basement room, there was a big bank of Edison cells.

Dick: Where was the quartz clock originally located?

Mikesell: It was located in that clock room, middle room, in the Time Service suite.

Dick: In the main building.

Mikesell: The main building, yes, right along up there, along with Sollenberger's number-one synchronous motor clock, which ran subsynchronously. I think the first one divided by 50 to 1 or something. It really sang as it went, as it turned, and, of course, it wasn't self-starting. You had to spin it, get it up to speed.

Dick: How good was the quartz crystal compared to the Shortts?

Mikesell: The two or three Shortts, whatever number of Shortts we had, certainly were better than our quartz crystal.

Dick: They were better?

Mikesell: Yes. That old X-cut crystal had the classic problem of classic drift, plus certainly some temperature problems, plus the fact that they didn't know, at the time they delivered that first one, of the need for hydrofluoric acid etching of a freshly ground crystal. Plus the fact that the frequency loading circuits that were external to the inner oven were temperature-sensitive. There was a little inductance in capacitors. As those things aged and as they suffered temperature effects, they would throw it off. It was good, it was very good, and our thousandth-of-a-second unit of precision in those broadcasts was a valid one, but from day to day we would vary by several thousandths.

Dick: So was the quartz clock used for transmitting the time?

Mikesell: Yes. That was the transmitter.

Dick: Why was the quartz clock used instead of the Shortts if they weren't quite as good?

Mikesell: In the first place, the Shortts were running on sidereal time, and we transmitted on mean time. In the second place, you had to have a complicated transmitting signal.

Dick: But they must have used the Shortts to transmit time before the quartz crystal came in.

Mikesell: No, they used the old Howard clock and ran the Howard by inter-comparison. The Time Service was equipped with a circuit breaker for a seconds tick.

Dick: Again they had to go from sidereal to mean and then transmit by mean.

Mikesell: The Howards, those individual second ticks on that were not very uniform. From one second to the next, there would be as much as five 1,000ths of a second difference.

Dick: But with a quartz clock, you could rig up an automatic scheme?

Mikesell: This was with a phonic clock. So you had a very nice circuit breaker jewel to actually mechanically break the signal for each second. Then it was easy to put in the programming for the pattern of breaks at the five-minute signal, including the SK for the end of transmission.

Dick: So this was the famous 1934 automatic time transmitter system based on the quartz clock, while the master clocks really were still Shortt clocks.

Mikesell: Yes.

Dick: At what point did the quartz clock become the master clock?

Mikesell: We had to get more of them and we had to get better. Of course, a lot of work was being done on it, and they rapidly came out with other less temperature-sensitive cuts. The DT cut had a temperature curve like this, so all you'd do is operate at this temperature zone. You had very little effect. Then the GT cuts had a curve like that, so you had a long temperature range, over which you had little change in frequency.

Then we had to learn how to control aging of the crystal, which involved not only the acid treatment, but polishing and evacuating and coupling and tuning in different ways. The Germans, from the start, had known about the polishing and the vacuuming. This hit the Americans late. Marrison soon picked it up from the Germans, and for his clocks at Bell Labs in New York City, he went over early on to GT crystals that were polished and evacuated.

Dick: How much experimentation was actually done at the Naval Observatory?

Mikesell: An enormous amount. There were times when I was fully engrossed in this for days on end, all of my spare time after doing my mundane duties. I was involved in cutting quartz crystals. Normally, we got them cut out at the Bureau of Standards. We'd take the quartz crystal out there. Then we also got in our own saw, and we sawed up our own crystals. The Bureau of Standards kept doing for us the work of checking them out for twinning. The original quartz crystal, you have to get it as nearly as possible untwinned optically and untwinned electrically. On quartz, the optical twinning shows up with a polariscope, and the electrical twinning shows up by etch pattern on the thing. You want to get rid of both twinning on the picture piece you cut, and then you have to cut at a very peculiar angle. We were cutting GT cuts, DT first, because they were the easiest.

Dick: What is GT versus DT mean?

Mikesell: You have your six axes in the crystal--X, Y, Z axes, then a six-sided crystal. An X-cut crystal, you're putting the piezoelectric force along the X-axis. For Y-cut, you're cutting it on the Y-axis. Then the Z-axis is the optical axis of the crystal, and you start twisting about X and Y, then, finally, Z, until you come with a twist about all three axes. You end up with a GT crystal, which would oscillate with all of its temperature coefficients cancelled out. So the change of temperature wouldn't change the frequency, which depends solely on the physical dimensions of the crystal.

Dick: Who were you working with in the Time Service on this?

Mikesell: Sollenberger.

Dick: Just Sollenberger and you at that point?

Mikesell: He was in charge of the Time Service, and he would direct me to spend my time stewing on this. Then all of us would read the literature, we'd talk to Marrison, would experiment. We picked anybody's brains we could.

Dick: So basically, you were trying to build a new quartz clock more or less from scratch.

Mikesell: We did. We finished up a lot of those crystals. I ruined my liver with it.

Dick: How is that?

Mikesell: We recognized that we had to have them clean, so we bathed them in carbon tetrachloride. We were doing this after we'd moved the chronometers out at the end of the war. We did this, or even earlier, in that little tight room, in the chronometer room amongst the chronometers ticking away. I'd be working in there on these crystals, grinding and then polishing them, then washing them in carbon tet. There was no ventilation. I was washing with bare hands. My hands were scrubbed and wet with it day after day after day.

I got curiously ill and lost a whole month not being able to come in and work. None of my doctors could run it down. They could find no cause for it. It wasn't until later, after the Navy had pulled all of our bottles of carbon tet off our shelves and all the fire extinguishers out, I tried to donate blood, and it would be rejected because of high bilirubin. Then it finally dawned on me what the problem had been and why I had been sick for a month.

Dick: So you built these clocks, which then improved the time-keeping?

Mikesell: Yes, it improved. We built certainly another mechanical signal transmitting device. We certainly sent one down to Richmond station after that got going. I was out of the

Time Service by then. There was the delightful day we had contracted with a firm to build us some new assemblies, multivibrator, electrical assemblies, and everything for doing all that, and had out a contract right after the war for ten of those assemblies at $4,000 apiece--$40,000. Then somebody at some stage, as the contract was going on, criticized the whole thing, and the Navy sent investigators up to see what in the world we were doing with their money. They were mostly looking for fraud, because cases like the present were surfacing, of fraud in procurement.

Sollenberger reported to me over the luncheon table one day, he had sat in on the final conference with the Navy's Board of Review, and the admiral said, "Well, it seems that with your present contract, for a mere $4,000 apiece you are getting clocks and systems that are adequate to your job, done by an outfit that's not very well known, but it looks like they're delivering all right and everything is in order. It will be fine. To do it in the way that the Navy keeps saying it ought to be done would cost $50,000 apiece." He sat there a moment, drumming his fingers on the table, said Sollenberger, and then he said, "Why be piddling?" The $4,000 devices were delivered and stuffed in the basement.

Dick: What was the company that made those, do you recall?

Mikesell: The good ones or the cheap ones? I don't remember either.

Dick: Over how many years did this experimentation continue?

Mikesell: Before we went out. Well, through the war years, yes, throughout the war years.

Dick: At what point, then, did the quartz clocks become the standards?

Mikesell: I don't know. You're going to have to ask Markowitz for that.

Dick: I know at one point they got the Essen rings from the British.

Mikesell: Oh, yes. That was coming in there.

Dick: That was the early '50s, though.

Mikesell: Yes, yes. That was one of those attempts, but I wouldn't say that they were still there. I would think that the electronic clocks became masters with the cesium clock. Soon after I left the Time Service, we began thinking all about that. Eckert wanted us to deal with Rabi and get a maser out of Rabi's lab, and the Bureau of Standards, of course, had their hydrogen maser clock going, which is a beautiful thing.

Dick: This is late '40s or early '40s?

Mikesell: Late '40s. This is all after the war. Late '40s, early '50s. The Essen ring brought in a lot of publicity. But I was really out of it then.

Dick: Who else in the U.S. was doing this kind of experimentation on crystals in the early '40s when you were? Was this something fairly unique?

Mikesell: For timepieces, I don't know of any other group besides Bell Labs. Of course, for radio communication purposes, we were turning out crystals by the millions. The collection of quartz that the Bureau of Standards had, they were handling the natural quartz consolidation for the country. They were into that. Land, of Polaroid fame, was into quartz very much.

Dick: Was there interaction between you and NBS or between you and Bell Labs?

Mikesell: NBS wasn't into making quartz clocks. They did that after the war. They got into it and started up their WWV service. That was post-war. The first one was at the labs right out there on Nebraska Avenue, and then they moved it over to Virginia. I have a delightful story. They had been set up and running there for a couple of weeks when they got an in-house fire and grabbed up a bunch of Pyrene fire extinguishers. You wouldn't know that brand name, very famous, widely advertised. They were the fire extinguishers of choice for every vehicle that had a fire extinguisher--trains, trucks, airplanes, tanks, you name it. They all did one thing: they squirted carbon

tetrachloride, which has the wonderful effect of being turned into phosgene gas, a very famous World War I poison gas, when it hits flames or heat. So five of the guys from the Bureau of Standards station went to the hospital, dangerously ill from phosgene-gas poisoning. Then was the last time that the Pyrene was allowed to sell Pyrene fire extinguishers. Didn't have any environmental control, no Ralph Nader, but the Bureau of Standards suddenly refused to certify. The government no longer would buy any fire extinguisher with carbon tet. The Navy had already snatched it off our shelves; they'd gotten bright earlier. But the Bureau of Standards was not allowed to interfere with private enterprise up to that point, nor were they for some time afterwards.

There was a very famous storage battery incident in the first year of Ike's [Eisenhower] regime. UDX-2. Dr. Ritchey, a four-flusher of the highest order, since we all talked to Kiess a lot about that, we were secondarily interested in following it, because Kiess was on the firing line. He was the man accused of doing Ritchey dirt. He was a very famous astronomer, by the way. He was a spectroscopist.

Dick: At Georgetown, wasn't he, for a while?

Mikesell: He taught there, but his base was Bureau of Standards. He did all of his work in spectroscopy. He got out the tables. Who was the lady? Moore, was it, Charlotte Moore?

Mikesell: Charlotte Moore Sitterly.

Mikesell: Yes, Charlotte Moore. Sitterly was a mathematician at American University. Charlotte Moore, I think, was a spectroscopist, and both of them were astronomers, basically. Kiess was a Berkeley man, and made up these fantastic tables for the astrophysicists of the era, and ran the Spectroscopy Division at the Bureau of Standards. So when Ritchey challenged people on the matter of the constitution of Rochelle's salts battery additive, Kiess was the one who had to absolutely find out what all the traces were without using mass spectroscopy.

The science community was relatively compact. Everybody knew the Georgetown people. After the war, a fair number of our astronomers were going there to get Ph.Ds, in order to finish up

degree work, either there or George Washington U. Then we'd have them to seminars at our place.

Dick: As far as the Time Service goes, the other function was the chronometer function. That was still a part of Time Service when you were there, is that right?

Mikesell: It was located there, but except for using our services to wind the chronometers on weekends and holidays, we had nothing to do with it. The warrant officer had a desk in our place and kept his books at his desk and looked after the chronometers in that middle room, which we borrowed the use of for working up crystals during those war years.

Dick: Who was rating the chronometers then?

Mikesell: He was, this warrant officer. He did all of the work with the chronometers. He rated them, he booked them in and out, did everything. The chronometer servicing area was moved, when it could no longer be contracted out--there were too many of them--was moved on the grounds in Building 52.

Dick: That chronometer function was moved entirely away from the Naval Observatory about 1950. Do you remember the circumstances around that?

Mikesell: Building 52 was not part of the Observatory's function. It was not under the Observatory, except in ways that the senior officer might be the superintendent of the Observatory. But the Observatory looked after buildings and grounds. Everything within the walls was handled by other offices of the Navy for that building. That was true of the chronometer function. It was always under BuNav, Bureau of Navigation.

There was lots of cross-work. For example, the Observatory printed up BuNav's tables. This was one of the first things that Eckert did, was to point out to them that the navigational tables could be worked up by his equipment. It was something to watch Eckert and Paul Herget and Gerald Clemence working out to use an IBM typewriter to print the very first pages of the very first Air Almanac. All of this came out of the experience of taking three weeks to find the guy lost out in the Pacific, who was

going from the Hawaiian Islands to another island, and when the plane went down, they couldn't find him.

Dick: So they decided they needed an Air Almanac.

Mikesell: They decided they needed much better navigation. Oh, gosh, a very famous automobile racer was the officer, a reserve officer, of course. Very famous name; I'll think of it. He was aboard that airplane. They spent those days on this rubber raft, tremendously written up. He was picked up in the very last sweep. By that time he was 300 miles away from where anybody thought he should be, and one of the Navy's planes, on the very last sweep that it was due to take, said, "Oh, well, if this is the last, we'll go wild." They went way away from where they were and caught sight of this raft and rescued these guys. This became, of course, a full-page story in Life magazine, complete with many pictures.

Dick: This would have been around 1942?

Mikesell: 1942, yes. This was the early days of our war. The other thing that, of course, the Almanac office got involved in very heavily, again on account of Clemence and Herget, was making the network for intercepting the submarines off of the Atlantic seaboard. In February of 1942, any of us who happened to be over on the Eastern Shore could see the flames of tankers being sunk by submarines at night, an interesting thing. So this brought in a whole army of WAVES to use those computers, because in order to run that out, that was number crunching at a great rate, and all they had were these business machines with 24 registers. So thousands of cards had to be moved back and forth through the machines.

Dick: What was the story behind Eckert coming to the Observatory? Do you know the circumstances under which he came, who asked him to come?

Mikesell: Almost certainly this Astronomical Council agreed on him after Brouwer turned it down.

Dick: Brouwer was offered the job.

Mikesell: He was offered the job. On the basis of his offer, he

got a promotion, and possibly even tenure, at Yale. Why the offer was then extended to Eckert, I don't know. Watts certainly got around the Washington scientific community a little bit, Morgan even more. They were all aware of Eckert's work in astronomical computing there, and I was much too lowly to have known what it was that pushed the decision. I don't know that Clemence would have been involved in that. Clemence was not yet up at that level. He moved up there fast under Eckert, because Eckert recognized true ability when he found it, and he saw to it that he was promoted.

Dick: Just a final question for today. How would you say that World War II affected the Naval Observatory? Do you think there was a big effect? We just mentioned a couple of things.

Mikesell: Oh, yes, yes. For example, it made it absolutely secure over things such as the Air Almanac and all of the other tables that came pouring out from their office.

Dick: So there was a big effect on Nautical Almanac Office. How about Time Service? Was there any big effect on Time Service?

Mikesell: I don't know. I remember the phone call. I was on duty in the Time Service one night in early 1942, and I fielded a phone call from a person who said, "This is Vannevar Bush. Some of us were here talking about the matter of your time signals going out by radio from Arlington radio station. Are those helping the German submarines to navigate off of our coasts and causing some of the damage on the coasts?"

I can recall that I replied something to the effect of, "Yes, sir, they are. But if we were to close them down, it would make it much more difficult for our ships to navigate, and very possibly those submarines, in any case, have to surface in order to pick up time signals. Even if they didn't get them from us, they would be able to hear the time signals which even we are able to hear out of Germany, France, England, Argentina, and 14 other countries of the world. So it seems simpler just to leave them going, that we profit more by them than we lose."

Dick: That's interesting. Of course, the number of chronometers needed during the Second World War must have increased greatly, too. So to the extent that Time Service was involved in the

chronometers, that would have been an effect of the war.

Mikesell: Not really. In other words, those chronometers could have been rated anyplace. They didn't have to be rated in our office. They could have rated those chronometers anyplace.

Dick: But there must have been more chronometers, because the number of ships in the Navy was increasing.

Mikesell: That's just a shelving situation. That just required that warrant officer to keep winding chronometers and rating them and getting out these curves, then shipping them out.

Dick: Then there were the observing divisions. Was there any effect on the observing divisions by the war?

Mikesell: Except that they lost manpower, no.

Dick: They did lose some manpower?

Mikesell: Yes, they were skeletonized. The Time Service was the only one that wasn't, and the Almanac office, of course. The Time Service took on at least one woman, a gal by the name of Hayner, who was still alive in 1982 but in advanced stages of Alzheimer's Disease. Later, more women. For the Transit Circle Divisions, I don't think there was any help. Except for Willis' efforts with things like pendulum astrolabe, I don't think you could say that the Equatorial Division was affected much by the war. When you think about the question, it's an interesting one.

Dick: Thank you very much.

[End of interview]

Interview Number Three with Alfred Mikesell
Date: August 10, 1989
Place: Baltimore, Maryland - IAU Meeting
Interviewer: Steven Dick

Dick: Last time, as I recall, we just passed World War II and your years in the Time Service, which was up to 1944. At that point, you were transferred from Time Service into the 9-inch Division. Do you recall what the reason was that you went from Time Service into the 9-inch?

Mikesell: They had a vacancy in the 9-inch, and I had spent almost ten years in the Time Service, and that was enough. I was ready to get out. There were strong personalities there and it was certainly more comfortable to move on. My underlying interests certainly were with the large telescopes and the more general astronomy.

Dick: How did the position come available in the 9-inch? Did someone else leave, or was this a new position?

Mikesell: This was at the time that John Hall came.

Dick: Hall didn't come until about '48. We're talking about '44 here.

Mikesell: Oh.

Dick: This is not when you went to Equatorial Division. This is 9-inch Division.

Mikesell: Do the records show I went in there in '44?

Dick: Yes.

Mikesell: Okay. There was a chap named Leiner had come during the war to the 9-inch Division. Morgan would be retiring just about then, and Pat Scott was becoming director. A.R. Leiner, after working a couple of years very credibly in the 9-inch, he left to go into the war. Because of the way the captain was running things when he left, he had no choice but to be drafted, which he was willing to do. He was very concerned to get involved in the war.

Dick: So did you take his place then?

Mikesell: I essentially took his place. Wiley, I think, was still in the 9-inch, but they were very much undermanned, and yet

they were being given the job of finishing up a program. They were not carrying on observations. Once they had finished the observing for the Washington 40 catalog, Scott was going to have the job of producing it, and he was handling that from the point of view of the old system.

Dick: Let me see if I have the picture. When you came in 1944, Morgan was still the Director of the 9-inch Division.

Mikesell: Scott, I think, had already taken over. So my association would have been with Scott.

Dick: Was Morgan still coming to the Observatory?

Mikesell: Oh, yes. Oh, yes. He kept coming for many years. He finished up a catalog or two or three, but these were assembled catalogs in the same vein as the FK3, 4 and 5, in which you take fundamental star observations from other catalogs and put them together. This was kind of a lifetime work with him, and he hadn't begun to finish it yet. Yale, I think, sponsored him and he was probably paid via Yale, who probably had a contract with the Navy.

Dick: Did you know Morgan before he came into the division?

Mikesell: Oh, yes, I knew him from '36 on, knew him as soon as I came to the Observatory.

Dick: What can you tell me about Morgan as a person and as a scientist?

Mikesell: I know a little about him first-hand as a scientist. When I told Struve I intended to go to the Observatory, he said, "Well, there's only two good people--Morgan and Hammond." Struve didn't seem to know that Hammond had already left the Observatory by that time. He had retired. Watts was taking his place. So I met Morgan within the first couple of days I was there. I looked him up and gave him Struve's regards, and spoke with him from time to time from then on.

Morgan was very narrow-minded in his scientific approach. He knew what he wanted to do, and he stuck with it and worked hard at it. It was not something that would appeal particularly

to me, so I didn't talk much science to him.

Dick: Why was Morgan so well known? Why was Morgan one of the few people that Struve knew?

Mikesell: Morgan had been on IAU commissions. Perhaps you can check. I wouldn't be surprised if he hadn't been president of a commission on some occasion. It was difficult for any American to be president of a commission on meridian-circle work, fundamental astronomy, but he might have been. He certainly knew that subject; there was no question. He knew that subject. Sometimes I did have to ask him about questions of that. Then he could tell me.

When he stayed on at the Observatory after his retirement, it was fascinating to watch him work. He did it the old way. For example, for every single star into his catalog--his first catalog would have been an ecliptic catalog, a catalog of ecliptic stars, which would have been used as reference stars by Yale people, which is one of the reasons I think that Yale was probably involved with his remuneration. The Observatory provided space. Every single star, he would plot every one of the positions. Behind each one of these positions there might have been 15 or 20 for a star, would have been the hours of work to ensure that every known correction had been applied to that position, all of the corrections that had been derived after the fact, after the catalog was published, and so he would have had to analyze the errors in the 15 or 20 catalogs that he was putting together.

Dick: Where was Morgan's office when he came back during this time? In the main building?

Mikesell: Yes, it was. The 9-inch Division had moved out of the clockhouse by that time.

Dick: You don't mean the clockhouse.

Mikesell: Yes, the 9-inch was originally in the clockhouse; the offices were in there. Morgan's office, I think, was in the north room, that little north room attached to the clockhouse. Beyond that north room was the 5-inch alt azimuth instrument. The building had been razed shortly before I went there. It should show up in photographs.

Dick: Are you sure it wasn't the prime vertical instrument?

Mikesell: Not sure at all. Could have been.

Dick: I think it was the prime vertical.

Mikesell: Okay. That building should show up in some of your pictures. Well, that was gone. The 6-inch used the west room as their ready room and service desk office.

Dick: Still do.

Mikesell: For their observations. The 9-inch used the east room. Leiner's desk was certainly in the east room. Scott's, Wiley's, and Morgan's were someplace in between.

Dick: So when you came into the 9-inch Division, the offices had moved to the main building. You said when you came in that the 9-inch was no longer observing.

Mikesell: True.

Dick: People were no longer observing on the 9-inch.

Mikesell: I didn't do any observing on the 9-inch. In fact, the 9-inch had been taken out of service in anticipation of the installation of the new telescope. What was Watts' telescope, the aperture? Seven inch or something?

Dick: You call it Watts' telescope. You mean the new transit circle?

Mikesell: The new transit circle.

Dick: That's a seven-inch. That's the one that's now in New Zealand.

Mikesell: Yes. That was originally going to be put up in the 9-inch housing, and was.

Dick: What was the reason that the 9-inch was no longer going to be used?

Mikesell: They felt it was obsolete. Watts felt that out of his experience, he could far and away improve on any transit circle made up to that time. Watts knew all about the glass transit circle at Greenwich, he knew about the other transit circles around the world, spoke about them at any length that one could listen to him, and felt out of all of this, especially his lifetime experience with the six-inch, that he knew what to do to improve it.

Dick: He was now director of the 6-inch, is that right?

Mikesell: Yes, he was director from whenever Hammond retired, which was not long before I came to the Observatory, a year or two before.

Dick: Yet had had, apparently, a lot of say in what went on in the 9-inch Division after Morgan retired.

Mikesell: Only in the instrumentation. These were separate divisions then. It was expected--and was, indeed, the case--that Scott would be director of a separate and autonomous division.

[End Tape 1, Side 1. Begin Tape 1, Side 2]

Dick: So we had two divisions, a 6-inch Division and a 9-inch Division. Did you know why they were separate divisions to start with? Why didn't you just have a Transit Circle Division?

Mikesell: A very interesting question, and one that was discussed at some length amongst all of these people. I was made to perceive this kind of a reason for it. Every one of these fundamentally operating instruments has a personality--instrumental and then human. The human one rises from the choice of subjects to observe with the instrument, including clock stars, observing lists, and philosophy about the handling of the planets and the philosophy about handling the basic orientation parameters on a transit circle. The method of establishing azimuth, the method of establishing level, the method of establishing zenith, the method by which one deals with time and clock stars, deals with personal equation with the instrument, deals with the organization of the hardware represented by the eyepiece on a transit circle, and then, of all things, the way

the lens is made and what you'll do about the lens, the extent to which you'll play with the lens that you're given, also with the tube. Watts was proud of the fact that there was no temperature effect on the 6-inch instrument. The tube was made out of forged steel. The lens, fortuitously, had the same temperature correction as the tube. They counteracted each other. So your images stayed in focus always. You didn't have to worry about losing focus of your images.

As you perhaps know from transit-circle work, or you may not, you dare not monkey with focus on a telescope. If you do, you must make sure that the records know about this and that a correction is thrown into the reduction of data. The 9-inch instrument had the brass tube, and between winter and summer, the images would go so far out of focus that you would lose your stars. Also there's the subject of what happens to the shape of the image as it's going out of focus.

Then there's a matter of philosophy about how often will you go in there and change the focus so you can get those images back usable again. This is also related to the location of the instrument. If you're in a location like Flagstaff, where you've got an enormous diurnal variation in temperature, it's a crucial effect, because between night and day your instrument is so different.

All of these are personality things that have to do with the interplay of both the responsible person for the equipment and the equipment. You cannot really have a committee decide what it's going to do in responding to the way the instrument works. It becomes one man.

So it became necessary that each instrument that you used, if you were going to have that as providing independently useful fundamental observations, as distinct from relative, then there had to be some person whose voice dominated the use of that instrument, who made the decisions, essentially a captain, on that instrument. Because the instrument required a corps of observers to make it work--it has to be observed around the clock--and a corps of computers to get the data out, keep them reduced, analyze how the instrument is working so that you can react to it fast enough, you have the makings of a group which could support a full division in the old division status, about

four or five astronomers in all.

You used astronomers as the observers, because while attempts had been made to use non-astronomer observers, you got into sloppiness, you got into the lack of awareness of what was going on, awareness of things that needed to be reported, carelessness at certain points. So the Observatory finally found that it was very helpful to demand a kind of career dedication which was represented by a professional astronomer.

This is the kind of outlook distilled from many conversations with the people that I knew well. That included Morgan, Watts, Scott, of course, Clemence, and Willis. These were the independent characters with independent thoughts which they were willing to express. You got into then your next tier--Adams and, of course, Burton, Lyons, the people there, with whom I spoke many times and at great length. But they were not ones that would ever bother about having independent opinions or to voice them. Eckert certainly had independent opinions and was absolutely frank that he knew nothing about observational astronomy and didn't care anything about it, but a very open mind. I've had long conversations with Eckert, with Woolard, very pleasant ones, but they were conversations in which I developed my thoughts and didn't get much of theirs out of these.

Dick: So this first tier of people that you mention, the first group, you think they would all have been in agreement with the philosophy that there should be a division for each instrument?

Mikesell: Yes, absolutely. Absolutely, if you were going to want to have these data, which they felt very important. This is an era when these data were deemed very important. Each instrument that was observing anyplace in the world, there were so few of them, in the first place, and so few good ones, in the second place, so each one of them became very important. It was very important that it be very independent. Nowadays you won't find that view perhaps anyplace in the world. But the whole matter of fundamental astronomy is approached differently.

I should back up. Gliese, almost certainly, and Pat Scott and Watts overlapped all over them, and I never knew Gliese, but Scott did very well, spent, I suppose, hundreds of hours arguing and talking with him.

Dick: You're speaking of the German.

Mikesell: Yes, at the Reckin Institute. You know where he is.

Dick: Yes. He gave a talk here.

Mikesell: I didn't hear it because I was busy listening to another one. Yes, he's given a talk at every IAU meeting that's been in my lifetime, certainly every one since WWII.

Dick: What were the differences, given that you had the two divisions, in philosophies between Watts and Morgan?

Mikesell: These were the differences that you would get from having an extraordinarily good instrumentalist who wanted to see things improved and updated and modernized, and an extraordinarily good reduction of data man whose underlying philosophy was, "It doesn't matter how lousy the data, providing you haven't lost track of what was done in taking it. Then you can always massage it. You can massage it to get out whatever you need out of it."

Dick: You're describing Morgan now.

Mikesell: That's right. Watts didn't agree with that. Watts said that if your data are not good enough to begin with, no amount of work afterwards can come to the truth; it will always evade you. Morgan was committed, from a lifetime of study on this, to good reductions. This meant don't ever change your instrument. The 9-inch was changed twice a year.

Dick: In what way?

Mikesell: Focus. See, when you change focus, you've just changed everything. You've changed alignment, you've changed alignment of the optical axis versus the pivots. All of these things were subject to being changed.

Dick: Why twice a year?

Mikesell: Because they didn't dare do it more often than that under Morgan. Morgan wouldn't want to change it at all, but in

that case he would have lost half his observations. So he had to.

Dick: That means things are out of focus then part of the time.

Mikesell: Yes. Well, they would only be in focus for maybe a month, and then they would be out of focus on the hot days or cold nights, whichever.

Dick: I begin to see why they decided not to use the 9-inch anymore. (Laughs) The brass construction was one thing.

Mikesell: Yes. Then because of its length, it had flexure. It was always an experimental instrument. So was the 6-inch. The 6-inch was made by Warner-Swasey at the same time that Warner-Swasey made the 26-inch mounting and dome. The 9-inch--what was it? You can find it in the history. It's described in great detail. It wasn't Repsold, but German.

Dick: It was originally the 8.5-inch Pistor and Martins, which, when they moved to the new site, was changed to a 9-inch.

Mikesell: Given a new lens. Right. Under Pistor and Martins, it had not been an instrument that they could really ride like you would ride a team horse. It always was bucking, and it continued.

Dick: Was good work done with the 9-inch?

Mikesell: Oh, unquestionably. In other words, I was in there on the reduction of a Washington 40 catalogue.

Dick: That's what you did when you first came into the division.

Mikesell: That's right. I went in there to give a hand on that.

Dick: What were the reduction techniques at that time? When you first came into the Observatory in '36?

Mikesell: We didn't use computers.

Dick: In '36, you were in the 6-inch Division. Now this is later.

Mikesell: Reductions were still the same.

Dick: Same methods, same calculating machines?

Mikesell: We didn't use the Millionaire anymore, but we used Marchants and Friedens.

Dick: By this time, Eckert was down in Nautical Almanac Office doing his punch-card techniques and all.

Mikesell: Yes.

Dick: Did any of that rub off on your reduction work?

Mikesell: Oh, it definitely did. One of the things that Eckert's techniques worked well on was the reduction to apparent place. So we, I think, finally depended upon him for all of that kind of reduction. Those were things that that kind of listing machine worked very well on. Until the IBM 650 came in, we didn't have--

Dick: That would have been 1957.

Mikesell: We didn't have the computers. We had those old listing machines, which had 24 registers. Then we had, finally, to supplement it, the old IBM multiplying machine, multiplying and dividing. Then there was that very first so-called compact machine, IBM's first attempt at a computer of sorts. I forget what it was called, before the 650 came. We had one of those.

Dick: Basically, when you came into the division, the 9-inch had finished its history as an observational instrument.

Mikesell: And didn't expect to renew it again.

Dick: What happened to the instrument?

Mikesell: Good question. Don't know. Surely Watts cannibalized it to any extent that it was useful. For example, the reading microscopes may have been taken off of it. I don't know. But the new instrument had a very carefully forged steel tube, examined by X-ray.

Dick: This is the new 7-inch.

Mikesell: Yes. Examined by X-ray. The pivots were made very carefully, according to Watts' distilled knowledge and information. The new circles engraved on the Observatory grounds by Steinacker, using the old Swiss engraving engine. Where's that engine?

Dick: We have it down in the basement, still. I can show it to you when you come.

Mikesell: In storage?

Dick: It's in storage. So the 7-inch was more or less built entirely on the grounds?

Mikesell: Totally, except for the lens. Lots of trouble with the lens. Lots of trouble. Atlantic Research grabbed onto the contract by being lowest bidder, totally botched the job. Part of it was bad specs. The write-up of the specs was not done correctly, as they discovered when Atlantic Research delivered and did, indeed, get paid.

Dick: Wouldn't Watts had written those specs?

Mikesell: No. He was certainly in on them, of course. My guess is they were written by Pat Scott. I was out of the division by that time.

Dick: What was the interaction between Scott, as director of the 9-inch, and Watts? They must have worked closely together.

Mikesell: Close. Very close, but still very independent. Very independent and no social life shared.

Dick: The 9-inch was decommissioned by the time you came in, and there was no 7-inch for quite a number of years, I believe into the '50s, even.

Mikesell: Right.

Dick: Was the 9-inch Division at that time then entirely devoted to reducing observations?

Mikesell: Good question. I don't know. I'm going to suggest that 9-inch people shared time on the 6-inch, that Scott arranged to take over some of the 6-inch observing time, and that he did start a series of observations which I'm sure would have been agreeable with Watts. It would help relieve the observing burden. Again, there would be two different points of view with regards to handling things.

I got around to telling you earlier a little bit about the story of the 6-inch, laughing at Westerhout's notion of an instrument being unchanged. One of the most serious things that happened when the 6-inch came to the new site and was set up, the 6-inch always had a nasty annual term to it, but as long as Hammond was in charge, there was no question of touching it. The first thing that Watts did when he took over was to carry out the results of a decision that he had made long before, that the marble piers supporting the 6-inch were involved with this annual term, and that he was going to get rid of those marble piers. So as soon as he was in charge and it was time to decommission it between observing series, he had the telescope taken down and the piers taken off.

Dick: These were the original marble?

Mikesell: The 1896 piers. Taken off. The Warner-Swasey system was built onto and around part of those piers. He had those piers taken off and discarded, and for years they lay over where that recreation area in the hollow is. One or two of them may still be down there underneath things. But when he took them off, he discovered heavy cardboard again, this same demon that beset the 40-inch telescope, a sheet of that underneath each pier, between the pier and the underlying pier. The underlying pier, I think, in each case was, again, a block of marble going independently of the building, of course, and of the ground down into a deep hole and surrounded with sand.

Dick: So the marble pier was not one piece; it was two pieces?

Mikesell: It was two pieces, and at the joint there was this cardboard in there. The moment Watts saw that, he guessed that that was probably the source of the problem. You can understand the logic of the makers in putting the cardboard in there. Neither of the surfaces of the marble was perfect. Neither was perfectly smooth, polished smooth. They felt something should be

there to absorb the difference. Well, Watts felt that he had put his finger on the source of this annual term. Nonetheless, he wasn't going to attempt to put it back. Instead, he built up a pier out of brick. I'm not sure that that brick pier is still in place. When they installed the 7-inch, they went over to concrete. Watts felt that the amorphous structure of concrete was really what he wanted, that in brick, you already had a mixture of elements, the mortar and the bricks.

Dick: As far as I know, the 6-inch here is concrete, also.

Mikesell: They changed over after they got the 7-inch running. Again, you see, it's not the same instrument. This makes two changes, and these are extraordinarily serious changes in the eyes of a fundamental astronomer. So no way is it the same instrument. These are very serious changes. That was a funny story. Then he built it up with brick, and it was brick during his modernization over to the photographic reading of the system, which he was working on in the late '30s.

Dick: Photographic reading of the circle?

Mikesell: Circles, and then, finally, photographic registration of the micrometer.

Dick: Do you recall when the 9-inch Division was no longer the 9-inch Division and became the 7-inch Division?

Mikesell: No, I don't recall.

Dick: Sometime in there when the 7-inch came in, it was obviously renamed.

Mikesell: Presumably in that interval, yes. That will show up in your annual report.

Dick: We're up to the late '40s now, and until 1948 you were in the 9-inch Division. An event occurred in which you played an important part, which was the possibility of the Observatory actually moving, which happened around 1947-1948. Scott and yourself became involved in the site testing.

Mikesell: Scott was in titular charge, and I was the man of all

work.

Dick: I have a photograph. One of those is you.

Mikesell: Yes, indeed. The interesting civilian here, I'm wondering if this isn't Lyons.

Dick: The back says, "Scott, Watts, Lyons," and yourself.

Mikesell: I don't remember the officer. The other day I was saying to myself the name of the man that's been penciled there.

Dick: Can you tell me the story of how you first learned that the Observatory was possibly going to have to move, and then how you became involved?

Mikesell: The Astronomical Council was assembled, and the then superintendent handed the fait accompli to the assembled astronomers that the Observatory was going to have to give up this site within the next month. They should plan to be moved out of there, within the next month.

Dick: Do you remember who the superintendent was?

Mikesell: No, I don't. Look him up for that era. [Captain Clark]

Dick: This was around '47 or '48?

Mikesell: '47. In '48, we were well into it. So you can find that. I remember the superintendent. He wasn't a strong personality. After Hellweg, you see, we got only terminal men.

Dick: This would have been right after Hellweg.

Mikesell: These were people who had been passed over and this was their last job before they were retired. Some of them were very bitter, some of them were pleasant. None of them was good. This is true--good administrators or good in relations with the Navy or other things.

Dick: Where had this come from, this idea of moving.

Mikesell: This is from downtown.

Dick: By "downtown," you mean Navy.

Mikesell: Main Navy, yes.

Dick: What were the circumstances?

Mikesell: Whoever was our boss then, if we were still under CNO, it had been through his office.

Dick: It was, by '42. So this would have been CNO.

Mikesell: Okay. The CNO would have gotten it straight from Millard Tydings.

Dick: Tell me what the involvement was.

Mikesell: Millard Tydings was the senator in charge of the Military Affairs Committee, and had been for some time.

Dick: In the Senate.

Mikesell: One of the senior senators, extraordinarily respected, as highly respected as, say, Taft from Ohio, and so on. Watts was, to my knowledge and feeling, the most outspoken in carrying the opinion of Scott and Sollenberger in the Time Service, to the captain. Probably Watts would have been the person who would have prepared the memorandum which the captain had to send down to the Main Navy. There was no case, of course, for saying, "We won't do it," but there was a case of explaining in detail. I know I handled that memorandum; I read it myself. Every one of us was allowed input if we could think of anything. I think the memorandum exceeded the Navy's dictum that everything of importance must be said on one page. If you require more than one page, it's not important.

Dick: What did the memorandum say?

Mikesell: It pointed out the role of the meridian-circle instruments in the history of the world and the history of astronomy, in the background of the Nautical Almanac, in the service to the Navy. This was emphasized over and over again, wherever one could bring it in, the importance to the Navy and to

the country, the continuity of this. The move must not be made in a hurried fashion; it had to be made deliberately and with care. We had to come up with an appropriate observing site which should be found by examination of possible candidates around the country.

Dick: So this memorandum would have been signed by Watts and the other department directors?

Mikesell: Yes. This is the Council, so this would include the director of the Almanac office, Clemence at that time.

Dick: And submitted to the superintendent?

Mikesell: Yes, for transmission to the Navy with his endorsement, which he did give.

Dick: What was the result of that?

Mikesell: We were granted unlimited funds to site test and a limited amount of time. The Navy wanted to say three months; we said a minimum of a year, preferably two years. We were to have any resources we needed. There was no limit on our resources.

Dick: What was the driving force behind this? You say it came from Tydings, but what were the circumstances?

Mikesell: The driving force, as it was made known to us, was Mrs. Tydings being on the District of Columbia committee to come up with a new medical center for the service of the District of Columbia area. Because it was Mrs. Tydings, transmitted by the senator to the Navy, the Navy said, "Yes, sir."

Dick: She decided that the real estate where the Naval Observatory was would be the ideal place for this.

Mikesell: Absolutely ideal, in her opinion.

Dick: So the Naval Observatory would have to go within a month or three.

Mikesell: We did unquestionably depend upon the residence of the Chief of Naval Operations on the Observatory grounds.

Dick: At that time, it was still the CNO.

Mikesell: Oh, yes. I am sure that in a very politic manner-- I've watched these captains approach the admirals, especially when you get up to that level, and believe me, they do it with kid gloves, carefully selected words. The stories that come out of Russia couldn't beat the things I've seen happen within the Navy, watching my captain deal with a top admiral, an admiral who's a head of a whole division. I saw that more than once in connection with the site-testing experience.

There was, for example, a matter of communications. By the time we got into handling five sites, we decided we needed to have ten radio stations so that they could talk amongst each other, or four sites and maybe one home-based at the Observatory, and talk amongst each other. To get surplus World War II equipment was no problem at all; that came instantly into our hands. But to get the frequencies assigned to us was a very tight matter, so we had to go to the director of communications, who was a very high-level admiral. We went into his office a senior captain, the assistant director of the Observatory at that time. That senior captain was good, because he made admiral and kept on in the Navy. But he had this beautiful deference. Now, this was fun, because the director of communications had been in Moscow for an URSI meeting, and he took up most of our time telling what it was like to travel in Russia and attend an international meeting in the Soviet Union.

Dick: How did you become involved in this site testing?

Mikesell: The moment we had permission to site test, we had to set up the organization. Of course, the Council looked around to see who would be in charge of it, and Scott was a very logical one. He wouldn't take Sollenberger; he was busy in the Time Service. Watts wasn't about to take it on himself. There was nobody at the 26-inch Division, as they called it in those days.

Dick: Had Burton just retired that year?

Mikesell: No, he hadn't retired yet. That came later. Obviously, Lyons had come back from the war and was working there. My guess, as I think about it now, is that he overlapped

the arrival of John Hall and of my going into that division, that he stayed on for a year or two before he finally left us.

Dick: Since Scott was put in charge of the site testing then, you, being under Scott, became involved.

Mikesell: Suddenly it was my baby.

Dick: And who else? Or was it just mainly two or three people?

Mikesell: We did various things. For example, one of the first maneuvers they did was for Norwood Adams and me to pile into an automobile and go traveling around the countryside, looking things over. I had read things like Schlesinger's and Pickering's articles on site testing. We already had the dictum that the farther south you go, the better your observing weather. I visited the meteorologists of the area right away to pick their brains, found out what went on with the weather patterns. Adams and I did a run down the Appalachians, and in every possible town we went in, found the local meteorologist. In those days there was still one there, and he was still a responsible person and normally had a good deal of experience in this area. We asked him about a lot of things and looked around.

Out of this, we became aware that our job was insufficiently defined. I called a meeting of essentially the heads of the divisions. At some stage along here, the role of Clemence became pivotal. I remember the meeting, though, that I called. Clemence said that he didn't care where in the country we went. I think Watts had addressed letters to other astronomers around the country. We got back a letter from Struve at Yerkes. In fact, Watts and Scott may, indeed, have traveled around the country, talking personally to these people. They came back, as I recall, with a report from Struve. Based upon his experience with the McDonald Observatory, he said, "It doesn't matter if you've got your observatory in the best location in the world if you can't get people to go to it."

Dick: By "people," he meant astronomers.

Mikesell: Right. I had already heard this stated as the dictum in the selection of Palomar. In fact, I once had been in a private conversation with Anderson over this matter of how you

come to select these things, and he had reiterated what I later found in print.

Dick: Which Anderson was this?

Mikesell: John, who organized the 200-inch business at Cal Tech. I had interviewed him once and this subject had come up as to how he had come to select Palomar.

Dick: So did these opinions of the other astronomers then affect your strategy in looking for a site?

Mikesell: Oh, yes, yes. It meant that whatever common sense we had for getting an observatory close to a good city, we were reinforced in it and could use the words of the other astronomers to articulate it, and we did.

Anyway, Clemence said, "You may not go anyplace more than two hours from Washington, D.C.," as far as he was concerned. He was a member of the National Academy by that time and being concerned in a fair amount of science. I said that I was delighted to have it so well defined and no longer would we go traipsing down into the Carolinas and Georgia and places like that. This was simple.

Dick: So to start with, you had gone further afield?

Mikesell: Yes.

Dick: Where had you gone?

Mikesell: Asheville, North Carolina, was certainly one. Danville, Virginia, of course, then over to Bristol, Virginia, area, Roanoke. All of those are more than two hours. Richmond we looked at. I don't think we went into South Carolina.

Dick: Did you actually do site testing at some of these places?

Mikesell: No.

Dick: Just looking around at this point?

Mikesell: Looking, talking to people, visiting the Weather

Bureau men, and, of course, asking the Weather Bureau for a printout of data, which wasn't a printout in those days, but photocopies.

Dick: So how much time did you spend doing that before Clemence came around?

Mikesell: Oh, not much. In other words, Watts and probably Scott had done their trip around the country. A number of people had suggested the Flagstaff area. I had never been there and had no mental picture at all of what Flagstaff was like. I pictured it like Phoenix, where I had been.

Dick: You mean a number of the astronomers that Scott and Watts had talked to, had recommended Flagstaff?

Mikesell: Yes, they kept speaking of Flagstaff. But I hadn't read Percival Lowell's story about it, and I hadn't read reports on it, particularly, and I hadn't seen pictures of it. I had no vision of it at all.

Dick: So was there any inclination to go to Flagstaff then or not?

Mikesell: Not amongst us, no, because all of the astronomers at the Observatory, except me, were aligned along the Maine-to-Florida axis and were not going to certainly ever be interested west of the Mississippi River.

Dick: Aligned in what way?

Mikesell: They probably came from New England or were educated in New England. They expected to retire to Florida, and their experience of living was from the Appalachians east. Watts, of course, had a degree from Indiana, but the rest of them were local. Pat Scott was a Michigan lad.

Dick: Sollenberger was also from Indiana, originally.

Mikesell: Yes, Sollenberger was. He was from South Bend. He essentially ran away from home to come to Washington. Scott did, too, by the way.

Dick: What was your strategy, then, once you were given the two-hour radius?

Mikesell: This was simple. We got Geological Survey maps of the whole schmeer. We knew already that the Appalachians were cloud traps, that we should stay away from them at least ten miles, hopefully.

Dick: Away from the Appalachians.

Mikesell: Yes. This made us amused when Leander McCormick selected Fan Mountain for their site, which is a good deal closer than that. I've never discussed with them their experience there.

Dick: So what sites did you go to then to site test?

Mikesell: It made us home in, in a hurry. We felt that Lynchburg would be the farthest south we could go. There were no fast highways down along that direction toward Bristol, Roanoke, in those days. We felt we didn't want to get too far away from the mountains, because we already knew that we needed to get an eminence that would get us above the little local inversion layer, this 110-meter nighttime inversion layer. Except for Mount Mitchell, there wasn't much hope of getting above the planetary slip level. I've got some nice pictures that we took of Mount Mitchell to show the inversion layer there, and the top is above it. We felt that anyplace we could come up with would be available to us--national park, national forest, private--the Navy would take care of the acquisition.

Dick: So how many sites did you actually test?

Mikesell: Four. There were two in the Lynchburg area and two in the Charlottesville area.

Dick: This is one of the Charlottesville sites in this picture?

Mikesell: This would be a Charlottesville site.

Dick: It says "Piney Mountain" on the back. Is Piney Mountain one of the sites?

Mikesell: That would be the site.

Dick: What was the other site near Charlottesville?

Mikesell: Peter's Mountain. Peter's Mountain now has microwave installation on top. It remains, to my mind, the best location in the Washington, D.C., area for an observatory. The elevation there is something on the order of 1,200 feet.

Dick: Is anything on Piney Mountain now?

Mikesell: Not that I know of. It's somewhat lower.

Dick: What were the names of the two places near Lynchburg? Did they have any name in particular?

Mikesell: They certainly did. One was Oak Mountain. At the moment I can't picture the other one. I just don't remember.

Dick: So you site tested.

Mikesell: We undertook to select two in each place by design, went out to find them.

Dick: You site tested four sites. What did you actually do?

Mikesell: We set up on each site a Polaris-observing telescope. Two of these were loaned to us indefinitely by Anderson, as part of the Mount Palomar survey equipage.

Dick: He had actually used those at Palomar?

Mikesell: These had been used as part of the Palomar survey, and he used two of them, at least.

Dick: Did you know Anderson? How did you make that connection?
Mikesell: I had met him back in my college days, possibly in the company of Horace Babcock, who was a schoolmate of mine.

Dick: So you had the Polaris monitor, which was simply some kind of a small telescope which pointed at Polaris.

Mikesell: With thumb-screw adjustment to put Polaris in

position, on a collapsible frame, the whole thing heavy enough to be very stable, with the right-angle eyepiece and a very high-powered eyepiece.

Dick: These were just visual observations?

Mikesell: Visual observations.

Dick: What were you looking for?

Mikesell: Gyration of the image in terms of the diameter of the central image, which would be about two seconds of arc. With this you can easily define seeing motion down to a fraction of a second, just by using the diameter of the first ring and the central image.

Dick: Over what period of time would you make an observation? Did you have a technique established?

Mikesell: Yes, definitely, because, you see, early on these were manned by quartermasters. We asked the Navy to provide us with manpower, so they provided two quartermasters for each station, one a higher rank rate than the other one, so there was no question about who was in charge of each of the stations. We had these four quartermasters assigned to us.

Dick: How many at one station at one time?

Mikesell: There were two. I guess one was responsible for each station. Then we scrounged up other personnel. We probably had four quartermasters in all, and probably we hired specially four civilians, at least four. So there would have been two people for each station.

Dick: How long would you stay at one site to test?

Mikesell: These stations were manned continuously for the 18 months of the survey.

Dick: Eighteen months, observing every clear night?

Mikesell: Every clear night was the instruction. If a man wanted a relief, somebody came down from Washington and relieved

him. So there was no question about having it manned and the observations made every 30 minutes visually, all night long. At each of these stations we located a five-inch transit-of-Venus telescope.

Dick: Along with the Polaris monitor?

Mikesell: Correct. Built a permanent type of housing for the five-inch, walk-in housing with slide-off, slip-off roof, I forget now. Someplace we've got pictures of these. Have you seen them?

Dick: I think we have some of those, yes.

Mikesell: Okay. And supplied a minimum of one jeep to each station, maybe two, and then had a steady flow of vehicles and people and resources and equipment, repair parts and services.

Dick: Quite an operation.

Mikesell: We located an Onan generator with each site, gave each one a communication radio system, complete with crystals.

[End Tape 3, Side 2. Begin Tape 4, Side 1]

Dick: Was there one person, basically, at each site?

Mikesell: Two persons per every site, one of whom was Navy enlisted rate, and one of whom was civilian hired under Civil Service as a part-time employee.

Dick: You've described the use of the Polaris monitor. How about the five-inch? What was that used for?

Mikesell: We used it with the Pickering scale. This is Harvard Annals about 1910.

Dick: That's a magnitude scale, is that right?

Mikesell: No, a seeing scale.

Dick: What were you looking at with the five-inch?

Mikesell: Motions of the stars and definition of star objects. In other words, we just handed them, ran off a mimeographed copy of Pickering scale, taken right off Harvard Annals. That had been used in the original Mt. Wilson site testing back in 1910, and that was the occasion for him to publish this. It appears in Amateur Telescope Making in one of the volumes, but we went to the original, typed it off, and mimeographed it. It has to do with the definition of the image and then the relative image motion. It includes, I think, double stars, the standard double stars. We would have given them a double-star list. These were telescopes, when permanently set up, they could be pointed without difficulty. The quartermasters are people in the Navy, at least then, who did do sextant sighting, and they understood navigation, so that this was within their realm of expertise to do this sort of thing.

Dick: So this went on, then, for 18 months, in '47, '48.

Mikesell: Actually, the stations were manned longer than that, but the serious depth would have been about 18 months.

Dick: So it must have gone into '49 or so.

Mikesell: Yes.

Dick: What was the outcome?

Mikesell: By that time, when John Hall came aboard and I was assigned over to his division.

Dick: In 1948.

Mikesell: Partly to give him somebody seasoned. I'm sure I overlapped Lyons then, although Lyons was a character such that I wouldn't have remembered him at this stage. I presumably had nothing to do with him scientifically and didn't carry over. I think he felt he had been passed over when the Observatory went outside of the staff--I'm beginning to recall this now--to bring in John Hall. There were a number of people whose noses went out of joint with Hall's arrival.

Dick: I want to ask you about that, but let's finish up on the

site testing.

Mikesell: Yes. We'll keep it here and that will remind me of Lyons.

Dick: Was a site actually chosen then?

Mikesell: Oh, yes.

Dick: It was which one?

Mikesell: Piney Mountain, mostly because the then superintendent, a chap by the name of Guy B. Clark, he was the one that assigned Julena and me the job of collecting money to make up the embezzlement.

Dick: From the cafeteria.

Mikesell: Yes. We drove him around to each of these sites.

Dick: I believe I've seen a picture with him in it, too.

Mikesell: He personally liked Piney Mountain.

Dick: But what about all the site testing that had been done? Didn't the site testing show Piney Mountain to be the better one?

Mikesell: Well, it showed that it wasn't too bad. I think it definitely showed that Peter's Mountain was better. I think it was reasonably clear that Lynchburg was no better on either of its sites than Piney Mountain.

Dick: What did Captain Clark like about Piney Mountain?

Mikesell: Access, view from the top, convenience to Washington, D.C. Peter's is over to the east and more directly north of Monticello.

Dick: So Piney Mountain was formally decided on then, was it?

Mikesell: Formally decided on. I'd gotten out of it, as I say, and been out of it for about a year, but Scott had--

Dick: You got out of it when you left the 9-inch Division.

Mikesell: The 9-inch Division. Scott, however, had some of his people go to work. He may have gotten somebody assigned to him from the 6-inch to help. They looked at all those data and they worked them up, went through the motions of working them up and getting out a report.

Dick: Then what happened? You were all ready to move?

Mikesell: We weren't ready to move, but--

Dick: I presume while the site testing was going on, there were other discussions taking place about how this was going to happen.

Mikesell: We kept putting off the Navy, the people downtown. It was along here, you see, at this time--and you can look up the exact date of this--that McCarthy stood up on the floor of the Senate and said, "I hold in my hand the names of 206 card-bearing communists who are employed by the State Department." Senator Tydings, to make the story as short as possible, was chairman of the committee appointed by the Senate to look into it. He couldn't find anything to McCarthy's claim about this, because mostly McCarthy wouldn't give him any information that McCarthy originally said he had. When they finally got through with it, they found that maybe on the list were some people that at some time had some connection with American communists, the U.S. Communist Party being one of the officially recognized political parties in the United States at that time. This is before any laws had been passed against it.

So Tydings reported that to the Senate. At the next election, which Tydings was supposed to win, a shoo-in, without any effort. The day before the election, the state of Maryland was totally clobbered with handbills unattributed in any way whatsoever, showing Senator Tydings shaking hands with Earl Browder. Underneath was the caption, "Are you satisfied with Tydings' report to the charges that are brought about communists in the government?"

Dick: Who was Browder?

Mikesell: Browder was the general secretary of the American Communist Party at the time. It was a name very well known to the American public, very well known, because he made lots of statements and pronouncements, and he had a very high profile. This is the pre-TV era, but nonetheless, everybody in the country, and certainly in the state of Maryland, knew who Earl Browder was.

Dick: This was about 1950?

Mikesell: It would have been '50. Might have been. It was either '48 or '50, probably '50. Must have been '50. That would have been the right time.

Dick: So as a result of this?

Mikesell: This was the day before the election. As a result of this, this absolutely unknown person named Butler, a Baltimore contractor that the Republicans had put up as a sacrificial lamb, he was suddenly elected.

Dick: Tydings was defeated.

Mikesell: Tydings was defeated. The Senate was presented with its first serious case since the Civil War, and maybe in its history, of whether or not to accept a man who is elected with the violation of so many of the rules for fair elections in the country. They were all violated. It was McCarthy's men, friends, and employees of the Chicago Tribune who had engineered this anonymous photograph and gotten it out. It had been done in McCarthy's office, as a matter of fact, the dirty work, the skullduggery, in McCarthy's office and the offices of the Washington Times Herald, which was related to the McCormick paper in Chicago and was the very arch-conservative newspaper in Washington at the time.

Dick: How was this all found out later?

Mikesell: It immediately surfaced. It became very clear. It was known right away that Tydings' defeat was due to the handbill, who had done the handbill, and before very long, there were just too many people involved at the Times Herald and in the Senate Office Building for it to be kept secret. The young guys

that did it, who became McCarthy's hatchetmen in the subsequent McCarthy hearings, were boastful about it. They were proud of what they had done. They thought it was funny and delightful. They thought it was tremendous and they had also proved the point that the public is a bunch of nitwits, and you could get anything done if you just played on the public correctly.

Dick: Yet the Senate refused to invalidate this?

Mikesell: Nonetheless, the Senate accepted Butler. Tydings was out. Within two weeks after that, when the captain went downtown to discuss the next stage of the Observatory's move, he was told he didn't have to worry about it right now. (Laughs) He could stop worrying about it for the indefinite future. That was very fast after Tydings lost that election.

Dick: By that point, the site testing had all been done and the site had been selected?

Mikesell: The site had been selected, the Observatory was ready to report on it, and they were already thinking about the move. Some of the people were buying land down in the area to be in on the ground floor and things like that.

Dick: Some of the employees, you mean?

Mikesell: Yes, who planned to be moving down there with it.

Dick: But the site had not been purchased.

Mikesell: It had not been purchased.

Dick: Was it contemplated that that would be purchased or rented or what?

Mikesell: It would have been purchased, no question. No problem working that out. If nothing else, the right of eminent domain. I'd been involved in getting occupancy on all of these sites. There was a chap by the name of Smyth, and I think it was spelled Smyth, who was essentially recently back from Japan. Smyth was an expert on municipal bonds. He told me there were 50 experts on municipal bonds in the United States. Smyth explained to me how he could come into any town or city you wanted, drive

through the town once, drive back through the town once, and then he could guarantee to anybody, any bank in the country, how much bonded indebtedness that particular community was good for, was sound for. I watched him in an operation. In each of these communities, we walked into the county courthouse and he had all the right words, he knew exactly the right person to see, and we got all the information we needed. He gave every evidence of being an expert.

However, from my point of view, the most interesting thing of being with him for four days was debriefing him on his experience in Japan. He had been the first American representative of the U.S. Navy to set foot on Japan. It happened immediately after the ceremonies on the USS Missouri. He had then been flown into the big airport. He had been trained for this role as an occupying officer during the preceding two or three years, being schooled at several schools. At that time I knew about the schools because they were very well known in the scuttlebutt, although they weren't spoken about widely. There were at least two in the United States. His was located in Chicago, where the military trained people to be the officers in charge of the armies or navies of occupation. He was one of several Navy people for occupying purposes, but the only one, the top one or only one, for Japan in the Navy's business. So that's a long story.

Dick: But no land was ever purchased, you say?

Mikesell: No land was purchased. We arranged to rent right of occupancy on each of these pieces. We found who the owners of title record were personally, or I did later, having seen him at work and knowing how to go about it. I finished up and got access for all of the sites for us.

On one of the sites we drove down and mounted an old school bus suitably converted to be an observing station. That was one of the sites in Lynchburg. The others we put up temporary houses that were made by the Observatory's building grounds department--a chap by the name of Gingras.

Dick: You say some of the employees had actually gone down and bought land. What was the feeling of the employees? Were they sort of glad to be moving or not?

Mikesell: Oh, no, nobody wanted to move.

Dick: The cost of living probably would have been lower, but nobody wanted to leave Washington.

Mikesell: Nobody wanted to move. It was interesting to see what happened to Charlottesville between the time we were first site testing there and over the periods of the next few years, from the time I had gotten back to see Charlottesville, which was a tiny, sleepy little village, with only one restaurant of decent food, to become what it has.

Dick: Do you have anything more to say about that site-testing episode?

Mikesell: I think we've disposed of the incident.

Dick: Were there any other attempts to move the Observatory during your time there in the '50s?

Mikesell: No.

Dick: That was the only one.

Mikesell: This was it. With the Chief of Naval Operations, then gradually, you see, all the other houses on the grounds were occupied by officers. The building and grounds gentleman housed in the second-best house on the grounds over near the 40-inch. He was superintendent of grounds, a civilian. There was an officer counterpart of his, and they shared an office together. This civilian was the guy who really did things. For example, when we had a little fire in the office, the tiny building which had a bed, a radio, a chronograph, and was associated with old photographic zenith tube, the original Ross zenith tube, we had a fire developed in the electrical wiring in the walls there. This grounds caretaker living close to it got called first of all to come on over and help put it out. There was a Pyrene tetrachloride fire extinguisher there, and it was put out fairly quickly, but there was some rather obvious damage.

The caretaker instantly went on down to the shop, got tools and materials, and came on up, replaced burned wood, burned

interior lining, repaired the wiring, and put it all back together, repainted it and everything. So by the time people came to work at 8:00 in the morning, there was not the slightest sign of it, because, as he explained to me, "If I hadn't done that, I would have been involved for the next 12 months with explanations, committees, meetings, and then changing everything on the grounds so this could never happen again. So the loss of three hours' sleep was trivial compared to what that would have cost me."

That house, you see, then went to very high-level officers. I think an admiral got that house when they kicked him out. Then over next to the boilerhouse was a duplex house. Burton had occupied half of the house, and C.B. Watts, the other half, as heads of the divisions. Then when Burton retired, John Hall got that side of the house, and Watts, at some stage, released his side and Markowitz took over.

Dick: How about Sollenberger? Did he live on the grounds?

Mikesell: He never lived on the grounds. He had a house over within easy walking distance right out the gate to the east there, across Wisconsin Avenue. I lived in his house for a while.

Dick: Why don't we go on to your Equatorial Division years? Did you go into the Equatorial Division before John Hall arrived?

Mikesell: No, no. With him. Along with his arrival, then I was assigned over there.

Dick: Can you explain why you went from 9-inch to Equatorial Division?

Mikesell: I didn't know what the guys in the Astronomical Committee might have dreamed up amongst themselves as the reason.

Dick: They assigned you to go?

Mikesell: They were the ones that recommended to the superintendent that this transfer be made.

Dick: It was coincident with John Hall's arrival.

Mikesell: It was on account of John Hall's arrival. John Hall inherited Lyons, who had come back from the war and been in there. Lyons was hoping to take over Burton's position and was passed over. What would Lyons have done? Well, he did what he was going to do, anyway, which was to carry on Burton's observations with the big Repsold micrometer, observations that consisted of these wider apart than three seconds of arc stars, plus parallels of the parallel lines and spacings of the vertical lines on the micrometer.

Dick: When John Hall came in, he did things quite different.

Mikesell: Well, John Hall certainly did. John Hall found it was just simpler to ignore Lyons in every way. The other person who was unhappy about John Hall's coming, of all things, was Isabel Lewis.

Dick: At Nautical Almanac.

Mikesell: At the Almanac office. I never found out the occasion of her vendetta, but I'm sure it was a vendetta that was far deeper than just her. There must have been a number of people involved. I can't imagine that any of them were particularly good friends of Lyons, because I hadn't thought of Lyons as making friends amongst any of the rest of the Observatory. Certainly he had no cabal or coterie or anything.

Lucy Day, however, was a very good friend of Miss Lewis', and Lucy Day, of course, was the other employee that John Hall inherited. It was simplest for John to leave Lucy with her solar observing. She had it well established with the Mt. Wilson plates coming in to her, the plates from the 60-foot tower telescope and the magnetic data off of the 150-foot tower. She collected all of these and published them all together. John was sufficiently impressed by advice of Nicholson and others at Mt. Wilson that this was worthy information, also people at Ann Arbor, who somewhat paralleled it, but depended upon Lucy's filling in. Finally, he heard from the Swiss that this was good work, so keep it on.

Dick: What do you think was the main purpose behind the work?

Was it for the Navy or were there other people who wanted that solar data?

Mikesell: There were lots of people that want it, even today. For example, Alan Shapley was already at Bureau of Standards, interested in it. Anytime he was interviewed, "Do you still want it?" he said, "By all means." We mailed out daily solar data and weekly and monthly reports, and had quite a mailing list that Mrs. Day handled in all of that.

One of the things that John Hall early learned when he was inclined to put Mrs. Day down and to try to change what she was doing and reassign her, generally maybe not treat her with respect that she felt she needed, the next thing he discovered was that her son was the Commandant of the Coast Guard.

That was the first time John learned something about the Navy. The next time was when he got hailed before the mast by the then superintendent of the Observatory, something that he had never imagined possible, never experienced before.

Dick: What was the reason?

Mikesell: I don't remember the reason. I'm certain it was trivial in both John's and my mind, but to the captain it was worth the disciplinary action. When the captain discovered that John was well defended by Civil Service, there were always chief clerks--they called them, finally, chief administrative officer, but back then they were chief clerks--to say, "Well, uh, Captain, uh." One of my little anecdotes which I'll throw in here, if I may. One of the captains came in--captain or superintendent. He had a deputy superintendent who was a commander, who was kind of one of the boys when he came aboard. He sat around and ate lunch with all of us, and especially he enjoyed the fact that there was a group from the Time Service and Almanac office and all, who would pile in their cars and go up in McLean Gardens, where there was a very nice cafeteria back in those days, and eat a very nice meal there or else go to a nice restaurant out on Wisconsin Avenue, an old German restaurant.

Dick: Old Europe is still there.

Mikesell: Old Europe. Okay. We'd go tearing up there for

lunch. But he soon discovered that this so-called titular 30 minutes' lunch hour that the Civil Service Washington day defined, was absolutely impossible. Transportation alone required more than 30 minutes to any of these places. Well, the professional help had no trouble filling in their time. Most of them didn't leave on time, anyway, regardless of when they came on the job. Many of them would be around there for hours after quitting time. But he decided, "Well, the thing to do is to legitimize all of this, since it's obvious that a lot of the people at the Observatory need this, and perhaps most of them." The Observatory's own eating place by that time was pretty lousy. They needed time to go someplace decent, get a proper meal. So the thing to do was to shift the work day, which, of course, any administrator may do in Civil Service and the Navy.

I was sitting down in the lunch room on the Observatory grounds, eating lunch, and Nelson happened in to eat lunch at the same time. We got talking, and I said, "By the way, Nelson, what's to it that the Observatory is going to lengthen out its work day and have a one-hour lunch period instead of 30 minutes? What's the rumor?"

Nelson looked at me and said, "Well, that's no rumor. We've already cut the stencil and run off the mimeograph of the orders which will be circulated soon." I sat back and I grinned at him, and I said, "Gee, Nelson this is wonderful! Absolutely wonderful! The first thing that's going to hit is going to be the Washington "Employee" column of the Washington Post, because everybody in the whole city of Washington knows that no civil servant can get his lunch in 30 minutes. This has always been flaunted, and here it will come to the permanent and wonderful credit of the Naval Observatory to do something about it. The publicity we're going to get on this is just going to be fantastic!"

You can picture the look on Nelson's face as he sat there. Of course, the silly thing is, it shouldn't have struck him as news. It showed he'd been too remote from reality. He had had nothing to do with the union, which we had formed on the grounds by then, and he was just disconnected with reality. Of course, we never saw another thing about that.

The Observatory had had its share of publicity; it wasn't nice. After the war, its name got bandied around on account of

scandal procurement and contractual services, nothing to do with the Observatory at all, but it happened on the Observatory's grounds down in Building 52, where they had the materiel department. There was a separate captain in charge of that and a whole line of many officers in charge down there and, of course, a very large work force down at that point. But after the war, there was a nasty investigation.

Then there had been another nasty little investigation. This caretaker that I spoke of, Gingras, had had an assistant who had thought that he should be promoted more, and Gingras discovered the assistant was incompetent and a four-flusher, something that some of the rest of us had also observed. While he wasn't attempting to fire him or anything, he had certainly passed him over on assignment of duties and promotions. So the assistant had sent a whole bill of materials down to the inspector general's office with regards to our caretaker, Gingras, living on the grounds and all that, an extraordinarily capable chap.

He had had to go through this investigation at the hands of a board that the Navy set up. One of the questions Gingras told me about was, "We understand that you had occasion to cut down some of the oak trees on the ground."

"Yes, Admiral."

"We understand that you had these cut up into firewood."

"Yes, sir."

"We understand that this got loaded into some of the Observatory's trucks and taken off of the grounds."

"Yes, sir, that is so."

"Would you, by any chance, be able to tell me the names of some of the people to whom this was taken?"

"Oh, yes, Admiral, I can. There was Secretary of Navy Woodrin, there was Chief of Staff General . . ."

"That's all right. Next question." And that was the way the whole thing ended. There were, curiously enough, almost 200 allegations on the thing, but they ended like that on all of them.

Dick: Let's go back to John Hall. Do you know who was instrumental in bringing him to the Observatory then? You said there was some opposition to him coming.

Mikesell: I do not. I remember that we had capable people in the Almanac office. Clemence was there and Eckert, I think, was still around.

Dick: Eckert would have left by '45.

Mikesell: Eckert would have left. But Clemence then had taken over from Eckert.

Dick: Of course, Watts.

Mikesell: Watts would not have opposed any positive action. Watts would have seen what the tenor was. Although Watts had his notion and had scuttlebutted it with Adams, and Adams had seen more to it than I'm sure Watts meant, Watts was probably thinking out loud, but for Adams, of course, it was stars in his eyes. When realities came and committees started getting serious, why, Watts wouldn't have pushed on something like that.

Dick: You mean Adams wanted to be director.

Mikesell: Adams thought he was promised by Watts to become--in the first place, Adams knew that he stood in line to succeed Watts when Watts retired. Indeed, for a little while he stepped in and served. So he was now going to be put in charge of the old Equatorial Division, but would be carrying out essentially Watts' notions with regards to the disposition of the 40-inch, the 26-inch, and anything else. So that would be innocuous for Adams. From Watts' point of view, it would be simplifying the Observatory structure in the correct direction, which was, according to Watts, just to have the Time Service and two transit circles as the observing operations.

Dick: Watts did not like the 26-inch?

Mikesell: He didn't think anything of the 26-inch or the 40-inch or the 15-inch, or any of the people concerned therewith.

Dick: Do you know why?

Mikesell: Not particularly, except his statement declared the point that the work of those instruments is done much better by other, better trained people in other locations, better

locations, and it distracted from the main effort of the Observatory, which was the meridian circles and Time Service.

Dick: When you say "his statement," you mean a written statement?

Mikesell: No, talking to me. This is the sort of thing I heard from him many times. He thought the 26-inch was fun, but long past any possible usefulness; the 40-inch was a dastardly mistake; the 15-inch was a sad mistake. Watts had written up the horrendous specs for the 15-inch. He said the specs for the lens said it should be a lens of the Cook-Triplet design that would give perfect performance over a field covered by a ten-by-twelve plate with a 90-inch focal length. Of course, whatever you mean by "perfect images," that was in the specs. There are copies of that around, conceivably in my files, but certainly because you won't find them in the Observatory files. When I left the division, I had a whole fistful of those things, and maybe they're someplace in the files that were left with Routley and company. They were the classic statement of how not to write a lens description. Of course, Lundin, when the glass was delivered for the 15-inch, found that the center element did not have what he had specified. Lundin said, "Well, I think I'll have no trouble just empirically working on it, bringing it into line."

Dick: What was the stated purpose of the 15-inch?

Mikesell: Essentially astrometric observations, positions, certainly, positions of any objects of interest--comets, asteroids.

Dick: So John Hall came in as head of the Equatorial Division. What did he do? You say Watts had this opinion that the Equatorial Division was completely outside of the Observatory's interests and the instrumentation was obsolete.

Mikesell: Watts certainly showed no animosity to John Hall, as far as I could see. He did nothing. Lucy Day had hers and probably Miss Lewis came in as being just a very good buddy to Mrs. Day.

Dick: John Hall came in.

Mikesell: You see, the thing that was controversial was that John Hall brought $5,000 worth of equipment with him from Amherst College. The Navy paid Amherst $5,000 for what John brought.

Dick: This was for his interstellar polarization work.

Mikesell: That was most of it. All sorts of things--photometric standards. He had together a collection of stuff. It was clear that the polarization project came along with him.

Dick: It's clear that he was going to be allowed to do work which, strictly speaking, was not mission-related, then?

Mikesell: It depends on what your mission is. The mission, as written up, was broad enough to include it. The mission of the Observatory has always been broad, as stated.

Dick: Something about "to advance astronomy."

Mikesell: Yes, yes. It includes making observations in astrophysics and general astronomy. All of that is in that mission. I don't know whether that mission is worded the same now, but it sure was back then, included it very nicely. Miss Lewis, you see, interpreted that $5,000 as being kumshaw paid to John Hall to come to the Observatory. The only kumshaw he got was the permission to bring along the work he'd been on at Amherst in order to attempt to finish it up, and certainly to pursue new subjects as he would find them desirable and necessary.

Dick: So John Hall, then, used the 40-inch, used that equipment in association with the 40-inch? It was really the first real work that was done with the 40-inch, wouldn't you say, that was published?

Mikesell: The first real work, yes, I think so. The observations of Mars' satellites had been published.

Dick: Sharpless' work. That's right.

Mikesell: Browne's observation of a comet had been published. We had made observations of satellites, and conceivably those were

published. These were done by Lyons and me, started by a program set up by Malcolm Browne, an occulting device on the camera and everything else.

Dick: That's when you were originally in the Equatorial Division.

Mikesell: That's right. I don't know that Willis published anything out of the 40-inch. He took his observations demonstrating its capability for parallaxes insofar as the field was concerned, the third-order corrections.

Dick: What were you put to work doing, then, when you came to the Equatorial Division in 1948?

Mikesell: It was pretty late. The first thing I really had to do was to work on rewiring the 40-inch and then, more extensively, on changing it over to be a more usable instrument. The 40-inch that was inherited by us back in '37, by Lyons and me, included this big heavy tube extension which stuck out of the telescope dome, plus curtains above it and below it, which would close the slit so that no light would come in, except that tube. This is related to an attempt to use it for deep space photography and then the fact that it was an open skeleton tube, so that just the local light from the city of Washington would make that almost impossible coming in and fogging up the plate. By using this tube extension and these curtains, one could get around that.

Willis had experimented with a number of things that were in the literature at the time, things of extending a diaphragm around the secondary mirror to block light, and then things of putting templates cut out in the form of curves along with spiders to change the distribution of light, essentially eliminate the crosses on images of dark stars. All of this, again, to prepare the thing for parallax work, where, above all, you want uniform images. You don't want to have crosses coming on to bother you. So he was experimenting with that. That was after '37.

Another thing that Lyons and I inherited in '37 was an inside tent made out of heavily quilted canvas arrangement, supported by hoists from the dome overhead, which would be

allowed to come down over the telescope. Inside, we would set up heaters with the hydrostat to turn on extra heat whenever the relative humidity started getting so high that condensation would be a problem. Half of the ironwork of that 40-inch mounting was below the observing deck, and so all of that metal down below could get cooled down very much during a clear cold spell, and then a warm moist front came through with rains all around. Of course, water would run off of the whole system by buckets. Browne had created this quilted tent to go over that and take care of it. Some of the old photographs did show that. Although I doubt that I ever saw or took a photograph, I inherited a lovely wide-angle lens to use with the four-by-fives graphic, and at least some of the 40-inch photographs I took with that whole thing in there. But I don't know that any of them showed the tent in place, nor am I sure that you've got any pictures showing the 40-inch dome with the extension sticking out.

Dick: I don't remember any.

Mikesell: Okay. All of that was with it, still, around in place when John Hall came there. With John Hall's permission, as soon as possible I tore all that stuff out, in order to simplify life.

Dick: So you were preparing the 40-inch basically for Hall's work?

Mikesell: For serious observing programs in just photometry. In other words, we weren't going to do much deep space wide field photography there, simply on account of sight. But we would use it, then, very much for photography. All of these other things would just get in the way and louse it up.

Dick: For photometry?

Mikesell: Yes. So we stripped off anything on the spider, the extra secondary thing, and mounted Hall's new auxiliary equipment, a synchronous alternating current polarimeter, onto the place in the back, and other photometers.

Along through this period would have been meetings of the AAS, and I think they were at Cambridge. You can look that up. It would have been Christmas of '48 or between Christmas and New Year's, which is when they used to hold their meetings. Hall went up there. You've probably heard this story from Hall.

Dick: Not that I remember now.

Mikesell: This is with regards to the announcement of polarization of starlight. Hall went up there at the meetings and caught Otto Struve, pulled him to one side, and said, "Look, I've been trying to . . ." The reason I'm stopping is because I suddenly have aphasia toward this extraordinarily well-known name of the then-Yerkes astronomer who is now working mostly in connection with Flagstaff.

[End Tape 2, Side 1. Begin Tape 2, Side 2]

Mikesell: He was at Yerkes. John had gone up to Yerkes once.

Dick: Hiltner.

Mikesell: W.A. Hiltner.

Dick: I know there was a priority dispute.

Mikesell: Yes. Hall had gone up to the AAS meetings. He had first been at Yerkes and had done some observing with Hiltner and then had gone back to Amherst, promising to develop this proper synchronous detection AC photometer. All of this I did not know particularly. I'm trying to recall how this fell out. I think my work on rewiring the 40-inch I had done very fast, very soon after I had joined Hall on the division. I'd gone in and gotten permission. The original wiring using rubber insulation had already rotted out, this being 15 years later, and I think after a night of working with Hall, trying to use his equipment, just bumping into all sorts of problems in pointing and everything, I said, "This thing is a mess. Here's what I would like to do." And Hall said, "Go ahead and do it."

Dick: Had the 40-inch not been used for a while?

Mikesell: It hadn't been used probably for quite a while. It had probably gone out of use. Willis had gotten his 30 plates for the parallax program out of the 120 he said he needed. They allowed him 30 dozen. He hadn't exposed even a full dozen of those. He'd opened one package. Then he'd gotten over to these other things. Willis had left. Then presumably nothing had been

done with it, except whatever Lyons had done, which was probably nothing until Hall came. Then Hall mounted his equipment on it right away, and we tried to use it. I think Hall gave me permission to muck it up, so I went to work and did all sorts of things.

Then Hall was going to go out and give a paper in California or someplace, had a beautifully planned itinerary, and came down with measles. The next clear night came along. I used the telescope and his equipment, running through a series of observations on Hall's project, admiring the way the results seemed to fall out. Hall recovered, was able to go up to Cambridge, and buttonholed Struve, saying to him--quoting Hall now, as he talked to me--"I'm trying to get in touch with Hiltner to find out what we can do about polarization of starlight observations in a joint paper."

Struve beamed and went off, "Isn't it wonderful what Hiltner has discovered here? Yes, Hiltner is just magnificent! He's got the paper in to Science, and we're coming out in two weeks in Science. This is just magnificent, this whole new subject that he's discovered!"

John, of course, was kicked in the solar plexus and said, "Dr. Struve, that's not the way it is." And he had with him the whole series of correspondence, which I have read through, partly as a witness, partly because Hall needed to share it. It ran over two years, at least, of Hall's attempt to make arrangements with Al Hiltner to do observing, and Hiltner not answering the letter. Then, finally, Hall gets an answer back and it's equivocation, talking about essentially something else. And Hall saying, "Look, if you look at such and such a star, you're going to get this effect," sharing some of Hall's observations with the Amherst equipment. "When can we get together and work up a joint paper announcing this?" Because they had discovered it jointly.

You know why they were together originally? This was looking for eclipses of B stars and wanting to see the polarization due to an electron atmosphere as you were in the last stages of eclipse. So Hall had taken his apparatus and they started off to check it out on another star, and they found there was polarization there, then in several others. Hall was

absolutely secure about his equipment and his observations, but he wanted to do better by it. Hiltner maintained that Hall was equivocal about it and didn't recognize what his observations showed, and that they really hadn't discovered this. Hall said, "Well, I'm going back. I'll set up this better apparatus and we can check it out in more detail, more accurately." Hiltner had said nothing, but as soon as Hall had left, he went to work using the Polaroids, which he rotated in front of a plate, to come up with his limited results on a few stars, especially the stars that Hall referred to him in the letters.

The correspondence was damning, to say the absolute least.

Dick: Hall showed this to Struve?

Mikesell: He laid it out.

Dick: Where was Struve at this time?

Mikesell: Struve was Director of Yerkes.

Dick: But he was at a meeting?

Mikesell: This was a meeting of AAS in Cambridge. Struve got the kick in the solar plexus and said, "Oh, this is bad. This is bad." Struve drew upon his role in astronomy to get in touch with the editor of Science, and authority to hold up the original article until Hall could bring in his article.

So Hall came dashing back to the Observatory in Washington. "We've got to have more observations instantly!" We went to work one night and observed seven stars, took the observations we got off of those, good, consistent observations. Hall wrote his paper, carried it down. By that time he could look at Hiltner's paper, and the two papers got published. Hiltner was forced, kicking and screaming, to add a footnote saying, "Oh, by the way, John Hall was there." You could see them. These are something in January 1949, Science, an unprecedented move on the part of Science, most unusual.

Dick: Why did Hall need to make more observations?

Mikesell: Because he felt that the test observations I had made

during his measles situation weren't adequate, weren't good enough, weren't complete enough or something. They may have been included. I've forgotten what all was included in there. I remember that one night's observing was really key to this thing, and we got it out, and the 40-inch was ready to work and did work.

Dick: Why had Hall taken his correspondence with Hiltner up to Cambridge? Did he know that he was going to present this to Struve?

Mikesell: I wonder. He was certainly covered. Struve was impressed and brought to bear his authority with Science to make sure that the two papers were, indeed, published together. Otherwise, Science would never have done it.

Dick: I can check dates of those papers in Science, but we're talking around 1952 or something?

Mikesell: No. Hall came in '48. This would have been in January of '49.

Dick: Oh, that early?

Mikesell: This was instantly. I'm talking about everything that's happened in those first six months. Hall came in October, and he made these crucial observations in December, before New Year's. He came back from Cambridge and we dashed into the dome. He wrote the thing up and had it in the hands of Science by the day after New Year's.

Dick: So within a few months, John Hall had done more with the 40-inch than the previous 15 years. Is that a fair statement?

Mikesell: Well, within four months, you could say, yes. And more epoch-making and, of course, more significant in terms of the design being accepted by the astronomical fraternity. This was absolutely crucial.

Dick: By "design," you mean the Ritchey-Chretien design?

Mikesell: Yes, the RC design, because it was frowned upon. I remember when it first came out and Smith--I think it was

Clifford Smith--he was at Fresno State, I guess, or finishing up his Ph.D. at Lick--he expressed the view of all the California astronomers, at least, that this was a waste of effort. I'll just finish up this note on John Hall. I think it was absolutely crucial to the acceptance of the RC design that John Hall came to the Observatory as soon as he did after the war. He came there thinking the telescope was hopeless, because this was the standard view of astronomers. Well, I was saying Clifford Smith had told me way back when it was first announced that it would be built, it was announced in Scientific American, among other places.

Dick: That the RC would be built at the Naval Observatory.

Mikesell: Right.

Dick: Who was Clifford Smith?

Mikesell: He was one of the astronomers of the country, ended up in San Diego, retired there about ten years ago.

Dick: What did he say?

Mikesell: So he wasn't that much older than I. He expressed the standard Lick-Berkeley view that this was just a horrible waste. You shouldn't build a telescope which would require a shaped secondary lens. The Mt. Wilson notion was you'd be able to use the Newtonian, then you had your standard Cassegrain lenses for short and long focus, and that's it. This idea of wasting a big telescope in its mounting, so scarce in those days, on almost a dedicated instrument. He rapidly changed his point of view after working with it at the Naval Observatory.

Dick: John Hall did?

Mikesell: Yes. John was accepted and recognized by all of the astronomers of the country as both capable and lively and a person to listen to. So his opinion touched everybody.

Dick: I'm wondering why John Hall came to the Naval Observatory if he thought the 40-inch was hopeless, though.

Mikesell: Ask him. He's still extant.

Dick: I know.

Mikesell: You can get him on the telephone. If he doesn't come to meetings, you can get him on the telephone. He's written up the story of the 40-inch, the RC. You can see that; that's been published. You can see what he says in that. In part, of course, Amherst was a dead-end for him. He had had an exciting experience working at the radiation lab at M.I.T. That had been extraordinarily exciting to him. It spilled over all the time in everything he said in his talk with me when I joined him. He may have thought that the 26-inch, at least, would be worthwhile. It was certainly one whale of a lot better than what he'd had at Amherst.

Perhaps he thought that on the experiments he narrowly envisioned, including this polarization bit, that the 40-inch would be just about right. He could guess already that you didn't want to do polarization with a Newtonian setup, and that even if he'd gone to prime focus on the 40-inch with his photometer he'd set up, the star images might not have been so bad if they wouldn't have worked at prime focus. But in any case, certainly in the Cassegrain mode, polarization could be done in the way it couldn't be with a Newtonian, or at least not easily done with a Newtonian.

All of this is possible, but go ahead and ask him. The division, when he took over, must not have looked like much. We had Mrs. Day on sunspots, about which Hall knew nothing and cared less, and Lyons with the Repsold micrometer, something of certainly no importance. Hall, early on, you see, had some interesting people in there. He got Art Hoag to come in. Art hadn't finished his dissertation yet.

Dick: What year was that, do you remember?

Mikesell: No, I don't, but it's readily available. Art will tell you and it's in the files. Again, your fly-page on the American Ephemeris always lists these people, and then the annual reports at the Observatory are awfully good.

Dick: So he got Hoag.

Mikesell: At the time he got Hoag, he interviewed Art Cox.

Then, of course, Stewart Sharpless came in, along with Hoag. So he had,
then, two extraordinarily clever people. Sharpless was no instrumentalist, but I certainly could see him as a fantastic thinker. I don't know what Sharpless has published since he went to Rochester. He went directly from the Observatory to Rochester, and I haven't been able to see anything published.

Dick: Do you know why he left the Naval Observatory?

Mikesell: No. Do you?

Dick: No. I'll ask him.

Mikesell: Mostly, I think he would have found just the general climate of Washington business and working with the Navy as inordinately poor. My relief, the guy who replaced me, came to us from Earlham College.

Dick: Who was this?

Mikesell: Aphasia again. It will come. James Wanner. Awfully good. Swarthmore, Harvard, Earlham. A young family, a sturdy wife. They right away bought a fairly nice house within easy walking distance of the Observatory, over there on 36th or 37th Street, those rowhouses, and was responsible for the key work on designing the second measuring engine, automatic measuring engine. The first one had been delivered earlier, and we had it working on the 60-inch plates. Then we were going now to this new measuring engine, which was located down there in Building 52 on the shop floor.

Dick: Who else did John Hall bring in, aside from Hoag and Sharpless?

Mikesell: Markowitz got transferred over. Markowitz got himself into a bind, a personal problem bind, vis a vis Sollenberger. Sollenberger, who had taken Markowitz under his wing when nobody else wanted him, finally they had reached the stage where it was better for them to separate.

Dick: And yet Markowitz succeeded Sollenberger.

Mikesell: This was all right. Sollenberger could have respect when there was some distance involved. Hall was willing to take Markowitz, and Markowitz, with customary energy, went tearing in on something. The first thing he did was to strip the old Repsold micrometer off the telescope.

Dick: The 26-inch.

Mikesell: Off the 26-inch. And fish out the beautiful little Clark micrometer out of storage someplace and stick it on, then go to work and find out that he could do very good work right down to subsecond separations. Then he went testing his system by moving on out to test it at using the 61-inch at Mt. Wilson. I think he used the 84-inch at McDonald. He traveled around the country some with that micrometer of his, just testing to see what he could do in various observing situations, and then came back and went to work making observations of binary stars with it, not too serious, not very long. Reasonably thereafter, Sollenberger retired and Markowitz moved on back into that division. I can't think of who else at the moment.

Dick: How about Otto Franz?

Mikesell: No, Otto came with Strand. Strand was at Northwestern and had brought Otto in there. When Strand came to the Naval Observatory, it was with the understanding that Otto would come along with him.

Dick: How about Pat Roemer?

Mikesell: Much later. She came out only to the Flagstaff station. Under Hall, Hall and I site tested in 1950. In the fall of 1950, we ran site testing at Flagstaff.

Dick: This is what I wanted to ask you, how soon that occurred. Apparently Hall had the idea that the 40-inch would be moved outside of Washington.

Mikesell: I suspect that had been promised to him originally. It had also almost certainly been promised to him that he could get some people of his own choosing, and so Art Hoag was one of those and Sharpless was another one. So he got two people of his own choosing. Art Code was offered and turned down and went

directly to Los Alamos.

The site testing accomplished, we selected our site all in that fall. Basically what we did was to look at seeing records at Lowell and then observe seeing over the period of our several weeks at Lowell and at the hill that we later bought there.

Dick: So this was following very shortly after your experience in site testing for the Piney Mountain.

Mikesell: Very much. We took along one of those instruments, for example.

Dick: Do you remember what the interval was there?

Mikesell: Piney Mountain had been closed down, of course, and the instruments had been brought back to town.

Dick: How long after that did you start doing site testing at Flagstaff?

Mikesell: The next year. We didn't start; I mean it was one very brief tour. John Hall and I drove out there, carrying our instrument along with us.

Dick: Which instrument was this?

Mikesell: One of the Polaris telescopes. We carried that along with us.

Dick: No Clark five-inch.

Mikesell: No, no. We did that in John's automobile that he had just bought.

Dick: Why Flagstaff?

Mikesell: John knew more about the Flagstaff area than I did. It was recommended to us as a possible observing station.

Dick: By whom?

Mikesell: General fraternity. There had been lots of

recommendations in that series of letters. Anybody one talked to would bandy about the name of Flagstaff. This was, of course, some time before Kitt Peak. John Irwin had already published his famous little story about the eight sites in Arizona that were good, including, especially, Black Butte.

Dick: Where was that published?

Mikesell: Science.

Dick: Prior to 1950?

Mikesell: Yes, prior to our research there, I think, right around that time. John, as soon as he had started trying to work first after the war, first at Philadelphia, his first post-war assignment after he left China Lake--then where next? Did he go directly to Indiana? Could be. But anyway, sometime along in this interval, it may have been after 1950, but he became obsessed with the notion of a Naval Observatory that would make equipment available to students and astronomers from all over these land-locked--

Dick: John Irwin did?

Mikesell: Yes. This was very much his notion, and he worked hard for it. He also visited in Chile. He was concerned with our having an observatory in Chile to get the Southern Hemisphere. He'd begun making observations then.

Dick: Was there ever any attempt to get the Naval Observatory involved in that kind of project for a national observatory?

Mikesell: Not for a national observatory. By that time, sometime along in there, the Naval Observatory was already accepting graduate students as post-docs and undergraduate and graduate students for various types of work, either as apprentice or post-doc or something experience. We had a large selection of these people circulated through the Observatory, pursuing work of their interests, whether in Almanac offices, normally in Almanac office or the Equatorial Division or Astronomy and Astrophysics division, whatever it was called, or 6-inch Division.

Dick: Since you mentioned that, let me ask you. At some point

in here while John Hall was director, the name did change from Equatorial Division to Astronomy and Astrophysics Division.

Mikesell: That would have been at the very end, near the end.

Dick: What was the reason?

Mikesell: In part, I suspect it could have been that it was along then that this matter of some of us being paid by ONR came up.

Dick: Office of Naval Research.

Mikesell: That could have made it for it.

Dick: Why?

Mikesell: Then you separate out the division which is pure research versus one where you can call it applied research. The transit circles have always been applied research, as far as the Navy.

Dick: Calling it Astronomy and Astrophysics just made it--

Mikesell: It didn't depart from the mission at all, of course.

Dick: It was a bit more descriptive than just Equatorial Division.

Mikesell: Far more. Far more. And far more descriptive than the so-called 26-inch Division, which is what it was called in 1936. The 26-inch Division, although it had a 15-inch, a 12-inch, and a 40-inch, and a sun telescope and a twin 8-inch, all of them under the division.

Dick: Was there much debate at this time that you recall over astrophysics being done within the Observatory?

Mikesell: Watts had a broad view on science, and he would be the only person that I would hear mention anything. Clemence, you see, was very good friends with all of these people and kept his mouth absolutely shut, regardless of his feeling. He spoke feelingly about the notion of moving the Observatory out of town

very far, but he certainly wouldn't have spoken up against all these other things. He was too broad a scientist. He justified his NAS appointment.

Dick: But Watts, you said, was against anything that wasn't mission-related.

Mikesell: Correct, yes. He thought it diluted the effort.

Dick: But he didn't give John Hall a hard time about it?

Mikesell: Not that I can ever hear, no. No, not at all.

Dick: How about the Navy people? Did they ever call on John Hall to justify what he was doing?

Mikesell: No, no.

Dick: And they had no objection?

Mikesell: This had all been taken care of within the mission and by the Astronomical Council at the time they hired him. I never heard any question being raised about what John Hall did.

Dick: Back to Flagstaff, then. You did a little bit of site testing on one occasion, you say, at Flagstaff?

Mikesell: A two-weeks, three-weeks trip.

Dick: 1950?

Mikesell: Yes, it was. The end of November, early December. The little five-by-eight-inch record books ought to be around, and I'm sure John Hall would have left the one. He made meticulous notes during our stay in Flagstaff.

Dick: What was the outcome?

Mikesell: We picked our site. In other words, we went there expecting to find a site, and we looked at Lampland's and E. C. Slipher's records. V. M. Slipher seemed to me to be in his dotage and, as far as I could tell, was beyond any effective astronomy. E.C. was still extraordinarily lively and very hot in his work,

still essentially Mars, and his work was published, in fact, after 1950 when we were there, his main Mars report. But he showed us the data he had and was assembling. Lampland was the man that knew the plate file and took us into the plate file and regaled us with things.

Dick: This was all at Lowell Observatory?

Mikesell: At Lowell. In our visits, we were just in and out of Lowell all the time we were there. Then we were using this 4-inch site-testing telescope at Lowell, then hauling it out on top of hills all around, then hauling it down the escarpment to see what it was like 2,000 feet lower down.

Dick: This is the Polaris telescope.

Mikesell: Yes. Taking measurements all around. I think we got ten nights, as I recall, in our stay there.

Dick: And you found the results satisfactory, then?

Mikesell: We felt we could select a site. We were preeminently concerned with finding a site, and we selected a site.

Dick: Did the Lowell people give you encouragement in that?

Mikesell: Oh, yes, yes. They invited us to come in every way. No encouragement to go on their site, and we'd have been crazy to do so. They had a lumber mill right next to it on the windward side, and the town on the other side, obviously it wasn't any good. They already were looking at sites outside of town, had one of them selected already. I forget when the Perkins telescope got moved out there, but it was around then, and it was going to be out of town, of course.

Dick: With your site testing done, then, what was the next step?

Mikesell: By the time we were coming back in, the Korean War was heating up, and John Hall said, "No effort or money should be spent for setting up another observing station while boys are shedding their blood on the fields of Korea."

Dick: John Hall said this?

Mikesell: John Hall said this on the drive back to Washington. He followed that dictum and wouldn't follow up anything for a year or two. Then I think he understood better what all was going on with regards to the Korean War, the whole thing, and for some reason that's beyond me, he started the maneuver to actually put the work in force. We may have started the acquisition of land immediately upon our return; I think we did. It's obvious, of course, that we didn't acquire enough land. At the time I was one of those who wanted to acquire all the land up to 66. There was that big field of private land. I wanted us to acquire all of that. Well, John was just too conservative and wouldn't let it be acquired.

Dick: Was he worrying about the money, the appropriation that would be required?

Mikesell: Oh, money. He was still thinking small. I'd been in the Navy much longer. I'd been through the war in the Navy, and I already had seen the problems with Mt. Wilson. Horace Babcock and others discussed their problems there from not having acquired enough land. It seemed utterly ridiculous to me when, for $200 an acre or less, we could have acquired a few hundred more acres, buffered ourselves better. You see, John wasn't thinking in terms of a 61-inch and everything that's gotten on the hill there. He deprecated the possibility of any development on that private land below us. This is just human things. It's a matter of experience. To me it wasn't important enough to make an issue, and I wasn't in a position to make one. I was going to stick with whatever John said, regardless of my feelings.

Dick: Did he have to go to Congress to get money for this?

Mikesell: No. The Navy made a trade with the U.S. Department of Forestry. The Navy traded land to them. They traded some land to the state. The site is on state forest land. They traded land to the state, so this was all done in-house.

Dick: How about when the 40-inch was actually moved? Was an appropriation required for that?

Mikesell: I'm sure there was a line item for that. Very modest, very, very modest. The lowest bidder on the moving was an outfit

that built bridges in Baltimore and happened at the moment to be out of work. They tried to load everything onto two trucks, both of which were seriously overloaded, so that we kept getting phone calls all the way across to come to their rescue. To some of us, we thought they deserved it, because they had bid out people who were far more capable than them. They should have known. We didn't fool them; we told them accurately what the job was.

One of the funny little stories there was that I was meeting with this same Mr. Nelson again, and he was saying that the mover had asked for more money. The Observatory had no choice but to give them more. I said, "Why in the world do they have to give them more?"

He said, "We want to avoid scandal."

I said, "What scandal?"

He said, "Well, there's all these personal things being moved in the truck."

I said, "There isn't one stick of personal on the truck."

He said, "There isn't? What about the toilet paper?"

I said, "All of those are necessaries for running the station. We put them on as packing to fill up spaces, anyway. There isn't as much as a pencil belonging to any of the people that went onto that."

He said, "Oh. Well, doesn't matter. It's too late now."

Dick: What happened once the telescope arrived in Flagstaff and was set up?

Mikesell: Part of the job of this moving company was they had to set it up.

Dick: A building was constructed already?

Mikesell: The building had been constructed. The road had been put in place, and these guys were to come out there and set the 40-inch in place and put it up. That was where the bridge-building part of it came in. They were good at that. The only thing they weren't good at was moving.

Dick: What was the first work that was done then with the 40-inch in Flagstaff?

Mikesell: I'll leave you with that one to Art Hoag. Art was

director. Of course, he had the instrument maker out there. Joe Egan a guy I know so well, and who, last I knew, was still doing instrument work for them, though retired.

Dick: Did Hall spend any time in Flagstaff working on the 40-inch then?

Mikesell: No.

Dick: So the 40-inch was now moved to Flagstaff. You and Hall and Sharpless were back in Washington. Hoag was out in Flagstaff.

Mikesell: That's right. He was in charge there, and he was soon given more help.

Dick: How did your work develop and John Hall's work develop in Washington?

Mikesell: Oh, boy, I don't know. I don't remember now. Let's see. John Hall stayed in Washington until '58. We got the telescope moved in '54, '55. Because I visited the station first in '56. I drove across the country with my family and stopped there for several days visiting with them.

Dick: Somewhere in this period you started some work on scintillation. Is that right?

Mikesell: That got started just immediately. John brought that experiment down from Amherst. This was related to photometry. He had already outlined in his mind some simple things to do.

Dick: What was the purpose behind the whole experiment?

Mikesell: The purpose, of course, was to find out what the effects of scintillation are on photometry and how you eliminate them. Then it broadened into everything related to scintillation. I got deeper and deeper into that.

Dick: In what way? What did you do?

Mikesell: Mostly just trying to pin it down, where did it enter the observing scene, where did it become part of observations.

Dick: What equipment were you using, just a photometer?

Mikesell: It was always with photometers. John Hall had arranged, before he came, to buy a wave analyzer from General Radio Corporation. He had brought with him a 12-inch lens, probably a Clark lens from Amherst, not part of the $5,000. When we were done with it, we sent it back up to Amherst. And a piece of drain pipe to use as a tube for it, and we set the thing up right away as a Polaris-observing telescope.

Dick: Where on the grounds was this set up?

Mikesell: Next to the PZT building was a louvered wall building with rolled-off roofing, which had served, I think, for a Stackpole broken-tube transit. It was the building in which the time had been observed before time was observed on the PZT. That old Stackpole may be the one on display down at the Smithsonian Air and Space Museum now. I'm not sure. I saw one there, anyway, Sunday, and that may be the one. The Observatory had several of them. They also had a Fauth and some others, I think one by Saegmuller. It had a nice collection of these, because initially there had to be such an instrument for every transit-of-Venus station. One was used for the eclipse observations in San Diego. Sollenberger went down on that expedition and made those. Another one was sent to Baja, California, for Mexican observations. They were often sent around. Some of them were used during the war at various stations and they all came back in. Then most of them were broken up and thrown in the trash can.

Anyway, there was this building, and until the PZT was used for time, that transit instrument was the source of time. Time sights were made on it every clear night, and it was the source of time.

Dick: Wasn't it the 5.3-inch transit instrument in the south building?

Mikesell: No, that was not used for time; that was used for position, initially to do a better job on declinations. You use your prime vertical instrument for declinations, and your transit instruments always work well for right ascensions. Then this attempt to make these circles come up with good declinations has always been a struggle amongst astronomers. The prime vertical

instrument--you're dredging up my memory from way back, but that's fundamentally an instrument that should potentially do a good job on declination.

Dick: But the 5.3-inch in the south transit--

Mikesell: South transit was next to the main building.

Dick: Wasn't that one used for time at some point?

Mikesell: No, I don't think that was ever used for time. That was another right-ascension instrument. That would be used for filling in. It was never used, as far as I know, fundamentally. It may have been at some stage, but there you are beyond my recollection now. There's a time, I'm sure, I knew all of that, but I don't now.

Anyway, that building next to the PZT, the Stackpole had been taken out of it. The building was available. We cleared out the big pier on the bottom and set up this North Star-observing telescope in there, along with the General Radio wave analyzer, and observed there. Then we made observations on the 40-inch. Then, finally, we ended up making observations on the 15-inch, using the 15-inch more than anything.

Dick: All of that was published, eventually, wasn't it?

Mikesell: More or less. Not all. A lot of it, to my mind, because too trivial. I still have some of it, and I look at it occasionally. Some of it would be interesting to publish. It gave rise to some interesting field trips, one a few weeks out on a mountain in Sierra Nevadas, observing twinkling as affected by atomic-bomb blasts, a series of observations, the last big above-ground observations. There were 20 of them in the series called Plumb Bob. I observed a number of those explosions.

Dick: What was the result of your scintillation work? Was there a major result?

Mikesell: It's contributed to certainly some understanding of the field. We published one Observatory publication which got widely used by people struggling for a clear theory and understanding. Finally, theory caught up and went beyond our

observations. What we found out remains what is known on the subject. Didn't publish as much, perhaps, as we should have. I got involved with the other things. As soon as Strand came, he had his own set of hobby horses, and scintillation had no part of that.

Dick: Did you do some balloon work in connection with scintillation?

Mikesell: Oh, yes, yes.

Dick: Tell me about that a little bit.

Mikesell: We were trying to, of course, make observations from airplanes. All of this was trying to pin down exactly where in the atmosphere is star twinkling introduced. When Malcolm Ross stopped by one day and said, "Somebody said that you folks have been playing around with balloons, sending lights up on balloons . . ."

Dick: The Naval Observatory was?

Mikesell: Yes. John Hall and I and Art Hoag. And sending lights up on helicopters as high as they could go, things like that.

Dick: Was this in the Washington area?

Mikesell: Yes. So Malcolm Ross showed up and said, "ONR is trying to find scientific applications for these things. Could our work with free balloons to high altitudes do anything to help you?" I sat in on the conference with John, and then when we were done, I drove Ross back downtown. He didn't have a car. I said, "I can run you downtown." On the way, he said, "We've generally found that when the scientist who is interested was right there making the observations, the work could be done better. How about you riding in one of these free balloons and making the observations?" He had spoken as though this were dull routine and there was nothing to it. So I said, "Oh, sure." As simple as that. Later on, I discovered there was nothing routine about it and it had never been done before, but that's beside the point.

Dick: So you did go up?

Mikesell: I did go up.

Dick: How many times?

Mikesell: Once! Once.

[End Tape 4, Side 2. Begin Tape 4, Side 1]

Interview Number 6 with Alfred Mikesell
Date: August 15, 1988
Place: U.S. Naval Observatory, Washington, D.C.
Interviewer: Steve Dick

Dick: Last time we were just beginning to talk about your scintillation work, which, I understand from what you said, was brought about as part of John Hall's photometry program.

Mikesell: Right.

Dick: How long did the scintillation work continue? Over what period?

Mikesell: It went past John Hall's stay on the grounds. He came in '48 and passed probably up until '55. He was spending a little bit of time on it.

Dick: It was when John Hall left in '58?

Mikesell: After that I had a couple of field trips. I had two field trips to the Bahamas and then one out to California.

Dick: With regard to scintillation work.

Mikesell: These are scintillation field trips, right. The one to the Bahamas was to get observations parallel to the project of NRL on the scattering of light that would be seen in a searchlight beam. We were trying to measure scintillation at the same time. But for me it was a tremendous opportunity to get into a different weather pattern, and the first time I could get observations which would show the variation of star twinklings as

one looked around the horizon. California was strictly the atom bombs.

Dick: What was the purpose of those? You mentioned those last time.

Mikesell: The purpose to us? Our interest in it was detection. In other words, is this another detection method? It was also of great interest in defining air compression and rarification factors in explosions. What's the pattern of air explosion? What does star twinkling indicate with regards to that?

Dick: You said "detection" first. What do you mean? Detection of what?

Mikesell: An atom bomb any place on earth. There were some nice things came out of World War II, which implied that you could detect heavy explosions thousands of miles away by optical atmospheric phenomena.

Dick: Where were these observations of yours?

Mikesell: I was going, of course, as far away from the sun as possible, because the explosions were done at daybreak at the Nevada test site. So I, of course, located to the west and as far away to the west as possible, and yet still have reasonably clear view. So I was in the westernmost ranges of the Sierras, and made observations at several points, both of them roughly due west.

Dick: What year was that, do you remember?

Mikesell: That would have been--you asked me the year before, and probably the best thing for me to do is to get home and send you a note on it.

Dick: Was anything published on it?

Mikesell: We did not publish. My data were turned over right away to a chap in ONR, and then a few years ago I got interested in some of the questions related to that, and gave him a phone call, found out he's still around. He hadn't done anything more with it, really, so he packed it all up and sent it to me. I got

it out and started looking at it.

Dick: At whose instigation were those observations made?

Mikesell: ONR. So this was a service deal. They paid all the expenses. I stayed out there almost two months.

Dick: We were also beginning to talk about your balloon flying the last time we talked.

Mikesell: Yes. The reason I am questioning in my mind is because I get mixed up a little bit. The ONR--those Plumb Bob series of explosions probably was about 1954.

Dick: The Plumb Bob being the code name for the atomic bomb.

Mikesell: The series of 20. One of them fizzled, but probably 19 of them came off and polluted the air so badly, it's still been polluted. We're still suffering fallout from that. That's incidental information.

Another incidental anecdote is that one of them, when it failed to go off, was on top of a quarter-mile-high single pole with a number of guy wires, single in order to have a minimum amount of extraneous metal attached to the explosion, a quarter of a mile designed to have the fireball just touch the surface of the earth at that. It didn't go. So one of the graduate students from Berkeley, probably Livermore, really, involved with that had, after they had waited a suitable number of hours like 48, he had to go hand-over-hand up that tower for a quarter of a mile, with the wind getting very strong before he got up, the whole thing, of course, always swaying, never knowing when the little timer would be shaken loose and continued to time down and reduce him along with the pole.

Dick: Why was he climbing up the pole?

Mikesell: Well, you can't leave it there. You've got a ten-kiloton bomb. They'd taken down the elevator. All the work of assembling the bomb had been done by the elevator, and this was a California project. He was one of the graduate students on it, and the moving finger had picked him out. So with his little bucket of tools, he went up there all the time arm over arm. I've had to do something like

that, so I was able to relate to him rather severely. And never knowing when it would be shaken loose.

Dick: How far away were you from the explosion site?

Mikesell: Seventeen minutes, whatever that figures out to.

Dick: Okay. Tell me about your balloon flight. I'd like to hear about how that came about. You mentioned the name of Malcolm Ross. Who was he?

Mikesell: Malcolm Ross was working for ONR in scientific ballooning.

Dick: He was a scientist himself?

Mikesell: No, indeed.

Dick: No?

Mikesell: He was an advertising executive prior to coming aboard in the Navy, USNR. He had, as he said, a burning zeal for balloon flying. So he and a chap named Lewis had made National Geographic with some open gondola flights, daytime flights, of brief duration.

Dick: They had made them themselves?

Mikesell: They made them. He engineered some more flights. He was going to do John Strong in an enclosed capsule after mine. He made a flight with Lewis in enclosed capsule. I would say I wrote up a report on it which I'll gladly send to you if you're interested.

Dick: Yes.

Mikesell: Nobody at the Observatory was interested. The resultant publicity annoyed most people at the Observatory a good deal.

Dick: Why is that?

Mikesell: Well, it detracted, of course, in the minds of some people, from scientific purpose, and there's a certain business

in astronomy that nobody should stand out. You can supply your own explanations.

Dick: Where was the flight from? Where did you take off from?

Mikesell: This was from an iron mine near Brainerd, Minnesota, north of Minneapolis about 120 miles. It ended near Galena, Illinois, which is eight miles beyond Dubuque. That's where we came down.

Dick: What was the duration of the flight?

Mikesell: The duration, I think, was about 14 hours.

Dick: Fourteen hours you were up?

Mikesell: Yes.

Dick: How many people were on the balloon?

Mikesell: Just two, Mal Ross and I.

Dick: This had not been done before?

Mikesell: Not as far as anybody in the United States, and I don't think even Dolfuss had done it in Europe. But ballooning has been around, you know, for several hundred years, and I am sure people have been up at night.

Dick: So what was different about this one?

Mikesell: The thing that was different was to be above the tropopause for so long. Nobody had been above the tropopause.

Dick: What height were you then?

Mikesell: We were at 40,000.

Dick: Forty-thousand feet in a balloon?

Mikesell: Yes, on a free balloon. Tropopause that night was about 35[000]. We were aware that if, through miscontrol, we had gone to 42,000, we would have probably gone asleep and frozen to

death. At 40,000 feet, because of partial pressures, the body is receiving the same amount of oxygen when it's breathing pure oxygen through a mask, the same amount of oxygen, as if one were without oxygen at 14,500 feet. About the same thing at Mt. Whitney. We went there very fast.

Dick: What time was it when you took off? It was still daylight?

Mikesell: Oh, yes, in the afternoon.

Dick: How long did it take you to get up to 40,000?

Mikesell: Not very long. This was one of the problems. We were too light. We got up there in about 35 minutes. We knew we were being pushed behind and being late, because the contractor, which was General Mills Corporation, had run through another flight, a free balloon unmanned, on the same day, and this diverted their services so that we did not get as much service on time. Ultimately we had all the service we'd need in pictures. We have, of course, dozens and dozens of pictures out of it.

Dick: ONR contracted with General Mills?

Mikesell: Correct.

Dick: To do what?

Mikesell: Scientific ballooning. This was because Ney was at University of Minnesota and had made the upper atmosphere and ballooning a matter of interest for himself and his students. He's an astronomer. I haven't looked up his name in the last few years, but until ten years ago, at least, he was in the directory of the AAS. He counted himself an astronomer and an astrophysicist. He started, then, essentially a course in examining the use of free balloons for scientific purposes, and with the sponsorship of the Air Force and ONR, was the active investigator in dozens and dozens of flights, he and his students.

Dick: What was the scientific purpose of these flights?

Mikesell: Mostly, of course, sounding up the upper atmosphere. When Martin Schwartzschild ran his flights with unmanned

balloons, he was using a telescope pointing at the sun in order to get higher-definition pictures of the solar surface for comparing with his theory on convection of the sun. There were cosmic-ray experiments galore, of course, and at that time in the Minnesota area, with Ed Ney's group providing the expertise to a great extent, the General Mills people with their balloon-flying section, there was Winston Research, which was purely for the purpose of flying balloons for the government, and then there was Don Picard, who was available for any of it, and it all started with Jean Picard, who had gone to Minnesota back much earlier and had gone up in some well-reported National Geographic Society upper-space expeditions. Now, Jean Picard and his brother also did deep-sea things and had bathyspheres that they used.

Dick: And you became involved because of your scintillation work?

Mikesell: Correct. Because this was far and away the best way to find where in the atmosphere the scintillation is inserted into starlight. This is absolute and definitive.

Dick: You're right there on the spot.

Mikesell: We were, indeed, almost certainly above it when we were above the tropopause.

Dick: Above the source of the scintillation.

Mikesell: Yes.

Dick: What scientific equipment did you have with you?

Mikesell: I had one small catadioptic telescope with photometer on it, with signal frequency analyzing equipment that we'd devised here, in which we used other places like in the California experience.

Dick: And how did your observations proceed? How many observations did you make of different kinds of stars?

Mikesell: With that equipment, I made none. We found that the circumstances of the flight were far different from anything projected, and the equipment could not be directed to make

observations from altitude. What had happened, you see, there were so many things different on this flight from Mal Ross' experience or anybody else's.

Dick: What was different?

Mikesell: We used the same gondola, a gondola the size of your desk here, made out of fiberglass, but whereas on the daytime flights that he had done with Lewis, he had just quickly gone up and quickly come down in daytime. They couldn't have stayed up too long or they would have roasted. They found the solar heating extraordinarily oppressive.

We were going to stay up a long time. We were going at least as high as they had ever gone. You see, this 40,000 feet was just about as high as one could go without a partial-pressure suit, breathe pure oxygen, and be reasonably secure at not going to sleep. People had accidentally gone a little higher, gone to sleep, and required several days before the balloon could come down. There was no way you could get the balloon down. You can't shoot holes in it or anything else.

Dick: How did you come down, then?

Mikesell: Well, the valve on the top worked perfectly. Now, not always had they worked, but on our flight it worked perfectly. It looks like a big round aluminum dishpan about this big in diameter, about that deep, with a motor to drive it, a switch down on the gondola, and that valve opens up about this far, giving you a hole several feet in diameter at the top of the balloon to let the gas go off.

Dick: As long as you don't fall asleep.

Mikesell: As long as you don't fall asleep. There was no radio control on that. You're into a subject where I could talk for quite some time.

Dick: It's very interesting.

Mikesell: As a consequence of that flight and with the possible expectation of being in charge of at least one, and maybe several more flights, I talked to a lot of people, both the Picards, Don

and his father John, and Mrs. Picard, and Ney, of course, and watched Winson operate, watched General Mills operate on other flights, had to go through the occasion of the death of Lewis while carrying on an experiment in Minneapolis, an experiment that I had asked for. I was in no way to blame because of his death, but . . .

Dick: What happened?

Mikesell: They were hoisting the gondola off of the floor just a little ways, and using nylon rope. A knot had been improperly tied and ran, and from 90 feet in the air, the block by which they were hoisting it had fallen. The gondola itself was only a foot off the floor. It hit the floor, Lewis put his hand over his head, and the block caught him on the back of the head and killed him instantly.

The last manned flight that Mal Ross took part in was his most amazing. He used a doctor by the name of Prather from the Naval Medical Center. There's quite a long story on that, but they killed Prather in that flight, and that ended Mal Ross' interest and, I think, ONR's interest.

Dick: What year was that?

Mikesell: If my flight was '58, that would have been within two years, within '60. So I had to see both of these very lovely people buried over here at Arlington, with their families standing alongside, and known that I was to some extent involved in each situation one way or another.

Dick: Was there a scientific result, then, from the flight that you went up on? Did you make some measurements?

Mikesell: There were a number of them. I've already told you, I guess, about the one of the clothing, which was extraordinarily amazing and effective. In preparation for this, we did cold-chamber tests, lots of them, some of them right down here in Building 56 next to 52.

Mikesell: Well, the Weather Bureau Research Division occupied all of that building. People there were very helpful in organizing us. So we used their cold-weather boxes. This is running temperatures

down to minus-50 Centigrade. Natik Air Force Station looked after clothing for the Air Force all over the world, ran experiments, and provided us with clothing which was double what they gave people at the South Pole. It's an interesting thing. We knew that the clothing was ineffective on our last pressure-chamber tests, in which we had a big fan blowing to distribute the cold air around. That one was in a chamber, I think, in Minnesota. There was attached to this whole business a DC-4 airplane belonging to the Navy and some Navy fliers and a Navy doctor, an officer in charge, of course. A very interesting crew. So we did a lot of flying in connection with it.

Dick: So there was some result with regard to the clothing, then?

Mikesell: The Natik group, whom I visited, fitted me out in this clothing, including big white foam boots with abilities to inflate and deflate them. While on our last chamber tests we could see the clothing was not adequate at minus-45 Centigrade when there was a big fan blowing a lot of air, we argued that in the real-life situation, there would be no moving air, so far as we were concerned. We did not know about radiation at the time.

The moment we went through the tropopause, everything was fine up to the tropopause. The instant we crossed through the tropopause, which was not a deep layer on that night, a couple of hundred meters, maybe, probably less, probably far more sharp than that, right away, sitting there in this gondola the way I'm facing you now, the tops of my legs felt very cold and I knew we were in trouble, because we were scheduled for hours up there above that. It is true that from then on, all we did was just get colder.

Our clothing, which was sort of khaki-colored, no matter how many layers the Navy could put into it, was ineffective because of radiation to outer space and to near absolute zero, 3 degrees above absolute zero, temperature. Ed Ney had a published report which came into my hands right afterwards, in which he had experimented with a black body up there and discovered the surface of it on the side toward outer space would go down to 120 degrees below zero Centigrade. So that was the temperature of the surface of our clothing, because Navy took our clothing when I spelled out my complaint to them, and found it was 95% efficient black-bodied.

They immediately went over experimenting with evaporative depositing of aluminum onto clothing, and other metals, but they found that the aluminum reduced it to 5% efficient blackbody, so they made up a lot of suits of that clothing, and the first people they tried it on were watch officers on submarine duty, on conning towers outside above the water, conning-tower duty. To the man, these watch officers said, "Finally you have given us clothing which serves our needs." The physicists at Natik said he was astounded. Now, it's published. He was astounded because it never dawned on him that radiative loss would be any factor at all when you're only 20 feet above the water level out in the middle of the ocean, but it was. He had sets of clothing ready. Of course, the people going into space were taking this kind of clothing to defeat solar radiation, because they had to keep cool. But from then on, he also had it available for anybody with nighttime radiation.

Dick: Back to the troposphere. How did you stay up for any length of time, then, if it was that cold?

Mikesell: We froze. We froze. This was one reason why we couldn't really accomplish too much of our work, because Mal Ross began to realize that he, at least, was being threatened. He had not totally instructed me on what to do. The one thing he had as his notion of policy was if we got into trouble--for example, supposing that valve on the top of the balloon didn't open. And I learned afterwards that it doesn't open lots of times--again, for this same radiation effect. In our case it was accidental that it still opened, because General Mills had never thought to check it out in the case of such extremes of temperatures as we were putting on it.

Dick: How long were you actually above the troposphere, then?

Mikesell: We were above the troposphere--I do have notes on this. This is a 30-year recollection, but it's on the order of two to three hours. We got up there before sunset. We got to our destination. We had a beautifully designed balloon. These are rigid balloons, as they call them. They cannot expand, so when you go higher than the balloon is designed for, then the gas spills out.

Dick: Those two hours or so that you were up there, then, what were you doing during those two hours?

Mikesell: Certainly making all the observing I could do. We also had with us a fixed overhead camera which was photographing us all the time, so that you could see that we weren't doing much, because I suffered some what they call abdominal bends.

Dick: What became of those photographs? You mean still photographs?

Mikesell: Yes. I have them. This is 70-millimeter camera, color photographs. Then there was another 70-millimeter camera giving photographs of one point on the horizon.

The funny thing about all of this, the Navy's notion for safety was to put a big cargo parachute between the balloon and the gondola, whether the gondola was enclosed or open, a cargo parachute. That endures to this day on almost all of these flights. After that trip, I learned that these plastic balloons can fail. They can fail at any point. If they fail within 200 feet of the ground, that's too bad. If they fail above 500 or 1,000 feet, the cargo parachute allegedly could save you. Mal Ross had stated as his policy that if anything went wrong, for example, if one of us passed out, which I learned later was a very likely possibility, that he was going to not play around trying to bring us down on the balloon, because the chances that the other person would pass out were too dangerous. So he was going to just trip the switch to cut off the balloon, explosive bolts holding the balloon on the top of the parachute, and allow us to come down on the parachute.

He had never before gone up with a gondola this size, with as much stuff in the gondola. We had a lot of extra oxygen, because we'd be up there for a long time. We also wanted to be secure. Supposing we got trapped up there and had to stay up there for eight hours? We needed oxygen for at least that long. We had to have lots of ballast. The ballast they used was a sintered iron ore, which rolled out as freely as BBs, but it's not nearly as large as that. It comes from the local iron processing plants around Brainerd, Minnesota, so it's easy to get. The bins holding the ballast were located on the outside, again, at the edge of this gondola. Inside of the gondola we had

ourselves on corners, we had a control console in the middle, where each of us could reach it. I think it was between us, actually, so we had to turn over in order to reach it. We had my telescope, we had radio equipment, of course, we had some other experiments that we took with us. We weighed 2,350 pounds all loaded, and Mal Ross was a lighter man than I, and I didn't weigh more than 160 pounds. We had 20 pounds of clothing each, not including the 20 pounds of boots each, and so on. We were loaded. The fact that it was on the outer periphery meant that we had a nice torsion pendulum. Think of this balance wheel in here. The parachute assembly from the top of the gondola to the bottom of the balloon would be about 100 feet, and consisted of a large canopy and long shrouds.

The balloons were of curious design that Ed Ney had come up with. They were essentially cylinders. They kind of called them cylindrical balloons. When they were at altitude from the ground through a telescope, I have established they look pretty much like a sphere when they're filled out. When they start off, it's essentially roughly this funny cylinder with the vinyl material all gathered in at the bottom, and all of the load is transmitted through this one breakaway point at the top of the parachute to the bottom of the balloon, to gores running up the sides of the balloon and then into ribs to take all the way around. So the load is distributed.

There are a couple of tubes that start up at the top of the balloon and come around the side down to the bottom. When the balloon overpressures, those tubes get full of gas as the gas is being forced out by its having gone up higher than the expansion of gas will permit. So it then overpressures. Now, if the balloon diameter is correctly matched to the load, it will stop off up at that elevation, and with just then a little bouncing, miniscule bouncing back and forth, it will release gas on the overpressuring and then come down a little bit and work about nicely.

Mal Ross had never before had the experience of flying one of these balloons at night, and he didn't realize how steady the temperature was. They had to take account of the fact there would be no thermal expansion of the gas, which had always been a problem for him in daylight. At night this was no problem whatsoever, and it was fantastically steady. As we went past

36,000 feet, he valved off some gas simply by guess, as nearly as I could tell, like he held it open for 30 seconds to cut off lift, and the balloon flight just tapered right off as beautifully as you can imagine to altitude and hung on just as if it was frozen there, even though the weather pattern showed no inversion for us to bump against. So we stayed at altitude very nicely.

But because of the weird shape of the bag and because we went up four times as fast as we should have, because it was too late in the day, we were supposed to get up there before sunset in any case, and General Mills, by dividing their crew, their crew didn't come on site until an hour or two late, so Mal Ross weighed us in lighter than he would have ordinarily, 400 pounds light--2,750 pounds. Now, partly that was because coming out of this rocky walled, steep iron mine, open pit out 400 feet deep, coming up out of that, he was worried of afternoon winds, that they would still be lingering on at that time of day. A 5:00 o'clock takeoff would be actually 4:00 o'clock God's time, so there could still be some surface winds, and he was afraid very much of being banged against the sides or in the shrubbery. So he called for a fast getaway, and he did, indeed, valve pretty soon, the first valving at about 5,000 feet above ground. It made no observable effect on the flight of the balloon. I think the gas may have still been thermally expanding at that stage, so we kept going just as fast.

But anyway, we took off at something on the order of 25 or 30 miles per hour vertically. This had a number of side effects, but the most serious of all was that this odd-shaped balloon twisted like that as it went. It spiraled up, so that by the time we were clear of the ground--and we did get out of there fast--by the time we were clear, it had wound up many turns on those long shrouds. If at any time during the night he had attempted to come down on parachute, we would have free fallen. It would have been deadly.

We each had personal parachutes. I found my personal parachute was very limiting to me in what I was trying to do. It made it difficult to work. I almost took the parachute off, and at the last moment I thought better of it, because I knew I couldn't ever put it back on again. It was a case of becoming so desperate to become really agile in working equipment that I

would take it off and get rid of the binding of the back and the bottom, sitting on it, and the straps and all. I did unstrap it; there was no question of that. I wondered, if I took it off, if I could hang onto it by looping an arm around. I had never done a parachute jump. Of course, I'd been instructed on parachutes all the time. I did not pack my parachute, nor did Mal. But I was thoroughly instructed on it. While I could have, of course, just dropped overboard, or supposing we were free falling, you have a long period of time when you're 40,000 feet to think about your things.

The fact that we would have been bound up in parachute shrouds and had to try to get our way out of this tangle of shrouds if we'd been free falling, was something that neither of us anticipated until in retrospect. And I'm not sure that Mal Ross ever realized what all his fast takeoff and the twisting of those shrouds meant, all of the implications. But anyway, I couldn't bring myself to cast the parachute aside.

Dick: Let me turn this over. We're almost at the end here.

[Begin Tape 6, Side 2]

Mikesell: Some of the things I'm reporting here are things that I didn't put down into any of my more or less official reports, where anything got typed up.

Dick: Were those official reports submitted somewhere, to ONR?

Mikesell: They were down at ONR. ONR typed them, sent me back the copy. The Observatory here was so unhappy about the whole deal that I didn't push the matter any farther because of the strict rules of the Observatory that nothing typed could go out here without having been seen by an editorial board and the deputy superintendent and the superintendent. To me it wasn't worth the hassle. So I didn't officially publish. I sent off a very lovely copy of it to one of the amateur astronomer society groups, this one at Huntsville, Alabama, where a school friend of mine was at the time and asked for it. So I sent him a report with pictures, and said he could publish it. I don't think he ever got around to publishing it in their newsletter, nor did I ever get that copy or those pictures back. PASP said they would be delighted to have a report, but that would have had to have

gone through the whole editorial board system. At the time I didn't have the equanimity.

Dick: Maybe you should write it now. You won't have to go through the editorial board.

Mikesell: This is a thought, and I have the material. I have a file cabinet with this much of that material. It's a thought. But anyway, we were the bottom part of the torsion pendulum, and we were spinning around both ways. The balloon itself at altitude, fully distended, with these overfilled pipes on the side, didn't rotate anything like as fast. In fact, if you give the 75-foot diameter of the balloon, it was a relatively stable thing, so the rotation was us in this basket with its weights way out a long radius, comparatively speaking, heavy weights on long radius from the center of rotation. That was what was doing the rotating back and forth one way and the other. I make it look fast; it wasn't that fast--one turn in a minute or two. That was far faster than we had geared our star tracking system on.

Dick: Did you do observations, then, for scintillation?

Mikesell: That was to be done with the telescope. That was what the telescope was for.

Dick: But that didn't work you, you say.

Mikesell: I couldn't take objective observations with the photoelectric photometer and analysis equipment in the telescope. I could take, of course, visual observations, and I did those of all sorts. The fact that we had up there at 40,000 feet at one stage of the flight some very odd--although it was an absolutely clear sky, we suddenly found ourselves surrounded by a cloud of what we call air crystals, which, in the light of the setting sun, gave a color to the sky all around us. This was interesting. We were the only ones in North America to see the Northern Lights that night.

My observations on star twinkling had to come, then, directly from eye observations, and this was spectacular. There was no star twinkling until you were looking down almost below the true horizon, the apparent horizon several degrees below us and at the true horizon or just below is where stars would

twinkle from that upper altitude. We were moving fast, but we were moving with the wind. So there wasn't too much shear that we were having to look through as I'd look out at stars in every direction. The shear between the center of effort, the center of gravity of the balloon, and our basket was larger than I expected; it was over a meter a second. I checked that out because we had little gas explosion devices which would release a cloud of gas when they exploded, and we tripped those. If there had been no lateral motion, they should have drifted along with us. They didn't. In other words, the balloon was going faster than we were down below, and they went scooting on away very fast, surprisingly fast. A meter a second is fast.

Dick: So after a couple of hours above the tropopause, you came down lower then. Describe that.

Mikesell: It looked like on the basis of my unwillingness to cast off the parachute and the fact that the gondola kept on rotating, and by that time, Mal Ross' oxygen mask was freezing up and he was, I think, definitely beginning to worry. He didn't show any signs of panic. We had insisted on having heaters put on our oxygen masks before.

I forgot to mention that the masks that were assigned to us were World War II oxygen masks. At 30,000 feet, they put on an overpressure against you. Up to that level, you're breathing the gas out of the tank running through an expansion bag, I think, and you are breathing very normally. As you go past 30,000 feet, suddenly it puts the gas on your face with the pressure of--what?--three inches of water, seven inches of water, I guess, pressure. That doesn't seem like much and maybe it was more than that. The effect was enormous. You try to talk to somebody over the microphone or to your neighbor, and you talk like, "Mal.....you.....see.....that.....over.....there?" Tremendous effort. We learned later that for one of us--and the people never told which one--the heart went into a very odd fibrillation.

Dick: So they were monitoring you all this time?

Mikesell: They were monitoring us. They intended to monitor oxygen intake, but I got frightened about adding more material to a line handling pure oxygen, especially because it turned out we were spending too long at sea level with pure oxygen. I just

didn't know enough about oxygen versus materials versus a spark of fire, and I decided that that was one experiment we'd leave out. But they did have us clobbered with a standard EKG pattern of heartbeat receptors, and they had each of us on EKG at Naval Medical Center, across the street from NIH. So that my wife went out there to the Medical Center and was sitting there watching both our hearts beating on these EKG receivers.

Dick: In Washington?

Mikesell: In Bethesda. Yes, from 40,000 feet up over. St. Paul, Minnesota. Yes, yes. This got a little exciting in the latter parts of our stay at that altitude, because someplace along the line, a telephone company operator listened in on the line and didn't interpret these thumps or clicks that were coming over the line, so she thought she had a dead line and pulled the connections on it. So suddenly they had a flat record at Naval Medical Center. Mary said it gave her quite a start. But the folks there said, "Oh, that just means the connection got pulled someplace. Don't worry about it."

They had gotten enough so that they had found that one of us developed ventricular fibrillation at the time that the overpressure cut in. This interested the medical people very much. During the war and right up to the time of our balloon flight, on rare occasions they utilized these same oxygen masks. They were sending people up to these high altitudes. They'd had the experience that now and then the pilot would suddenly just aim the plane down at the surface of the earth and fly right into the ground from these high altitudes. They had never had any means of telemetering to know what in the world had gone wrong, because they could never communicate with the pilot; he had disappeared on them. All they knew is that wearing this mask at those altitudes, he had suddenly flown into the ground. This was the first time they had seen what happened.

I had no trouble guessing whose heart it was. My breathing rate was profoundly different from Mal Ross'. He was a tobacco smoker, heavy cigarette smoker, and he breathed very shallow, very fast. I breathed very deeply and very slow. There was no question whose heart had been affected.

Dick: So whose was it?

Mikesell: Well, it would have been mine. In any case, Ross suddenly felt that we'd jolly well better get out of there. We had been up there longer than anybody in history, as far as he knew, had ever been. This kind of experience had been unavailable to early balloonists. All he had were the examples of the guys who had gone up in daylight and had gotten frozen to death. He wanted to get out of there, so we came on down.

We had experiments set up at lower altitudes, and I was prepared to carry them out, but they all involved using our optical equipment--binoculars and telescope, especially. Lo and behold, when we hit the tropopause, there was a quarter of an inch of frost on every single optical surface that was exposed. The eyepiece I was using for convenience, of course, was right next to me, well, suddenly there was nothing but frost there. The objective of the telescope was frosted up. This was just the instant we hit the tropopause on our way down. So there was no point in attempting to level off. I think both of us felt that we were pushing ourselves physiologically. We were up against all kinds of experiences that had not been in the books and had not been in any of our pressure-chamber tests.

I enjoyed the fact that I didn't suffer muscular bends. On my last pressure-chamber test, just to overdo it, we had run the test up to 42,000 feet, and I developed bends in this arm. It took eight weeks before it stopped feeling like I'd broken that arm. I could use it, of course, but it was a standard broken-arm sensation when the thing hit me, and it lasted that long. Now, bends from high altitude is nothing like bends from below the surface of the water; that's a whole different kettle of fish and far more life threatening.

Dick: Where was the 14 hours spent, then? You said you went up very quickly, you spent two hours above the troposphere.

Mikesell: Probably a little more than that, maybe three.

Dick: And then?

Mikesell: The rest of the night, we parked ourselves. We found that at 14,000 feet was a lovely inversion. We just let the balloon come up against it very gently, and it stayed there. We spent

the rest of the night at 14,000 feet.

Dick: You didn't want to land in the dark.

Mikesell: Impossible. Absolutely impossible. Not if you can avoid it.

Dick: What was the publicity that this flight received? Was there a lot of press?

Mikesell: This was right after, of course, the Sputnik had been the previous October, and then there had been another Sputnik. Then the Navy had tried to send off its first several flights, both of which had failed miserably. I don't think our first manned--that kind of a flight, had been sent off yet.

Dick: That was '61.

Mikesell: Was that the first time? I thought we sent him off earlier. But anyway, on that very short flight.

Dick: The suborbital flight, I think was May of '61.

Mikesell: I see.

Dick: So what month was this flight?

Mikesell: May 9 of '58. The U.S. papers were looking for any kind of a success, and they caught this as something spectacular and ran it every place.

Dick: What was the reaction at the Naval Observatory?

Mikesell: Well, at least the official reaction was one that we shouldn't have had anything to do with it, but that this was all a mistake. My colleagues, of course, got a kick out of it.

Dick: This had been done with John Hall's permission, I take it.

Mikesell: Tacit permission, yes. He was not a person that ruled strongly on these things, and he knew he had gotten me into this, in one manner of speaking, himself. He did come in on one thing. He observed the weird show that went on out at Naval

Medical Center that night, and although we were scheduled to have another attempt at this, and Art Hoag was going to be the scientist in flight on the second trial, Art Hoag had been at Minnesota as backup. He was really quite anxious, I think, to make the flight. He went through pressure-chamber tests, had some clothes fitted out for him, and right up to the last minute he said, "Are you sure you want to go through with this?"

Dick: But you never went on a second flight. What happened?

Mikesell: John Hall said, "That was so much monkeyshine, I don't want to see you (speaking to Art Hoag) get involved in that. It's too dangerous."

Dick: And he didn't want you to, either, I guess.

Mikesell: No, I don't think he wanted any of us to. It looked like we might have gotten somebody to go as an observer, but definitely Art was director of the Flagstaff station at the time, of course, and we could have gotten somebody. Art came up with some very nice observing equipment to use on a second flight, and I redesigned the gondola and the load and the whole use of the parachute and things, worked out plans so that another flight would have almost certainly have been more successful.

Dick: Did other flights go, or just no flights from the Naval Observatory?

Mikesell: Not on our project. They wanted data from our flight for these unmanned telescope flights for Martin Schwartschield, and Dolphuss, of course, was struggling to make things work in his area. The data were needed on all sorts of counts.

Dick: So from the time that Ross first suggested it until the end, how long were you involved in ballooning?

Mikesell: I suppose two years. With Prather's death, it was essentially over. I went to some meetings having to do with the setting up of NCAR and the setting up of the Palestine balloon facility.

Dick: What is NCAR?

Mikesell: National Center for Atmospheric Research. And the Palestine, Texas, balloon facility. I went to the formation meetings on those.

Dick: As part of the Naval Observatory program?

Mikesell: Well, not as part of their program, but because of association with ONR, which was very much involved with NCAR. I was essentially resource material for some of that. I'd also, by that time, done a fair amount of observing of what went on in connection with these things. I had a very good friend. I met some of the chaps out at China Lake, at NOTS China Lake, at the time I was off serving the atom bombs there, and, in fact, they ran some experimental explosions for us and we took some data. I left them equipment so they could get more data. China Lake is south of the explosion facility, so that they couldn't really work on stars. They could do other things.

One of those chaps signed up for scientific ballooning, also--Ned Ashworth, or something like that. He was essentially a meteorologist by background, and his flights were being sponsored by the Air Force, although he was working for the Navy at NOTS. They all sort of got off the ground. They were to be manned flights, basically, but by that time the feeling was such that these things should be checked out ahead of time. He ran into the situation of where the enclosed gondola, because they were going to higher altitudes, again on the cargo parachute, and, of course, the parachute did not open. In fact, it didn't open on any of their flights and all of them failed before reaching target altitudes. In other words, the later stages of scientific ballooning were less successful than the earlier stages. His gondola came down in the Sierras because of where they had put the thing aloft, and lit on top of a pine tree up in the Sierras. When they took the manhole cover off, I asked him, "What is it like inside?" The thing was packed, he said, as solid as you can pack it with toothpicks. [Laughter] Increasingly he got discouraged over that. I didn't, unfortunately, record the long conversation with him in my office on his experiences on many of this.

They hadn't explained to John Strong any more than they had to me about that crucial 300 feet as you take off. Some of the later flights had provision with backup balloons to protect them

in case one envelope split. They were sending him up in a manned flight, and the balloon split, but fortunately they hadn't left the ground when it split. It was fully inflated and they were just getting ready to take off, and it split. But the old fabric balloons filled with hydrogen gas, they had, of course, no parachutes, and if the balloon split, they essentially parachuted to ground with the fabric of the balloon itself serving as the canopy at great speed. But with these modern vinyl balloons, unless they had double envelope schemes, they're at the mercy.

I picked up an amazing number of details out of that whole experience. We came down the next morning very successfully. As Mal Ross said, the most beautiful flight he had ever been party to, and the last good one. Every one after that was jaundiced somehow or another.

Dick: That's all a very interesting episode. Should we go on? We're up to 1958 now.

Mikesell: After the time Strand came in here, there was less monkeying around with this.

Dick: This is one thing I want to ask you. In '58, Hall left.

Mikesell: Correct.

Dick: What was the reason that Hall left? I know he went to Lowell.

Mikesell: Better job. By that time, he'd had his fill of the Navy.

Dick: His place was taken by Kaj Strand.

Mikesell: Correct. Yes, Strand came in. Stewart Sharpless served as second in command for the division.

Dick: So Strand was the Director of the Equatorial Division--called Astronomy and Astrophysics by then, I guess. How did things change, then, when Strand came?

Mikesell: He brought his programs and, of course, he brought his man, Otto Franz. His really number-one program was the photographic observation of binary stars. He wanted to see that

going. He brought a camera with him from Dearborn, an ongoing program, semi-observed observing list, and he wanted that put onto our telescope right away.

Dick: On the 26-inch.

Mikesell: Yes. I rapidly got involved with the matter of modernizing the 26-inch, because we were under several dicta. We didn't want to lose any observing time at all. We didn't want to have to go to the Navy for any large lump of money and announce a big outside contract and lose control of our equipment and our instrument. We did, at the time, have a very nicely staffed instrument-making shop. Steinacker was the head of it. There was a fellow named Bell, who was a good instrument maker. Charlie Bruhn was still there, a good instrument maker, but he was working on other things. Bell was the key man in manufacturing the seven-inch telescope for Watts. Steinacker was the key man, with Bell, for engraving the circle. They may have done it more than once.

Dick: The circle for the seven-inch.

Mikesell: Correct. They also engraved circles for lots of other people at that time.

Dick: I understand when Steinacker left, that capability left the Observatory.

Mikesell: Bell was gone by that time. Bruhn was retired on disability. Turned out he had the same illness I had--coronary artery disease. At that time, a cousin of mine was just developing the operation, now called a CABG, coronary artery bypass graph. It wasn't ready for Bruhn, so he retired to his chalet near Uniontown, Pennsylvania. I visited him once there, and he died soon thereafter. He was an amazing person, Swiss born, Swiss trained. And a skier. Ran Bruhn Ski Shop, and the Kennedys all patronized it, including the President and Mrs. Kennedy and Caroline. Bruhn's Ski Shop down near Capitol Hill would make the newspapers from time to time, and Charlie Bruhn himself would always take a month off in the middle of the winter. And of all things, showed up once with a broken leg, which made us all give him the big "ha ha."

Dick: Back to the 26-inch. I take it the idea was to modernize the instrument. What exactly was it that you did to the 26-inch? Is that documented? It must be documented.

Mikesell: It was published. We have one of the publications with a "before and after" picture. I noticed the postcards of a picture I took in an intermediate stage. We'd stripped off a lot of the junk, but we hadn't put on the new tailpiece yet.

Dick: You mean the postcard that we have here recently?

Mikesell: Yes, the postcard that you had piles of at the Naval Observatory's display at Baltimore. I picked up a handful because I figured each of my kids should have one of those postcards. Yes, that's one I took. I borrowed the lens from a newspaper photographer that happened to be passing through. I had a Leica, so I used his Leica lens, and crawled up in the slit on the wall and took that picture with a 21-millimeter Leica lens. Then later on--and I think the pictures in the publication show it with the new tailpiece, which I assume is still on.

Dick: How long did that program take, that modernization?

Mikesell: Oh, off and on. Of course, we soon got into lots of other things. We got into the program of bringing Samm aboard.

Dick: The measuring machine.

Mikesell: Then Strand was involved in the 61-inch. So very much I was into instrumentation, and essentially in it from then on, and procurement. There was lots and lots of procurement.

Dick: For the 26-inch or the 61-inch?

Mikesell: Well, for the whole division, which included, at that time, the whole Flagstaff station. So I would be involved in writing up the contracts, write the contracts and letter of justification for the mirror blank for the 61-inch, blanks, a lot of things. By the time Victor Blanco came, we were still trying to carry on Strand's program of photographic binary star observing. Strand had brought Charles Worley on with his visual work. We made a new micrometer for him. We digitized everything we could.

Dick: So things changed very much, you would say, then. The direction of the division changed quite a bit when Strand came on?

Mikesell: We got more prosperous.

Dick: Why was that?

Mikesell: It was one of these times, like the present, when the Navy had lots of money.

Dick: Probably because of Sputnik, to some extent.

Mikesell: Oh, yes. This is all Sputnik fallout. I would have in my file cabinet a file of a want list, and I would have those purchase orders complete, justification for sole-source procurement, and the whole works, because I knew that come 5:00 the day before the end of the fiscal year, one of my buddies up in the main building would get me on the phone and say, "Hey, Mike, Main Navy's just called up and said the Observatory can have $3 million if we can spend it by 5:00 tomorrow afternoon." And I would say, "Okay. Kaj's here in his office. I'll get his signature and I'll be over in ten minutes." Of course, in anticipation of that, I'd be canvassing guys--the director of the division and anybody else who would give me time to talk. We'd get kind of a feeling of pecking order. Now, Kaj's 120-inch reflector wasn't quite in any of that.

Dick: What's the story behind that?

Mikesell: Which part? Kaj came here wanting it. Kaj felt, of course, that to do real good astrometric work, you needed the folded prime-focus telescope. The 61-inch, which he had already worked out in his mind before he came to the Naval Observatory, fell into that. He knew that he was in such bad grace with the people at Northwestern, that he couldn't do anything farther there. He rubbed everybody the wrong way, and all he could do was to leave. So when he was offered the job here, he snatched it.

Dick: But did he want both the 61-inch and 120-inch?

Mikesell: Of course. The 61-inch is a dedicated parallax telescope, astrometric. The 120-inch was going to be your light bucket for all the ancillary observations. See, along with the 61-inch, we picked up a very nice spectrograph, and then with the help of Art Hoag reworking photometers all the time. So we wanted a good telescope for use of those. It would have been, I think, an R.C. Cassegrain configuration.

Dick: Where was it supposed to be located?

Mikesell: On one of the hills there, on a hill.

Dick: In Arizona?

Mikesell: Yes, in Arizona, right part of that complex. Possibly the 40-inch would have been moved to a lesser site.

Dick: How far did the plan proceed then? What happened?

Mikesell: They got it pretty well along. Certainly they had drawings on it, specs, all sorts of things.
Perkin Elmer, Bowler and Chivens, and Davidson, that group of three. Bowler and Chivens, I think, essentially rode herd on the 61-inch, and were the primary contractor. L & F Machinery and Davidson, then Davidson Optics.

Dick: So the same people were going to be used for the 120-inch.

Mikesell: Oh, almost certainly. I'm sure that Bowler and Chivens had given him all the drawings and all the specs and everything else he needed.

Dick: Was this after the 61-inch was completed?

Mikesell: Oh, yes, working very well. Furthermore, it was after Strand had paused briefly in his carrying around and had gone through the motions of reworking Von Maanen's parallax observations made with the 60-inch at Mt. Wilson, and was astounded to discover that those observations were sound. They'd been dismissed by the fraternity, especially the long focus refractor people of the eastern establishment as being worthless because, first, there was the given knowledge that no Casssegrain could possibly do parallax work.

Dick: But didn't he know that before he built the 61-inch?

Mikesell: That's why he made the 61-inch into a folded prime-focus camera. Not only a prime-focus camera, but with special gadgetry for alignment of the thing. The whole story on that, which he's published, is very delightful. The alignment turned out to be unnecessary absolutely, and has never been used, the alignment apparatus, but the provision was cranked into the original plan.

Dick: So what became of the 120-inch then?

Mikesell: The 120-inch was then lined up to be funded. Now, this was a time that the Navy was building the 600-foot Sugar Grove radio telescope over in West Virginia and had already ordered up the pintel and had seen the overruns on that project go from something like $16 million up to $60 million, with no solution of the fundamental problems behind the creation of that thing. For all I know, the pintel is still standing there, by the way. A very good friend of mine was party to the selection of that site. It was very easy. There were only six families living in the whole county in West Virginia. They wanted a radio noise-free site. My friend guaranteed it to them.

Dick: So the 120-inch was bound up, then, with the Sugar Grove in what way?

Mikesell: Money and success.

Dick: Did the fiasco of the radio telescope brought down 120-inch also?

Mikesell: There was a general tightening up of the whole scheme. We were running into more raucous areas of the Vietnam War. We were beginning to lost not only scads of money there, but scads of people.

Dick: We're talking what now? Toward the mid-'60s? Late '60s?

Mikesell: This was '60s. This would be sometime after '65. I don't know which presidential administration. Have you interviewed Strand?

Dick: I interviewed him before I went to New Zealand, but not completely.

Mikesell: Well, work on him on the story of his--start him off with the 61-inch, of which he's extraordinarily proud. Then take him up to the matter of his big photometric spectrographic telescope for Flagstaff, and get his opinion.

I have anecdotes to tell on that. One of them, Nelson was chief administrative assistant here and, of course, always went along with anybody going down to budget hearings in Main Navy. This was the budget hearing in front of the admirals. He lived out in my part of the country, so we not infrequently rode back and forth together. At one point, he said, "By the way, there's something that I've been wanting to ask you about. At our meeting with the budget committee here a couple of days ago, Strand was trying to explain why he needed this telescope and what he wanted it for and what he was going to do with it. I don't think anybody understood what he was saying, but there came a point at which he paused for breath, and one of the admirals said, 'Now, Dr. Strand, what is the largest telescope in the world?' Strand said, 'Well, the 200-inch out at Mt. Palomar' (which I think was the case at that time). The admiral said, 'Well, how big is this telescope that you are asking for?' '120-inch.' 'Why isn't it bigger?'" Says Nelson, "Strand gave some kind of an answer and I could see that the admiral didn't understand him and neither do I. Why didn't he want it any bigger?" You've already got on record my story about the clocks. This is, of course, in keeping with it.

Dick: Which clocks?

Mikesell: The Time Service transmitting clocks. "Why be piddling?"

Dick: Right. Yes, that's right.

Mikesell: "Well, why be piddling?" That, in fact, of course, was why the Navy went on to build a 600-foot radio telescope. There was no scientific reason for it, because they already understood radio interferometry. Between Haystack and a few other telescopes, we were well cared for. That's beside the point.

Strand thinks it was cut out of budget at the congressional level in a money-saving feature, and I know why it was cut out of budget. Money saving had nothing to do with it. And I'm not going to tell you the story, because I'm going to write it up and give it to Sky and Telescope after Strand has died.

But I know, and it had to do with the whole policy of running the Observatory. Related to it, it came back to me hard today when I was trying to get your phone number. I finally got through to a live body. I didn't have to live through seven minutes of useless recordings, but I wanted to see what in the world is going on. I'd heard something about it in Baltimore. There had been some amused comment with regards to it, and I wanted to see what it was like. The live body had a deep, silky southern voice.

The Navy, of course, is racist as all get-out. The Naval Observatory, in my experience, has been more racist than Main Navy throughout my experience. We lost our 120-inch telescope on account of that, and on account of the fact that administration, including division heads and Strand, had not thought ever that visitors were really important.

Dick: Visitors to the Observatory.

Mikesell: Yes.

Dick: No matter what level?

Mikesell: No, no. They're very sensitive to level. But ordinary visitors. I picked that up when I came in at the gate here. None of the guards that I used to know was on duty, and they started turning me off, getting rid of me. It's the brush-off. You know, considering that any one of these visitors to the gate down there, no matter what the license plate on the car, which is probably a rented car, any one of those visitors there in the course of their visit to Washington, D.C., is going to call on those congressmen's office. The kind of treatment you give people at that main gate there is always going to be hard on the Observatory. In these flush times, it doesn't matter. The insulation ability of the Navy is extraordinarily good. You can do anything you damn please to the visitors and to congressmen. But it adds up. I've known a lot of congressmen in my stay in

town. My kids would go to school with their kids and things like that. These congressmen are very ordinary people, and so are the visitors, when you come right down to it. The visitors pass along little things. In the case in question, it wasn't one congressmen; it was 15 congressmen. It was a racial matter at heart.

Dick: I hope you'll write that up.

Mikesell: The same thing was out here this time. Now, I tried to mutter that to Strand. "No, that isn't it. That isn't it. It's just budget cuts." But it was. The timing was just much too tight and the people concerned were too important.

Dick: Let me change the tape.

[Begin Tape 2, Side 1]
14 September, 1988 at USNO

Dick: I just asked a question as to where some of our old instruments, such as the old mural circle, were buried on the grounds here.

Mikesell: The road running around the 26-inch and down into the hollow and out the Wisconsin Avenue gate has always essentially been there.

Dick: In fact, that was the original entrance, I think.

Mikesell: That was the original entrance. In 1936, when I came, on the downhill side of that road toward the river, the south side, I guess you'd say, there was a very steep drop-off, proclivity at least 30 feet. Down at the bottom was a little creek running out down there, draining a stream or something, running out from underneath that. At the time that Massachusetts Avenue across Rock Creek Park--and you can find in the history when that occurred--either immediately before the war, during the war, after the war, I don't remember, my guess is it was right after the war. Initially, for example, in 1936, Massachusetts Avenue crossed Rock Creek Park with a landfill all the way from one side to the other, and the road which ran up Rock Creek Park, going on up toward Connecticut Avenue and north, went through a tunnel underneath this fill, a tunnel 150 feet long, probably.

When it was decided to put in a bridge, all of that earth had to be taken someplace. The Naval Observatory accepted it, and it was hauled up here in trucks. I don't know how much earth may have been taken elsewhere, but we got all that we were willing to take.

Dick: So this was from where Massachusetts Avenue crossed Rock Creek. There used to be a tunnel there?

Mikesell: Used to be a landfill, an artificial fill of earth that had been hauled in and dumped there to build up Mass Avenue and make it level. They decided to replace all of that with a bridge. So all of that earth got taken away and much of it was brought onto our grounds and distributed in this hollow, which dropped off fast away from the roadway out to the Wisconsin Avenue gate.

Dick: You said the drop-off was to the south side?

Mikesell: South side, all the way out to our border. For Observatory Circle, defining the border comes, the level would have been way down, so there was room for an awful lot of earth there. Gingras was the groundskeeper at the time, the civilian in charge of maintenance of the whole plant, and he had us go out and buy quickly and easily corrugated pipe, which was put down where he was going to throw this earth, in order to haul the dirt away. They brought the level up to a grade level. Now, immediately next to the road, it came up more slowly and probably the equipment we're talking about is around 20 feet down underneath the present level of that recreational level land immediately south of the roadway.

Dick: Immediately south of the roadway.

Mikesell: Yes. I may be wrong as to where it is. It may be a little farther south.

Dick: Sounds like it's about where the tennis court is now.

Mikesell: Could be. Could be.

Dick: The Vice President's tennis court.

Mikesell: Yes. The sensible way to go would have been to have

filled up level to the road starting at the road, and then extend that on down. If they proceeded sensibly, then this junk I'm talking about is farther away from the road. This is the sort of thing you could pick up with a magnetometer, because the mural circle was iron.

Dick: Could you tell that far down, 20 feet under?

Mikesell: I think you can. And a lot of stuff went in there. They put all sorts of things. The old marble piers for telescopes like the original 26-inch pier and 9.6-inch refractor, marble pier, and all sorts of things went into that location.

Dick: All at the same time or bit by bit?

Mikesell: Distributed, yes.

Dick: But some of it starting at the same time when the landfill was brought up here?

Mikesell: Oh, yes, because there were things already piled down there like some of these marble piers. For example, the old six-inch marble piers that we referred to earlier, they were down there and added to these things.

Dick: Sounds like it might be a real treasure for an archeological dig.

Mikesell: Yes, yes. You could, of course, ditch it first with vertical ditches, but remember it's all alluvial fill and liable to cave in on anybody. No promising what you'd find when. There were lots of those marble piers all around, because each transit house, you see, would have not only the main supporting piers, but the piers for the mark lenses north and south on the meridian, so there's two more piers.

Dick: Why were those piers all changed?

Mikesell: Partly I expect the notion that the dimensions were wrong, and then certainly Watts' instinct to the effect that amorphous material like ordinary concrete would be less likely to have peculiar temperature effects. Then if any of these had by any mischance been put down on top of these layers of cardboard,

he wanted to get rid of them.

Giovane spent more time than I had realized--Frank Giovane, who has been in charge of this group meeting this week--he spent more time than I realized in the nine-inch transit-circle division, then the seven-inch division.

Dick: Where is he located now?

Mikesell: You'll have to look in the AAS directory, but at least this week he's occupying an office in the NSF and issues a card. I can give you his phone number there if you're at all interested.

Dick: When was he here?

Mikesell: Good question. Again, I think your American Nautical Almanac would tell on the fly pages. When did they drop giving all of these people?

Dick: Oh, I'm not sure. I'd have to check.

Mikesell: Okay. One phone number for reaching him would be 357-9793, it looks like I've got here. He's in instrumentation in the Astronomy Division. Another phone number for Frank is 357-5079. That would be his secretary.

Dick: While we're talking about buildings and grounds, can you tell me during the years that you were here, '36 to '70, did the grounds or the buildings change much?

Mikesell: Very little. We've mentioned the fact they weren't able to get the pier out from under the 12-inch. I forget if we mentioned the point that prior to the heart-bleeding decision to take out that pier, there was the use of a seismograph located first on the top of the pier, then on the floor of the top level 12-inch dome shelter, and they found that there was more shaking on the top of the pier than there was on the floor, which is held, of course, by this truncated pyramid of a tower, that that was more stable. After they demonstrated that with seismographs borrowed from the Coast and Geodetic, or the Geological Survey, then there was no opposition to removing the pier.

Dick: But it never was.

Mikesell: Cost, rubble, mess. Perhaps there are always people that say, "Well, in the last analysis, that little hole down in the bottom is the ideal bomb shelter."

Dick: Would you say the major building that went on must have been the Simon Newcomb Laboratory during that time?

Mikesell: Oh, yes. Of course, after '36 there was an enormous amount of building. All of the buildings down south of you are recent. You look at the old maps, the old photographs, and remember there's one for Peters' twin astrographic telescopes, utilizing the old 26-inch mounting. I think he may have put that into a building that had been used for the 9.6-inch telescope. Then there was Peters' photographic lab down there. That was a wonderful Victorian building.

Dick: When did that Victorian building disappear?

Mikesell: At the same time that they built Building 52.

Dick: I see. It was excavated.

Mikesell: That's all during the war, all of those structures.

Dick: They just tore it down?

Mikesell: Sure, sure, tore it down, excavated out, and put in a whole new array there. The building that Mrs. Day used, which had one of the 40-foot eclipse lenses providing a daily solar photograph, that was right across the sidewalk from the Simon Newcomb Laboratory. The Simon Newcomb Laboratory was a latecomer, because originally there was what was called Building 24, a one-story building with the two office rooms. That was a new building occasioned by the construction of the 15-inch and the 40-inch, and that was the service building for those.

Dick: Was that known as the astrographic laboratory?

Mikesell: I suppose so, when it came to that kind of a name for it. That had the darkrooms, two offices, a bedroom, and--

Dick: Were these offices for Equatorial Division people?

Mikesell: Yes, all of these were Equatorial Division, Burton's division and then Hall's division.

Dick: Was the prime vertical building still here when you came?

Mikesell: Yes, that was on the north side of the Clock House and it was still occupied. The instrument was still in it in 1936.

Dick: Was it used at that point?

Mikesell: No.

Dick: What became of that instrument?

Mikesell: Well, it's a question. Either in the scrap barrels down there, or you can talk to Debbie Warner at the Smithsonian and see what she's able to get.

Dick: I'm pretty sure she doesn't have it.

Mikesell: Or we can look underneath the floor, underneath the shop, and see if by any chance. But we wouldn't have had shipping boxes, so my guess is it was just broken up. Some of these lenses you saw me pawing over there underneath the library represent things that were scavenged off of those instruments. Also some of the objective lenses would have been. Some of those objective lenses could be very interesting indicators of state of the art, in terms of the type of glass, trying to figure where the glass came from, who made the lens and what kind of lens design was involved. These could be interesting.

Dick: Yes. I hope we can discuss that when we're over there. The prime vertical building itself, when did that disappear? Do you remember?

Mikesell: No, I don't. It was after the war. You see, over at the PZT, there was another building with a pier inside, which I think is gone now. It had a roll-off roofing. It was there into the '50s. That initially had been the building alongside of the PZT for the Time Service to operate one of these transit

instruments like the south transit or Stackpole or Prin, 3 or 4-inch, or something.

Dick: For determining time?

Mikesell: Time.

Dick: And cross-checking it with a PZT?

Mikesell: Well, the PZT, after it was moved from Gaithersburg, was put right next to it for comparing with there, but not for time, remember. It was brought down to continue Ross' program of variation of latitude. Do you have a copy of Ross' original monograph on the development of the PZT?

Dick: I haven't looked for it.

Mikesell: We had one copy in the library, I had one personal copy, which I had gotten in Berkeley, of all things, the first time I had learned about it before I ever thought about the Naval Observatory or heard about PZT here, and here I had a copy of that.

Dick: I'll have to check that out.

Mikesell: Yes, it's worth checking out. The research in it is sound, and there he develops the method which has become a controlling source for all the world's PZTs.

Dick: Over by the PZT, there was also some kind of a tower, wasn't there?

Mikesell: That was gone by the time I got here. That was the water tower for operating the floor here in the 26-inch dome.

Dick: Do you know any of the history behind that? In the original specifications, apparently the 26-inch building here, the hydraulic-powered rams and all were directly corrected through the conduits to the boiler house.

Mikesell: Well, they might have been, but the water pressure which raised the floor came out of that tower, I was told. Remember when the Observatory was put here, there was no

Massachusetts Avenue. I have seen pictures showing the cows going down the fields where the British Embassy is now, on down into Rock Creek, which was a deep valley, as you know. These photographs taken around the turn of the century show all that. Those are part of that big collection of negatives which disappeared when the captain said, "Throw it all out," and I hadn't paid my dues to the groundskeeper at the time, so they got thrown out instead of into my hands. But there was a tremendous collection of genre pictures showing everything related to locating the Observatory here. As far as I know, they're still extant someplace around the District.

Dick: The pictures?

Mikesell: Yes, yes. The first time I knew they were gone was when I got a phone call from a fellow trying to identify some of the features shown on some of those negatives. These are eight-by-ten glass negatives.

Dick: Any ideas where they would be?

Mikesell: Nope. I wasn't able to find out from him exactly what his connections were, where he was located, what he was going to do with these plates. I had a feeling that he was selling them to some antiquarian service that was going to look forward to the day when they would publish a history book on the District. In other words, he was going to make money off of it. When he found that I thought he had gotten them illegally, he shut up and terminated the phone call.

Dick: We talked about the buildings and grounds, the changes over those years. Let's talk about some of the other trends over the years that you were here.

Mikesell: Incidentally, one of the little houses was down next to the parking lot, just west of the parking lot north of Building 52. There was a little white wooden house there, plus another one about 50 yards north of it, and these two houses were totally non-magnetic for the purpose of checking magnetic compasses. They were still being used for various purposes almost up to the time I retired.

Dick: But not for magnetic study?

Mikesell: No.

Dick: How about the reputation of the Observatory? Would you say that it changed from when you came in 1936 to when you left in 1970?

Mikesell: Oh, very much. No question about that.

Dick: In what way?

Mikesell: The fact that we finally got a civilian scientific director gave the Observatory a status to which institutions all over could relate. However, I would think its change really dated from when Eckert came in as the Director of the Almanac Office before the war.

Dick: About 1940 he came. Because of the innovative work that he did?

Mikesell: And his stature and his recognition amongst astronomers every place. So that was the start to the change right there. I think I've told you already my story indicating that Struve had respect, really, for only Hammond, who already had retired, and Morgan. Struve hadn't heard anything about Watts. Watts continued for some time as a tinker in a very esoteric corner of astronomy.

One could also perceive the change after the war about 1947, when C.D. Shane came calling at the Naval Observatory, because he had taken over as Director of the Lick Observatory and inherited a program to use their 20-inch Ross lens astrograph for the mapping of the sky with 14th magnitude galaxies. And suddenly he discovered that he knew nothing about mapping the sky and that, furthermore, the problems to making a sky map based upon the galaxy positions were insufficiently defined, and he didn't know anything about this field and neither did anybody else who had accepted delivery of this wonderful twin-astrograph at Lick. So he visited here, the first time in quite some time, almost since Newcomb, that a director of another observatory in the country had seen fit to come to the Observatory, hat in hand, to get information that was essential.

Dick: What year was that?

Mikesell: This would have been about '47, '48.

Dick: Whom did he consult?

Mikesell: Anybody. But he came here specifically to talk to the people in the transit-circle divisions. They were the people who understood star catalogs. They were on the star-catalog commissions, the IAU. This would be Pat Scott and C. B. Watts. H. R. Morgan was still around. Then he was willing to talk to anybody over in the Almanac office who were the only people in the country who had experience using computers for the kinds of work that he was being faced with, so he knew that he was going to have to get into that.

Dick: But isn't it true that at this point at the Naval Observatory, we really had no experience in astrographic cataloguing?

Mikesell: We had had it before. Littell certainly had had it, and Hammond. Those were people who had been in with the Astrographic Catalog Commission of the IAU. They had sat on all those deliberations. I think Watts had been in on that. Hammond had definitely been in on that. All of these people understood astrographic cataloguing from their point of view.

Dick: Was any work actually being done here on that?

Mikesell: No.

Dick: That's what the 15-inch was for. It was 1950 until that thing was finally accepted in some form, I think. Isn't that right?

Mikesell: It was interesting. As far as I could tell, Watts wrote the specs on that. There's one paragraph which said that the bidder will supply 15-inch F-6 wide-field astrographic lens which will deliver perfect images over a field of five-by-eight degrees.

Dick: This was the Warner and Swasey--

Mikesell: They accepted the proposal and bid their $15,000 on that.

Dick: But you say that Littell and Watts and Hammond were involved in the IAU commissions on astrophotography, even though we didn't have an astrograph.

Mikesell: I think you would find that out in the astrographic catalog very specifically. That was a specific project with the English.

Dick: Which we were never involved in.

Mikesell: Oh, yes, sure! We had an astrographic--one of the catalogs, one of the series of the Washington catalog.

Dick: But those are transit-circle observations. They're reference stars for the astrographic catalog.

Mikesell: Could well be. We had no photographic observations then. You are correct on that. I'm not sure yet about it, but this is so far back and I never really used it much. You think it was only the reference star zones?

Dick: I'm trying to think what instrument we would have used.

Mikesell: These instruments were loaners. They would be stuck around all around the world. Cordoba, for example, was given one for a while and so on, the same way that Markowitz was putting moon cameras all over the world to anybody that would make observations, then supplying them with photographic materials. We did have, with Peters, a qualified photographer to handle these things, and other people came along. I think the 1923 Mars apparition, somebody rigged up a double-slide plate holder on the 12-inch and took photographs of Mars.

Dick: It's true that Peters, for a long time, was taking minor-planet photographs.

Mikesell: Sure, with his double astrograph that he had built himself.

Dick: That's right.

Mikesell: Yes. I don't know if Peters was ever a member of the IAU.

Dick: I don't know, either. So you would date this change beginning with Eckert. Does that mean that you don't put much impact in the 40-inch, which, of course, was finished about 1934?

Mikesell: You see, it was finished about 1935 or '36. I would say 1936.

Dick: Did that help the Naval Observatory's reputation?

Mikesell: Not at all. Not at all. In fact, you see, you've already heard me observe that Watts was saying, in 1948, that with Burton's retirement they would close down the 40-inch completely and get rid of it. So that was how good its reputation was with Watts, and nobody else in the country thought better of it.

Hall himself, I think you'll find--and he may say this in writing in his story on the 40-inch, which he's now published--that when he came here, he assumed that that was essentially a worthless instrument and what he should do is to early on change the optics over to a classic Cassegrain and save the mounting. So he was expecting, and had been tacitly promised, that he could change the optics. He got here and got to work on it, and immediately changed his mind. This was in '48. Hall was able to speak to the whole astronomical community, and he was the one who told me, "This is a very successful design." He started, then, the whole turn. He got everybody to look at it, and from then on it got used. This was on the basis of Hall.

Dick: Right. So that was not until the late '40s when both Hall and the 40-inch would also be adding to the Observatory's reputation.

Mikesell: 1948. From that time on, the 40-inch had a worthy project in his polarization program, had a worthy defender in Hall.

Dick: And, of course, shortly after that was moved to Flagstaff and then we had the beginnings of the Flagstaff station.

Mikesell: It wasn't shortly after; it was six years.

Dick: Right. In the history of the Observatory, shortly after.

Mikesell: In terms of the effort it took to do it.

Dick: We've talked about photography a bit. How about attempts at spectroscopy here at the Observatory? Do you know anything about that?

Mikesell: When they took delivery on the new Warner and Swasey mounting, they also took delivery on three- and five-prism spectrographs to be attached to the 26-inch to do the Lick Observatory type of spectroscopy.

Dick: This was way back in the 1890s.

Mikesell: 1897. I've told you the tale about their ill-fated experiments. Then all of that equipment was still here in cupboards in this building in the '30s. So far as I could tell, it had never been used between 1898 and the 1930s. Wasn't touched.

Dick: How about after that period, during the time you were in the ANA Division? Were there any attempts?

Mikesell: We did no spectroscopy.

Dick: Was there anyone who wanted to do it and didn't do it because of lack of instrumentation?

Mikesell: Anybody that wanted to could have gotten the instruments. For example, with the 61-inch, we did, indeed, get a spectrograph. It's a good instrument, as far as I know, well worthy, has an excellent replica and excellent grading. They're all replicas nowadays, of course. Spectroscopy was done at eclipse expeditions, and I've told you that I had a couple of Gaertner gradings in my cupboard until they somehow or other disappeared, and I've never known to whom. I've suspected Stuart Sharpless.

Dick: By the way, is he still at Rochester?

Mikesell: Last I know.

Dick: I'm thinking of going up to Rochester to look at the papers of William Harkness, who was here for a long time. That was his alma mater. Those papers are up there.

Mikesell: Get the librarian to refer to the Rochester phone directory. The librarian can access it through her resources for you and see if Stewart Sharpless shows up there.

Dick: If he retired, he may have retired in Rochester. Otherwise, he may have retired somewhere else.

Mikesell: The other thing to do, of course, call the University of Rochester. I'd say pick up the phone. Do you have the directory handy? Marian Hardy was Sharpless' wife while he was here at the Naval Observatory.

Dick: She was an astronomer?

Mikesell: Yes, qualified in astronomy with a master's from the University of Michigan. The last I knew, she was working at the Army Map Service, whatever that's now called, the big facility out by De La Carlia. She would almost certainly have to be retired by now, but not necessarily. Not necessarily. An interesting woman. She might still know what Stuart is doing, because I got the impression that they separated reasonably amicably.

Dick: You've mentioned one of the big changes during this period that you were here was an administrative change. In other words, the scientific director was appointed for the first time. I don't remember if I've asked you if you know anything about the story behind that.

Mikesell: No, I don't. I do know that we were the only facility of our caliber within the Navy that didn't have a scientific director.

Dick: In other words, Naval Research Lab and places like that.

Mikesell: They all had them.

Dick: In addition to a military as administrator.

Mikesell: Always. Two of them, offices side by side, across the hall or something. We were the only ones that didn't, and suddenly we had one.

Dick: During your time here, was there much of an issue about the Navy versus the civilian control? Historically that's always been a big issue at the Observatory. Was it during the time that you were here?

Mikesell: No. One understood the role of the Navy, and people like John Hall coming in had growing pains to get used to what the Navy prerogatives were. They didn't understand that the Navy had the ability to haze a civilian, but not ability to do anything more, because we were very protected by Civil Service.

Dick: What do you mean exactly when you say that, to haze a civilian?

Mikesell: Well, you've heard me mention about Hellweg's dressing down Malcolm Browne after he had mashed his finger. And John Hall somehow or other did something which the captain at the time thought was a transgression, and he had Hall stand up essentially at attention in his office while he told Hall that he was a no good son of a bitch and was absolutely no good in what he did and ought to not be in a place of the caliber of the Naval Observatory and so on.

Dick: Was it shortly after that that he left?

Mikesell: No, but it took him a while. I suppose a number of people had to comfort him and smooth his feathers. This happened fairly early on in this period here, a couple of years after. Then I got it once. I got it twice, in fact, I got dressed down, once for belonging to organizations which though not on the attorney general's list of communist or communist-controlled organizations, were still known to be organizations which comforted communists and communism.

Dick: How did they know about that here?

Mikesell: Well, because at a certain stage we were all required, under oath, to list everything to which we belonged or had any connections. So I was into Consumers' Co-ops, and I was an officer of a credit union that was operated by the local Consumers' Co-op. The service station was operated by them and a grocery store, Washington Bookstore--I forget what it was called, co-op. That's an interesting story on its own right in connection with McCarthyism.

Dick: So that was the first instance. You said there were two.

Mikesell: You see, the point that I was a member of a credit union, at that time only this co-op credit union, but it had the word "union." And there was the time that I went to point out to a captain that he needed to support Navy Federal Credit Union and to get members of the Observatory staff to join it, since it was a privilege that they could command, and a very important one. He said, "A union is absolutely a communist work of the devil."

Dick: But it was the Navy Federal Credit Union.

Mikesell: I said, "Captain, admirals in the Navy are officers in this particular credit union. He said, "I don't care. It shows how deeply perverted the United States is by these communist devils."

Dick: Obviously this was the 1950s.

Mikesell: Yes. Yes, it's an interesting experience to be dressed down. You have to listen to anything he says, all of it essentially untrue, distorted, erroneous, and out of context, and all of it done to personally impinge upon you. But he dare not put it into one's personnel file because it's all outside the workings of Civil Service and would get the Navy into trouble. As I mentioned once before, the one thing Navy doesn't want is publicity.

Dick: How do you think the dual-head concept has worked here at the Observatory?

Mikesell: I couldn't say. Clemence had no trouble with it, and Clemence had a personal approach which made it easy. With Strand it was a mess, because Strand had a narrow understanding of the workings of American society. He never understood North American

society, to my feeling. He was always an immigrant. He never understood the workings of the Navy. He didn't understand, in fact, a lot of workings, and his own personal objectives were much too narrow to make a good administrator. He got in terrible cross purposes with the Navy.

Dick: Yet he seems to have accomplished quite a bit with the 61-inch and all.

Mikesell: That was early years. He was still director of this division at that time. He came in with that project already fully formed while he had been at Northwestern.

Dick: The double-star project.

Mikesell: Suddenly he found that he was in the Navy at the time when the Navy wanted to spend money in enormous dollops, and they couldn't care less how it was spent as long as they spent the money.

Dick: You're talking about the 61-inch now.

Mikesell: Correct. He was just lucky on his timing and he was ready for it.

Dick: How about interaction with outside laboratories either in the United States or outside? Do you see much change when you think back over your 35 years from the 1930s to 1970s? Was there more or less interaction?

Mikesell: When you say "outside laboratories," the Washington, D.C., laboratories, of course, the Bureau of Standards and NRL and--well, you name them. What laboratories have we got to talk about? DTM. Amazingly good, highly personal.

Dick: At what point? All the way through?

Mikesell: Yes. I came here and I discovered that lots of my colleagues, even down at my level of P-1s, so-called junior astronomers, had friends who were very capable in the Bureau of Standards, which was our biggest one, more than NRL. Later on we got more acquainted with NRL, but that was after World War II. I told you about the clock NRL made for us. We could command

things. We had good access after the war, certainly, and probably before, with the laboratories down at the Navy Gun Factory--now called Weapons Facility? Well, now. I don't know what it's called now. It was Weapons Facility for a while. They had big laboratories developed there during the war, and in optics, extraordinarily capable. Also a big production facility in optics.

Dick: What was our association with them?

Mikesell: Anything we wanted. Immediately after the war, the building next to Building 52, the big building toward the east there--

Dick: Building 56.

Mikesell: Building 56. You ought to look at that building. It's amazing construction. This is wartime timber construction, but the timber that the government got was prime timber that was accumulated during the Depression years when the lumbering industry was supported by the government buying up this absolutely beautiful stuff. Those are the most beautiful timbers. If they ever go to wreck the building, see about getting your share of them, because they're not available any longer. Not available in American technology nor in the world--Douglas fir structural members and things like that. Fantastic stuff.

Anyway, the Weather Bureau moved their research branch in there. We had very nice and close relations with them right there on our grounds.

Dick: When were they there, do you remember?

Mikesell: From '48 on. You'll have to look at the history books. They were certainly there when I did my balloon flight in '58, because their facilities got me off the ground. Probably they were there into the '50s. That would be '58 into the '60s, and maybe '62, '64.

Dick: How about funding for the Naval Observatory? I don't know if you know much about that, but were there new or different funding sources developed during the time you were here?

Mikesell: They just monkeyed with it. Hopefully, you have history books available that will tell you this. When I came here, for example, all of the Observatory was funded probably out of the CNO's budget and was operated under the CNO. That continued through the war, certainly, but with lots of confusion because of all of our tenant activities--the Bureau of Ships down in 52 during the war and occupying a lot of offices, BuOrd, BuShips offices in the main building. So everything was confused, but all of our salaries came out of the one thing. Then long after the war, maybe around '48, '52, someplace in that stretch, then suddenly they said, "Okay, the Almanac office is operated out of BuShips"--is it, that used to put out the navigational publications, HO2-140 and all that series. I forget the name.

Dick: Hydrographic Office?

Mikesell: Hydrographic Office. Right. So all of things like--I think including transit circle directly related to the Almanac were to be funded as one comp, possibly out of Hydrographic Office. Then this division was out of another office. Where was Time Service? That was something else. So suddenly our budgets came from separate line items, but we were always well insulated against poverty.

Dick: What about the Office of Naval Research? Would you say that was a new source after the war?

Mikesell: That's the one I should have said. ONR then had mortgaged funds to run the A & A division.

Dick: As you look back over your 35 years here, what would you consider your major contribution or contributions?

Mikesell: I think it was my share in helping realize instrumentation efforts preeminently. Did nothing on that of much consequence in the transit-circle divisions. Worked with Pat Scott for a couple of years there, and it was after I'd gone back into this division under Hall and from then on that--

Dick: Work on the 40-inch and the 26-inch?

Mikesell: And the 15-inch and 61-inch and the moving of the telescope, all sorts of things. Basically support role.

[Begin Tape 6, Side 2]

Dick: Before we go to this picture, just a question or two about the 1960s. Apparently you were most of the time there involved with the 26-inch, right? The modernization of the 26-inch and that sort of thing?

Mikesell: Yes. When did we get delivery on the 61-inch?

Dick: That would have been about early '60s.

Mikesell: I wrote up the request for bids for various features of that--the optical work, the mirror blanks, contracting for the telescope. On some of those things, Strand had his own friends downtown or elsewhere to help guide him. In things like mirror blanks, some of the things were in-house.

Dick: Can you tell me a little more about the work of the division at that time? There seem to have been a lot of people came and went, people like Roemer and Sharpless and Franz and Blanco.

Mikesell: Roemer was never in Washington.

Dick: She was always at Flagstaff?

Mikesell: She came from Berkeley to Flagstaff and she would have come there to join Art Hoag while he was still there.

Dick: Well, when Strand left, I believe Stewart Sharpless became director, but he only stayed for about a year.

Mikesell: Then he got called to Rochester and went there. You mean John Hall. Sharpless came under Hall, and after Hall left and Strand came, Sharpless left pretty early on. Strand had a personality that did not relate to working with people of quality. I was just thinking. We were talking over lunch about the Steward Observatory at the University of Arizona, where Peter Strittmatter is director. They were expressing amazement at the

numbers of things that are going. Here's this guy in charge of four geographically disparate observatories, including this highly touchy and extravagant on Mt. Graham, plus in this other program, all sorts of things. Well, I've been able to observe almost from the inside that Strittmatter has a genius for letting good people get in good spots and do their thing, and he supports them. Strand didn't have that. Strand insisted that everything had to be Strand, and he had to get all the credit. People like Sharpless wouldn't stay. Strand was astounded when even Otto Franz wouldn't stay, because Strand had brought Otto over from Austria, then brought him here from Northwestern. Otto refused to have anything to do with Strand and got out.

Dick: The same problem with Blanco, then?

Mikesell: Exactly. Exactly. Blanco was most outspoken in private. Finally, all of the Navy was the same way. Strand was at cross-purposes with the Navy. 1970, in the middle of the IAU meetings, all of a sudden, Strand's secretary, who was the only person loyal to him here, phoned him up to say that the Navy was about to get rid of not only Strand and Strand's job, but the Naval Observatory. It was going to wipe out the whole thing, because the Navy was so disgusted with what they saw as a representation of Strand.

Dick: And what happened then? What did Strand do?

Mikesell: He flew home. He caught the next plane back to Washington, came in here, and went around and utilized every piece of strength he had and hung on. But from then on, he essentially had no important role. The superintendent didn't defer to him, particularly, and the Navy simply went back to the original articles of faith, which say the superintendent is absolutely, totally, and completely in charge. So it was something to bring in Gart, as a reasonably capable person, and reinstitute the position of scientific director and give it authority and place.

Dick: I'd like to, in closing, ask you about this picture. These people are all identified. I know who they are. Some of them we talked about already. If you could just briefly tell me if you know anything about them, starting with number one. The people are listed there, if you could tell me if you know

anything about them and whether you think it's worth my while to follow up on what they might have done. This is about from the 1930s, so you might not recognize everybody.

Mikesell: This says July '32. Most of these people, of course, were here in '36. Just looking at them to try to refresh my memory on what they had looked like back then. Michaelson was gone. He was in the computing office.

Dick: You mean he was gone when you came?

Mikesell: Yes. He was in that computing office, and I was looking to see the lady who was in charge of that.

Dick: Eleanor Lamson. She's on there, I believe, and it's very shortly before she died. She died suddenly, I think, the next year or so.

Mikesell: Lamson. There we are. Yes. She was gone before I came. It was with her death that they broke up the office.

Dick: I was just going to ask you that.

Mikesell: Gave each of the people, the workers in there, an unassembled examination to become junior astronomers, P-1s.

Dick: Why did they do that? Had the division grown obsolete, or what?

Mikesell: It was essentially her office, and without her it wouldn't work. There was no place for it. There was nobody who would have taken over and run it the same way she had. Michelson, we spoke about. He apparently had been quite a character. He was obviously a young man. Bevan Sharpless, we've spoken about. He inherited money from his Philadelphia family, an interesting wife, who, at last writing, is still alive.

Dick: Oh, really?

Mikesell: Yes, in the Miami area. Renstrom, I know nothing about. Then, of course, we get into C.B. Watts. Fascinating. A much younger man. We've spoken about Watts.
Yes, Elsie Willis was working. You can look back and see if

she doesn't show up in the almanacs. I'd forgotten until this moment that she had, indeed, been on the staff of the Observatory prior to her marriage and after her marriage with John Willis.

Dick: Is this where they met, then?

Mikesell: I assume so. Hamilton, this cute little guy who kept on looking like that for the next few years, and would go sidling down the hall carrying a glass of water in his pocket. He didn't want to be seen carrying a glass of water to his desk.

Dick: He was in Nautical Almanac?

Mikesell: Nautical Almanac. They had all of these people, relatively high-level people, working in that one large room there east of the main foyer and north of the hall to the library, and all these people were due to work in there together, doing this terrible work. Terrible drudgery. And these were bright people. Isabel Lewis was unquestionably intelligent. I don't know about Hamilton.

Dick: Did you know Lewis? You knew Isabel Lewis?

Mikesell: Oh, yes. My, yes.

Dick: She was in Nautical Almanac Office?

Mikesell: Yes.

Dick: She seemed to have written quite a bit in the popular vein.

Mikesell: Yes, she wrote the regular articles for Popular Astronomy. I think she was very capable in an era when women were given a very minor role in astronomy.

Grace O. Savage was the librarian, not well-qualified librarian, but the job of librarian was coming up, and Grace O. Savage wandered up onto the grounds, came in as a visitor into the library, and spoke of being a fellow librarian to the acting librarian, who was a young woman. The acting librarian showed her around, showed her all that they were doing, and told her about her plans for the future, when she would be promoted to

regular librarian. Grace O. Savage was actually given a copy of some of that as an example of the way to organize a scientific institutional library. So she went out and wrote it all up, signed her name to it, submitted it, and got the job. This occasioned the bitterness that continued for quite a few years, through the war, in fact.

Dick: Who was the acting librarian?

Mikesell: I don't remember now, and probably is not on this list.Robertson, you know plenty about. Hedrick is interesting.

Dick: What is he known for? Was he in Nautical Almanac?

Mikesell: No. You'll have to look him up, but I thought he was in the transit-circle division. I'll have to think about it again. Could be that he was one of the last of the professors.

Dick: Professors of mathematics.

Mikesell: Yes. Either that or the last of the commissioned officers. I think he was in that category.H.R. Morgan, you know about. And there's Peters.

Dick: George Peters.

Mikesell: Yes.

Dick: Was he still here when you were here?

Mikesell: No. In fact, he was deceased by four years later. It was exactly four years later that I came. Savage, Robertson. Well, this Hedrick is the lady, and that lady, at the time of the picture, would have been in the Nautical Almanac Office. She's not the man. So that's Miss Hedrick, or Mrs., or something, possibly the daughter of the name I'm trying to think of. Then H.R. Morgan and Hammond, who, I think, was deceased by the time I got here, and Peters.

Dick: But Hammond is one of the people you say was well thought of.

Mikesell: Yes. At least he was known to Struve.
Now, let's see. The next row. F. P. Scott, Nordberg. Scott

and Nordberg were people out of Miss Lamson's group.

Dick: That's where they started.

Mikesell: That's where they started. Scott has told me an amusing human story of how he came to get his job.

Dick: What was that story?

Mikesell: It's almost a shaggy-dog story. He was born and raised on a farm outside of Detroit, Michigan, went to school, had the experience of having to get up at 3:00 a.m. and do the farm chores before he could go to school, coming home and having to do chores, then do homework, then get to bed in time for five or six hours before 3:00 a.m., and he was out again, because there was no way that his father would have allowed him to go to school--high school we're talking about--if he hadn't done those chores.

He graduated from high school, became 18, told his old man to go to hell, took a train into Detroit. As he got off the train, walked out of the station, he'd never been in the city before in his life, and he looked around. One of these Jewish clothing merchants there grabbed him and said, "You've got to have a new suit." Before Scott could say anything, he had put a jacket on him, smoothed it down, and said, "Here. Go into the room there, put on these trousers." Scott came out, he fitted him right then and there without taking anything off, still Scott unable to say anything. Then he said, "Give me your ten dollars, come back tomorrow and get the suit when it's all trimmed up." He said, "It was the best suit I ever had and it fitted me perfectly." Lasted him for years.

He went to work for Ford Motor Company and it turned out that he had a high school education, was reasonably bright, as well as hard working and sincere, so they sent him over to Briggs Body Works to be their inspector. He went on to the Briggs Body Works payroll to be the inspector for Ford, which had a funny mixture of loyalties that could get him into trouble and also gave him a feeling for how cars were put together.

Then came the spring of 1929, and there was the standard close-down of the auto industry for the change of the model year,

only this year everybody knew that this was going to be more serious. At Briggs, Ford bodies were arranged on the roofs of all the buildings and just anyplace they could store some bodies, and no cars were being sold, and they knew that the Depression had started. The rest of the world didn't know for another four months or so.

So he dropped by the post office and saw on a bulletin board there a Civil Service job at the U.S. Naval Observatory. He knew nothing about it, but he had adequate qualifications. He got on the next train to Washington, because he knew there was going to be no more job in Detroit, and went in and got himself this job in Miss Lamson's "slave factory." He immediately started going to college at George Washington University, and by 1936 he had his bachelor's degree. He immediately turned around and went to Catholic U. to get a master's in physics, and basically a specialty in problem related to thermometry. In three years, he had his master's.

He stayed on and worked hard and mastered meridian-circle astronomy and learned a lot of things as he went along. I joined him for several years. We'd have heavy, intense discussions, in which he would work to master whatever subject was of concern at the time, demonstrating the turn of mind that stayed with him all of his life and made him so useful. It's a shame he died so young.

Dick: His wife's not still alive, is she?

Mikesell: I wouldn't know.

Dick: You don't know what became of his papers? We have some of his papers, correspondence and such, but I'm not sure if it's all of it or not.

Mikesell: I'm sure it's not. I'm sure it's not. Part of this business that everything was to be thrown out after three years, so that the only things you would have would be something that summarily got specially saved. But he became very important for the development of things like the FK4, FK5, serious in international affairs. Paul Sollenberger was another one of these self-trained people. I guess I've told you he started in the Studebaker factory.

Dick: I've interviewed him.

Mikesell: Wonderful.

Dick: He's still down in Miami.

Mikesell: And reasonably sharp, I assume.

Dick: Yes, very sharp for 96.

Mikesell: And is able to recall his pre-astronomy years, pre-Observatory years?

Dick: Very well.

Mikesell: Wonderful. I've forgotten how it came about that he joined the Observatory staff.

Dick: He went to the post office and saw it advertised, took an exam, and was hired.

Mikesell: What did he come into? Which part of the Observatory?

Dick: I believe he started in transit circle. I'd have to check that. I've got it all down.

Mikesell: Clemence, I think, came directly to the Time Service and spent his first ten years here in the Time Service. Clemence, when he came, already had a master's at Brown. Let's see. Before I got to Sollenberger, there was Draper. Draper was the Mormon and the chap who was out there proving Euclid's fifth postulate and trying to come up with a better theory than Einstein's for relativity.

Dick: What division was he in?

Mikesell: By the time I knew him, and I suspect at the time of this [photograph], he was in the Almanac office. I was kind of amused when Eckert came aboard. He was thinking of Draper as one of his oddball people he'd inherited, that he should somehow or other get along without worrying much about and pushed to one side, crackpot, and all the rest. He quickly learned that Draper

was very intelligent, very bright, took readily to the use of computers, became the right-hand man in the Almanac office. Draper, Sollenberger, Larravee.

Larravee was in the Almanac office, was getting a degree in mathematics at Catholic U. at the time. Grace O. Savage thought he was wonderful and helped him in any way she could. Charlotte Krampe. An interesting gal. I heard about her name from a relative of hers in Dayton, Ohio, when I was visiting a relative of mine there, on the trip east to Washington.

Dick: When you first came to the Observatory?

Mikesell: Yes. They told me they had this relative of theirs named Charlotte Crampie at the Observatory and why not look her up. I did. A wispy woman.

Dick: I believe she's still here in town somewhere.

Mikesell: Really?

Dick: I think so.

Mikesell: She had to take retirement after she developed a brain tumor. The removal of the brain tumor left her seriously impaired, not intellectually, but mechanically in many ways. She was in charge of satellites, I believe. Lewis was in charge of eclipses, and Crampie was in charge of satellites.

Rush, I never knew.

Clemence, fascinating, with his dark-rimmed glasses, owl-eyed there. It's about the way he looked when I arrived and he took me into his home, because his wife and kids were out of town.

Dick: You stayed with him for a while?

Mikesell: Yes, the first three weeks, at least, in town, because he had a spare bedroom and lived out in Bethesda, easy to get into town and back and forth.

John Willis, a delightful, eager look as he's leaning around

the side of Clemence to look at the camera. Amazing guy, one of these natural, self-trained geniuses.

Fisher was this chap that you've heard me describe as such a character who talked to himself, entertaining and distracting all of the other people in that room full of computers in the Almanac office.

Sharnoff was the Observatory's communist, an avowed, admitted, registered, card-bearing communist at a time when the Communist Party was legal, entered primaries, elections, had candidates on the national ballots, all those things. Sharnoff was willing to argue with anybody. He looks like the intellectual that could become a communist. This is the first picture I can recall. I'm sure I've seen others. Interesting.

Dick: What was his work here--in Equatorial Division?

Mikesell: No, he worked in the six-inch transit-circle division, and I essentially replaced him. He had gone someplace else. At the time I came, the Social Security Administration was just starting up. The legislation had been passed. They were recruiting in quantity, and a number of people went over to them. I think Sharnoff was one of them. Some of the other people on here went over to them.

Dick: By the way, do you know anything about Willis' political views?

Mikesell: I didn't know he had any. Well, he was very egalitarian. He got himself into funny scrapes at a time when you got a haircut anyplace in town for 35 cents, with or without a nickel tip. So he had done some computations on the length of time it took for a barber to cut his hair. He figured out that share and share alike on this whole scheme, Willis was getting paid quite a bit more, so he owed the barber $2.73, which astounded the barber and made people like Clemence and Whittaker laugh like crazy.

Dick: He would actually pay it to the barber?

Mikesell: Oh, yes, yes. Yes, he was very egalitarian. Nothing that you could call a communist, because he had no political excitement. For a person born after the Depression, it's hard to

realize what the Depression did to the thinking in the United States, let alone the mood of living in the United States. One could carry on a long time, and it has nothing to do with the history of the Observatory, except as it reflected on the Observatory. But it demanded of many people intense thinking about how things were gone and what we could do, the sort of thinking you heard me on transportation in the Washington, D.C., area. The capability of being rational, and people aren't, and things ought to be done to do it more rationally for various reasons. Norwood Adams is another of Miss Lamson's.

Dick: Who eventually became assistant director of the transit-circle division.

Mikesell: He became director of it at one stage for a little while, yes. I was speaking to you about this matter of showing no imagination, no originality, and doing what you were told and saying, "Yes, sir," "No, sir." Then you become director. He wasn't able to hang onto it, really, but for a while he was director. He really didn't have the kind of a push which was required in the change here.

Raynsford was a funny guy. I think when I came in '36, Raynsford was in the transit-circle division. That, again, you'd find in the Almanacs. Then he had been recruited separately. He didn't come through Lamson, I think. He was essentially an engineer. During the war, for example, he could write up engineering textbooks which the Navy then distributed to the teams that they sent all over the Pacific, coming up with geographic positions of the isles that the Navy wanted to affix this tour from. Soft-spoken, funny guy, I think a bachelor.

Sylvan Bestul was certainly one of Miss Lamson's and went into Time Service.

Liferock, I never knew. Let's see number 30. Where is that? He was gone by '36, probably went over to Social Security, because everybody instantly got a grade raise, which amounted to $600 a year then, by joining Social Security. It's like when NASA got set up here, anybody that left the Observatory to go into NASA instantly got the equivalent of one, maybe two, full grade raises, just automatically.

Dick: Did many people do that?

Mikesell: Yes, yes, a lot did. Lots. Anybody loosely attached here for one reason or another went over there. A lot of them did. I could name any number of names.

Joyers, I don't know anything about. He was not, apparently, a name important enough to be mentioned particularly amongst my confreres, which was Whittaker, Markowitz, Clemence, Adams, Bestul, these five guys. Ilse I loved. He was a guy that I could relate to.

Dick: Instrument person.

Mikesell: He was the instrument maker.

Dick: Was he the predecessor of Steinacker, then?

Mikesell: Yes. He had an assistant, one assistant, whose name I don't see on here. Joyers, for example, might have been an assistant. If Joyers' name doesn't show up in the Almanac, then my guess is that, for example, he could have been Ilsie's assistant. Ilse was born and raised in America, but wanted to become an instrument maker, so he went to Germany and became an apprentice in one of the instrument-making factories there. If I look down the list of the factories of the early part of this century, I might recognize the name. I don't think it was Zeiss. He went through an apprenticeship, then came back to North America, worked with people like Gaertner in Chicago, where he did important things on ruling machines, measuring engines, all sorts of things. Then worked in New York for a while with the famous surveying instrument company, whose name I can't say at the moment, though it is a very famous name.

Dick: Gurley?

Mikesell: No, not that one.

Dick: What big projects did Ilse work on while he was here?

Mikesell: Anything. He was the instrument maker. All of Watts' conversions on the meridian circle were done by Ilse. When Ritchey liquidated his investments on the grounds here, the shop

he set up in the South Transit, Ilse bought his ten-inch swing, four-foot bed engine lathe, moved it over to the basement of his home right over to the side of Wisconsin Avenue outside of the Observatory gates. Ilse loved beer in a moderate way--one bottle per day at bedtime. When the war came upon us, he recognized things were going to be scarce, so he lined his basement with cases of beer. It wasn't until many, many years later that I learned that beer has a very short lifetime. I've often thought of Ilse and his beer. I've also thought of that engine lathe and wished I had had a place for it.

Dick: When did Ilse leave the Observatory?

Mikesell: After the war.

Dick: And Steinacker came?

Mikesell: Well, it's not quite that simple, because we had an enormous development shop down in Building 52. The building was essentially a shop from one end to the other, the whole building, two floors of shop. Optical shop. They had an enormous room in there coating optics for binoculars and anything else having to do with the Navy--range finders. These were evaporation coating machines, the walls just lined.

Dick: Was all this directly under the Naval Observatory?

Mikesell: No, these were under things like BuShips. But we had full access. There were no security problems to walk in and out any of the offices down there. They would do all sorts of things for us. If we wanted optics coated, we would go down there and get it taken care of. They had, of course, barrels and barrels of binoculars, lenses, and anything else. We could pick it up and walk out with it.

Dick: But wasn't there a certain amount of instrumentation that came under the Naval Observatory, like the sextants, the navigational instruments?

Mikesell: These were all the same thing; they were down there. The sextants tended to be downtown. Binoculars were all up here with our establishment here. We had a big section down in the present instrument-maker shop; given over to collimation of

binoculars after they had been reassembled. These binoculars, you recall, were not only being built by ex-amateur telescope makers of the United States, but they were being donated. The Navy asked for donations of binoculars. One dollar would be given for every pair of binoculars. We would get in beautiful Zeiss binoculars, and the donor was given a dollar. Then these things were all cycled through that building, and at some stage would be taken apart, the optics all coated with an evaporative process, reassembled, collimated, sent out, and given a little "O.N." mark that signified they'd gone through the Naval Observatory. This would have been worked on down there underneath the minute hand there. All of these deck clocks went through there. We had an enormous clock section, enormous chronometer section. Chronometers, all the Navy were cycled through the chronometer shop.

Dick: This "O.N." under the minute hand on this?

Mikesell: This means it had gone through the shop of the U.S. Naval Observatory.

Dick: I see. I never would have noticed that.

Mikesell: If I'm wrong, you find somebody to make it straight, but this is my understanding and it's been consistent with what I've seen. I have lots of sextants with the "O.N." on it. BuShips was separate--it was BUSHPS. So they had their own statement, but this was the Naval Observatory's hallmark. All that sort of thing was down there, including things like Willis' pendulum astrolabes and other research projects.

All of that time, Ilse, who was way past retirement age, was kept on at the Observatory and operated a shop on the ground floor underneath the 12-inch, was his shop. Main floor was his, which reminds me now that the museum was on the second floor under the 12-inch, and the instrument shop was the main floor. He had this one assistant, Wirtz. He may, at some stage, have had two assistants, because there was a young man who had lost a leg motorcycling, just like Draper had.

Draper got a motorcycle because he felt it was philosophically wrong for a human being to demand a ton and a half of machinery just to transfer 175 pounds of body around

town, so he got himself a motorcycle, which lasted until he lost a leg.

As I say, I haven't seen here either of the people. In '36, Ilsie only had one assistant, who was an older man. Then during the war, I think he had two, or else this older man was replaced by a younger man who had badly damaged a leg and tried valiantly to save it, and he eventually had it amputated.

Dick: You don't know who Ilse's predecessor was, do you?

Mikesell: No. Ilse, Burton--of course, looking very much like Burton. Sewald, an interesting guy in the Time Service Division when I came. Browne. Phenix had gone to Social Security. He had been quite a crony of all the crowd here. I met him at least once or twice when he came back to visit and tried hard to recruit more people to go into Social Security. Ralph Haupt, of course, you have talked with.

Dick: Right.

Mikesell: A magnificent business of carving out a niche for himself in the management of publications. He was essentially the publisher and editor of our Observatory's publications. Pawling was still around, stayed around a long time, had been an observer with the 9-inch transit-circle division, and in '36 was still working hard every day with the little numbers reducing. He was still working for Morgan.

U.S. Lyons, you've heard me speak about. And Snow, I think, was in the Almanac office in '36. Obviously all of the guys of this group that welcomed me in and made me at home had enjoyed Sharnoff, enjoyed teasing him no end. He was still working at the Observatory into at least 1939, and he got taken out on account of being communist a year or two later.

Dick: I thought you took his place.

Mikesell: I took his place in the 6-inch transit-circle division, but he went down into the Almanac office, so he was here in the Almanac office. It's true I'm correct in my recollection at this stage, but you'll find him listed for several years there, until he was fired as a security risk.

Dick: Okay. We're almost at the end of the tape. Is there anything else you'd like to say about your career here or about the history of the Observatory?

Mikesell: I can't think of it now. In other words, you've squeezed me at the moment.

Dick: Thanks very much. I appreciate all your time.

[End of interview]