

# UC Santa Cruz

## Lick Observatory

### Title

Charles Donald Shane: The Lick Observatory

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### Authors

Shane, Charles Donald  
Calciano, Elizabeth Spedding

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# UC Santa Cruz

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Regional History Project, UCSC Library  
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University of California, Santa Cruz

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CHARLES DONALD SHANE

THE LICK OBSERVATORY

An Interview Conducted By  
Elizabeth Spedding Calciano

Santa Cruz



Charles Donald Shane  
1964

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## INTRODUCTION

Shortly after the administration of the Lick Observatory was transferred to the Santa Cruz campus of the University of California in 1965, the Regional History Project decided that interviews on the history of the Observatory should be included as part of our proposed University History series.

The Lick Observatory, of course, has much more "history" behind it than our own very young campus. It was almost a century ago that James Lick, a rather eccentric California bachelor, decided, although he knew almost nothing about astronomy, "To expend the sum of seven hundred thousand dollars (\$700,000) for the purpose of purchasing land, and. constructing and putting up on such land ... a powerful telescope, superior to and more powerful than any telescope yet made, with all the machinery appertaining thereto and also a suitable observatory connected therewith."

Lick began thinking seriously about building an observatory in 1873 and included it as part of a trust he set up in 1874. Lick changed the trust and his trustees twice before his death in 1876, but all three versions contained provisions for the Observatory. Upon its completion, Lick wanted the Observatory to be given to the Regents of the University of California.

In 1875 Lick selected Mount Hamilton, a 4,213 foot peak to



the east of San Jose, as the site for his observatory and soon thereafter arranged for Santa Clara County to build a road to the top of the mountain. Lick died at the age of 80 on October 1, 1876, and thus never saw his observatory take shape, but he had set the course and construction proceeded steadily for the next twelve years.

In 1888 the Lick Trustees conveyed the completed observatory to the Regents of the University of California; however a great observatory is never truly completed and over the years superb telescopes and ever more sophisticated machinery have been added. Thus the Lick Observatory is still today in the ranks of the world's outstanding observatories.

The Lick Observatory had the status of an independent campus of the University of California until 1958 when it was made a part of the Berkeley campus. On July 1, 1965, the administrative responsibility for the Observatory was shifted to the Santa Cruz campus, and in late 1966 the astronomers moved their homes and offices from Mount Hamilton to Santa Cruz. The observational facilities on Mount Hamilton, of course, continue to be used to full capacity by the Lick astronomers and their counterparts in the astronomy departments on the other University campuses. Visiting astronomers also use the facilities from time to time.

When the Regional History Project began planning its

University History series, it was abundantly clear that our first interviews on the Observatory should be with Dr. and Mrs. C. D. Shane. Dr. Shane, who is a former Director of the Observatory, first visited Mount Hamilton in 1914 when he was an undergraduate in astronomy at the University of California, Berkeley. He took his Ph.D. in astronomy at Berkeley and was twice a Lick Fellow (1916-17 and 1919-20); thus he worked closely with the Lick astronomers during this period. Some of these astronomers were men who had been with the Observatory since its very early years.

From 1920 to 1942 Dr. Shane was a member of the Berkeley faculty; in 1942 he became Assistant Director of the Lawrence Radiation Laboratory and in 1944 went to the Los Alamos Laboratory where he was Assistant Director in charge of personnel. In 1945 he was appointed Director of the Lick Observatory, a position he held until 1958. During his tenure as Director he was faced with the postwar rebuilding of the staff, with putting into operation the Carnegie 20-inch Astrograph, with instituting a general building program to provide adequate housing and facilities on the mountain, and with the tremendous administrative responsibilities involved in the funding, designing, and building of the great 120-inch reflecting telescope.

Dr. Shane asked to retire as Director in 1958 so that he

could devote more time to research; he and Mrs. Shane remained on Mount Hamilton until 1963 when he became Astronomer Emeritus. They now live on a small acreage in a lovely hilly area near Santa Cruz.

Since his retirement Dr. Shane, who is a member of the National Academy of Sciences, has continued to be most active in national and international astronomy, serving on numerous advisory committees as well as lecturing, writing, and continuing his research. Indeed it seemed that on every visit the interviewer made to the Shane home, Dr. Shane was either packing for a trip or unpacking from one just completed. Mary Lea Heger Shane's association with the Lick Observatory also goes back to her student days at Berkeley. She graduated in 1919 with a degree in astronomy and moved up on Mount Hamilton in July of that year for a year's postgraduate work, work which eventually resulted in her Ph.D. thesis. She married Dr. Shane in 1920 and completed her Ph.D. in 1924. She did not pursue a career in astronomy, but her training has proved an invaluable asset both in assisting in her husband's work (doing calculations, editing papers, et cetera) and in one of her main hobbies which has been the organizing and interpreting of the early archives of the Observatory. In her interviews, Mrs. Shane talked knowledgeably about the astronomical community, about life on Mount Hamilton in 1919 and the post-1945 period, and

about the earlier history of the Lick Observatory and its astronomers.

Mrs. Shane's interviews were held between November 7, 1966, and August 1, 1967, with Dr. Shane's scheduled to follow. In the meantime, however, (in July of 1967) Helen Wright of the American Institute of Physics (AIP) flew out to the West Coast and conducted interviews with the Shanes. Since the Regional History Project and the AIP had already discussed the possibility of exchanging manuscripts, our office decided it would be best to wait until the rough transcript of Dr. Shane's AIP interview had been completed and then design our interview as a supplement to it. This met with the approval of the Shanes, of Helen Wright, and of Dr. Charles Weiner, Director of the Center for History and Philosophy of Physics of the American Institute of Physics. Therefore our interviews with Dr. Shane were held on February 22 and March 14, 1968.

The interviews were held in one of the listening rooms on the first floor of the Library. The room was rather stark and uncomfortable, but Dr. Shane did not seem to mind. He answered the questions rapidly and yet with considerable detail.

Since these interviews were designed as a supplement to the AIP manuscript, only a small portion of this volume deals directly with Dr. Shane's research work or his administrative career. Instead, the first interview concentrated primarily on

Dr. Shane's knowledge of the early years of the Lick Observatory. In discussing this period, Dr. Shane was always most careful to distinguish between the information he knew firsthand or from his own historical research and that which had been told to him by others during his student days at the Observatory. The manuscript starts out with comments on the early Lick astronomers and a discussion of the development of the Astronomy Department at Berkeley and its relationship over the years with the Lick Observatory. Dr. Shane was also asked to comment upon the various men who have been Directors of the Observatory and to discuss the progress of the Observatory under each man. This section of the manuscript was completed with comments on the Observatory's present status within the University and some of its possible developments in the future.

The second portion of this manuscript deals with various items Dr. Shane felt he should have included in the AIP interviews. Here Dr. Shane comments on the establishment of the Statistics Department at Berkeley and mentions his experiences working with the University's Academic Senate. This is followed by a discussion of some of the astronomy advisory committees Dr. Shane has served on both in the United States and abroad.

The manuscript was edited by the interviewer and returned to Dr. Shane for additions and corrections. Dr. and Mrs. Shane checked the manuscript very carefully and made a number of small

changes wherever they felt the working was ambiguous or inaccurate. Mrs. Shane also made several trips to the Library to proofread the pages of the master copy. Dr. Shane asked that several pages of the manuscript be sealed until January 1, 1979, or his death, whichever occurred later, but he was perfectly willing to let the rest of the manuscript be bound and released at this time.

The picture of Dr. Shane used as the frontispiece was taken in 1964 and was loaned to us by Dr. Shane. When we expressed the hope that we could find a group picture of the Lick astronomers of the 1920 period as well as a picture of Dr. Shane when he was Director, Dr. Shane very kindly hunted through his collection and produced the pictures that are reproduced on pages 51 and 95. The name and subject index in this volume was done with two purposes in mind: the needs of the astronomical community and the needs of those who use our regional history index, hence the index is quite detailed and rather lengthy.

Copies of this manuscript are on deposit in the Bancroft Library, University of California, Berkeley; at the Center for History and Philosophy of Physics of the American Institute of Physics in New York; and in the Special Collections Room of the University Library at the University of California, Santa Cruz. This manuscript is part of a collection of interviews on the history of the University of California, Santa Cruz, which

have been conducted by the Regional History Project. The Project is under the administrative supervision of Donald T. Clark, University Librarian.

Elizabeth Spedding Calciano

December 4, 1969

Regional History Project

University Library

University of California, Santa Cruz

LICK OBSERVATORY, 1880-1900

Edward Singleton Holden and the First Lick Astronomers

Calciano: When we first talked about doing this interview, you told me that when you were up on the mountain in 1914 or '15 or so, there were still a few people who'd been there when the original astronomers were there. You said that because of this you knew some stories, just hearsay material, but things that you really felt hadn't been preserved anywhere, and I'd like to hear some of these. From some of the reading I've done, many of the astronomers appear one-dimensional; no personality comes through.

Dr. Shane: Well did you want to ask about anyone in particular?

Calciano: All right, I can give you names if you want.

Dr. Shane: Yes.

Calciano: I suppose Holden is the logical one to start with.

Dr. Shane: Didn't I talk about Holden in the other interview?\*

Calciano: Not a great deal. I wouldn't worry too much about the duplication; a little bit of duplication is going to creep in here and there, but that's not going to be a

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\*Ed. note: An interview with Dr. Shane was done by Helen Wright in 1967 for the American Institute of Physics. This UCSC interview is designed as a supplement to the AIP interview.



sin.

Dr. Shane: Well Holden was a graduate of West Point, and I don't know what his career was until he became an assistant to Simon Newcomb in the U.S. Naval Observatory. Simon Newcomb was an advisor of the Lick Trust, one of the principal ones, and he ... well I would say informal advisor, and he suggested Holden as a person with whom they might consult, which they did. And they consulted with Holden at great length, and I think he gave good advice. Sometime later he became Director of the Washburn Observatory at the University of Wisconsin, and when I was there a number of years ago, perhaps ten years ago, I looked at the furnishings in the Washburn Observatory, and I could see the Lick Observatory sticking out all through them. The bookcases were the same style and the tables and the furniture, except that I believe at Washburn they were made of walnut and at Lick Observatory they were made of oak or ash (laughter), but it was the same general arrangement. I might say also that as far as the design of the hallways in the main building at Lick was concerned, those were obviously copied after the home of Floyd up on Clear Lake. I went through that

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house once and I saw the great big central hall with marble floors just exactly as in the Lick Observatory except, of course, size and proportions were different. Well anyhow, coming back to Holden, he was one of the main advisors and finally it was decided that he should be made the first Director of the Observatory. I don't know on whose recommendation; probably on Newcomb's. He brought together an extraordinarily good group of astronomers, but he'd hardly got them on the mountain when quarrels started. And I think one thing was that he was something of a martinet. His own astronomical accomplishments were not such as to inspire too much respect on the part of his subordinates. We've looked into some of the correspondence, and when he had to communicate with an astronomer in writing, usually he could write the most reasonable sort of a letter, and you'd think this fellow is absolutely right, but I am told that when he talked to them, he could make himself very disagreeable. One astronomer, Tucker, told Stebbins, I believe, that Holden got along pretty well with the unmarried men, but he didn't get along with the married men. And the reason was that he'd be very disagreeable in some interview, and the victim would

fume and fret about it, and if he was unmarried, he would forget about it after a while. But if he was married, he'd go home and tell his wife, and she'd say, "Don't let that fellow walk over you. Are you a man or a mouse?" (laughter) and thus keep things pretty well stirred up. Well anyhow, this went on and finally I think the first important one to resign was Burnham, S. W. Burnham. I think he resigned without a great deal of fanfare and returned to his work as a Clerk of the Court in Chicago. He was dissatisfied with conditions at Lick under Holden, but his leaving wasn't given much publicity. Holden had brought Campbell\* and Henry Crew as spectroscopists, and Henry Crew left after a year or thereabouts, and...

Calciano: Was he a good man?

Dr. Shane: An excellent man. He was subsequently professor of physics at Northwestern University. I saw his daughter, talked to her about 1950, and she gave me a few pictures that he had taken in the early days. Now I looked into the difficulties there, and it seemed that these two young men were brought as spectroscopists. Campbell was supposed to do stellar spectroscopy with the 36-inch telescope, and Crew was supposed to do

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\* Ed. note: W. W. Campbell, later Director of the Observatory.

solar spectroscopy with the 36-inch telescope. So he worked in the day and Campbell worked at night. But presently, as nearly as I could make out from the correspondence, Crew became dissatisfied because the real opportunities were in stellar spectroscopy, and he wanted assignments and time at night, and that hadn't been in the original agreement, and he became dissatisfied and he left. Holden's most troublesome quarrel, probably, was with Barnard, who was another outstanding astronomer, an ardent observer, one who'd never let an hour go by that was observable without observing. They quarreled on several scores. One was that Barnard thought Holden didn't give him enough time with the 36-inch telescope; another was that Holden wanted Barnard to take over some of the routine work such as the time service, and Barnard said he already had an assigned job which had to do with the photography of the Milky Way with a small camera lens. As a matter of fact, the latter was a piece of work that Barnard should have been glad to do. I think he just didn't want to spend the time on these other routine matters. I read some of the correspondence; it finally reached a point where Holden and Barnard weren't speaking, and they always communicated by

letter. And...

Calciano: Both on the mountain, but writing each other letters?

Dr. Shane: That's right. (Laughter) And so finally Barnard left and that created something of a stir. People said Holden can't keep these good men. I might say an earlier person who left, and probably the best one of all, was Keeler. He was, I think, the first astronomer they employed, and he left not because of any quarrel, as far as I know, but because he was offered a position as Director of the Allegheny Observatory to succeed Samuel Pierpont Langley, who went to become Secretary of the Smithsonian Institution. Well, anyhow...

Calciano: But Holden was the one who was responsible for getting the good crew in the first place?

Dr. Shane: He got them and then he couldn't keep them. I think that Campbell rode through all of this without any great troubles with Holden, and who else... There was...

Calciano: Well Schaeberle was...

Dr. Shane: Schaeberle had been brought from Michigan. He was in charge of the meridian circle work, and once I ran across a notebook that Holden had written for Schaeberle in which Holden was telling him how the

meridian work should be conducted. He gave the most precise directions, right down to the last detail, and that was something that no self-respecting astronomer would want to take. If he was to do the meridian circle work, he'd want to do it in his own way. Now you can't blame Holden entirely, because Schaeberle was terribly sloppy.

Calciano: Oh. (Laughter)

Dr. Shane: I found out afterwards that no one could ever interpret his notes, so perhaps Holden knew why it was necessary to write all these detailed directions.

Calciano: May I ask if meridian circle work is no longer particularly important, or...

Dr. Shane: Oh it's very important, but not done at Mount Hamilton.

Calciano: I asked because I remember you mentioning somewhere that they tore down the meridian circle building.

Dr. Shane: That's right, and sent the instrument down to South America where it's being used on some other program.

Calciano: Why was this...

Dr. Shane: Well the astronomers' interests were elsewhere, and whereas at an earlier time a single man, perhaps with an assistant, could do a lot of valuable meridian

circle work, a great deal of it became more or less automated in the sense that the observations were taken with semiautomatic equipment and the reductions were made on machines. To do a big program, however, required quite an extensive staff, and good people at Lick just weren't too much interested in it. Jeffers was the last one who did any meridian circle work on Mount Hamilton. He did some fundamental work there and finally finished the program he had undertaken, and then he went off into other things. The instrument was just sitting there idle because, as I say, the staff had other interests. And I think it was a wise move. If you want to establish an observatory for meridian circle work, you establish it not with a single man operating it, but you have a whole staff who can keep the instrument busy every night observing and keep up with the reductions. Now they had one man there during Holden's time, during part of Holden's time, Tucker, who got along all right with Holden. He was a very queer fellow himself, eccentric. I knew him well on the mountain, and I think I last talked to him when he was 90 years old.

Calciano: Oh my!

Dr. Shane: But he was very, very systematic. He got an immense

amount of work done; he never hurried; he always moved slowly, but he never wasted a motion. Everything was systematized right down to the last degree. The story is told that once when Campbell published the annual report which gave the number of observations that Tucker had made in the course of the year, some astronomer wrote in and said, "Wasn't this a misprint? Didn't you put an extra zero on it?" (Laughter)

Calciano: It was tenfold over what would be expected?

Dr. Shane: Yes, yes. I don't think anybody ever could turn out the work that he did.

Calciano: In what way was he eccentric?

Dr. Shane: Well, he was a bachelor until he was about 56 years old, or some such age as that. Finally he married and had two daughters. He was a great hunter; he loved to play games; he hated to lose, and he could become rather unpleasant if he lost in a game. He fancied himself quite an actor (and he was good) and was always putting on shows in which he'd play the principal part. His temperament was entirely different from that of W. H. Wright, who was just a youngster at that time. Crawford told me that once they were having a play in the schoolhouse (I think it was in the schoolhouse) and Tucker took the principal part, and



after it was over there was applause and he came out and bowed. Wright proceeded to throw a bouquet up onto the platform from the audience, and the bouquet consisted of celery and carrots and other vegetables. Tucker looked at it suspiciously, then he reached down to pick it up, and Wright pulled a string and yanked it away. (Laughter) Keeler, who was then Director and was sitting in the audience, laughed uproariously. Well you can imagine that with a man who took himself so seriously as Tucker that...

Calciano: It wouldn't go, would it?

Dr. Shane: It didn't go very well. But...

Calciano: Well was this the origin of the Wright-Tucker feud, or just one symptom of it? (Laughter)

Dr. Shane: Oh no. It was just one thing after another. I think the climax came when Tucker's dog died and he accused Wright of poisoning it, or something like that.

Calciano: Oh my!

Dr. Shane: They had plenty of trouble.

Calciano: What years were these that Tucker and Wright were feuding?

Dr. Shane: Well, up until 1920 or thereabouts, which was about

the time Tucker retired. He retired in '26.

Calciano: What type of person was Burnham? Do you know?

Dr. Shane: I don't know, no. I never saw him. I have only heard stories of him. He was a wonderful observer of double stars and nothing else. He had no other interest in astronomy. Walter Adams once told me that at an early meeting of the American Astronomical Society he was standing outside the building where some papers on spectroscopy (then a relatively young and exciting astronomical subject) were being read. Burnham and Hough, another old-timer, had come up for air and were talking. Hough said, "Burnham, what do you think of this spectroscopy stuff?" Burnham replied, "I don't know much about it, but Michelson took me down to the Ryerson Laboratory once and showed me the "soda" lines, and I didn't think much of 'em." (Laughter) And the story is also told that once at Lick Observatory when he showed up for lunch after observing the night before, he remarked casually, "While I was measuring a double star last night, I saw a comet in the field of view," and Barnard, who was sitting there, fairly jumped up and down; he was avid for discovering comets. But Burnham just had no interest in comets and had merely gone on with his double star. Well Barnard

said, "What double star was this you were measuring?" Well Burnham didn't remember. (Laughter) So Barnard proceeded to go over Burnham's observing book and look in the areas of all the stars he'd observed the night before, but of course the comet had moved in the meantime, and so...

Calciano: He never found it?

Dr. Shane: He never found it.

Calciano: Well Burnham and Barnard were both amateurs in a sense in that Burnham had been a court reporter...

Dr. Shane: That's right.

Calciano: ...a court clerk, and Barnard a photographer.

Dr. Shane: That's right.

Calciano: Had it been that in their amateur astronomy they'd picked on one thing that they loved and sort of followed it through?

Dr. Shane: Yes, I think so. I suppose they didn't have the same breadth of interest that they might have had if they'd had a more formal training, though actually Barnard's interests in astronomy were fairly broad.

Calciano: Well am I right in thinking that astronomy at that time was much more visual and less theoretical?

Dr. Shane: Oh no, much was theoretical, but they didn't do much theoretical work on Mount Hamilton. Now they did have

Leuschner on Mount Hamilton. He came about 1890 or '88 or thereabouts, right after Holden came. And he was just a young student; he didn't have a Ph.D. yet, and he came to tutor Holden's son, Ned. But he also, of course, took the opportunity to do astronomy, but the astronomy he did was theoretical, computing orbits. He was working up a new method of computing orbits, or perhaps he did that later. Anyhow, he was learning the subject of orbit calculation. He didn't get along at all with Holden either, and finally he went to Berkeley to teach astronomy and organized a teaching department there. Holden resented that because he thought all astronomy in the University should be under the Lick Observatory. Well to continue, (I think we've covered about all of the...

Calciano: Well I did want to ask you a bit more on the early period, if I may, and then I want to return to Leuschner.

Dr. Shane: All right.

Calciano: In this early period, and of course this was true in many professions, the people were just self-trained. But it was interesting to me that someone like Burnham, who'd really not had much formal education, nevertheless just on the basis of his practical

ability was considered one of the best astronomers, right?

Dr. Shane: Well they had a different viewpoint in those days from what they do now, although there's a much more modern parallel, and that is Milton Humason at Mount Wilson. I think he had less than a high school education. In the early days when they were establishing the observatory, he worked with the pack trains. He would conduct the mule trains up and down the mountain; all they had was a trail, you know.

Calciano: What year?

Dr. Shane: Oh that must have been about 1907 or 1908. And by the way, he's given an interview to Helen Wright.

Calciano: Oh good!

Dr. Shane: And they say it's a good one. He continued in various capacities working for the observatory, but he had some interest and he was encouraged by, I think by Paul Merrill, to make use of a little photographic telescope they had there and take some of the long exposures that were needed. He did this and he did it well, and he showed such talent as an observer that he was set to work on some of the larger instruments doing the routine work. He and Hubble ultimately

became a great team, and it was through the work of Hubble and Humason that the red-shift effect was discovered; the red-shift law. It was known that there was something funny here, but they got it straightened out through Humason's observations which were more or less directed by Hubble.

Calciano: And Hubble did the theoretical work?

Dr. Shane: Well also he did a lot of related observations. He didn't do the spectroscopic observations, but he did the direct photography, and he directed the general program, laying out the observations that Humason made. I have been told that if the Nobel Committee could have interpreted this work in the broad sense as physics, (and in the sense of cosmology, it is physics) Hubble and Humason would have got the Nobel prize. But it was interpreted as astronomy, and not physics.

Calciano: Oh dear!

Dr. Shane: Well anyhow, that is something of a parallel to these other people. Here was an amateur who had a very special talent, and he made a great name for himself.

Calciano: What struck me as I read about these early men was that most of them were amateurs; Keeler, I think, was

the only really professionally trained man other than Holden, in a sense.

Dr. Shane: Well Campbell was.

Calciano: Yes, he was, but he wasn't one of the original ones on the mountain.

Dr. Shane: Yes.

Calciano: Am I right that photography was just coming into astronomy as a major factor about this time?

Dr. Shane: That's right. And Holden made a great elaborate study of the Orion Nebula which was based on visual observations. It was a tremendous amount of work, and it was just the most untimely thing possible because everything about it could be done so much better by photography which was then coming in to take over. And so it was a very large waste of time.

Calciano: Barnard was one of the pioneers in photography, wasn't he?

Dr. Shane: Yes, that's right.

Calciano: I have a feeling that all of these early astronomers on the mountain were doing most of their own work. It wasn't ... well that's the wrong way of phrasing it, but am I not right that now in many cases the astronomers set up the programs and quite a bit of the

work of keeping the telescope pinned on a star is done by trained assistants while the astronomer is busy doing other things?

Dr. Shane: Well that's, yes, that's certainly done more now.

Calciano: More now than it was then?

Dr. Shane: Yes. Now I would also say that Holden himself had a program of photographing the moon. Holden was no observer, and the program was very badly conceived and executed, but he made an atlas of the moon that was published (no doubt they have it here) and it was not much good; I mean the photography was not sharp.

Calciano: So that's two things he did that weren't all that productive?

Dr. Shane: That's right. No, I'd say he really didn't do any astronomical work that was worthwhile. He had an assistant named Colton. Now I don't know what Colton's position was, but he worked with Holden, and finally he had a break with Holden. He resigned and sent a big blast to the newspapers severely criticizing the way Holden was doing his work, whereupon this was the last straw. Holden had been under fire, and he resigned. And I am told that the day Holden left on the stage, there was only one person in the Observatory who went out to say good-bye to him, and that was a young



assistant named Aitken.

Calciano: Oh!

Dr. Shane: Aitken went out and said good-bye to him.

Calciano: So he was really disliked by everyone.

Dr. Shane: Yes, it seems so. Perhaps my implications are not wholly fair, for he did have real ability as an organizer and in keeping and preserving records. His plans for the Observatory were excellent, and despite the turbulence, his regime was productive and contained the basis for future growth. But he resigned as a result of all this controversy, and Keeler was then appointed to the position. And well, you probably...

Calciano: Well I've heard nothing but good about Keeler, is this right?

Dr. Shane: That's right. And I never heard anything but good about him.

Calciano: As an astronomer and as a person?

Dr. Shane: Both.

Calciano: And as an administrator, too?

Dr. Shane: Yes. Wonderful.

Calciano: There's an astronomer named Hussey who was there quite early.

Dr. Shane: Yes, he was a double-star astronomer, and I can't tell you much about him except he worked on double stars at that time and he left, and whether it was because of differences with Holden I don't know.

Calciano: And then of the original people there was a machinist and foreman, John McDonald, who was there for quite a few years.

Dr. Shane: Yes, he was there during the construction of the Observatory because he's referred to in Fraser's diary.

Calciano: Oh is he?

Dr. Shane: He was the one who saw the last grizzly bear in Santa Clara County.

Calciano: Oh! And what year was that?

Dr. Shane: In 1882. He was going down to the spring to take care of the pump and a light snow had fallen on the ground, and he was walking down the road looking down, and when he looked up he looked into the face of a bear. And it's not sure which was the more startled, he or the bear, but he reversed his direction, and the bear reversed its direction, and McDonald went back up to the top of the mountain. Now it happened that just

that day there were coming up on the stage Fraser and a man from Kentucky, I think, who was noted as a hunter. So McDonald reported the bear, and they got out some guns and went down and found the tracks of the bear and they proceeded to follow them in the snow. But the bear had gone on down the mountain until it was below the snow line, and then they could no longer follow the tracks. Now I have read Tevis and Storer's California Grizzly, and they give the date of the last sighting of a grizzly bear in Santa Clara County as 1879. So this was really the last one. As a matter of fact, I wrote to them and gave them the extract from the diary. (Laughter) Well, anyhow, we know it was a grizzly bear because there were no other kinds; there were no black bears in the coast range south of San Francisco Bay.

Calciano: Well, it's pretty hard to mistake a grizzly when you see one. (Laughter)

Dr. Shane: Yes. Well he didn't say grizzly, he said a bear, but if it was a bear, it had to be a grizzly.

THE DEPARTMENT OF ASTRONOMY, BERKELEY

Armin Otto Leuschner

Calciano: Now a few minutes ago you were commenting on Holden

being very unhappy about Leuschner as head of the astronomy department at Berkeley. But the astronomy department had been formed right from the very beginning at the University of California if I recall correctly the accounts I have read.

Dr. Shane: No, I don't think so. I believe there had been a few courses, but no organized department. There was a professor, Frank Soul, who was the professor of civil engineering...

Calciano: Perhaps I shouldn't have said "department;" you're right.

Dr. Shane: ...and he taught some astronomy, but it was really undertaken seriously with Leuschner.

Calciano: It wasn't a separate department until...

Dr. Shane: No. I don't think so. I can't tell you about dates; you'd have to look back in the announcements of courses for that.

Calciano: Well now, you mentioned to Helen Wright that Leuschner would tell many stories about Holden, and of course I immediately thought, "What stories?" (Laughter)

Dr. Shane: Oh actually I can't remember. No I really, I really don't remember... I sort of remember the general spirit of them, and I know that at least one that Leuschner told I thought didn't reflect too much

credit on him, but it was just kind of a trivial matter. I think that when Leuschner came to the mountain, Holden assigned him some quarters with some very, very inadequate furnishings, whereupon Leuschner managed to fix it up. I think he borrowed some things from people and had it fixed up pretty nicely, and then he had some little party to which he invited Holden, I think with the real purpose of embarrassing Holden in this respect. I'm not sure, but he used to tell it with a good deal of glee, so I think there was some pettiness on both sides.

Calciano: There was certainly no love lost between them then?

Dr. Shane: Oh my goodness no.

Calciano: Well what was the relationship between Lick and Berkeley at that point?

Dr. Shane: I don't know. I used to hear when I was a student in Berkeley that there was some friction between Campbell and Leuschner, but later on when I was a member of the staff and it was a question of discussing the courses of graduate students and the arrangements for the Ph.D.'s, we would have department meetings each year with people from Lick, and I thought the relations were most cordial. But the suggestion of friction was something in the atmosphere that I picked up as a

student.

Calciano: What type of man was Leuschner?

Dr. Shane: Well, Leuschner was in a strange sense one of the best teachers I ever knew. And the reason was that he was an enthusiast for his subject, which is a subject that is today pretty much outmoded.

Calciano: What was it?

Dr. Shane: Well it was the computation of orbits, that was all. That was his whole life practically. He was an enthusiast, and he would always be working on some piece of research in connection with it. Then when he'd start his course in orbit computation, he'd start in with this detail of research that he was interested in at the moment, and the students would wonder what all this was about because they had no foundation. They hadn't started at the beginning, and then they would get frightened and would have to work like the mischief and would study it up and learn it. By the time they were through, they really knew the subject.

(Laughter)

Calciano: He sort of tossed them in the ocean, so to speak.

Dr. Shane: It's what you might call teaching by disorganization.

(Laughter) And I remember I had a talk once with two

or three chemists, and we were talking about teaching and someone felt that the best teaching was not the best organized teaching. That if the teaching was too well organized, the students took it down painlessly and it didn't stick, whereas if they had to do some organizing of their work themselves they did better.

Calciano: That's an interesting point, isn't it?

Dr. Shane: Yes.

Calciano: Leuschner was head from 1900 to 1938 which is a jolly long spell. Was he a good administrator?

Dr. Shane: Yes. Yes, I think so, and he was Dean of the Graduate Division. He was Dean of the Graduate Division for several years until Campbell came to Berkeley. He had that position under Barrows, anyhow, and I don't know whether under Wheeler or not.\* Now I'm sure he didn't leave the position because of any objection on the part of Campbell, because I believe that Campbell always felt much indebted to Leuschner; when Campbell was going down to Berkeley as President and was unfamiliar with the running of the University, I think that Leuschner did an awful lot of coaching him and

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\*Ed. note: Leuschner was Dean of the Graduate Division from 1913-18 and 1920-23; he was on leave 1918-19.

advising him as to how he would best get along. And so as far as I know their relations were good. But Campbell had Charles Lipman appointed Dean of the Graduate Division. He was a plant biologist.

Calciano: I see. What kind of person was Leuschner?

Dr. Shane: Well, I think he was a man who would do a great deal to help the students, but he was one of these people who would think a great deal about himself, too. I mean he was always telling the students stories of his experiences and this and that kind of an operation he was engaged in, and it was clear that Leuschner was very high in his mind. And in his later years he became almost obsessed with battling the income tax authorities (this was after he retired), and it was really not too pleasant to go and visit him because you'd hear all these long tales of these disputes with the income tax people.

Calciano: Oh dear.

Dr. Shane: But now I don't mean to be too critical of him because I feel personally I owe him a great deal, and I think a great many other students owe him a great deal, and he had a leadership ability that was able to produce some wonderful results. He built up that department so it was the best teaching department of astronomy in



the country, if not the world. But what I'm speaking about are these personal foibles.

Calciano: Right. He came to Berkeley almost by accident, in a sense. You said he came to tutor Holden's children and then went down the mountain...

Dr. Shane: I think it was just Holden's son.

Calciano: Holden's son.

Dr. Shane: Yes. How he happened to go to Berkeley to teach I can't recall.

Calciano: But he was certainly a blessing to Berkeley?

Dr. Shane: Oh yes, yes, I should say he most emphatically was.

#### Berkeley-Lick Relationship, 1915-1935

Calciano: You've already partly discussed the relationship between Lick and the Berkeley astronomy department; I'd like to know a bit more about that, and I'm also interested in the relation Lick and the astronomy department had with the math and physics departments at Berkeley -- the whole kit and caboodle. (Laughter)

Dr. Shane: Well, shall I talk about the relation with the astronomy department first?

Calciano: Fine.

Dr. Shane: And when? Of what period?

Calciano: Well let's do the period 1915 to 1935 right now.

Dr. Shane: Yes. Well I entered the University as a student in 1912, and I remember at that time every so often an astronomer from Lick would come down and give a public lecture on astronomy. I remember Campbell coming and lecturing, and Wright lecturing, and H. D. Curtis lecturing. And these were rather notable events, so there must have been some pretty good cooperation between the departments. It was no easy thing to come down in those days. I think they had just introduced an automobile stage. You'd have to go to San Jose, and you'd have to take the train from San Jose to Oakland, and then you'd have to take a streetcar from Oakland out to Berkeley, and it was something of an effort, whereas nowadays you make the trip in about two hours by automobile, you see. Well anyhow, the relations were good; the students took their courses in Berkeley; most graduate students did their research at Mount Hamilton; and they got their Ph.D.'s on this basis. I think that in the year 1913 they graduated six Ph.D.'s, which was really an extraordinary record. And some of them turned out to be very first-class

astronomers. Paul Merrill was one. So when I joined the University as instructor in 1920, our relations were good. We used to have an exchange arrangement in which for half a year an astronomer would come down and teach in Berkeley and one of the Berkeley staff would go up and do work at Lick. That went on for some time and seemed to work out very satisfactorily. They continued through this cooperative method to turn out their Ph.D.'s. The Lick Observatory had three fellowships, and these fellowships came about in this way: I think it was when either Keeler or Campbell was appointed Director, Schaeberle thought he should have been Director, and so he resigned in a huff. And I believe that it was at Leuschner's suggestion they took Schaeberle's salary, which was \$1800 a year, and divided it into three parts and created three Lick fellowships. I might say that I think I figured once that 50 years after that time, the first three Lick fellows were all living.

Calciano: Oh my.

Dr. Shane: There was something of the sort.

Calciano: Yes, I remember in the speech that you gave a few years ago, you said two of them went through their 57th year and one was still alive at the 60th year.

Dr. Shane: Yes, that's right.

Calciano: Were you a Lick fellow later?

Dr. Shane: Yes, I was a Lick fellow later.

Calciano: I'm afraid I cut in. Go on with what you were saying.

Dr. Shane: Well, what I was saying was they created these Lick fellowships. And then when I was teaching in Berkeley the normal arrangement, though this wasn't universally true, was that a Lick fellow would spend half his time in Berkeley taking courses and half his time on Mount Hamilton doing his research, and that seemed to work out very well. And when they became candidates for a Ph.D., some astronomers on Mount Hamilton would be on the committee, one, or possibly two, and someone from the Berkeley department, and then a physicist and a mathematician and so on. So that was the way the committees were made up. And I thought it was working out extremely well. I don't know whether there is anything further to say or not.

Calciano: Was there any connection with the math and physics departments at this time?

Dr. Shane: Well normally the candidate would have one or two minors. I had two minors -- physics and mathematics. And I don't think there was any closer connection than that the students were all encouraged to take a

certain amount of mathematics, advanced mathematics and physics, and the courses at that time, I think, in mathematics and physics were pretty well adapted to the sort of thing that astronomy students needed. At a later time I think they rather drifted apart so that it was not so easy for an astronomy student to get just the courses in mathematics that he needed in his work. Now I may be mistaken because I'm probably way behind the times, so I don't know. (Laughter)

Calciano: And what was the purpose of the Student's Observatory and its relation to Lick? I know they maintained a student observatory down at Berkeley, but all the Ph.D.'s seemed to use the big facilities, right?

Dr. Shane: Yes, well, but let me say that the instruments at the Student's Observatory were simply small instruments which, if you might call it such, were rather small models of larger instruments, and the students used these to go through all the motions of observing with the larger instrument..

Calciano: Learning the technique?

Dr. Shane: They'd learn their observational astronomy with these small instruments, and it worked extremely well. And I might say that if you could take the six-inch telescope and measure a comet's position with it, and

it turned out to have an accuracy that was at least acceptable by astronomical standards, the student felt pretty well set up. And so I think they learned a great deal that way.

Calciano: Is it still used?

Dr. Shane: I think that after the Second World War the use of the instruments there fell pretty much into a state of confusion. They didn't seem to have anyone who was interested in maintaining the instruments in proper condition. I know that while I was there we purchased a very good photographic lens -- it was a small one, but of the highest quality. And later a new astronomer came who directed one of the students to take the lens to pieces and clean it, and they were never able to get it together again so that it was in good adjustment. Some of those lens adjustments are the most delicate things in the world, matters of a thousandth of an inch.

Calciano: Oh dear.

Dr. Shane: But anyhow, they did not have anyone who was interested in keeping up the instruments.

#### REFRACTING AND REFLECTING TELESCOPES

Calciano: Speaking of lens-making and so forth, there was one

thing I did want to ask you. In all the early accounts of the Observatory, much is made of Alvan Clark and Sons who ground the 36-inch lens. Did that company ever continue, or did it peter out when the old man died?

Dr. Shane: No, they made the 40-inch for Yerkes, and the last one I know that was of any size was a 40-inch reflector for Lowell Observatory, and that was done by the two Lundins, father and son, who had worked for the Clarks, and I think continued the business. When I was a student you used to see their advertisements, but they were finally displaced by other firms. I don't know whether they exist at all now or not.

Calciano: Your wife told me in reference to Keeler (of course the Crossley had come and he got it set up properly) that he was the man who really brought reflecting telescopes back into respect among the astronomers.

Dr. Shane: That's right.

Calciano: Well why had they been so looked down upon?

Dr. Shane: Well ... of course the reflecting telescopes up to the middle of the nineteenth century were inferior. The mirrors were not made of glass; they were made of what they called speculum metal, which was a highly reflecting alloy, and it was hard to support them.

They were much heavier than glass and they tended to sag under the weight. When they would become tarnished, as they would in the course of time, it was a matter of repolishing them in which case you might ruin the figure. It had to be an optician who would take care of that. The mountings of reflecting telescopes were completely inadequate. They didn't know how to make a good mounting. Finally the process of depositing silver on glass was developed by the chemist Liebig, and it was adopted in the latter part of the nineteenth century. Meanwhile refractors had been coming into more use. The reflector wasn't of much value until you could start taking photographs with it, you see. And it was only in the latter part of the nineteenth century that photography was developed to a point where it could be applied to astronomy. And then the application to reflectors came about gradually. Before Keeler there was a Sir Isaac Roberts who had one or more reflectors with which he took some very fine photographs for his day. And I think that Keeler, just through tremendous observational skill and an immense amount of hard work, got the very most out of this Crossley reflector, which happened to have a very good mirror,



but a very poor mounting. And Keeler's great difficulties were with the mounting.

Calciano: Well did he set up a program for the Crossley simply because it was there, or did he need a reflecting telescope for the problems he wanted to do?

Dr. Shane: No, what happened was that in 1895 Holden had persuaded Crossley to give this instrument to the Lick Observatory. And when it came a lot of citizens contributed to the transportation and to building the dome. There's a marble tablet in the building with the names of all these people who contributed to it.

Calciano: Yes.

Dr. Shane: So it was set up and they tried to use it, and the mounting was so bad that it was discouraging. Then when Keeler came in '98, he asked each one of the astronomers if they wanted to take over the responsibilities of the Crossley, and none of them would do it because it was too hard to work. So he said, "All right, I'll do it," which he did, and during that period I think he did the most important work that was done at the Lick Observatory. Some of the men really missed an opportunity there, but perhaps they wouldn't have had the ability to make the most of it.

Calciano: I wonder why Mr. Crossley, this English amateur, had

invested in a three-foot reflector if reflectors weren't all that well thought of?

Dr. Shane: Well, I can't tell you; I don't know about that. But he had set it up at Halifax, England, and the climate was bad and perhaps he lost interest.

Calciano: But it was one of the glass types with the silver deposits on it?

Dr. Shane: It was. And it had two mirrors.

Calciano: Two?

Dr. Shane: Yes, two mirrors came with it.

Calciano: Interchangeable?

Dr. Shane: They were supposed to be interchangeable. And then in 1903 or thereabouts, when Campbell established the D. O. Mills station in Santiago, Chile, he was going to use one of those mirrors in a similar-sized reflector there. So he gave the mirror to Brashear to drill a hole in the center of it because he wanted to use it in the Cassegrain form in which the light is reflected through the hole. Brashear was a little afraid because the mirror had strains in it, and in the course of drilling the hole the glass exploded. So then they got a new mirror which they sent to Chile.

Calciano: You mentioned that the old metal ones tarnished. Well

as a housewife who polishes silver all the time, may I ask how you keep the silver deposit on the glass from tarnishing?

Dr. Shane: When it tarnishes, you take it off and put on a new one, although it can stand a small amount of light polishing.

Calciano: So it does tarnish.

Dr. Shane: Oh yes. The preservation of a bright surface depends on the climate. On Mount Hamilton it was easier, but I would say they would probably silver the Crossley perhaps once a year. And it was a day's job. I used to silver the little telescope mirrors down there in Berkeley. Now, of course, they put aluminum on the surface by an evaporation process. The aluminum is much more permanent.

Calciano: And that's why you don't have to do the 120-inch very often?

Dr. Shane: Yes, that's right.

Calciano: I see. And is the Crossley also aluminum now?

Dr. Shane: Oh yes. In fact the Crossley was the first telescope mirror of respectable size ever aluminized, and there's a good story about that.

Calciano: Oh good!

Dr. Shane: It seems that when the method of aluminizing was developed by John Strong in Pasadena...

Calciano: About what year?

Dr. Shane: In the 1930's, and it must have been about the middle 1930's. I think Wright was the Director here at that time. So the people at Pasadena built an aluminizing chamber down there just big enough to take the Crossley reflector, and Lick sent the mirror down to Pasadena to be aluminized. And Wright was most interested in it because the aluminum reflected ultraviolet light better than the silver, and Wright was very anxious to work as far into the ultraviolet as he could, so he was delighted with this opportunity. The mirror came back all packed up, and they were going to open the packing and see this beautiful object. Now Wright was one of these terribly fussy people, and he made the astronomers who were looking on stand back so they wouldn't get any lint from their clothes on this beautiful surface. Just before they put the mirror in the telescope, they were going to run over it with a vacuum cleaner to suck up the last bit of dust that might be on it. So as they stood back, Wright started to do this; he turned on the vacuum cleaner, it was connected the wrong way,

and it blew the dust out of the bag onto the mirror.

Calciano: Onto the mirror! (Laughter) Oh no! But to no lasting damage apparently?

Dr. Shane: No, there was no damage. It brushed off easily then.

Calciano: Oh how funny.

Dr. Shane: But they told me that...

Calciano: I bet he never lived that down.

Dr. Shane: Well nobody ever dared mention it to him. I know that Nick Mayall, who was standing by, said that they just didn't dare to laugh. (Laughter)

Calciano: Oh goodness.

LICK OBSERVATORY, 1900-1935

William Wallace Campbell

Calciano: Now earlier you started to mention Campbell, and I really didn't let you finish. I'd like now, though, to really go into Campbell as a man, as a director, as an astronomer.

Dr. Shane: Well ... of course you got the picture from Kenneth pretty well about his father; I mean to say as a person. At least I hope you did.

Calciano: Yes, we got the son's image of the father.

Dr. Shane: The first I ever heard of Campbell was when I was a small boy in Auburn. And at that time the Lick Observatory was perhaps regarded as the foremost scientific institution in the state, so people talked about it. And I remember someone having made reference to Campbell as a successor to Keeler. They said, well, something to this effect: that this man Campbell, I suppose, is good enough, but of course nobody could touch Keeler. I mean that seemed to be the attitude. Campbell did not have what you might call outgoing ways with him, and I take it that Keeler did. You know, everybody just liked Keeler. Campbell was stiff; nobody could ever criticize his integrity or anything of that sort; he was perhaps one of the most honest men I ever knew, and one of the most conscientious individuals. He did wonderful work, spectroscopic work, from the very beginning, and he made a series of outstanding discoveries in astronomical spectroscopy. He attracted the support of certain people outside the Observatory. Mrs. Hearst helped out in many ways, and D. O. Mills, the financier, was particularly generous. And finally when Campbell felt that to advance the use of the spectrograph for radial velocities he needed a

new spectrograph, Mills put up the money and he built the D. O. Mills spectrograph. With that instrument he was able to improve the art of determining radial velocities far beyond what it had ever been before. Then at a later time, and I think this must have been after 1900, a new Mills spectrograph was built on more improved designs for which Campbell gives credit to Wright who had introduced some of the mechanical principles that made it so superior. Both instruments continued in use up until my own time. I think they were used clear up into the 1930's and even later. I know that Neubauer was using the old Mills after I went as Director in '45. But anyhow, Campbell brought this art of measuring the radial velocities of stars to a very high degree of perfection. It was something, by the way, that Keeler had worked on by visual methods when he was at the Observatory initially. He had a spectroscope made for visual observations. He had measured the radial velocities of a lot of planetary nebulae which were more adaptable to that kind of observation than stars. Well anyhow, that was Campbell's great work, but not only did he perfect the art of measuring the radial velocities, he introduced a very large program of measuring the radial

velocities of nearly all the naked-eye stars and using them to determine the motion of the sun with reference to the stars -- the sun's motion among the stars. In the course of this a great number of stars of variable radial velocity were discovered which turned out to be spectroscopic binaries. And on the whole Campbell was, perhaps with Hale, at the top of American astronomy. They were two giants in their time. Now when I was a student, I used to hear harsh things of Campbell. Some of the men who had worked with him at first felt that he was hard and he was selfish; that he felt that (this is according to them) he felt that the credit for any discovery made with this equipment that he had designed was due largely to him, and there was some complaint that he'd put his name on papers for which others had made the observations and measures. Now I don't know how true that was. But I know that Wright felt that way and Moore felt that way too. That seemed to be the general atmosphere. But when I got to know him, and I went there as a graduate student in 1916, no one could have been kinder and more generous than he was. Now maybe he had mellowed with age. And maybe these other people had taken too critical a view of him; I don't know. But I always was terribly fond of



him, and instead of being harsh and unbending I can recall that even in my first year there as a graduate student I didn't feel any hesitation in going to his office an hour before quitting time and saying, "Well, Dr. Campbell, how would it be to adjourn over to the tennis court and have some tennis this afternoon."

Well he usually did it very willingly. He...

Calciano: Well you're a very personable type, a very pleasant man. Do you think that your counterparts, the other graduate students, also...

Dr. Shane: Well I don't know that they... You see, I really didn't have a counterpart. I think I was the only graduate student there at that time.

Calciano: Oh really?

Dr. Shane: Yes. They had brought someone out from a Midwestern university to be a Lick fellow, and he arrived there at noon on the stage and didn't like it and turned around and went down that afternoon. Campbell was as mad as he could be. (Laughter) But...

Calciano: You'd think so, yes.

Dr. Shane: But anyhow, I don't think that ... well I think that Campbell always seemed to like me, but I think other students experienced in greater or less degree the same friendliness.

Calciano: And while you were there the other professional astronomers seemed to...

Dr. Shane: You could see there was some irritation there, but I think that was a holdover. Well there had recently been a tremendous row between Campbell and Moore on the one hand and Wright on the other, and the air was a little bit electrical.

Calciano: In reference to what?

Dr. Shane: Wright was working with the spectroscope on the Crossley, and he had taken the spectrum of a planetary nebula and the spectrum lines looked kind of funny to him, but the spectrograph on the Crossley was of such low power that he couldn't quite interpret the photograph, so he went to Campbell and asked if he could have the 36-inch to verify his suspicion. Now Campbell and Moore were working on another program of nebulae, and this object that Wright had observed was right on their program and due to come up shortly for observation. So Campbell said, "Well this is on our program so we'll observe it and you won't need to have the time with the 36-inch." Now that was a case in which I think Campbell was perfectly conscientious though not generous. He tried to be fair to everybody, including himself. Wright was just as mad as he could

be about this, and Moore told me afterwards that Wright made such noises that if he'd been Campbell he'd have fired him right there. I don't know whether he had authority to fire him; I doubt if he did, but that was the way Moore felt about it.

Calciano: So that is the Wright-Campbell feud that you mentioned in the Wright transcript?

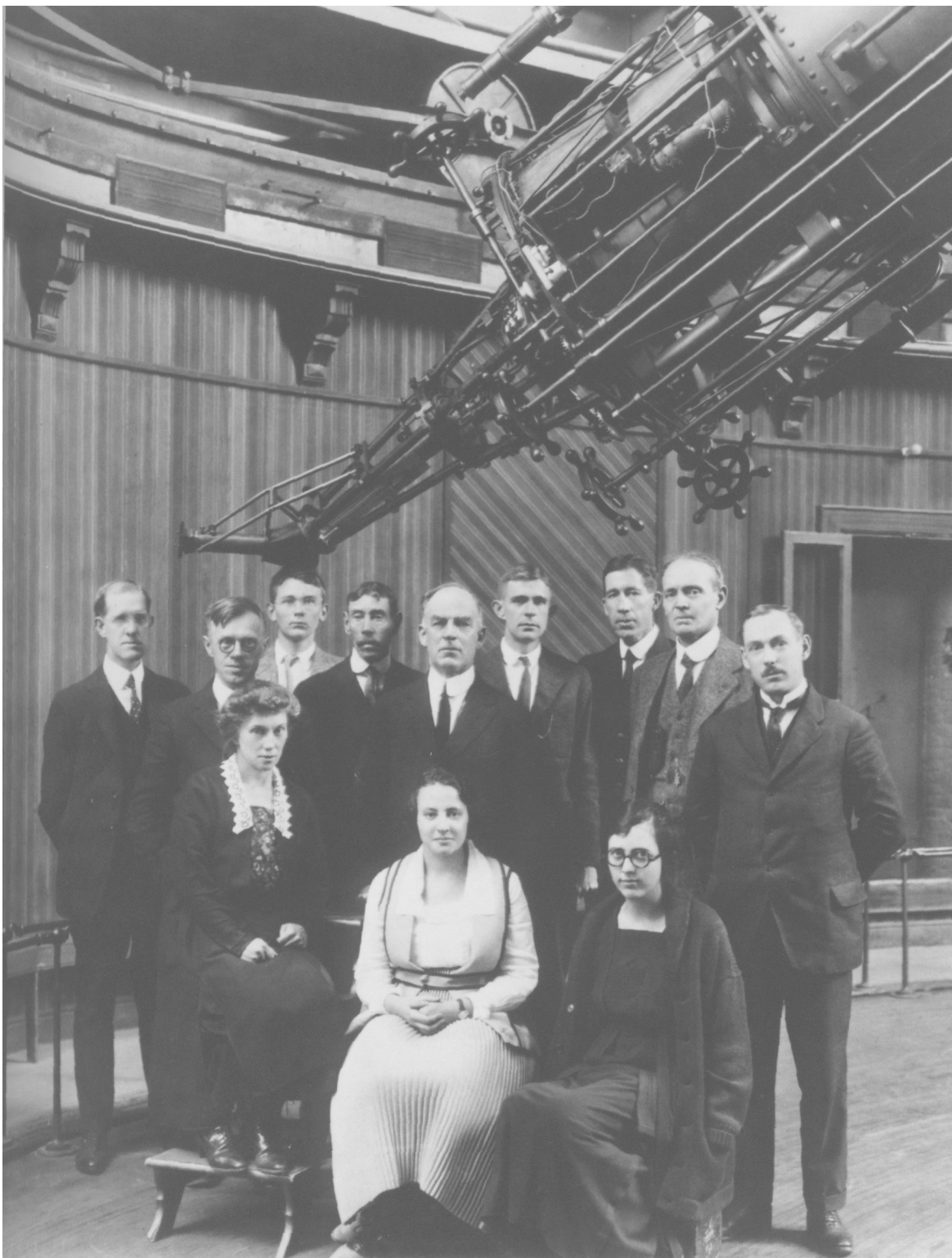
Dr. Shane: Yes. And Campbell was one of these people, in a sense I think. he was a little bit like some other people that you may know who don't believe too much in vacations. Sure, people could take a vacation all right, but he was a little grumpy about it; he really thought they were there to do astronomy, not to take vacations. And they used to say that while he appreciated Wright's very great ability and accomplishments, he still felt Wright didn't work quite hard enough. (Laughter) So that was a part of it. I don't know what else there was. Wright could be awfully unpleasant at times. It turned out that he and I got along all right and never had any quarrels, though we sometimes had differences of opinion, but if he didn't like a person, why he could be difficult. I remember there was, I think it was Pete van de Kamp, who came from Holland and is now Director or Director

Emeritus of the observatory at Swarthmore. Pete was quite a musician, played the violin beautifully and the piano beautifully, and Wright thought that was terribly effeminate; he didn't have any use for it.

(Laughter)

Calciano: That was just his judgment, and...

Dr. Shane: Yes, that was it. When I say van de Kamp, it is possible that it was another person, but van de Kamp will do for this purpose. (Laughter) So Wright was apt to be rather intolerant.



Lick Observatory, December 19, 1922  
Standing l. to r. - J.H. Moore, F.J. Neubauer, W.J. Luyten, R.H. Tucker, W.W. Campbell, R.H. Baker, W.H. Wright, R.G. Aitken, J.A. Pearce; seated - Amy G. Marshall, Mary Howe, Margaret E. Powell.

Robert Grant Aitken

Calciano: Now when Campbell took the Presidency of the University, he would not relinquish the Lick Directorship.

Dr. Shane: I believe the reason was that he was not sure he would want to remain as President, and the Lick Observatory was really his life.

Calciano: Aitken had to sort of be Director and not be Director, is this right?

Dr. Shane: Aitken was Associate Director, and I can't tell you just what the relations were. I think that Aitken handled all ordinary matters, but I just have a feeling that Campbell always retained the authority to overrule him, which is bad business; or perhaps he required consultation in certain matters.

Calciano: Yes.

Dr. Shane: But whether he ever overruled him or not, I don't know; probably Aitken consulted him on all important matters that he felt Campbell wanted to take an interest in. I never heard that there was any trouble. I think that Aitken felt rather hurt at really directing the Observatory and not having the title. Of course when Campbell retired from the University, then Aitken became Director.

Calciano: What about Aitken as Director?

Dr. Shane: I don't know too much about him. He was an awfully nice fellow. He was another of these double-star observers, and he did very little but double-star observing, but he was probably the greatest one of all time.

Calciano: What's the fascination of double stars?

Dr. Shane: Well, I don't know. I never had it, although when I was a student, sure it was nice to see how these observations were made. But the point is that if you get enough observations over a long enough time, you can calculate the orbital motions of the stars, and with some extra information you can determine the masses of the stars. And the natures of the orbits themselves are subjects of interest too, as bearing on the evolution of stars.

Calciano: Are double stars still studied, or is this a thing of the past?

Dr. Shane: Yes, yes, they're studied. Perhaps the greatest living double-star observer now is van den Bos down in South Africa with whom it was just a perfect passion. He's had a stroke now and is pretty much disabled, but long, long after he retired he was measuring double stars just as fast as he could, and he'd keep exact

count of the number of measures. We had a letter the other day from him; I think his total number was 71,000 measures, or something of the sort. I couldn't get that excited about it, but it's a useful thing scientifically, and we've learned a great deal from double star measures.

Calciano: Back when Burnham was doing it, was he doing the theoretical computation work?

Dr. Shane: No.

Calciano: He just found them?

Dr. Shane: He discovered them and he measured them, and he might have computed orbits, which is a fairly elementary thing.

Calciano: Once you learn the formula and technique you can do it without a lot of mathematical training?

Dr. Shane: Yes, yes, that's right.

Calciano: I see. So returning to Aitken, how did he rank as an astronomer?

Dr. Shane: Very high, Oh yes, very high.

Calciano: And how did you feel about him as a, well you said you didn't really know him as an administrator.

Dr. Shane: I was not on the mountain then. All I can say is this, that I think he took a somewhat narrow view of the



development of the Observatory. And one of the astronomers, Menzel, who was there during Aitken's regime told me a story the other day that I thought illustrated this point. Menzel didn't get along with Aitken at all, and it seemed that Menzel had a certain program of work, and he wanted to observe with the Crossley reflector. Well on a certain night when he was planning to work with it, it happened. that there was no one that night to work with the 36-inch refractor. Aitken was insistent that Menzel should work with the 36-inch refractor because the investment in that was much greater, so that if it lay idle it was much more costly than if the Crossley lay idle. Well of course that was a peculiar way of thinking.

Calciano: Yes, if you're already set up on one (laughter) and...

Dr. Shane: Well there wasn't anything that Menzel wanted to do with it! (Laughter) Well anyhow, he told me that story and, no, he didn't get along with Aitken very well.

Calciano: Was Tucker there under Aitken's regime, or had he retired by then?

Dr. Shane: Tucker retired in 1926 while Aitken was Associate Director.

Heber Doust Curtis

Calciano: When was Curtis there?

Dr. Shane: Curtis taught in the 1890's at the University of the Pacific in Santa Clara, and I think he early established some kind of a connection with the Lick Observatory. He came as assistant in 1902. The first I really know of Curtis is that after Wright was in Chile and established the D. O. Mills station down there in Santiago his successor in charge was Curtis. So Curtis was for several years in Chile, and then he came back to the Lick Observatory and he was, I think, succeeded by Moore in Chile, and Moore came back about 1913. The observatory there was only established in 1903, so it was a reasonably rapid turnover.

Calciano: But Curtis stayed on the mountain, didn't he, for a number of years?

Dr. Shane: Yes. Then Curtis was on the mountain until 1920. He undertook a program with the Crossley reflector. Now by that time the Crossley reflector had been remounted so it had a very, very much superior mounting. And I believe that new mounting was designed by Perrine. Although Perrine was not a trained astronomer, nor as far as I know a trained engineer, he did a fine job on the mounting. I'll talk more about Perrine later, but for now I'll just say that he had had this new

mounting built, and. Curtis went to work with it, and Curtis further improved the Crossley. He studied both the planetary nebulae and the spiral nebulae, and that's what he was doing when I was there as a student. He was taking all kinds of photographs and photographs of different exposures so that you could put the details, more detail, in a drawing made of several photographs than you could get from a single photograph, because on exposures long enough to show the faint parts of a nebula, the bright parts would be burned out and so on. So he was busily engaged in that and in work on the spiral nebulae. He was interested in such problems as the size of our galaxy and developed the opinion that spiral nebulae were other galaxies, and his work resulted in a great deal of information to support that view. His work on Mount Hamilton culminated with the famous Curtis-Shapley debate.

Calciano: Yes.

Dr. Shane: And...

Calciano: Who won?

Dr. Shane: Well...

Calciano: Neither one?

Dr. Shane: Of course they didn't have a referee. (Laughter) And what people have concluded is that Shapley's argument was the best, but that Curtis' conclusions were nearest right. (Laughter) So...

Calciano: In reference to this Curtis-Shapley thing, I wanted to ask you, was there much East-West rivalry among astronomers?

Dr. Shane: Oh there used to be some; I don't know. When I was a youngster there was a kind of a feeling that there was a clique of astronomers in the East who were running the American Astronomical Society, but I was never enough interested to pay much attention to it so I don't know. No, I suppose there was a certain amount of envy on the part of Eastern astronomers that we had better facilities out here, I don't know. But it was never much in my mind.

Calciano: Curtis was a good astronomer, then?

Dr. Shane: Oh, top-notch.

Calciano: Well now every...

Dr. Shane: But...

Calciano: But what?

Dr. Shane: Well then I will say that the culmination of his career was this Curtis-Shapley debate. And just about that time he received the offer to go to the Allegheny Observatory as Director, which he accepted, and that, I think, was the biggest mistake he ever made.

Calciano: Why?

Dr. Shane: Because it was an observatory that was somewhat run down, and I think he thought he could build it up. But he never could get the financial support to build it up. Furthermore he had always been interested in machine shop work, and he used to make a lot of his own instruments in the machine shop. He spent a large part of his time at Allegheny making instruments for the other astronomers in the machine shop. (Laughter)

Calciano: A high-priced technician! (Laughter)

Dr. Shane: Yes. And things didn't work out too well, so pretty soon he was given an opportunity to go to the University of Michigan with the partial promise of a very large reflecting telescope, but owing to the Depression that never came to anything. Shortly after he went to Allegheny he made a trip to Europe. While he was in Italy he contracted some kind of a bug that infected his thyroid, and when we saw him at Allegheny in 1923, he looked like a shadow of his former self.

Formerly he'd been a stout round fellow, quite overweight in fact, and then when we saw him again he looked all thin and drawn. I don't think he ever recovered his health completely.

Calciano: Shapley must have been a fairly young man at the time of this big debate.

Dr. Shane: Oh he was, yes, he was younger than Curtis. He was about thirty-five at that time.

Calciano: Every astronomer you've mentioned so far you say was a good astronomer. Were there some bad ones at Lick, or was Lick very lucky.

Dr. Shane: Well, if they weren't good they didn't keep them, that was all.

Calciano: They had enough prestige that they could boot out the bad ones?

Dr. Shane: Well let me just say I think they wouldn't get a foothold. That was, I'm just trying to think. I doubt if this fellow Colton was any kind of an astronomer, and of course Holden wasn't much of an astronomer.

Calciano: Yes.

Dr. Shane: Let's see, during the first World War, right afterwards, they brought in two men at the same time, Trumpler and Thiele, and Trumpler turned out to be a wonderfully good astronomer and Thiele was not

successful. But then he didn't last. He was appointed assistant astronomer, but then they didn't retain him.

Calciano: By not promoting him he got the idea he'd better go? Is that how it happened?

Dr. Shane: Well now I don't know. No. You see those appointments I think in those days were for three years, and they just probably didn't renew his.

Calciano: I see.

Charles Dillon Perrine

Calciano: You mentioned a fellow named Perrine?

Dr. Shane: Perrine had been an amateur. He was secretary at the Lick Observatory for a while. They used to have male secretaries there, at least a good deal. So he was secretary, but he got interested in astronomy and used to hunt for comets with a comet seeker they had, and he discovered a lot of comets and made quite a reputation for himself.

Calciano: When was this?

Dr. Shane: This was during Keeler's regime, and possibly before, I'm not too sure how long he was there. He made a reputation just because he found all these comets and

was an avid observer, but it didn't take any astronomical knowledge, particularly, to do that. He also made important contributions to the study of Nova Persei of 1901. And then I think that he, yes, when Keeler died, Campbell put Perrine in charge of the Crossley reflector. And I think there was another chap who thought he should have been put in charge of it and he left on that account. What was his name ... it'll come to me presently ... anyhow, he left. Perrine redesigned the telescope and had a new mounting built. It was a very, very good mounting for that time. It's a clumsy, awkward thing, but it's steady and...

Calciano: Well the thing that's there now, is that Perrine's?

Dr. Shane: Yes, that was it except that there have been some modifications. Oh, the fellow who left was Palmer, H. K. Palmer, who'd been Keeler's assistant. Palmer, by the way, I met after I was Director. At that time he was a sanitary engineer and had made that his career. Well anyhow, Perrine revamped the Crossley, and then he was offered the position as Director of an observatory in the Argentine, and he went there and continued there during the rest of his active career.

Calciano: This was Lick's other observatory?



Dr. Shane: No.

Calciano: This was another one?

Dr. Shane: This was an Argentine government observatory.

Calciano: I see. But he wasn't a trained astronomer.

Dr. Shane: Well I guess the Latins didn't know; they knew here was a fellow who had made a big splash and so they brought him down there. Now I'm not sure whether it was at La Plata or Cordoba (they had two observatories), but he continued there during his active career, and he finally retired and came back to this country. He lived in Alameda, and shortly after I became Director of the Lick Observatory I had a communication from him which was the first contact I'd ever had. But he just wrote to me as Director of the Observatory. He was always coming out with some kind of a theory that was unsound. He just didn't have the background.

Calciano: As you keep mentioning all these people that hunted comets and found x number of comets, I am reminded of the fact that about two or three years ago somebody in Japan spotted a comet and it hit the front pages all over.

Dr. Shane: Yes.

Calciano: Is that because almost all comets have been discovered, or was this just some newspaper guy blowing up something?

Dr. Shane: Oh, no. The only reason this hit the front pages was because it was the brightest comet in a generation.

Calciano: Oh, so it was worthy of...

Dr. Shane: Oh yes. I saw that one in Flagstaff right in full daylight up close to the sun, it was so bright.

Calciano: Oh!

Dr. Shane: Yes, I happened to be in Flagstaff at the time. Oh no, that was quite a comet.

Calciano: So people are still finding faint ones all the time, are they?

Dr. Shane: Oh yes, they find them, but they don't attract much popular attention.

Calciano: I see.

Robert Julius Trumpler

Calciano: Now what about Trumpler? When was he there?

Dr. Shane: Trumpler came during or towards the end of World War I. He'd been at the Allegheny Observatory and worked under Frank Schlesinger who was the Director at that

time, and then he came out to the Lick Observatory as an assistant. He was made assistant astronomer and continued through the ranks and was advanced up to the rank of astronomer and was there until the late 1930's, but he was unhappy on Mount Hamilton under Wright's directorship. He and Wright never got along at all, so he was willing to go to Berkeley and accept a professorship in the Berkeley department and was in the Berkeley department up until the time of his retirement.

Calciano: He had gotten along with Campbell though?

Dr. Shane: Yes, fine. And he had several very great accomplishments in astronomy. At the eclipse in Western Australia in 1922 he was responsible very largely for taking the photographs and measuring them in connection with the Einstein effect, the gravitational effect, the bending of light around the sun.

Calciano: Oh yes.

Dr. Shane: He did a superb job of that, and it was what I've always regarded as the first real confirmation of the theoretical prediction. Now in an eclipse in 1919 Eddington had gone to Brazil, I think it was, to observe the same effect, but they were plagued by clouds and all he could photograph was two stars, one

on either side of the sun, and it is to me completely inconceivable that, even though he got the right result, he deserved it. So Eddington usually gets the credit, but I think it was because of good luck, whereas Campbell and Trumpler did a superb job and sewed it up.

Calciano: Absolutely?

Dr. Shane: Yes. Now Trumpler worked with the Crossley reflector a great deal and also with the 36-inch. He was interested in clusters, star clusters, and from his work on star clusters he made the discovery of the reddening of light as it passes through dust in our galaxy. That is one of the things that is most greatly to his credit. It was a beautiful piece of work and he...

Calciano: Now this is different than the red shift?

Dr. Shane: Yes. This means that starlight coming through dust in our galaxy is reddened just as the sun is reddened at sunset because the blue light is scattered by the small dust particles. And he produced this evidence, not only of the reddening, but also of the absorption of the light.

Calciano: And what effect did this have on future astronomy? Were measurements of stars changed, or...

Dr. Shane: Oh yes, they have to make allowance for the absorption in interpreting many types of observations.

Calciano: So it was quite a good piece of original work.

Dr. Shane: Oh yes. And he made a great reputation; he was a member of the National Academy; he received all kinds of honors. He was one of the best astronomers they ever had. His widow is still living in Aptos. She's, I suppose, near 80. She traveled around the world a few years ago.

Calciano: And when did he retire?

Dr. Shane: Oh, he must have retired quite early in the '50's, and he died not long afterwards.

F. J. Neubauer and G. F. Paddock

Calciano: Now what other important astronomers have I missed in the period before Wright became Director?

Dr. Shane: Neubauer and Paddock were on the mountain during this period. Neubauer was an Austrian or ... well he'd come from Austria-Hungary, but he may have been born in Czechoslovakia, I'm not sure. And he was about ten years older than I was. He wasn't a great astronomer; he was a nice jolly fellow, and after he got his Ph.D. in Berkeley he went up to operate the international

latitude station at Ukiah. It's a very dull routine job. Finally when Campbell was having trouble getting people to go to Chile to operate the observatory there, he prevailed upon Neubauer to go, so Neubauer went down and operated it. He did it competently enough, but I think he'd had some kind of an agreement with Campbell that when his term was over, he would come back and have a position on the Lick staff. I think it was a mistake of Campbell's because Neubauer was not up to the professional standards of the other astronomers at Mount Hamilton. But anyhow, he was in Chile for a while and then finally when they no longer could raise funds to run the station, Neubauer was given the job of closing up and selling the observatory, which he did to the Catholic University. So then he came back and was at the Lick Observatory, but his work was disappointing. He was still there when I came as Director, but he was approaching the age of retirement and was slowing down. He had a program of the measurement of radial velocities of some early-type stars, but the work was not of high quality. Then he retired. His first wife died shortly after I went there in 1945, and then he remarried and lived at Pacific Grove. He married Dr. Margaret

Swigart, and in 1952 he died. Then there was a chap named Paddock who came from the University of Virginia and was a terribly queer chap. They had him as an assistant. He could do certain things very well. He could measure plates very accurately and was a good observer. He was sent to Chile for a while to run things down there.

Calciano: (Laughter) That seems to have been the great shifting ground for...

Dr. Shane: Yes, yes. They sent Paddock there before Neubauer. His performance down there didn't please Campbell at all, though in some ways I think Campbell was not quite just to him. I was told that after much delay for instrumental adjustments he obtained the best quality results that this instrument ever gave. But he didn't know how to run his own affairs, and he just took off and came back to the States one time without even letting the Director of the Lick Observatory know about it. Then he worked at Northwestern University for a while, and I think Aitken felt sorry for him and brought him back and made him an assistant astronomer. He was still there when I became Director of the Lick Observatory; he was an assistant astronomer but due to retire in two or three years. And so finally he

retired, but we had room on the mountain (he just loved it there) and I let him live there for a while until we no longer could afford the room, and I had to almost put him off the mountain by force.

Calciano: Oh dear.

Dr. Shane: Of course that broke his heart. He was terribly queer and yet an awfully nice and likable fellow. He was always doing things for people, and he was greatly imposed on by some nephew of his. He was a regular pack rat for making collections. He was always trying to sort out his possessions on the mountain, but he never did get finished, and finally after his death I communicated with his brother in Rhode Island. Well his brother said, "Do whatever you want with the things," so Mary and I went down and went over things. He had saved old magazines; he'd buy fruit by the box and he'd save the paper wrappings the fruit came in. (Laughter) And all his old letters and everything. Mary and I went through this material and opened up the old letters just to make sure there was nothing in them, and every once in a while we'd find a five dollar bill. We ran across several gold pieces.

Calciano: Good heavens!

Dr. Shane: All of the money I sent to his brother. The one thing



of his I kept was a little magnifying glass that he used to examine plates, and I still have that at home; I kept that to remember him by. Well anyhow, he was a queer one. He always was brushing his clothes.

Calciano: He sounds like a nut. (Laughter)

Dr. Shane: You remember, I think Kenneth Campbell told about our trip when he and Paddock and I came back from the back country. We had that terribly long day, and coming up the last grade Paddock was so tired that I was afraid he would collapse, and I said, "George, why don't you stop and rest?" and he said, "I'm afraid if I stop, I can't start again." We finally got to our rooms in the dormitory, and I went to bed about 2:30. I was so tired that I wasn't sleeping well, and when I woke about 4:00 I heard George still brushing his clothes in the next room.

Calciano: Before he went to bed?

Dr. Shane: Before he went to bed. (Laughter)

### The Time Service

Calciano: I have a couple of loose ends that I want to pick up concerning the earlier years. I notice you referred to

the fact that the Lick Observatory had to keep time, and I remember reading in articles that they used to send time signals to the California railroads and to San Jose...

Dr. Shane: That's right.

Calciano: Why? Was this because this was the only good place to get time from, or...

Dr. Shane: Well, I think it was the best place in California, and they didn't have the nationwide time services that they have now, so that was a public duty that the Lick Observatory assumed. I don't know whether they were paid for it or not.

Calciano: Was it very time consuming, or is it...

Dr. Shane: Oh it took a considerable fraction of the time of one person. I couldn't tell you just how thoroughly they did it. They didn't have to supply the time to the railroads closer than a second or two. But they did for their own purposes observe time, I suppose several times a week when the weather permitted, so they could keep their clocks much more accurately set.

Calciano: When did they discontinue this practice?

Dr. Shane: I don't know. It may have been when Western Union installed a time service. I know that it was fairly early that the time was distributed nationally over

Western Union, but thereafter the Lick Observatory still did keep their time service because they needed more accurate time than the Western Union supplied.

Calciano: I wonder what California did before Lick came. I mean, who...

Dr. Shane: Well there was an observatory in San Francisco, the Davidson Observatory, and I think they took time observations. I know that when I was a student in Berkeley, and for a number of years thereafter, we kept our clocks set by our own observations. It was perhaps as much an exercise as anything else, but we had a very good instrument and it was excellent training for students. Usually you could get time from the observatory clocks to one or two tenths of a second.

Calciano: You do this via the sun?

Dr. Shane: No, stars.

Calciano: This perhaps isn't too relevant; it's just that I'm curious. What is the difference between the standard time for this time zone and the actual time on Mount Hamilton?

Dr. Shane: To get the local time you have to subtract eight minutes and a fraction from standard time.

Calciano: I see.

The Academic Status of the Lick Astronomers

Calciano: Another thing that aroused my curiosity was when you mentioned the time that Wright was very upset with Campbell about the allotment of time on the 36-inch telescope. Somebody later commented that Campbell ought to have fired him right then, and you said, "I don't really know if he would have had the authority to." So I wondered, just where did the authority lie?

Dr. Shane: I don't know. I believe that at that time the authority to fire rested entirely with the President of the University, but he would probably have followed Campbell's recommendation. But shortly after that, about 1920, there was a reorganization in which the Academic Senate acquired much more authority and the policy of tenure in certain ranks was accepted by the Regents. I don't think that the Regents ever made the tenure actually legal so it could be made a matter of lawsuit, but I think they adopted it as a policy from which they never departed. But I think in cases -- now this is just my impression, and I may be entirely wrong -- but all the time I was with the University I had the feeling that the Regents could revoke the

tenure, and I never saw any document that indicated that they had bound themselves to it. It was simply a policy, and I think that it was a wise policy, but it did not bind them legally, although probably today the courts would consider the Regents legally bound in some respects.

Calciano: But if you get a fellow who just really goes off the deep end, you can dismiss him.

Dr. Shane: Well, even when you have it legally, there's a...

Calciano: You have a provision?

Dr. Shane: Yes, there's always a qualifying clause that a professor can be fired for cause. In fact I know one case in which an associate professor was dismissed. He had tenure, but he had lost interest completely in his work. His entire University activity consisted of meeting his classes and holding perhaps one office hour a week, and the rest of the time he was away pursuing his hobbies and doing other things. So the University did dismiss him. And I think there was never any row about it. In another case there was a man who seemed to be losing his grip; he was becoming erratic. Although he was a very smart man and a very hard worker in his department, he was becoming so erratic that he was getting pretty nearly impossible

to live with in the department. So what they did was to retire him well before the normal retirement age on what was at that time a fairly generous pension.

Calciano: Were these in science departments?

Dr. Shane: One was in engineering, one was in science. Your father no doubt knew the second one. He was in chemistry.

Calciano: Oh really. (Laughter) Now am I right in assuming that associate astronomers and full astronomers have tenure as do associate professors and full professors?

Dr. Shane: Yes, it's equivalent in every respect.

Calciano: And assistant astronomers would not?

Dr. Shane: Assistant astronomers would not, that's right.

Calciano: These titles of associate astronomer and astronomer, are they found in other university observatories across the country, or is this our own devising?

Dr. Shane: The title of astronomer I think is used in some places, but whether it carries the same implications as it does here or not I don't know. And of course the title of astronomer was only used in the Lick Observatory, not in the other departments, not in the Berkeley department. But it is used in the Lick Observatory because in the early days they did no teaching; they weren't, in a sense, professors, but

there was a special provision in the bylaws of the Academic Senate stating that astronomers were equivalent to professors as far as membership in the Senate, tenure, and so on was concerned.

Calciano: What will happen now that the Lick astronomers are beginning to assume teaching duties?

Dr. Shane: Well that I don't know. I don't think it makes very much difference. And I don't know whether they'd prefer to be called professors or astronomers. They had to make special provision for the rank of astronomer in the Senate bylaws because I think that they defined members of the Senate as certain persons engaged in instruction on the campus and a very few others. Now the astronomers did not engage in instruction, at least not formal instruction. They did have to do with the research of graduate students. So a special provision was made that they were members of the Senate with the same status as professors.

Calciano: Very good. Are there any other special...

Dr. Shane: The University librarians, for example.

Calciano: Yes.

Dr. Shane: And I think the Registrar is. There were a very few, and of course the President of the University.

LICK OBSERVATORY, 1935-1968

William Hammond Wright

Calciano: Now Wright was your predecessor.

Dr. Shane: No, Moore.

Calciano: Oh that's right. Wright was in the pre-war years, pre-World War II.

Dr. Shane: Yes. Well Wright was up to 1942, and Moore continued until '45.

Calciano: Well I have several questions about Wright. Perhaps first of all you'd just like to give your own comments on him without my...

Dr. Shane: Well, it's hard to dredge up something offhand. He was a very brilliant person, a man of somewhat strong personal prejudices. He was accused by Campbell of not working hard enough, but I think that accusation was not correct. I think that like a good many other scientific people, when he was apparently doing something else he was thinking of scientific matters, and probably some of his best ideas came out that way. That very frequently happens. The other day I had a little problem that I was anxious to solve, and I was a bit up against it, so I was reading some other book



and getting awfully sleepy and just about ready to go to sleep in my chair and suddenly the answer came to me. Just out of thin air. Well I mean that frequently happens. So you can't judge by how much apparent activity a scientist puts in just how hard he's working. Now I know that General Groves was terribly fussy at Los Alamos because some of the scientists didn't put in an eight-hour day. But he didn't know how much time they were spending when they were doing other things.

Calciano: Thinking.

Dr. Shane: Thinking about their problems.

Calciano: Well how was Wright as a director?

Dr. Shane: Well I think he was somewhat ... he had a one-track mind. He thought that most of the effort of the Observatory should go into this program with the 20-inch astrograph, and that was really what he visualized in the future would be the main work of the Observatory, and that, of course, was not popular with some of the other members. Furthermore he, as well as his predecessors, had had a tendency to make all their decisions by themselves, or perhaps in conference with one other person, and they very seldom took the

department into their confidence. And so the result was that there was a feeling both with him and with his predecessors that this was a one-man show, and they were the hired hands, you see.

Calciano: Yes. I recall you. about Aitken that you thought he took a very narrow view of the Observatory. What view was this?

Dr. Shane: Well I mentioned this incident with Menzel in which he felt that Menzel should use the 36-inch when it was available because there was a bigger investment in it, quite regardless of the importance of Menzel's immediate problem. I don't think he had a broad grasp of astronomy.

Calciano: In the early years he was, as you said, in the unfortunate position of being sort of a caretaker under Campbell.

Dr. Shane: That's right.

Calciano: But then he did have a go at it on his own.

Dr. Shane: Yes. He had a go at it on his own, and I would say that the Observatory got along, but without too much imagination. Now Moore, who succeeded Wright, I think he had a much broader point of view. Wright, I will say, had a tremendous scientific imagination, and he

thought up good problems, and he worked them through, but I think that as far as the planning for the Observatory went, he had a one-track mind, and it would have to go this way and no other.

Calciano: In the Helen Wright transcript you commented that Wright didn't want the 120-inch and even made an abortive attempt to kill the project. What's the story behind this?

Dr. Shane: Well the first ... well I'll go back to Campbell.

Calciano: All right.

Dr. Shane: After Campbell had retired he was interested in getting a large reflector for the Observatory, and I heard he worked on an article on large reflecting telescopes with the thought of perhaps stirring up some interest -- I'm not sure whether he published it or not -- but then the thing dragged on during Aitken's administration and then during Wright's administration. I might say that Wright did a fine thing in getting Wyse and Mayall and Kron on the staff. He got some awfully good men. And these young fellows were very anxious to get a large reflecting telescope, but Wright had this prejudice against large reflectors because he hadn't been happy with what he had got when he went to Mount Wilson and worked with

the 100-inch. He just didn't have any use for a large reflector, and as I say, he thought most of the work of the Observatory should center around this astrograph. But that didn't satisfy Kron and Mayall (I think it was Kron and Mayan; it could have been Mayan and Wyse) so the two of them went on their own and saw President Sproul and put before him the case for a large reflector. And that was what Sproul had in mind when he made arrangements right toward the end of the war to get money for a large reflector. By the time I came, Wright had retired and was living in San Jose. He didn't like the idea of a big reflector, and he called me up and said that he was inclined to write some letters opposing it, and did I object to that? Well I told him that it was perfectly within his rights to do it, and I could not offer any objection, but didn't agree with him. And that's the last I know. Whether he wrote the letters or not, I can't say.

Calciano: Well now this work he did on the 100-inch, did he get poor results because he had the wrong project for it, or bad weather, or is it not as good a telescope as it might be?

Dr. Shane: I can't tell you. Oh no, it's a fine telescope, and I think he should have ... he took the spectrograph that

he had used on the Crossley and had obtained such wonderful results with; he took that down and put it on the 100-inch with the idea of improving those results, and I think he was disappointed in the fact that the 100-inch was in some ways more difficult to work with; perhaps also he wasn't so used to it, and so he didn't think he got results that were much if any improvement on what he'd got with the Crossley. And from that time forward he felt that there was no need for larger telescopes.

Calciano: You mentioned something about him in reference to the Crossley ... I think it was if you aluminized it, it goes farther into the ultraviolet?

Dr. Shane: That's right, that's right.

Calciano: Did it also go farther into the infrared?

Dr. Shane: No. Just into the ultraviolet.

Calciano: Well the 100-inch would be aluminized, wouldn't it?

Dr. Shane: Oh yes.

Calciano: So he had hopes that this...

Dr. Shane: Now wait. I'm not sure whether the 100-inch was aluminized at that time or not. I don't think it was; I don't think it was at all. But even so there were lots of his results in the ordinary photographic

region that he could have improved on, that he would have hoped to improve on.

Joseph Haines Moore

Calciano: Well now Moore, in a sense, was the caretaker government during the war.

Dr. Shane: That's right. Because most of his staff were away.

Calciano: What happened to Lick during the war? I mean, what did it do?

Dr. Shane: Well they had a few astronomers there. Neubauer was there, and Paddock was there, and let me see ... oh yes, and of course they had a wonderful assistant, George Herbig, who is now an astronomer here on the staff, and then of course Moore himself, and I don't know that there was anyone else there except, as I say, some assistants. I really can't remember now who all was there.

Calciano: Was all the work just pure research work? There was no way that the work at Lick at that point could be applied to war science, was there?

Dr. Shane: No. Anyone who was engaged in war work went away someplace else. You see Wyse got involved in war work very early, and then he was killed in an accident. And Mayall and Kron, I think both of them worked at M.I.T.

on the radar project, and I think both of them worked at Inyokern on the rocket project.

Calciano: What type of a man was Moore?

Dr. Shane: Well he was a very friendly chap; he didn't have the brilliance of Wright. He had a greater, much greater, breadth of view than Wright did. He was much interested in students. He talked to them a great deal and was always very patient about his explanations. Perhaps it was more interest in the thing he was talking about than real patience. He just loved to talk about all kinds of astronomy and he didn't care who the audience was, and I felt they got a great deal from him. He wasn't, as I say, a man of tremendous imagination, but he had a very good grasp of astronomy, and he had this interest and enthusiasm.

Calciano: What was his particular field?

Dr. Shane: Spectroscopy. He came out originally to assist Campbell with the radial velocity work; he had taken his Ph.D. in physics, spectroscopy, under R. W. Wood at Johns Hopkins.

Calciano: Quite a number of people you've mentioned have had spectroscopy as their specialty. Did Lick have a higher proportion of people interested in that?

Dr. Shane: I think so, yes. That was due to Campbell's influence as well as to the times. In those days it was the most active field of astronomy.

Calciano: Was Moore of retirement age in '45?

Dr. Shane: Well he was an age when he could retire. He didn't have to, but he started to suffer from a bad heart, so he retired at the time I came.

C. D. Shane, Appointment as Director

Calciano: Had you had any inkling that you might be going back up on the mountain? When did you first get the overture?

Dr. Shane: It was in 1942. Sproul talked to me about Wright's retiring and wanted to know if I wanted to assume the Directorship. I'd heard rumors that they'd been writing around and I'd been considered, but I would say I wasn't too much excited about it; I was perfectly happy at Berkeley. So he asked me about it, and it was just at that time that I was getting involved in the Manhattan Project work, and I told him that I had this other matter and I felt during the war it was important to do that and suggested that he have Moore carry on during that time, which he did. Arid then when I came back after



the war, why he asked if I wanted to take over. I told him I would, but that if I didn't like the job I was going to feel free to pull out, and if he wasn't satisfied with my operation he need feel no embarrassment about asking me to.

Calciano: My goodness. (Laughter)

Dr. Shane: He seemed quite pleased with that proposal, and so that's the way it went. I had seen so much of people in corresponding jobs -- there was one, the head of one of the engineering departments once, who became a complete nonentity in his department. In fact he was a drag on it, and for years they were just waiting anxiously for the time when he should retire, and I didn't want such a situation to come about in my case. (Laughter)

Calciano: That's an interesting sidelight on your acceptance. Now I don't know whether I should ask you this or not, but I've asked you to assess the strengths and weaknesses of all your predecessors. Do you want to make any comments on your actions as Director?

Dr. Shane: No, I don't think so. I would say the one thing was that I did consult with the department very freely on all matters of Observatory policy, and that pleased them. I think it was responsible for a considerable

part of the good feeling that existed in the staff,  
but I think that's about all I want to say in the  
matter. (Laughter)

Calciano: Okay.

#### The Size of the Lick Staff

Calciano: Now Lick has stayed relatively small in staff number  
compared to some of the other major observatories,  
hasn't it?

Dr. Shane: That's right.

Calciano: Now this must have been part of your policy... Or was  
it...

Dr. Shane: Well, I never tried to make a case for a very large  
staff. I thought that we should have a very good  
staff; that it should be in proportion to the use that  
could be made of the telescopes; that we ought to have  
assistants in about the number of one to an  
astronomer.

Calciano: Is it that way at other observatories?

Dr. Shane: Oh in some observatories they have all kinds of  
people. For example, I think that at some observa-  
tories, some rather lush observatories, they have  
perhaps one secretary to each one of the astronomers

and things like that. I think that Harvard goes rather overboard in that respect. I've never been able to see that the output of such observatories was any better than those that operated on a more economical basis. Another thing, of course, I always had the feeling that it was not desirable for an observatory to get too large, because you're apt to run into this problem that when you want to get a new director for an observatory you want to get a good scientist, and if he's to be a good scientist he wants to be interested in research and able to do it. And if he has to take over such an overgrown institution that he has to spend all his time administering it, he's very apt to turn it down, because usually the first thing he asks is, "How much time will I have for research?" And if it's a bloated institution you just have to tell him, "You're not going to have any time." So then you're going to get as Director, perhaps, a person whose interest is more in administration than in science.

Calciano: Right.

Dr. Shane: So I always felt that there was a disadvantage in becoming too large.

Allotting Time on the Telescopes

Calciano: Since Lick was in effect attached to a number of campuses, two of which had astronomy departments, UCLA and...

Dr. Shane: Well it wasn't attached to any other campus.

Calciano: Well not attached, but part of the overall...

Dr. Shane: That's right.

Calciano: Maybe I'm phrasing it wrong. What I was getting at was did you have more demand on the available time on your telescopes from the people within the University of California group as well as outside astronomers than perhaps some of the other big observatories would have?

Dr. Shane: We had almost no demand from elsewhere in the University for time on the telescopes except for graduate students who were doing their thesis problems. As to the faculty, there was very little use of our telescopes.

Calciano: So that was not a factor in keeping Lick small?

Dr. Shane: No.

Calciano: Okay.

Dr. Shane: No. But let me say that Dan Popper from UCLA came and worked some. There was a very little bit on the part of someone from Berkeley, but it was practically

negligible, although I was very anxious that these other departments should use the instruments.

Calciano: How did you determine who should have time on the telescopes?



C.D. Shane  
At his desk in the Director's office  
Of the Lick Observatory, 1946

Dr. Shane: We really didn't have any problems; we didn't have a 120-inch to worry about; we did have the other telescopes.

Calciano: Well with people coming from Russia or Holland or...

Dr. Shane: Oh yes. Well I'd always talk it over with the department, and we didn't have too many people at that time who came and observed with our smaller instruments. But I think there was never any problem. The demands weren't too great, and the only disputes might have been between members of the staff themselves. And what they always did was this: I would assign one person to program the time, say, on the Crossley reflector, and the program was put up a week in advance. So once a week all the members of the staff who were interested in time on the Crossley would meet together under the chairmanship of this individual, and they would thrash it out and compose what differences they had and would present their requests and the reasons for them and it would be worked out. I never heard of any trouble.

Calciano: Very smart. You didn't get any of the abuse that way.  
(Laughter)

Dr. Shane: Well there just wasn't that much of a problem. Now just as soon as they got the 120-inch, which was after

I was no longer Director, then there was a tremendous demand on the part of all the other astronomy departments, and the demand was so great, and they placed such arguments before the administration in Berkeley, that the Lick astronomers were in great danger of being almost squeezed out of the use of the 120-inch. It resulted in a tremendous amount of hard feeling. I think it came very close to wrecking the Observatory. But I think they found the solution when they decided to come down here.

Calciano: You mentioned the pair of Burbidges in San Diego?

Dr. Shane: Yes, they were ... yes, the Burbidges and a number of the people from Berkeley whom I can't pinpoint quite so closely; the people from Los Angeles went along to some extent, but not so much. They still wanted their time on the 120-inch, Aller particularly, but I don't think that he took such a hostile attitude towards the Observatory as did some of the others.

Calciano: Well what had these people been doing before the 120-inch came?

Dr. Shane: Well Aller hadn't been at UCLA. I think one reason he came to UCLA was because they told him there that they'd get him time on the 120-inch, and that was what the various departments did. They recruited people



with the understanding that they could have time on the 120-inch.

Calciano: So that's why the pressure built up all...

Dr. Shane: That's one reason.

Calciano: Aside from the fact that it was a beautiful research tool.

Dr. Shane: Yes.

Calciano: Well now, all through its history Lick has made its facilities available to astronomers from other universities.

Dr. Shane: That's right.

Calciano: To a greater or lesser extent than other observatories do?

Dr. Shane: Oh I think comparable.

Calciano: Well now what happened to them in this internecine fight about letting everybody in?

Dr. Shane: Well of course now there isn't very much time on the 120-inch for outside astronomers. It's rather interesting, however, that though the Lick astronomers make and have made a tremendous amount of use of the smaller instruments, it's the rarest thing in the world for any of the outsiders to want them. They apparently are unable to do any astronomy unless they

have one of the biggest telescopes in the world. Now it seems to me that reflects a certain lack of imagination.

Calciano: True. I guess there's always the lure, the glamour of a new tool.

Dr. Shane: Oh yes.

Calciano: You feel that the 36-inch and the astrograph are not outmoded in today's astronomical world at all? Dr. Shane: Not at all. No.

Calciano: If you devise the right program, or...

Dr. Shane: That's right. Now Vasilevskis is making use of both of them, and it is extraordinarily good use. I think that some of the most important work in the Observatory is going to come out of those two telescopes -- work that is quite comparable in ultimate importance with the work that's coming out of the 120-inch.. And I think that an astronomer who had the same sort of interest as Vasilevskis could do a tremendous amount with those telescopes, and they would be available.

Calciano: Yes, it would behoove a bright young man to tailor his work that way.

Dr. Shane: Sure. Well they have brought Klemola here as a co-worker with Vasilevskis, and I hope it works out. I think it will and that he will succeed Vasilevskis

when he retires and continue the work, because this work of Vasilevskis is something that doesn't produce flashy results in a short time, but it produces results of fundamental importance over a long period of time.

Calciano: Is it the type of work that would ever raise one to National Academy stature, or...

Dr. Shane: It should. Certainly. By all means.

Calciano: So you don't have to go to the 120-inch to produce something...

Dr. Shane: No, no. My goodness no.

Changes in the Administrative Status of the Lick  
Observatory, 1958 - 1968

Calciano: I remember you commenting that all during the Sproul period the Lick Observatory got what money it needed when it asked. I think you also said that you always tailored your requests so that they were realistic; you didn't inflate them in anticipation of parts getting chopped out.

Dr. Shane: No.

Calciano: Did your predecessors have much trouble getting money?

Dr. Shane: Well I know that all during Sproul's administration he

was favorable to the Lick Observatory. And I can't remember now whether they had trouble getting the funds that they wanted or not. I think their requests were always pretty modest.

Calciano: And what was Clark Kerr's attitude towards the Observatory?

Dr. Shane: Well of course I retired as Director at the same time that he came in, but I can say that Kerr had a scientific advisor, Robert Brode, in physics, and Kerr asked Brode to advise him as to the future of the Lick Observatory; and though I like Bob Brode very much personally, I think he lacked a broad administrative approach. He looked at the problem in a rather mechanical fashion, and he said, "The University has all of these astronomy departments who should have access to the facilities of the Lick Observatory. They're the ones who do the teaching. Teaching is the function of the University. The Lick Observatory should really be maintained for their benefit. We shouldn't have the staff, the large staff, they have at the Lick Observatory." He thought it was large. He thought that the staff should be cut to about four people who would keep the instruments in order.

Calciano: Caretakers?

Dr. Shane: Yes, sort of caretakers, to make them available for others. Well we had a big battle over that. I tried to help Whitford out in this matter, and whether my efforts were any good or not I don't know, but Brode's plans were not adopted. But the attack from the other departments on the Lick Observatory continued. One thing they proposed was that there should be a staff of the Lick Observatory consisting of people who held simultaneous appointments in the other departments. The staff of the Lick Observatory should be composed of people who would be, say, part-time Lick and part-time Berkeley, or part-time Lick and part-time Los Angeles, and so on. Well that, in my mind, was one of the most foolish proposals I'd ever heard because each man then would have two superiors, so to speak, to whom he should report. But it was to meet such proposals as that, that the department, and I think very wisely, determined on requesting the move to Santa Cruz where they would have the protection of a separate campus. Now I don't know-whether I said or not that during my administration the Lick Observatory was a campus of the University, and had all of the authority that any other campus had. This seemed to be a somewhat anomalous situation because we were so

microscopic compared to the others, and it didn't look very good on a...

Calciano: Organization chart? (Laughter)

Dr. Shane: Yes, on an organization chart. But I think Sproul was entirely satisfied with it, and I certainly know that I was.

Calciano: Yes.

Dr. Shane: Because I could go directly to Sproul and talk to him, and he was friendly and everything was fine. But during my last year -- have I ever said this before?

Calciano: Well you said part of this in the Wright interview.

Dr. Shane: I see. Well shall I repeat it?

Calciano: To a certain extent because I'm going to ask a question relating to it, so go on.

Dr. Shane: So I went to Sproul, or he called me in, and he said that the Budget Office had proposed that the Lick Observatory be made responsible to the Berkeley campus. I told him that I didn't think that made any sense. That in its present status we got along very well; we were not any trouble to him because he never had to pay any attention to us except at budget time, and that was very simple, and he paid no more attention to us than he did to some of the larger departments on individual campuses. But I said in

particular that I thought it was unwise to make the change at that time because one argument I'd used in selling the job of Director to Whitford was that he would be the head of a separate campus, and it would not be fair to switch signals then -- that certainly he should be here and have a chance to answer the arguments, and that was done. The decision was put off until after he came, and then they did make the change. He was left in some kind of a position that I'm not quite sure about, but instead of reporting directly to the President, he reported to the General Vice--President, Wellman. And after a while it was changed again so he was reporting in some way to the Berkeley campus. And then pretty soon he was reporting, as I understood it, to the Dean of Letters and Science on the Berkeley campus. In other words, it looked to me as though it was just one step down after another. And of course I'm sure that that wasn't too pleasing to him. And I know that if I had been in his place, I would not have continued as Director under such circumstances. But..

Calciano: Why do you think he stuck with it?

Dr. Shane: Well he's a very determined and stubborn person, and I think that's one of his characteristics. He's a little bit like a bulldog; he'll grab hold and never let go.

Calciano: That would be a characteristic that would make me wonder whether there's as much harmony in the department as there was in the years before then.

Dr. Shane: Well, people have said there isn't, but my relations with him have not been close by any means since that time, so I'm not in a position to comment.

Calciano: You don't care to make . . . Well, is he a good astronomer?

Dr. Shane: Yes, he's top-notch as an astronomer. No question about that.

Calciano: But you don't want to comment on...

Dr. Shane: No.

Calciano: Okay. Well now, I gather that two of the reasons for the transfer to Santa Cruz were this pressure from all of the campuses and this "demotion" of the status?

Dr. Shane: That's right.

Calciano: Any others? Mountain-top living getting to anybody, or...

Dr. Shane: I don't think so. There was some little dissatisfaction, but after all I always felt that most of the people who lived on the mountain were very well satisfied. And what happened was -- at least in the case of the non-academic people --- if they didn't like living on the mountain they didn't stay any



length of time, and they'd be replaced by someone who did like it. And so finally we had a group living up there who, I think, were very fond of the place, and that was just because there'd been a weeding out of the others.

Calciano: Yes. Natural selection. (Laughter)

#### Lick at Santa Cruz

Calciano: Well, now you commented in the Wright transcript (and naturally my curiosity was aroused) that once the decision to come to Santa Cruz had been made there was some foot-dragging, a considerable amount. McHenry had sort of put the pressure on a little bit to make them move. Would you amplify? Because as it stands now anybody can interpret it any way they want. I think perhaps a clearer record might be better.

Dr. Shane: I was told by one of the astronomers that at the time they made the proposal to move to Santa Cruz that they expected it to be turned down. They framed the proposal in such a fashion that they thought it would be turned down. When it was snapped up promptly by Kerr, it was quite a disappointment to them. Now what was back of all this, I don't know. I think they thought it was some smart political move. I say I was told this by one member of the department, and that's my only source of information, and so it could be entirely wrong. And then

I think they were quite reluctant to come.

Calciano: Was it Whitford, or all of the astronomers, that decided to make this offer?

Dr. Shane: Well, it was decided in a department meeting and I'm sure that at least the great majority wanted it.

Calciano: Wanted to try the move? To present it, I mean?

Dr. Shane: I'm not sure. If it is found that the proposal was signed by all members, it does not mean that all members agreed, because Whitford was always a great person to insist on unanimity, and I was told in one case, whether this was the case or not, he told one of the astronomers, "Well, even though you don't agree with it, it's going to go through, and you might as well sign it so as to go along with the rest of the department." So I'm not at all sure whether there was complete unanimity in the matter.

Calciano: But you don't have the feeling that it was an idea that Whitford imposed on the others?

Dr. Shane: I don't know who proposed it. All I know is that when I was told about it afterwards, I was very much pleased that the proposal had been made. I didn't know any of these qualifying circumstances, but I thought it was the real answer.

Calciano: Well this is what I'd gotten from your other comments—that it really was the best way out of a bad situation. So then I wonder, why was there the foot-dragging?

Dr. Shane: I can't tell you. I don't know.

Calciano: What is the mood of the astronomers now?

Dr. Shane: Well, of course, there's a lot of unhappiness now because of the budget situation. You see they claim, and I don't know whether this is true or not, but they claim that a lot of promises were made to them when they came down that the University has not fulfilled. Now..

Calciano: Promises by Santa Cruz, or by the overall University?

Dr. Shane: No, by Santa Cruz. And these promises have not been fulfilled, and so they're very much upset over this. But the relations with the administration here are not good; there's a lot of hostility. Now of course I don't know what the administration told them, but I do know that the administration could not have foreseen these budget cuts. But whether they are made..

Calciano: You mean the Reagan budget cuts?

Dr. Shane: Yes, that's right.

Calciano: Right.

Dr. Shane: Whether the administration made them unqualified promises, I don't know. If they did, it was a mistake because I don't think you should ever make unqualified promises because you can't predict everything.

Calciano: Not in *this* world. (Laughter)

Dr. Shane: And I know that when I was at Los Alamos I succeeded a man who had got himself into a lot of trouble because he had made promises to so many people and then the army

would turn him down on these things, and he became unpopular all around. And so when I went there, I had an understanding with myself that I would never make a promise to anybody. All I would do would be to tell them I'd do the best I could. And I adhered to that throughout the entire time, so that nobody could come back and say, "You promised me this." And it worked out much better.

Calciano: Yes.

Dr. Shane: But as I say, I don't know whether these were qualified or unqualified promises. I'm sure that they have interpreted them as having been unqualified promises.

#### Funding for the Lick Observatory

Calciano: Now that the Observatory has been transferred to our campus, does the money for actually running the equipment up on the mountain also channel through the Santa Cruz campus?

Dr. Shane: Yes. At least I suppose so, but I can't be sure.

Calciano: With all the recent budget cuts, can you tell me where the cuts have occurred at Lick? Has it been in personnel, or new equipment? I mean is there any

particular source of grievance?

Dr. Shane: I can't tell you, except that I do think that the staff have had some slightly enlarged ideas about assistants and instrumental support and things of that sort, because they've lived in some pretty lush times and been able to get just about what they wanted, and now all of a sudden when they have to cut back, they take it pretty hard. But I can't tell you where the budget cuts are. I think that one thing they may have had to cut was in the hiring of assistants, but I'm not sure of that. And probably there is not so much money for instrumentation. Of course there's the unhappiness, too, that money for instrumentation is harder to get from government sources now too, and they've got a good deal of that in the past.

Calciano: I was going to ask that. The Vietnam war is making this cutback?

Dr. Shane: That's right. Yes.

Calciano: But...

Dr. Shane: And the Great Society. (Laughter) Combined.

Calciano: Well the 120-inch was funded out of State funds mainly, right?

Dr. Shane: Entirely.

Calciano: Well now what significant things did Lick get from federal money?

Dr. Shane: Well they got the big automatic measuring engine of Vasilevskis's; that's National Science.

Calciano: Big measuring what?

Dr. Shane: Measuring engine. A machine for measuring photographic plates. I think that that was \$300,000. And then the individual astronomers have got federal funds, I think mostly from the National Science Foundation, for various pieces of apparatus -- photometers, for example; George Preston got a very elaborate machine for measuring spectrograms.

Calciano: Were there any research grants that paid people's salaries?

Dr. Shane: Some paid the salaries of assistants. Kron's work was almost entirely supported by funds from the Office of Naval Research, I believe, and he was able to employ an assistant to help him; and Walker has had some federal money to hire an assistant.

Calciano: I was wondering if the Observatory generated any income at all? For instance, when other astronomers come from other places to use the instruments, is there an exchange of money, or...

Dr. Shane: No.

Calciano: Is that goodwill?

Dr. Shane: That's goodwill.

Calciano: Then this is just an international policy?

Dr. Shane: Generally, yes. There are some observatories that do charge for observing time. The MacDonald Observatory.

Calciano: Where's that?

Dr. Shane: It's in Texas.

Calciano: Oh. Is that going to be the coming thing, or not?

Dr. Shane: I don't know. I doubt it. I think that in their case the University of Texas at the time that policy was started didn't have an astronomy department of their own, and they, together with Yerkes, were putting a good deal of money into maintaining the observatory. As they didn't have the astronomers themselves to use it (it was used partly by Yerkes and partly by outsiders), they were reimbursed on the basis of so much a night. That was all right because for a department in some Eastern university that did not have a good climate and for which it wasn't worthwhile to put an investment into a big observatory, well they should be perfectly willing to rent the use of the facilities; it might be even

cheaper for them.

Calciano: Well that's why I'm intrigued that none of these Western observatories have charged for the time -- you rent time on computers...

Dr. Shane: Yes.

Calciano: ...because you don't want to buy a million-dollar computer, so why...

Dr. Shane: Well in the first place, as far as the Lick Observatory and the 120-inch telescope are concerned, there isn't any time to rent because it's all demanded by departments in the University. Of course I have thought that it might be a good idea to rent time on the 120-inch to the departments within the University. In other words, they would be given a certain portion of the budget from which they could rent time on the 120-inch, and that would reduce the budget of the Lick Observatory correspondingly. Well one thing is I think that the departments would look a little more closely at their demands if they were going to have to pay for the time. I may be wrong, but...

Calciano: As it stands now Whitford just decides? Or does a committee decide?

Dr. Shane: I don't know how it's operated. Of course I think



Whitford has the last word, but to what extent he relies on advisors I don't know. Let me say that Whitford takes what I regard as a somewhat feverish attitude towards astronomy. As a matter of fact one of his favorite expressions is that he feels the astronomers should have a "burning interest," and that nothing should stand in the way of pursuing the work. I think he may have suffered from that point of view because there's a tendency to neglect human relationships when you look at it that way. You're more apt to have disputes and differences originate in the department. if everybody has a feverish desire to get ahead, and they may quarrel over facilities and over this and that. They're apt to neglect the social contacts which tend to smooth things. Now there are several astronomers who have that same attitude, and I think the department has lost something in internal relations through. that sort of thing. Each one of these astronomers is absolutely top-notch, and he turns out a tremendous amount of excellent work, but I'm not at all sure that they wouldn't turn out on the whole just as much or perhaps more if they took things a little more smoothly.

Radio Astronomy

Calciano: What effect has radio astronomy had on optical astronomy, and what about plans as far as Lick is concerned?

Dr. Shane: Well Lick has never done anything to speak of in radio astronomy until quite recently.

Calciano: Kinman?

Dr. Shane: Kinman in connection with the quasar business. You see Kinman's been in on the optical side of quasars which were discovered, at least in part, by radio astronomy. Now an astronomer named Bolton is here from Australia who's one of the world's leading radio astronomers, and he has been doing some things in optical astronomy that supplement his work in radio astronomy, and I think that's a very good thing. I have been much disappointed that there was no contact between the Lick Observatory and the Radio Astronomy Laboratory of the University that's under Weaver's direction.

Calciano: Where's that?

Dr. Shane: That's at Hat Creek up near Mount Lassen.

Calciano: And there isn't any...

Dr. Shane: No, there's no contact at all.

Calciano: Well what does somebody like Kinman do? Negotiate with

radio observatories?

Dr. Shane: No. He doesn't do any radio astronomy.

Calciano: Oh, he doesn't do any?

Dr. Shane: He observes optically these objects that have been discovered by radio astronomy. He works on the interpretation of the radio astronomy observations and his optical observations combined, that's all. But he doesn't do the radio astronomy.

Calciano: What does he do, spectroscopy or...

Dr. Shane: Yes, that's right. Spectroscopy and photometry.

Calciano: I see.

Dr. Shane: He has discovered, for example, the very rapid variations of some of these objects. There are variations which, in view of the supposed size of the objects, are almost incredible and leave some very big puzzles to be solved ultimately. No, he's a leader in that field. The work that Bolton's been doing -- I was talking to him about it yesterday -- has to do with the much more accurate determination of the positions of some of these radio sources. The determinations are being made down in the Owens Valley at Caltech's big interferometer radio station, but the measures have to be calibrated by some photographic optical

observations which he's been doing here.

Calciano: Now am. I interpreting this correctly or not --  
optical and radio astronomers have to work hand in  
hand on producing results, but generally one man  
handles the optical and another man concentrates on  
the radio.

Dr. Shane: That's right.

Calciano: You don't have one fellow running around doing it all?

Dr. Shane: No, that's generally right. Because the techniques are  
entirely different. Indeed I think it would be  
wasteful, but if you can get two of them working  
together it's good, it's a fine thing. Now there are  
probably some instances in which optical astronomers  
also work in radio astronomy, but in general they're  
working in one or the other.

Calciano: Well now I would assume that a fellow like Kinman,  
who's working on an optical aspect, would have to be  
in very close communication with his counterparts in  
radio astronomy?

Dr. Shane: Oh yes. I presume they are.

Calciano: Yes. They don't wait for published articles to appear.

Dr. Shane: Oh no, they write back and forth.

Calciano: And is that also the only type of relationship that exists between the two University Observatories?

Dr. Shane: It would be, except that I don't think that there's any of that communication between the Lick Observatory and the Hat Creek station. But perhaps the types of problems that they are working on are of such a nature that there would be no occasion to. Hat Creek may be working on problems that could not be supplemented optically by anything that the people here are doing, so...

Calciano: What's going to be the long-range impact of radio astronomy on optical astronomy?

Dr. Shane: Well, the two will just work hand in hand.

Calciano: You don't feel that the one will ever be perfected to the point where it'll tend to relegate...

Dr. Shane: Oh, no. They'll both always be useful.

Calciano: But Lick itself has no plans to set up any radio type...

Dr. Shane: No, that's right. And I don't think they should. I think they should cooperate with the radio astronomers, but not set up the observational facilities themselves.

Calciano: One other question. The balance at Lick over the years

between research and instruction -- now in the earlier years it was sort of 90 percent research to 10 percent instruction roughly...

Dr. Shane: Yes, I would say so.

Calciano: What is it going to be now, do you think?

Dr. Shane: I don't know. I would think it will probably come much closer to 50-50, but by that I include the work with graduate students.

Calciano: Yes, definitely. That was almost the only type of instruction they dealt with before.

Dr. Shane: That's right. That was all. And it is nearly all now. I think that some of the staff give lectures in undergraduate courses, but not very many.

#### Proposals for Other Lick Observing Stations

Calciano: Now you told me that I should be sure to ask, and I certainly want to, about an opportunity that Lick had to get an observatory in Hawaii.

Dr. Shane: Well again this is entirely hearsay, but I have it from two of the astronomers that NASA or the Air Force wanted to set up a planetary observatory, and Hawaii

was at least talked about at the time. There was a suggestion that the Lick Observatory might operate it, but when it came up in a department meeting, the department, without scarcely discussing it, turned down the suggestion. I think they were thinking in terms of something like a 60- or 80-inch telescope. Now I'm not quite sure what the arguments were because it was said there was almost no discussion. I think one or two of these people, the ones who talked to me, wanted to argue for it, but they were pretty well squelched. Now it's being built on Mauna Kea at an elevation of almost 14,000 feet. which will be, I think, the highest observatory in the world. It will have an 88-inch telescope, and apparently it's under the University of Hawaii. They have a good Director there; his name is Jefferies; he's an Englishman, I believe, and they're going ahead in a very lively fashion. I don't know whether the Lick people now think they missed an opportunity; I never talked with them about it.

Calciano: I gather that you feel that they did, though?

Dr. Shane: I think they should at least have given the thing some consideration. Now this doesn't mean that they were offered the opportunity; they were asked if they were

interested.

Calciano: They cut out at that point?

Dr. Shane: Yes.

Calciano: Planetary -- does that mean it's just going to observe the nine planets?

Dr. Shane: Well no, it was built primarily for that, but it could be used for other things too. I think that NASA or the Air Force wanted a certain amount of the program devoted to the observation of planets, but how much I don't know. Now I try to qualify when these things are hearsay.

Calciano: It goes in the record that way and I appreciate it.

Dr. Shane: If this is ever to be made use of, it should be verified by someone else.

Calciano: Right. Well I'm ready now to move on to some of the other things not directly related to Lick, but before we do that, is there anything else you feel ought to be said about the Observatory?

Dr. Shane: No, I don't think so.

Calciano: Are there any plans for expansion or change that you know of?

Dr. Shane: Well of course they are always anxious to get a large



southern telescope, and you know they thought they had it in their grasp and then they lost it.

Calciano: What was this?

Dr. Shane: Well you see they wanted a telescope of about 150-inches to be located in the southern hemisphere, and in 1966 when I was in Australia, I was told by the astronomers there that it was practically settled that Lick and Australia should own and operate such a telescope jointly in Australia, and I think it was announced in the papers there. Shortly after I got back the thing collapsed completely. The American side was to have been supported by NASA, and NASA withdrew. Now one reason that was suggested was that England objected to this kind of a partnership with the Australian government. The other was that NASA was starting to feel the pinch on funds. Anyhow England did go in with Australia, and now they're going to do it together, you see, and Lick is out. But Lick thought it was settled and Australia felt the same way. I think Australia would have much rather worked with Lick than with the English, because Lick has much more experience in these matters than the English do. But anyhow, that's the way it worked out, so they were left high and dry. It was a big disappointment. I'm

sure that they would be terribly anxious for another opportunity. Now the other thing is, of course, that the Mount Hamilton site is being seriously damaged by the proximity of San Jose and the lights in the Santa Clara Valley, as well as smog, and they're very anxious to have another observing site. And that's the one on Junipero Serra Peak which they have investigated and found to be an excellent site. I think there are some negotiations under way now to acquire it -- at least to acquire the use of some of the property there, but they are again stalled on account of finances in the matter of getting any instruments to put there. However, I'm sure that will come in time.

Calciano: If the lighting situation around Mount Hamilton gets serious enough, is there any possibility that an instrument as big as the 120-inch could be moved to another site, or is it there forever?

Dr. Shane: No, they couldn't move it. But the point is there is a lot of work that can be done with it that isn't bothered by the lights, so if things got terribly bad, they would simply confine its work to high dispersion spectroscopy, say, or something equivalent, that's just not bothered by city lights.

ADVISORY WORK DONE BY C. D. SHANE, 1935-1968

The Establishment of the Department of Statistics at  
Berkeley

Calciano: Well now we'll shift mental gears here. There were several things that you told me should have been included in the Wright transcript, and of course I want to get them in. One of them was that there's a story concerning the appointment of Professor Neyman as professor of statistics and the organization of the statistics department at Berkeley.

Dr. Shane: It was when I was on the Budget Committee in Berkeley which was between the years 1937 and '41. We used to go over the offerings of the departments in the interest of a study of the budget, and one thing that we noticed was that there was a great multiplicity of courses in statistics. We counted them up and we found that there were fourteen courses in statistics given in different departments of the University. Forestry had a course, and education did, and economics, and so on. Each of them, except for the one in the math department, was on a most elementary basis, not even requiring second year high school algebra. Well we thought that this was a terrible waste, and also that

it was not putting the subject on a proper level, so we proposed to the University that they employ a statistician, make him a professor in the mathematics department, have him give courses in statistics that rested on an adequate mathematical foundation, and at the same time make some courses of sufficient practical value that they could attract people from other departments.

Calciano: But you didn't feel there was any need for the low-level statistics course?

Dr. Shane: We thought the low-level courses should be better than those currently offered.

Calciano: Yes, but you said they were to offer ones that required a higher level of math.

Dr. Shane: Well we felt that no course in statistics could really be worth anything if it didn't require at least two years of high school algebra. Otherwise it was just...

Calciano: Pablum? (Laughter)

Dr. Shane: It was just playing with numbers.

Calciano: Okay.

Dr. Shane: So anyhow, we proposed this and the idea was accepted by the President, and he appointed a committee to pick out a professor of statistics. Birge was the chairman

of that committee. I was on the committee, but Dirge did the real work, and he dug up this man Neyman who had been in England, but was perhaps temporarily in this country. Anyhow, he was offered the position and he came. Now I had felt that astronomers, like many others, had not gone deeply enough into statistics to make the best use of it. I didn't know anything about it. Trumpler knew something, had some pretty good knowledge of astronomical statistics, but in any case we had a very bright undergraduate student who was about to graduate, Elizabeth Scott, and I suggested to her that, with Neyman coming, it might be an opportunity to learn statistics thoroughly and then make use of the applications of statistics to astronomy. She thought it was a good idea so the first thing she did was to go down to Neyman's department and take his courses, and he was much impressed by her abilities, and she was presently made an assistant, and they entered into a partnership which has continued up to the present time. They have done an immense amount of very valuable work, not only in various other applied fields of statistics, but in astronomy particularly. And so it's been a very fruitful partnership, and I might say that he is, if

not the leading statistician in the United States, he's very close to it. Ultimately there was established under him a statistical laboratory, and then finally a separate Department of Statistics was split off. So I think that worked out satisfactorily. But a few years later, it must have been maybe close to twenty years later, I got a letter from someone, either on or working with the Budget Committee in Berkeley, who said that the question of the various statistics courses in the University had come up. They had made a survey but they had also got out our original report, and they found that except for the building up of the Statistical Laboratory at Berkeley, the statistics situation in the other departments was just about as described in our report.

Calciano: Oh no! You mean they still were offering poor...

Dr. Shane: They were still doing the same thing.

Calciano: Oh. I needn't have worried about the kids who needed the pablum. (Laughter)

Dr. Shane: I remember the matter came up in connection with the Department of Economics at one time, and we urged that they place a little more in the way of mathematical prerequisites for students of economics. But we got

the impression they didn't want to do that because that would frighten students away. There was at that time, and I don't know whether there still is, this awful desire to attract more students even though it means maintaining lower standards.

Calciano: Hmmm. This was the '30's?

Dr. Shane: This was in the '30's, yes. I don't know whether that's true now or not.

Calciano: No, I think there are other problems now. (Laughter)  
Not enough money. It's ironic, but am I not right in recalling that all this galaxy-cluster work you've been doing has got a lot of statistics mixed into it?

Dr. Shane: Oh yes, that's true. When I started to analyze the counts of galaxies, it appeared to me that clustering was a predominant feature; it wasn't just a random distribution. Now others had suspected that. At one time Hubble thought that except for a few clusters here and there, in general the distribution was a random one. I think later he tended to change his mind, and other people, particularly Bok, who analyzed some of Hubble's material, recognized that it was not random. But anyhow, it really stood out when I started plotting the distributions that there was a tendency toward clustering, so I went to Neyman because I

didn't have enough statistical background. I went to Neyman and said would it be possible for him to make some statistical tests to see whether or not clustering was a predominant feature in the distribution. He took a great interest in the problem, and he and Scott together set up a theory, or hypothesis if you like, that all galaxies are members of clusters, and that the clusters may contain various numbers of members, even down to one galaxy.

(Laughter) There was a formula expressing this distribution, and the question was to see whether with such a model he could represent the counts. He and Scott put a great deal of work on the problem and developed a lot of new theory in this connection, and it turned out that the counts could be represented on the basis of his hypothesis. Now that doesn't mean they couldn't be represented in some other way, but at least that this did cover it.

Calciano: Do you have any hypothesis as to why they are clustered?

Dr. Shane: No. I don't. Some have said that the clusters existed originally and have been dispersing, and others have maintained that a small cluster being started somewhat by accident attracts new members and becomes larger,



but I'm not enough of a theoretician to have any sensible opinion. Well anyhow, this work resulted in quite a number of papers by Neyman and Scott, and some by Neyman, Scott, and myself. So this formed a considerable fraction of the work that they did. And of course now it is recognized everywhere that clustering is a very common, if not universal, feature of galaxies, and other people have supported this besides ourselves. Abell at UCLA, and Zwicky at Caltech in particular. One point that we also noted from our counts is that some clusters themselves seem to be clustered into larger aggregations.

Calciano: Oh?

Dr. Shane: In other words, you'd have a great big cloud of galaxies with a center here and a center here and a center there as though there were clusters of clusters. I called them clouds. Others called them clusters of clusters or superclusters, particularly Abell. Zwicky objects to that idea strongly; he doesn't think there are such things as clusters of clusters, but he does admit there are large clusters that have several centers of condensation.

Calciano: Oh! (Laughter)

Dr. Shane: So it's a matter of semantics.

Calciano: Semantics strictly, yes. Oh that's funny.

Experiences with the Academic Senate

Calciano: You also said that I should remind you to discuss your experiences with the Academic Senate.

Dr. Shane: Well let's see... The Academic Senate was organized in its somewhat semipermanent form (not the same form as now, but it was the form it had all the time say up until the 1940's) in about 1920 when the faculty, following the resignation of President Wheeler and a very unhappy rule at the University by a triumvirate of men, decided to stage a revolt, and they demanded certain privileges. It was an exciting time, but I was on Mount Hamilton as a student and didn't see anything of it. But they got a charter of rights and privileges, and they became a very effective body in influencing the affairs of the University. They were not so large but what they could. hold pretty lively and worthwhile meetings. I made it a point when I became instructor to attend the Academic Senate meetings whenever I could. I got to know the important people in the faculty -- they were the ones who got up and spoke -- and I got to know them pretty well and

their characteristics, and some were very sound and some were windbags. I remember one professor one day got up to argue a certain point, and he was a terribly windy fellow, and by the time he was through he'd got himself over onto the other side. (Laughter) He argued himself right around! (Laughter)

Calciano: My goodness. Logic personified.

Dr. Shane: Well some of those things were funny. But I might say that I never took part in any of the debates in the Senate because I wasn't a good debater and was a little bit diffident I suppose. I think I only addressed the Senate once or twice in all my experience there, and that was when as Chairman of the Budget Committee I had to make an annual report or some other special report, but I did not get up and participate in the debates. But I learned a great deal, and in my last two years there I was Vice-chairman. In Barrow's administration, and I think it was the same in both Barrow's and Campbell's administrations, the Senate elected its own chairman, although Campbell was quite consistently elected. Then when Sproul came in, the Senate, following a motion by Deutsch, made Sproul permanent Chairman of the Senate, and then they would elect a Vice--chairman who would

serve in his absence. And he served as a very good Chairman; I never heard any complaint.

Calciano: Who? Sproul or the Vice-chairman?

Dr. Shane: Sproul.

Calciano: Okay.

Dr. Shane: Sproul. Yes. And during the last two years I was active (I suppose it was from '40 to '42) I was Vice chairman of the Senate, and I had to preside two or three times when Sproul couldn't come. Now later they reorganized the Senate. I think that some felt it was becoming cumbersome from too many members and they had a committee appointed to reorganize it. I was on the committee, but this was following the war, so I was on Mount Hamilton and had to make the trip down to meetings of the committee; furthermore I wasn't at all happy about the direction in which the reorganization was going, and...

Calciano: Which was?

Dr. Shane: Oh they were to have an elected body, a representative assembly I think they called it, and they were to do the work of the Senate, except I think they'd have a general Senate meeting once a year, and then it got all tied in with the other campuses. I never did learn

the mechanism, because I resigned from the committee before the plan was finally hammered out. But there was one thing I wanted to mention, and that was that when we entered the war it was necessary to do a lot of planning for the contributions the University might make and how it should meet the war situation. So the Senate appointed an Executive Committee to which they gave practically their full authority to take actions with reference to the war situation, and I was a member of that Executive Committee. And I continued on it until I left to go into war work in 1942, late in 1942.

Calciano: Did this committee have anything to do with okaying Los Alamos and...

Dr. Shane: No, oh no. They wouldn't know anything about that. I remember one thing, and I was told that I became very unpopular on this account (laughter), and that was the question of accelerating the teaching program of the University. On the Executive Committee a question came up one night at a meeting -- we had an awful lot of meetings and worked very hard -- the question came up about having an extra session during the summer so that we could get over a whole semester in the course of the summer. I was in favor of it. That would

accelerate the graduation of some of the students who would then be in a position to go into military or other service. On the Executive Committee this was argued, and it appeared that it was about to be defeated, and someone made a motion (I think it was Joel Hildebrand) to disapprove the proposal. The chairman of the committee was George Louderback, of whom you may have heard; he was a geologist, a very able fellow, and so this came to a vote, and it went around the table, and everyone voted for the motion to kill the proposal until it came to me, and I said, "I'm going to vote against the motion, and I want to be recorded as such." And then Joel Hildebrand, I think it was, said, "Well let's hear your reasons." So I set forth my reasons. The whole discussion was opened up, and before we left the scheme was adopted. (Laughter) Well now, it seemed that there was no money to pay people for this extra teaching.

Calciano: Oh! Ouch. (Laughter)

Dr. Shane: But I felt, and some of the others felt, that this could be a contribution to the war effort. And so it was established, but the teaching would be on a voluntary basis, whoever wanted to do it.. Well of course that immediately put pressure on individuals

who didn't want to do it, but they didn't want to seem to be laggard, so to speak, so a lot of them rather unwillingly did it. I was told that I was very unpopular and was going to hear from this after the war was over. However, it turned out that subsequently the legislature made the money available and everyone was paid for his teaching. So it worked out all right.

(Laughter)

Calciano: Well, isn't that interesting.

Dr. Shane: Yes. Well anyhow...

Calciano: It pays to stand by your convictions.

Dr. Shane: Well yes, that was one thing that really satisfied me a good deal.

Calciano: Quite a number of other schools did this too, didn't they?

Dr. Shane: I suppose so. I don't know. But you see this was just at the time that I had finished up with teaching. Then I went to work full time for Lawrence's Radiation Laboratory, so I had no further contact.

The Oppenheimer Committee Study of the Harvard  
University Observatory

Calciano: You told me that you once served on a committee that

was headed by Oppenheimer that had to do with overhauling the Harvard University Observatory.

Dr. Shane: That was at the time of Shapley's retirement or impending retirement.

Calciano: Which was when?

Dr. Shane: It was about... I went to Harvard twice at intervals of a year. I know one time was in 1952, and whether the other one was '51 or '53 I'm not sure. But it was at the time of Shapley's retirement, and it was a committee composed of people who were prominent in their fields. Oppenheimer was chairman. I think he was a member of the Harvard Board of Visitors, you see. He served as chairman, and Bob Bacher (I've heard he's apt to succeed DuBridge as President of Caltech) he was a member, and Bengt Stromgren, who was the Director of the Yerkes-MacDonald Observatories at the time, was a member, and I forget who the other one was I don't know whether Struve was on it or not. Well anyhow, we met, and the meetings were attended by Dean Buck who was largely running Harvard under Conant at that time. Conant only participated very, very slightly, and he seemed to me to have completely lost interest in Harvard. You know shortly afterwards he resigned, but he really wasn't taking too much



interest in things then. Others have verified the opinion that I had. Well we had these very good meetings in one of the houses there and had a very interesting time, but I think the thing that impressed me most was the insight into Oppenheimer's character, and I'd known Oppenheimer a long time, but...

Calciano: How did you happen to know ... oh, because of the war period, yes.

Dr. Shane: Well not only that, but I'd known him when he was on the staff at Berkeley, and in fact I'd been the chairman of the committee that recommended his promotion to professorship. That was the first promotion committee I was ever on and I was made chairman of it. I might say one member of the committee was G. N. Lewis, and G. N. Lewis was the one person who at first opposed the promotion, and we had to argue him into it.

Calciano: On what grounds did he oppose it?

Dr. Shane: He thought Oppie was too young, hadn't proved himself yet. On the other hand I understand Lewis resigned from the National Academy because he objected to the fact that they didn't elect enough young members.

Calciano: Oh?

Dr. Shane: Someone told me that once; it may not be correct.

J. Robert Oppenheimer

Dr. Shane: Well anyhow, Oppenheimer was very interesting. He was such a persuasive talker that he could convince you of almost anything, and the result was that if he was on a committee he was the committee. And I remember one morning we were arguing some point, I don't remember what it was, and we came to a conclusion unanimously. And after lunch we came back and Oppenheimer reopened the question; he'd been thinking this over, and he gave a long speech on the other side, and we took another vote and we unanimously switched our opinion. He was so persuasive that you just...

Calciano: His ideas were good, I gather?

Dr. Shane: His ideas were extremely logical, but he could be logical first on one side and then on the other.

(Laughter) I thought that indicated something in his qualities, in his makeup, that had some bearing on his subsequent troubles.

Calciano: It wasn't too long after that that...

Dr. Shane: About 1954. But he was in the one sense a dangerous man to have on a committee, because as I say, he could

just swing things pretty much his own way. Well another interesting comment of his was made one time when we'd been arguing some knotty question and finally he said, "We must not let the clarity of our thoughts be confused by contact with the facts."

(Laughter)

Calciano: That ought to go in Bartlett's!

Dr. Shane: When it was a question, I think at a later meeting, of a possible Director of the Harvard College Observatory, a certain person was proposed, and he was one of the most, perhaps the most brilliant astronomer in the country, and I said that I wasn't sure he was the right person because I thought that he guided his students so completely that they never developed the way they should if they had been left more on their own. Oppenheimer said that he thought that that was one of his troubles, too -- that he had been such a lucid lecturer that the students could get what he was trying to say without too much effort. The result was that he had been disappointed in the degree to which his students had advanced. Now I am not at all sure that this was justified, because I think that Oppenheimer had some awfully good students. But the idea was floating around in his mind.

Calciano: That's interesting.

Dr. Shane: Let me see, can I say anything more about that. We recommended one or two people as directors, and none of them accepted, and finally Menzel was appointed Director, and I think that he made a very good Director at Harvard. He's recently retired and now Goldberg is Director.

Calciano: Was your main task to find a successor, or did you say it was reorganization?

Dr. Shane: Well the first was on how it should be reorganized, because Conant was very unhappy with the way the observatory had been handled under Shapley, and he thought the whole thing needed an overhauling. But he was, I think, quite unreasonable. He was not prepared to do anything for them. He said, "Well let them stew in their own juice," which I think none of us could agree with. But fortunately he didn't participate too much in these discussions. We made some proposals about abandoning the support of the South African station; I think that was not well received by members of the staff, and we probably showed bad judgment there. And I can't

Calciano: That's interesting.

Harlow Shapley

Calciano: Well what was the problem with Shapley's administration?

Dr. Shane: Shapley didn't have too much instrumental feeling, for one thing. He believed in a lot of wholesale observations with inadequate instruments, and that you could overcome the inadequacy of your material by increasing its bulk; that was one thing.

Calciano: Was this because he had an inadequate observatory to work with?

Dr. Shane: I think there was a somewhat uncritical attitude toward accuracy and the treatment of observations. However, during his administration he and Adelaide Ames got out a catalog of galaxies which, considering the rather poor equipment they had to work with, has turned out to be extraordinarily good. And I might say that when I was preparing my recent paper on galaxies, I needed to supplement some of my material for the northern hemisphere with some that he'd obtained in the southern hemisphere. I started to plot his material without having too much optimism as to how it might fit in with mine, and it turned out that where they overlapped they fitted together perfectly. So I

wouldn't be surprised if maybe there's been some injustice done him.

Calciano: Did he work almost entirely at the Harvard Observatory, or did he go to better facilities?

Dr. Shane: Well, no. After he went there as Director he remained there, But...

Calciano: And that's just sitting in the middle of the town, isn't it?

Dr. Shane: Yes, oh yes. But they had small instruments that didn't have to take very faint objects, and they didn't have to have very good definition, and they took thousands and thousands of photographs and stored them. away and. repeated one field after another, so that if some interesting object was discovered, say a nova, they could look back at the old plates and see what it looked like earlier. I mean there was a lot of valuable material there, but they could have done much better because they didn't pay enough attention to getting really good instruments that could have been well used even where they were. He really made his reputation when he was at Mount Wilson; he went to Mount Wilson as a very young man, and he was a student of Henry Norris Russell's, and he did wonderful work on the globular clusters. And his work on globular

clusters really, I think, gave the first rather satisfactory picture of our galaxy. It was still very crude, and the details not filled in, but it was really fine work. And though he made many mistakes in interpretation, so does almost everybody else.

Calciano: Yes, none of us are safe on that ground. (Laughter)

Dr. Shane: Oh yes, and I would say that Conant was very, very much annoyed. with him because of the political pronouncements he was always making.

Calciano: Oh, what...

Dr. Shane: He was always sounding off in the papers or in lectures on the rather extreme leftist and pacifist side, and he became almost notorious in the country as a leader in those things, and it produced a great deal of embarrassment for Harvard, so Conant wasn't happy about it. Now when I say leftist, I'm riot sure whether in internal social matters he was or not, but I think he was much more friendly to the Communists, and at least the Communists abroad, than most people thought he should be.

Calciano: What did you mean "internal social matters"?

Dr. Shane: Well I mean to say the New Deal situation and things of that sort.

Calciano: I see. Committees Studying the University of

## Michigan's Observatories

Calciano: Now you told me that there were two committees at the University of Michigan dealing with the organization of Michigan's observatory program?

Dr. Shane: Yes. The first one was shortly after I became Director at Lick, and I can't remember who all was there. Struve was there, I believe, and I don't remember who else. There was a question of appointing a Director following the death of H. D. Curtis, who had been Director there. And we made again some recommendations which didn't carry over because the nominees didn't accept, and they then appointed Leo Goldberg as Director. He turned out to be exceedingly good. And then it was not too many years ago Leo Goldberg left Michigan this must have been around '62 or thereabouts to go to Harvard. And so I was on a committee again to make some nominations. Again we made some nominations that didn't work out. (Laughter) We were always making these nominations and the people didn't accept, so they would get somebody else. They appointed Oren Mohler from the McMath Hulbert Observatory which is also part of the University of Michigan.

Calciano: You said the committee had something to do with the



organization of the Michigan Observatory program. Was one of these...

Dr. Shane: The first one had to do with the question of their getting a Schmidt telescope, I believe, and they got such a telescope and it was named after H. D. Curtis. I can't remember whether there were any other organizational problems or not.

Calciano: Well...

Dr. Shane: Well it was a general problem of what should they do about instruments, and the recommendation was that they should get this telescope which, by the way, has just been moved down to South America and put on Cerro Tololo.

Calciano: Well now is this a type of duty that I would think might make you some enemies within the department of whatever university you're setting out to reorganize?

Dr. Shane: Well they're not supposed to know who the committee is, or at least how each person...

Calciano: Oh!

Dr. Shane: Well of course they usually do learn who's on the committee, and in the Oppenheimer committees, yes, each member of the department came in and talked to the committee. The committee took certain actions, but

they don't know whether I voted for 'the actions or whether I didn't.

Calciano: Has Lick ever had any committees appointed to reorganize it?

Dr. Shane: Yes, they had one recently that met here in Santa Cruz, about a year ago or thereabouts. I don't know what the purpose was.

Calciano: Oh. Who asked it to meet?

Dr. Shane: I can't tell you. Maybe McHenry; maybe it was Kerr. I remember Goldberg was on that committee.

Calciano: Did anything come of it?

Dr. Shane: I don't know; I never heard. (Laughter) I know Goldberg stayed overnight with us when he was here.

Calciano: That's the only time you know of that a committee has come in to analyze Lick?

Dr. Shane: Yes.

Albert E. Whitford's Appointment as Director of Lick

Calciano: You were also on a committee to select a Director for the National Radio Astronomy Observatory at Greenbank.

Dr. Shane: Yes. Now let me see... That was under the chairman-

ship of Menzel. We met in New York in the offices of the Associated Universities, Inc., the one that runs Greenbank and Brookhaven. We met under Menzel's chairmanship, and we made some recommendations. I recall that the number one choice was Goldberg, and number two was Whitford. And I could tell you pretty nearly when that was... It was about 1956.

Calciano: It was just about the time that you picked him for here, wasn't it?

Dr. Shane: Yes. It was just before, just before. And that's the point. You see when I determined to retire, it must have been pretty nearly five years before I did, and I wrote to Sproul that I wanted to retire such and such a date, and. I hoped that they would act in plenty of time to get a successor. And the time went on and nothing happened. Well there was no urgency for a while, but I thought that the department ought to have some kind. of a say in who should be the successor, and so I told them that I would invite them to meet without my presence because they would be the ones affected. They were to try to decide on whom they could agree, and then I would transmit the nomination to Sproul and. support it if I possibly could. Of course if I felt the person was entirely the wrong

choice, then I wouldn't. So they held their meetings, and presently they came up with an agreement for Whitford. And I believe. that Whitford was the first choice of practically, but not quite, everyone. He was my first choice. I know one person for whom he wasn't the first choice, but that person .did not offer any serious objection, and he was ready to go along. So anyhow, that's where the matter stood. And then one day I learned that Goldberg had turned down the Greenbank job and that there had been a call from Whitford to Stebbins (who was Whitford's old teacher and was then at Mount Hamilton) saying that he'd been offered the Greenbank job and how about his taking it? How about some advice? And I think he wanted to talk to me, too. Perhaps Stebbins suggested that he do so. So I got on the phone, and I told him that. I wished he would hold up because I thought there was a good chance that he might be offered the job at Lick. Thereupon I got in touch with Sproul, and I told him about this and did he want to offer Whitford the job? I told him what the situation was, and Sproul said, "Well you go ahead and negotiate with him." But under the rules of the University, Sproul had to get the approval of an appointment committee (which is

corresponding to a promotion committee), and I was put on the committee, and there were some other people, but there was not too much trouble getting approval there. So the appointment was approved and I suggested a certain salary for Whitford and Sproul agreed to it and said go ahead and negotiate with him, which I did by telephone. Then we had him come out for a visit, and it took some selling. I think the reason was that his wife didn't want to leave Madison. She was tied up with the children who were going to school there, and I think she was somewhat appalled, perhaps, by the amount of entertaining that might be involved. And he himself admitted that it was not going to be easy for her. But one of the selling points I used was that he would have the independence of being the head of his own campus, which I mentioned earlier. So he decided to take it; but it happened that he was to take over July 1st, 1958. One thing that I had insisted on was that since I'd given lots of warning I was to be out finally and absolutely as of July 1st. I wanted no further responsibility. Well it just happened that he was having a meeting of the American Astronomical Society in Wisconsin in June, just before he was to come out. He had that meeting and then there was to be

the TAU in Moscow, which was to be almost immediately following this. So he came out here on July 1st; I met him at the plane and took him up the mountain and he started in. But then he almost immediately had to leave to go to Moscow, and the question was who to put in charge. Well I was unwilling, of course, to be in charge, and I don't even know whether he asked me for he may have known I wasn't willing. Anyhow, it was arranged that Jeffers should be in charge in his absence, which he was, and there was no problem about that, and finally he got back in August. I never knew whether Whitford resented the fact that I was unwilling to carry on at that time or not, but after his return he seemed to have a less friendly feeling. I don't know if there was any other factor or not.

Calciano: Hmm. The Greenbank Observatory does radio astronomy, and of course we're an optical. observatory didn't it matter that he was an optical man when they were looking for a head for a radio observatory?

Dr. Shane: Apparently not because they took Struve then, who was an optical man.

Calciano: Of course there weren't too many radio men at that time.

Dr. Shane: That's right, that's right. And I think that while he

wouldn't be expected to do any research in radio astronomy, if he were a real alert and competent person, even though his training was optical astronomy, he would know enough astronomy that with the advice and help of his radio astronomers there it would be quite feasible to have an optical man.

Calciano: I was thinking also that without optical facilities, a person's own research program would become curtailed.

Dr. Shane: That's right. After Struve went he may have done a little observing at Mount Wilson or some other place.

Calciano: I see.

Committee Studying a Proposed. Planetary Observatory  
for the Air Force

Calciano: You said you were also on a committee under the Air Force dealing with the possible establishment of a planetary observatory at Cloudcroft, New Mexico.

Dr. Shane: Yes. The post office is called Sunspot.

Calciano: Sunspot? (Laughter) Oh no.

Dr. Shane: Yes. And yes, this was promoted I think very largely by Clyde Tombaugh, who was the chap who discovered Pluto. He never had too much background in astronomy, but he's been active, and he teaches at I think New Mexico State University. Some others were promoting it

too. They'd made some tests in an area up in the high mountains not too far from Cloudcroft. The Air Force wanted a committee to go up to investigate whether that site was suitable on the basis of the test they'd made. The committee went up -- and I might say, by the way, we went up there the day that John Glenn made his orbit. I happened into the lobby of a hotel in El Paso just a minute before blast-off and saw it on the T.V. there.

Calciano: Oh! What timing! (Laughter)

Dr. Shane: Yes. So all the way up that day to Cloudcroft (it was a long trip) we listened to the reports on the radio in the car. But anyhow, we recommended against the site, and I don't know how he did it, but Menzel wangled out of the Air Force a consulting fee of a \$1000 for each one of us for that day's work.

Calciano: Good heavens!

Dr. Shane: Well Menzel had large ideas.

Calciano: (Laughter) And you were the happy recipient of that large idea.

Dr. Shane: Yes. I never went after consulting fees at all; in fact I turned some down, or tried to, and in at least one case I turned it back to the Observatory because I really prefer to do these things voluntarily, but I



thought the Air Force could probably afford this one.

Calciano: Why was the Air Force interested in a planetary observatory if NASA was also thinking of one?

Dr. Shane: I couldn't tell you. The Air Force got themselves mixed up in some of the ... it was the Air Force, for example, that gave the 60-inch telescope for Tololo. And that was really the start of the Cerro Tololo Observatory, some interest that the Air Force had. That had been stirred up by Kuiper, but it was inadequately financed, so when we took it over, why we had to get the Air Force to multiply their offer by quite a large factor. (Laughter) But that's all in the Wright transcript.

Committee Advising the Venezuelan Government on a Site  
for an Observatory

Calciano: Now you said you made two visits to Venezuela?

Dr. Shane: Yes, in 1961 and 1962. What happened was that there was a chap down there who was not quite an astronomer, he was a meteorologist, I think, but he was Director of their small astronomical observatory in Caracas. His name was Dr. Röhl, I believe; he was a German. And for some reason he was a close friend of the dictator of Venezuela, Perez Jimenez. Perez Jimenez, as you

know, was riding high, wide, and handsome with oil revenues, and he ultimately spent so much that he ran the country into bankruptcy and fled to the United States. Well anyhow, this Dr. Rohl was a close friend of his and prevailed upon the dictator to give him a large sum of money which amounted to between four and five million dollars to buy astronomical instruments. So Röh1 went over to Germany and traveled around, and he ordered some from Zeiss and some from Askania, I believe.. Having spent about that amount of money he proceeded to die. And so here these companies were building these instruments which presently started. to arrive in Venezuela where they had no astronomers! Here was all this instrumental equipment, so what to do with it? Well the instruments were owned by the Venezuelan Navy for some reason (I don't know what the technical side of it was) so they appointed a committee to see what should be done, and the committee appointed one of their members as Director. The member was Dr. Jose Abdala, which is a funny Venezuelan name, but he was of Syrian parentage. So he was Director of the observatory, the Cagigal Observatory, which was a small observatory, but it had-been furnished in a reasonably elaborate fashion.

He set about taking care of this equipment that was arriving and trying to see that the damp climate didn't cause it to rust. I think most of it had been packed in airtight zinc containers to protect it. Anyhow, he proceeded to have it unpacked and stored and looked after, and they got an engineer -- I think it was from Zeiss -- to come and help set it up. What was his name? Sourell, that's it. He was out there setting the stuff up where they had room to set it up, but they had to have advice as to what to do with it. So he asked two or three Americans at different times to come down, some from the Naval Observatory, and finally he invited me to go down, so I went and spent some time with him. He was interested in finding a site for the observatory, and he had engaged part time Jurgen Stock who was in charge of our site survey in Chile. He brought him there, so when I was there Jurgen Stock had site testing going on in several localities. We went around and visited these localities, and in addition we looked for more. We went out on the island of Margarita, which was off the coast of Venezuela, a very, very beautiful place, and it was thought we might do something there. Of course Venezuela doesn't promise much in the way of

locations. Finally I wrote a report to Abdala offering my own suggestions (I wrote that after I got back) and one of the suggestions was that they look for a place Stock had mentioned -- a place down in the Andes of Venezuela which would have a high altitude and be fairly well inland. We thought that might be good. Well during the next year Stock had the place investigated and favored a place called Lake Mucuhaji which. was located in a pass up at about 12,000 feet elevation where the road passes between where two ranges of the Andes come together. Now the next year Abdala invited a committee of quite a number of people to go down. Mayall was one, and Frank Edmundson was one, and Scott from the Naval Observatory, and Haro from Mexico, Sahade from the Argentine, John Coleman from the National Academy, and Jurgen Stock. So we spent a few days going over the possibilities. We visited the sites, and I might say on the first trip we had thought of a site in the mountains south of the Orinoco River, and on this trip the Air Force gave us a plane and we spent the whole day flying down to Ciudad Bolivar and across the Orinoco going down into the mountains beyond. But in any case, we didn't find a place that looked any good down there. We met again

and made some recommendations, but by that time the relations between Abdala and the Navy had reached a breaking point. I haven't any idea what the trouble was, but things were so strained that when Abdala tried to get into the observatory at off hours, the Naval guard wouldn't let him in. He told me that he was about to resign at the time. Anyhow, we made a report, and I dictated the report to a secretary. She was very good; she took it all down in shorthand and wrote it up nicely and the various members of the committee went over it to check it. Then it turned out that some of us, Mayall and Haro and I, had an extra day because the planes didn't fly every day, so we decided to go down and look at this Lake Mucubaji site which we did, and we flew down to Merida, which is one of the most attractive places I ever saw; it's right in between two ranges of the Andes; it has a very fine university for that part of the country. It's located at about 5000 feet elevation. There are bananas and all kinds of tropical fruit growing there and you look from the city up to the summit of the mountains at 16,000 feet where there are glaciers. It happened that Perez Jimenez had had a teleferique built up to the top of the mountain right from the city. It wasn't

open to the public yet, but it was running, so they sent a special trip with us up there, and in an hour we went from an elevation of 5000 feet to 15,700, up among the glaciers. It really was a marvelous trip, one of the finest trips I've ever had. And there was not only Nick, Haro, and I, but a chap named Frederick who was the man who had been doing the site survey for Stock, and there was a priest, Father Prata, who taught in the university, and also an architect named Nunez from Bolivia who was teaching in the university. We went up, and it was, as I say, very, very fine. At one place the cable goes across a valley for two miles without any intermediate support, and you look down on the lakes way below -- oh it was really wonderful.

Calciano: I wouldn't ride that. (Laughter)

Dr. Shane: Then we got back to Merida and had a quick lunch and were taken by car up the valley to Lake Mucubaji where we saw the site. One interesting thing we noted was, and this was called to our attention too, that the natives up there all have very red faces. This is because of the high altitude. They develop a very large red blood corpuscle count, but they all look almost as though they have a fever.

Calciano: Oh, how strange.

Dr. Shane: Well, we got up there and we looked over the site. We got there about sunset, it was getting a little late, and we looked around, and I wasn't at all pleased with where they had been doing the observing because they had been observing on a flat area up - there in the pass which would be one of the worst possible places for seeing. They should have gone upon top of one of the rather low mountains nearby. It would have been a higher altitude, but I think they'd have got much better seeing. Well we came back and the next day flew home. And then through the National Academy I tried persistently to find out what was going on there. I never could hear except that Abdala had resigned. We couldn't find who was the director; we'd get just an occasional glimpse that they had decided on the Lake Muaubaji site, then we couldn't find anything more -- letters wouldn't be answered. We had been entertained while in Caracas by the U. S. Ambassador to Venezuela, and I had talked particularly to a chap named Charlie Bridgett who is connected with the embassy and who seemed very friendly, and we tried through him to find out what was going on, but he never could find out. I think the thing's dead and they're letting the instruments go to pieces.

Calciano: What an anti-climax! I thought you were going to tell me which American university had taken over.

(Laughter)

Dr. Shane: No. But to illustrate the very bad. Relations between Abdala and the Navy, on the last night of our meeting he'd set up a dinner by the Navy for us. It was to be held in the officer's club, a very beautiful place built by Perez Jimenez again. (Laughter) The Navy was to entertain us, and it turned out that the only representative of the Navy who came was some lieutenant in civilian clothes. Evidently they were just cutting us dead. Well we had a pleasant enough dinner. I think in view of the circumstances it was better that there were no high officers there.

Calciano: There'd have been a bit of friction, to say the least.

Dr. Shane: Another thing that Abdala took me out to see was the racetrack built by Perez Jimenez. It cost \$25,000,000 (laughter) and it was quite a racetrack. But he told me about the fact that it does pay for itself.

Calciano: It does?

Dr. Shane: In their take, yes.



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