9

American Institute of Physics
Interview, 1978

Dorothy Weeks

Transcript of an Interview

taken on a Tape Recorder

by Katherine Sopka

on 19 July 1978

23 pages

American Institute of Physics

Center for History of Physics

335 East 45th Street

New York, N.Y. 10017

PREFACE

This manuscript is based on a tape-recorded interview conducted for the Center for History of Physics of the American Institute of Physics, the tape and the manuscript being the property of the Institute. I have read the transcript and made only minor corrections and emendations. The reader is therefore asked to bear in mind that this is a transcript of the spoken word rather than a literary product.

I wish to place the following condition upon the use of this interview, and I understand that the Institute will enforce that condition to the fullest extent possible:

(Check one)

_____ OPEN. This manuscript may be read and the tape heard by scholars approved by the Institute. The scholar pledges not to quote from, cite or reproduce by any means this material except with the written permission of the Institute.

__✓__ MY PERMISSION REQUIRED TO QUOTE, CITE OR REPRODUCE. This manuscript and the tape are open to examination as above. The scholar pledges not to quote from, cite or reproduce by any means this material except with the written permission of the Institute, in which permission I must join. Upon my death this interview becomes Open.

_____ MY PERMISSION REQUIRED FOR ACCESS. I must give written permission before the manuscript or tape can be examined (other than by Institute staff in the normal course of processing). Also, my permission is required to quote from, cite or reproduce by any means. Upon my death the interview becomes Open.

Dorothy W. Weeks
(Signature)

July 14, 1986
(Date)

DOROTHY WEEKS - 19 July 1978

ABSTRACT: Family background, education, and emergence of scientific orientation. Undergraduate years at Wellesley College (1912-1916); description of physics department. Assistant examiner in U.S. Patent Office during World War I. At MIT under E.B. Wilson as graduate student and laboratory assistant, then lab instructor (1920-24). Returned to MIT for doctoral work in 1928. Mathematical physics thesis under Norbert Wiener, while teaching at Wellesley. Depression years brought teaching position at Wilson College (1930-43), used Wellesley as model. Work on Zeeman Pattern earns her Guggenheim Fellowship (1949-50) at MIT and European labs. World War II years as head of OSRD British Report Section. Returned to Wilson (1945-56), worked part-time at National Science Foundation (1953-56). Retirement years including affiliation with U.S. Army and spectroscopic work at Harvard College Observatory. Comments on women in physics in U.S., her own opportunities, and teaching in general.

INTERVIEWER: Katherine Russell Sopka received her B.A. and M.A. degrees in physics from Radcliffe College of Harvard University. Between 1959 and 1968 she taught physical science at the University of Colorado at Boulder. During this period she became interested in the history of physics and spent the academic years 1966-67 in Geneva, Switzerland reading in the history of science with J.M. Jauch. In 1969 she returned to Harvard to study formally in the history of science and education. Her doctoral dissertation on the rise of theoretical physics in the United States during the early 20th century, completed in 1976, was written under the guidance of Gerald Holton and John H. Van Vleck. Her present interests focus on the growth of physics in America, the history of modern physics and the careers of women physicists. She is presently a Research Associate in the Physics Department of Harvard University.

PROGRAM: This interview was conducted as part of a continuing effort by the AIP Center for History of Physics to document the history of physics in the United States since the 1920s. Funding came from AIP, the Friends of the Center for History of Physics, and a grant awarded in 1976 by the Alfred P. Sloan Foundation. Both Center staff and outside scholars, working on their own research but aided by AIP, have participated, so a broad range of topics is represented in the various interviews.

Subject Table of Contents of Tape Recorded Interview with Dorothy Weeks

	Page	Topic	July 19, 1978
ape 1	1-3	Family background and childhood 1893-1912	
ide 1	1	born in Phila., grew up in Wash., D.C.; parents education; colonial ancestors	
	1-2	father's occupation: engraver; older brother with scientific interests stand by DW (see also pp 7 and 33); younger sister musical	
	2	public school education; notable teachers, advanced chem. course in HS; emergence of DW's scientific talent	
	3	family church affiliation	
	3-6	Wellesley College - undergraduate years 1912-16	
	3	early parental decision on college	
	3-5	DW's decision to study physics; courses and teachers	
	5	effect of college Hall fire (1914) on physics instruction	
	6-7	U.S. Patent Office 1917-1920	
	6	qualifying exams	
	6-7	increased opportunities for woman during WWI; DW's duties at Patent Office	
	7-9	Graduate work and teaching at MIT 1920-1924	
	7	E.B. Wilson recruited women to be lab assistants (see also p.12)	
Tape 1	8	DW head ass't, later promoted to instructor	
Side 2	8-9	master's degree work and lab instructing	
	9-10	Business training and experience 1924-27	
	9	MS from Simmons College	
	9-10	job in personnel at Jordan Marsh Co.	
	10	Temporary job at Harvard Medical School	
	10-12	Doctoral work in MIT Math Dept. and teaching at Wellesley College 1928-30	
	10-11	thesis in mathematical physics with Norbert Wiener	
	11	math dep't superior to phys. dept. in 1920's (see also p. 16)	
	12	3/4 time teaching at Wellesley; commuting via Model A Ford	
	13-18	Pre-war years at Wilson College 1930-43 and Guggenheim fellowship 1949-50	
	13	job search and mother's illness	
	13-14	landing the job at Wilson - no smoking faculty edict	
	14	Wellesley as model for phys. dept. at Wilson	
Tape 2	15	outstanding Wilson students: Pauline Morrow Austin; Helen Beard	
Side 1	15-16	start of spectroscopic research at MIT with Geo. Harrison 1935	
	16	extension to subsequent years and to work at Wilson	
	16-17	undergraduate volunteers from women's colleges - "Charm School" - assist in calculating tasks	
	17-18	research on Zeeman patterns in iron spectrum; DW gets Guggenheim fellowship '49-'50, goes to MIT and European labs	

	Page	Topic	2.
	18-19	War work in Washington w. OSRD 1943-1945	
	18-19	DW head of British Report Section, big responsibilities	
	20	Post War years at Wilson 1945-56 plus part-time work at Nat. Sci. Found. 1953-56	
	20-21	"Retirement" Years 1956-1976	
	20	advisor to Ordnance Dept. of U.S. Army 1956-64	
	20	spectroscopist at Harv. College Observatory	
Tape 2	21-23	comments on women in physics in U.S.	
Side 2	21	unequal opportunities and isolating incidents led to some self consciousness	
	21-22	DW made her own way using existing opportunities	
	22	teaching common for <u>both</u> men and women physicists of DW's day	
	22-23	advantage of women's colleges for education in physics	

INDEX from Tape Recorded Interivew with Dorothy Weeks
July 19, 1978

INDEX from Tape Recorded Interview with Dorothy Weeks
July 19, 1978

INDEX from Tape Recorded Interview with Dorothy Weeks
July 19, 1978

INTERVIEW: Dorothy Weeks LS

INTERVIEWED BY: K. R. Sopka

PLACE: Wellesley, Massachusetts

DATE: 19 July 1978

Sopka: This is Katherine Sopka. I'm visiting today, the 19th of July 1978, with Professor Emeritas Dorothy Weeks at her home in Wellesley, Massachusetts, where we shall be discussing her long career in the world of physics. I would like to begin, Professor Weeks, by asking you to tell me something of your childhood, of your family background.

Weeks: I was born in Philadelphia; at the age of seven, we moved to Washington, D.C., where my father had a government position. My parents were persons very much interested in education, although they were not college graduates. My mother, in 1887, graduated from the Girls Normal School in Philadelphia, my father from a country school in New Jersey. They were descendants of early American pioneers. The first members of our Weeks family to come to America, George Weeks, landed in Dorchester Bay in 1635. My mother's ancestors in this country included Roger Williams of Rhode Island, and Lieutenant Thomas Putnam of Salem, Massachusetts.

My father supplemented his earlier education by studying art in the evening to perfect his engraving. He had been apprenticed as an engraver to Bailey, Banks and Biddle in Philadelphia, when he completed the country school.

When we moved to Washington, he was an engraver at the Bureau of Engraving and Printing, and designed some of our stamps. He also contributed to the design of our one dollar bill, and engraved an exact copy of the Declaration of Independence on a steel plate at the request of FDR, obtainable from the U.S. Treasury Department.

My brother, who was three years older than I, was a scientific whiz. He earned money in the usual way that young boys do, selling at that time the SATURDAY EVENING POST at five cents a copy, and delivering newspapers. With the great sums of money earned this way, he chose the best of articles in all the junk shops of Washington. These were transferred to our attic, where he experimented. It was in his senior year in high school that he gave an electrical show on the vacant lot next to us. Many persons in Washington came to see the wonders of the day.

Sopka: What year would this have been?

Weeks: This was in the spring of 1909. The newspapers had loaned him a teleautograph used in the previous presidential election; the National Bureau of Standards, an X-ray tube. He set up a singing arc. He became interested in radio, after Marconi's success. My brother built a radio on which he could receive, but not send messages.

Our home in Washington, when we moved in 1900, was only a half mile through the woods to the National Bureau of Standards. The very first derrick I ever saw was the derrick for the South Building of that Bureau.

My sister, three years younger than I, was musical and not scientific. My brother and I had a wonderful companionship. He objected to my playing in the attic where he had his gadgets, but he had to admit that I never ruined anything.

My education prior to attending Wellesley College was entirely in the Washington public schools, which were coeducational. In the high school they offered two years of chemistry as well as two years of physics, the physics being taught by Roberta Wallace, a very brilliant, able woman, a provocative teacher.

Sopka: What was the name of your high school?

Weeks: Western High School. Western High school was a remarkable school. There were about 500 students. The principal, Miss Edith Wescott, was affectionately called "Billy." It was filled with sons and daughters of Congressmen, Senators, and many of the diplomatic boys. The diplomatic girls in general went to the private schools. Miss Wallace taught also review algebra for college, so I had her my senior year. However, I took two years of chemistry and showed an aptitude for science in those courses, particularly in my senior year, when I was permitted to do qualitative analysis, which was spread over a year, at my own pace. I finished it by Christmas time.

Sopka: I believe you told me that you had already become interested in mathematics and showed some talent while you were still in grammar school.

Weeks: At the age of 12, my aptitude in math seemed to emerge. At that time, in one of the "Truth Books," I wrote that my favorite subject was mathematics. My ambition was to be a teacher. What I most enjoyed doing was teaching. My favorite college was MIT, then known as Boston Tech. My general all around ability seemed to emerge in the 7th grade, and my strong space factor emerged as a sophomore in plane geometry in high school. Of course, I didn't realize what was emerging.

Sopka: What kinds of things did you do outside of school when you were a child, and in high school?

Weeks: We played tennis. The girls had a little club. We lived just a block from the Washington Episcopal Cathedral, the foundation stone of which was laid September 29, 1907. In the summer we had the privilege of using the swings and tennis courts of the Cathedral School for Girls. Also, I learned to cook, which I enjoyed very much. The neighborhood in which we lived was developing. There were only 40 houses in a large area when we moved there in 1900, so one of our outdoor or indoor sports, whatever you choose to call it, was helping the builders build the houses in which we played hide and go seek. Later, in high school and college, it was dancing, especially the waltz that I enjoyed most. I enjoyed also basketball, apparatus work in the gym and rope climbing.

Sopka: Did your family belong to a particular church?

Weeks: We went to St. Albans Church, the grounds of which adjoined the cathedral grounds. It was founded by a member of the Nourse family. It was the Nourse Farm on which the cathedral and St. Alban's were built. My father and mother were very active participants in that church.

In high school, I had a Miss Nanny J. McKnight, Wellesley '87, whom I respected and admired very much. Many persons thought my decision to go to Wellesley was because of Miss McKnight. That was merely co-incidental.

My parents, when they were first married in '89, lived in Newton Highlands, Massachusetts, and one Sunday, drove around the Wellesley College campus. They were so impressed by the beauty, they built dreams, hoping for a daughter to go to Wellesley. In the same house lived a young man who went to Boston Tech. Similar dreams were built for a son to go there. I combined both. My sister went to Wellesley, my brother to MIT.

It wasn't until sophomore year at Wellesley that I took physics. I had signed up for it freshman year, eager to study it, but I had also signed up for chemistry. In those days all freshmen at Wellesley lived in the village. The dean advised me to take only one science because of the long walk from the village to the campus. In those days I was docile and accepted her decision, and chose chemistry so as not to interrupt that subject, postponing physics to sophomore year.

Louise McDowell, who was my professor and first teacher of physics, asked all of her beginning students to sign up for a conference, in order to know her students better. I carefully signed at the beginning of the period when no one else had signed, so I could monopolize the hour. Her clarity of mind and her whole approach had impressed me very much. I told her in that first conference that I intended to do graduate work in physics.

Sopka: Were you influenced primarily by the subject matter, of physics as a discipline, or by the kind of people that you had met doing physics, or can you reconstruct your feelings?

Weeks: It's very difficult to know why. It just seemed to me physics was a part of me as well as mathematics. In high school I had first thought before I was introduced to science, that I would teach mathematics. However, I found chemistry very fascinating, and was allowed, as I have previously mentioned, to go at my own pace in the second year of chemistry in my senior year in high school. I had planned to combine physics, chemistry and mathematics, but was somewhat turned against chemistry by my instructor with a fresh PhD, who taught the course in chemistry I took freshman year at Wellesley. I was jumped into sophomore chemistry because I had entered with two years of chemistry, more than was required for the course offered to freshmen entering with one year of chemistry.

Sopka: Had you taken physics in high school or not?

Weeks: I had never taken physics. Because of my brother's interest, particularly in electricity, I acquired an interest too. He was always doing interesting things in the attic, and I too experimented with motors and other equipment. When I studied physics, I quickly completed the laboratory experiment in about a third of the allowed time and left. The following year they changed the system in the physics lab and required a person to stay three hours and work on a second experiment.

Sopka: At the time that you're speaking of now, when you were studying physics at Wellesley, was it in the old building before the fire?

Weeks: This was the year of 1913-14. The College Hall fire was on March 17, 1914, when I was taking my first course in physics, in old College Hall up on the east end of the 5th floor. The only thing I lost in the fire, since I lived in another dormitory, was my beginning physics notebook.

Sopka: Was Miss McDowell the only person teaching physics at Wellesley then?

Weeks: We had four members of the physics department at that time -- Louise McDowell, who was chairman of the department, and Miss Grace Davis, who taught the second course in electricity, meteorology, and heat. We had a Miss Stevenson and a Miss (Margaret) Shields, who taught the laboratory and had weekly discussion groups for students in the beginning course. The lectures were given by Miss McDowell.

Miss Stevenson's sister was in the chemistry department. Miss Shields taught my weekly discussion groups in the beginning course. Miss Davis was my teacher for Heat, Electricity, Meteorology, and Optics lab. Miss McDowell taught optics, and advanced electricity in my senior year.

Sopka: By the time you were studying physics, was Sarah Frances Whiting entirely involved with astronomy?

Weeks: Sarah Frances Whiting was entirely involved in astronomy, with Miss Ellen Hayes. They constituted the astronomy department.

During my college years, I took all the courses in physics, chemistry and mathematics that were offered.

Sopka: May I ask, when you were so heavily involved in studying mathematics and science, what were your contemporaries at Wellesley doing? Were you unusual?

Weeks: There were a number of girls who majored in mathematics. There were some who majored in chemistry, of course, more than physics. There was one classmate who took all the courses in physics with me, as well as mathematics but took no chemistry in college. There was one junior in the course in optics but, I think, did not continue.

After the fire, physics was scattered in three buildings, because the fire destroyed completely everything that the physics department owned.

Sopka: That must have been a great blow.

Weeks: It was a great blow. We went home for three weeks. The last half of the three weeks was our regularly scheduled spring vacation. When we came back, a trunk room in one dormitory had been converted to a physics laboratory. The basement of a temporary building built prior to 1900 for chemistry, was converted to a physics lecture room. The basement of the observatory was used for our experiments in optics. Later Miss McDowell told me that I studied physics when it was at its lowest ebb at Wellesley College, and I think that's true.

She shared with us the problems, how the various universities and colleges in the greater Boston area loaned equipment. She attended the meeting of The American Physical Society that spring in Washington, and came back telling us of some equipment that she'd seen and had ordered. In those days faculty members did not have cars, and the loyal, devoted members of the physics department would carry equipment from one of these three buildings to another, which were widely scattered on the Wellesley campus.

All of this was in itself a great inspiration.

Sopka: I'm sure it was. It speaks well for the Wellesley physics department.

Weeks: During the spring of 1916, I was looking for a job and thinking what I would do after graduation. That spring, I had met a group of young men in Washington who were assistant examiners in the U.S. Patent Office. The Bureau of Standards at that time would not even take women secretaries, so there were no women scientists there. Then,

I learned that one of my classmates who had flunked freshman mathematics, was going to some small town in New England to teach mathematics at about $500 for the school year. That was a rude awakening; that a person who had flunked her college math was considered qualified to teach math in the public school system was something that did not appeal to me.

However, I learned that the U.S. Patent Office did take women examiners and after struggling a number of times, I managed to obtain a passing average grade for the six three-hour examinations that I had to take, to be considered as an assistant examiner in the Patent Office. These six 3-hour examinations were two a day for three days in succession.

Sopka: What kinds of topics did they cover?

Weeks: Mathematics through differential calculus, chemistry, including organic chemistry, physics, scientific French or German, the reading of two Patent Office drawings (three being given, one all electrical, one all mechanical, one a combination), and "technics." To illustrate technics, one question was, "How is cotton cloth made? giving the procedure step by step from the growing of the cotton in the field to the finished cloth."

Technics was a struggle. By studying and repeating the examinations, I finally passed. In August of 1917 I was appointed assistant examiner in the Patent Office, the third woman to be so appointed. One had already retired, so there were only two of us out of 400 examiners.

By this time the United States was in World War I. Therefore, after passing the exams, one did not have to wait as long as earlier because the men were being drafted. This is one thing that I've always resented, that my opportunities have come through wars, which is no way for women to get their opportunities.

Sopka: I understand that Louise McDowell was one of the first, if not <u>the</u> first woman to work at the National Bureau of Standards?

Weeks: Louise McDowell was the very first woman to be given a position with a high rating at the Bureau of Standards. Later on, when Bureau of Standards took women, I left the Patent Office for a few months, at a lower salary, to work at the Bureau of Standards. Neither they nor I knew how to evaluate my experience in the Patent Office, in relation to the position at the Bureau. It was certainly not my cup of tea, and I returned to the Patent Office.

Sopka: What were your duties at the Patent Office after you got your job?

Weeks: I worked in two different divisions -- in the first division, it was just little odds and ends, one might say. Hairpins, garters, buckles and miscellaneous devices such as that. In the same division were signals, mechanical signals, not electrical. I remember when the zipper application was received in that division. Also the applications for street signals for regulating automobile traffic were received; we all doubted whether motorists would ever obey such signals!

Later on, I was transferred to one of the four electrical divisions.

After I had been in the Patent Office a year, more men were being drafted, and therefore more women were appointed. One of my classmates, Jessica Dee, who had been a fellow student with me in math and physics at Wellesley, received an appointment in the Patent Office as an assistant examiner. She was placed in the radio section, and eventually became a consultant and patent attorney outside the government.

I studied patent law for one year in the evening, at George Washington University Law School. At that time, to be promoted in the Patent Office, it was necessary to take promotional examinations. Eventually I passed and received a promotion. In the meantime, MIT was having difficulty finding men assistants in physics. The war had interfered with the training of young men. Professor Edwin Bidwell Wilson, then head of the physics department, decided he would try women.

He wrote to Miss McDowell at Wellesley, Miss Laird at Mt. Holyoke, and Miss Maltby at Barnard. And thus recruited four women: Louisa Eyre, Barnard 1920; Evelyn Clift, Mt. Holyoke, 1919, Elzora Chandler, Wellesley, 1920, and Dorothy Weeks, Wellesley 1916.

Because of my experience, I was assigned head assistant in the sophomore electrical laboratory, which was required of all sophomores at MIT. At that time there were 600 taking the course.

Sopka: How many other assistants like you four girls were there?

Weeks: At that time there were no other young women at MIT as working assistants.

We were told by the professor in charge of the course that the instructors were to teach the boys, and we were to assist the instructors. This arrangement was to protect us from one of the indoor sports of students. In those days students would try to reach the end of the knowledge of their professors. They might sit up all night long to try to get something that would stump the professor.

Tape # 1, Side 2

Weeks: The principal job of the assistants was to correct the reports, to assign the students as they came into the lab to the particular experiment and table, to see that the equipment was working -- but not to explain Ohm's Law!

Sopka: Were there any girls among the 600 students taking the course?

Weeks: There was one girl who majored in physics while we were there, Excellenza Morse, who eventually went to the Patent Office, and became the first woman to be a principal examiner in the Patent Office. She married and later retired. I don't know if she's living.

In the beginning all students had to report to the laboratory to receive an assignment for a lab section. Among the very first group, one young man said, "Oh, Miss Weeks." I had met him in Washington when he was recuperating from a war injury. He was one of a group of injured soldiers I had entertained in my house at a card party.

The next year we had the same limitations, but by the third year, Louisa Eyre and I had been appointed instructors. I was assigned the job as head instructor of that laboratory and was now teaching the boys Ohm's Law and electrical theory.

Sopka: Did they indeed try to heckle you and test you or were they gentlemanly and courteous?

Weeks: Well, the boys in general were very cooperative. Of course, there are always some who try to take advantage. I was trying to do a Master's thesis in X-rays on equipment that had been used by a former member of the faculty. The X-ray Lab was in the basement. The door was labeled in black, "Department of Physics," the room number, and my name, Miss Weeks. But above my name in big red letters: "DANGER, 50,000 VOLTS..."

The students considered that an appropriate designation. It was a well known door, even made the student newspaper. (laughter)

Years later, when I met Vannevar Bush at an MIT dinner, in Pierre Dupont's beautiful gardens at Wilmington, he remembered the 50,000 volts on the door.

In fact, during a meeting of The American Physical Society held in Cambridge, the man across the table from me at dinner said, "Oh, Miss Weeks, you are from MIT."

I remarked, "Yes, how did you know?" Then I said, "Oh, you must have seen my door."

He said, "No, I didn't see your door, but I've been in the electrical engineering laboratory, and the different machines are labeled "DANGER, 35,000 volts, Miss Weeks -- DANGER, 50,000 volts, Miss Weeks." (laughter)

I think my relationship with the boys was good. Not only was I head instructor for the sophomore electrical laboratory, but I assisted in an electrical laboratory required of all physics majors at MIT, and some students of electrical engineering. I set up experiments, some of which required that I learn to blow glass. I took glass blowing lessons from McAllister and Bicknell, who did intricate glass blowing for both MIT and Harvard.

One summer, I was in charge of the laboratory course.

It was during those four years at MIT that my executive ability seemed to emerge. To run that laboratory smoothly required organization. It also required some experimental skill in replacing galvanometer suspensions! Those MIT boys were expert at destroying them. Although I was re-appointed for a third year as instructor, of physics, I did not accept. At that time there appeared to be no future at MIT.

Sopka: Were you able to complete the Master's program you were trying to?

Weeks: I received the Master's degree in 1923. It was in experimental physics, on powder analysis by X-rays. The next year, in addition to being instructor in physics at MIT, I was also part time instructor of physics and general science at Buckingham School in Cambridge. This gave me a little extra money. Since many persons had commented on my executive ability, I decided that I would seek administrative work.

Having been a member of the Shakespeare Society at Wellesley College as an undergraduate, I continued my contact by attending meetings while living in Boston. There I met a Mrs. Lucinda Wyman Prince, who had founded the Prince School for Store Service. A number of able Wellesley alumnae had graduated from the Prince School, which was now a part of Simmons College, and had interesting administrative positions. I received a Master's degree from Simmons in '25, having completed that course.

Sopka: Was this Master's degree in personnel work or what?

Weeks: It was an MS in the Prince School course. I was hired as supervisor of women for the Jordan Marsh Company while I was still studying at the Prince School. I reported to Jordan's for a few hours every morning, and all day Saturday. I had the experience of selling in 36 different departments, working in the receiving room, the shipping room, the mail order department, and the adjustment office, giving me a wide range of experience.

In August, I became hiring supervisor, which I held until September of '27.

But this was certainly not my cup of tea.

Sopka: Was the pay significantly better than what you had been getting teaching or working at MIT?

Weeks: About the same. Had I stayed longer it probably would have been higher. I did have some interesting opportunities. I experimented with interesting help-wanted advertisements, completely rearranged my part of the employment office so that it was more efficient. I became acquainted with a group of persons who had an entirely different background. This I feel is important. It has contributed tremendously to my life.

We are so sheltered in the academic and scientific world. It is important to realize the problems that these underprivileged persons have to face, and their insecurity. I feel strongly that first of all, we are persons, our professional selves second. This experience has contributed to me as a person.

I could not subscribe to some of their methods or policies, so I left, and found a temporary job at the Harvard Medical School, working with Dr. Donald Augustine, who had just returned from Egypt, on a grant from the Rockefeller Foundation for Medical Research. He'd made a study in ten or twelve towns along the Nile, of hookworm and trichinosis. He needed someone to work up that data. I had the fun of doing that. And having time to think about what I really wished to do.

I decided that my heart had always been in the academic world and that I would get a PhD. I would let events take care of themselves, whether I would eventually be in academic administrative work or teaching, but I would earn the degree, and I would go back to MIT, because I could not afford to lose credits and I could get full credit -- the physics department still did not really rate. Professor Wilson had left MIT in 1922 to become professor of Vital Statistics at the Harvard School of Public Health. He had been one of the three administrative officers at MIT, serving in place of the president. In 1923, Samuel Stratton, who had been at the Bureau of Standards, and had never allowed women until World War I, became president. At that time the physics department was more interested in industrial physics, and did not rate. But the mathematics department offered all the theoretical physics courses. It was considered one of the seven distinguished departments of mathematics in the United States.

I decided to return and study for a doctorate in mathematics, writing my thesis in mathematical physics, that I would do my thesis under Norbert Wiener, whose reputation was well known.

Sopka: What was your thesis topic?

Weeks: My thesis topic was: The Study of the Interference of Polarized Light, by the Method of Coherency Matrices.

It was both physical and mathematical. I found it a fascinating subject. In those days, since computers were not yet a part of life, I had the fun of computing more than 1000 matrices. This study also involved group theory.

Sopka: That was an exciting time in physics.

Weeks: It was. Since theoretical physics was in the Math Department, it was the mathematical approach of the newer physics that was emphasized.

Sopka: Norbert Wiener had collaborated with Max Born, when Max Born came to MIT in 1926.

Weeks: That may be true. It was exciting. Vallarta in physics and a group of younger men in the math department were discussing the impact of the newer physics.

Sopka: Did you know H. B. Phillips?

Weeks: Yes, I knew Phillips, but only slightly. I never had a course with him. I studied differential geometry with Struik, which was an outstanding course.

Sopka: Professor Phillips had tried to give quantum theory courses in the early twenties, when the physics department wasn't doing anything theoretical at all.

Weeks: In the physics department, we had one outstanding course from 1920 to 1922. That was under Professor Edwin Bidwell Wilson, who gave a course in the constitution of Matter. It was a two year course. Robert Lindsay took the course. Louisa Eyre and I took the course. It was quite a fantastic course. Later Lindsay, who has published a number of books in physics, said he got most of his material from this course.

Professor Wilson was a Harvard graduate, a Yale PhD, and reputed to have been Willard Gibbs' most brilliant student.

Sopka: When you went back to MIT to do your doctoral work, were you completely acceptable as a woman graduate student?

Weeks: Oh, I had no problem. I was known at MIT. The math department knew me. It was like going home.

Sopka: Had your brother gone to MIT, by the way?

Weeks: My brother was class of 1913 at MIT, electrical engineering, and took his Masters in 1914.

Sopka: Apparently during this period when you were doing your doctoral work at MIT, you also had begun teaching at Wellesley.

Weeks: I taught at Wellesley the year of 1928-29, and delayed obtaining my doctorate until 1930. When I returned to MIT in February of '28, I said, "I want my doctorate in '29," that was to complete the work in a year and a half. I was offered a three-quarter time instructorship at Wellesley for '28-'29. This I accepted because it gave me a more recent college teaching position when seeking a position.

I continued my studies that year but was not able to do very much at MIT while teaching at Wellesley.

Sopka: You had to commute, presumably?

Weeks: I lived in Cambridge and commuted to Wellesley via a Model A Ford. They came out that summer of '28.

Sopka: Had you learned to drive before or did you learn to drive when you bought your car?

Weeks: In 1919 I bought a Model T Ford in Washington. I had it for only a year. I sold it when I went to MIT as an assistant and took a salary half of what I had as an assistant examiner in the U.S. Patent Office. I'd been living at home and having a gay time. I changed from living at home to hall bedrooms and no car and buying my clothes in the basements of Jordans and Filene's.

Sopka: I see. So you were able to commute in your Model A Ford from Cambridge to Wellesley to teach classes.

Weeks: Very easily. It was very easy to drive to MIT and to Wellesley in the car.

Sopka: Did this tend to separate you out from the MIT graduate students, if you were so busy with your teaching duties, or did that get to be a problem?

Weeks: At MIT in those days, there was very little social life. When MIT moved in 1916 from Back Bay to Cambridge, there were rooms assigned for the women students. I attended my classes but did my work in my apartment. It was on Shepherd Street across from the Radcliffe dormitories. This is where I did the computing of the matrices.

When I was completing my doctorate, it was Depression times, and it was a difficult time to find a job. My mother had become ill with cancer of the liver, so I spent the summer of 1929 at home. During that summer I sent out penny postcards to more than a hundred colleges, asking for their catalogues. Since they thought I was a candidate for admission I received interesting view books, all of which were very entertaining for my mother. I looked up in WHO'S WHO the president of the college, and in AMERICAN MEN OF SCIENCE the head of the physics department, and also Rita Halle's book, WHICH COLLEGE? Thus I made a study of these colleges. I would determine the average income per student, the average endowment per student. Then, I listed the first twelve colleges I thought possible, the next 25, then all the rest. With the help of a friend in the advertising department of a publishing company, I prepared a one-page letter which I took to a public stenographer at Harvard Square. She became so interested in my case that she did the typing herself instead of delegating it to her group. We sent letters to these 12 chosen colleges.

I received three nibbles. Wilson College was one of the 12, and eventually it was Wilson College that offered me a satisfactory appointment.

Sopka: Can I ask who the other two were, do you remember?

Weeks: I don't really remember.

Sopka: I was curious to know whether you had any realistic hope of getting a position at a school which was not a woman's college.

Weeks: I think the first 12 were all women's colleges. I did not expect to receive a position with a good rank in a university.

Sopka: That seems to have emerged in my research, but I wasn't sure --

Weeks: In 1930, I'm sure they were all women's colleges. I know there was an opening at Mt. Holyoke, at Vassar, and an opening at Wilson. There was another opening down South which I think was a women's college. Wilson College was ideal for me because it was only 90 miles from Washington, DC. I could drive down frequently to see my mother, who did not die until the fall of my third year at Wilson.

Sopka: Did you feel that you got the job at Wilson entirely from your initiative in writing these letters?

Weeks: Yes, I had great fun with that. I wrote to Dr. Ethelbert D. Warfield, a very distinguished old gentleman whose brother had been head of the Divinity School at Princeton. Dr. Warfield had been President of Lafayette College, where he was fired. I understand that situation is what provoked the founding of the American Association

of University Professors. Dr. Warfield went to Wilson in 1915. He was strict. Members of the faculty were not permitted to smoke while in service of the college. He wrote a reply to my first letter that he thought there might be an opening but he wasn't quite sure. After about five weeks, I wrote him again, and asked him if by chance he did know. And yes, he did know.

We corresponded every week for about four or five weeks, and every letter told me that members of the faculty were not permitted to smoke while in the service of the college.

Sopka: Had you taken up smoking at that point in your life?

Weeks: Fortunately, when I first came up to Boston in 1920, I, to declare my great independence, started to smoke and learned, of course, how to blow rings -- but I never liked it. So I'd given it up. I had no desire for it. But I did not care to say, "I will not smoke."

I also was insistent that I would be free to do research, and so Dr. Warfield wrote back and said I was more interested in research than in teaching. So I wrote back and quoted from a letter that I fortunately had received from the parent of one of the boys I'd had in summer senior high school in Washington, expressing great gratitude for what I had done for his boy. And on hearing this, he wrote and offered me the job -- and I had not yet promised not to smoke!

So in accepting the position, I wrote that in accepting the position I naturally expected to conform to the standards set for the faculty. (laughter)

I was the sixth person to take over the physics department since 1923, when it became separated from chemistry. I had great fun in building a department, imitating, of course, Wellesley's. Miss McDowell allowed me to go through the card file of their equipment, noting where they had purchased it, the price of it, etc. I had a complete set of her lecture outlines for the beginning course, with notes of the experimental demonstrations that she gave. I had a complete set of the beginning lab directions, all of this to start to build a department at Wilson.

Sopka: Were you the sole member of the physics department?

Weeks: I was the sole member of the physics department. In fact, I was the janitor as well as the professor.

(laughter)

Tape # 2, Side 3

We had some very good students at Wilson while I was there. I had a number in physics. The ablest student that I had practically anywhere was Pauline Morrow Austin, who later went to MIT and received her PhD in physics. While there, she passed with honor every course, a record I understand, that is rarely made by anyone. She's continued to be at MIT and now is a Senior Research Associate in charge of their Weather Radar. She married, has two daughters, but has never allowed her profession to interfere with her family life.

Another one of my students, a math major, took four years of physics. She studied for her PhD in mathematics at MIT and is now professor of mathematics at Binghamton, N.Y. State University. Her name is Helen Beard.

Another student took a Master's degree in physics at MIT. Two of my students were appointed assistants in physics at Wellesley. They received Master's degrees in physics from Wellesley, and others have done graduate work at Penn State, and the University of Pennsylvania. Although we had enrollment that varied from 350 to 400 while I was at Wilson, a good number responded to the attraction of physics.

Sopka: I think that's a very notable record, for you and for Wilson.

Weeks: Louise McDowell always seemed to think it was comparable to the numbers in the Seven Sisters Colleges.

Sopka: How did your desire to do research work out?

Weeks: First,I had to split my doctor's thesis into two papers, and have them published.* Then, in the summer of '34, while Miss McDowell and I were in Europe, I said, "I think I'll go back to MIT and get training in spectroscopy."

In 1932, I had attended the dedication of the spectroscopy laboratory at MIT. It wasn't until Karl Compton became President of MIT in 1930, the year that I received my doctorate, that the emphasis in the physics department was changed from courses for support engineering to include courses for physics per se. Distinguished research theoretical professors and experimental physicists were appointed and the physics department modernized.

At the dedication of the spectroscopy laboratory, Henry Norris Russell of Princeton, known world-wide as an outstanding

---

*MIT Journal of Mathematical Physics

astronomer, gave the dedicatory address: "On Revealing the Universe Through the Spectroscope." Before he had said a few sentences, I was sitting on the edge of my seat, and felt: this is the subject that I would like to study. It was not possible to continue my theoretical work at Wilson, where there was nobody with whom I could discuss ideas or get any inspiration or who would even understand the theory. I felt that in a small college, which awarded only the BA degree, one should have a research subject that could be brought down to the understanding of undergraduate students. Spectroscopy was such a subject. There were women working in the field of astronomy, and the related field of optics. It seemed therefore to me a field where less prejudice existed and was ideal for my situation.

I went to see George Harrison during Christmas of 1934 and told him my plan, namely, in the summer to study spectroscopy at MIT.

He offered a course each summer, on practical spectroscopy. MIT had a meeting of spectroscopists every summer. Harrison suggested that I attend. He would arrange for me to be taught the use of every piece of equipment in the spec lab.

Sopka: Oh, that was very valuable.

Weeks: I spent the summer of '35 at MIT, learning and studying atomic spectroscopy. I told him that if he could supply me with plates, I could do a little research at Wilson.

After a few days he asked me to work on the iron spectrum. Little did I know that he had planned a WPA* Project. I learned that later. He needed more tertiary standards in iron because of the great spectral range he would be measuring. So I determined the new standards needed for the project.

From 1935 until World War II and after, I spent every vacation, spring, Christmas, sometimes midyears, at MIT. I was a volunteer, working at my own expense. WPA workers did some routine computing for me.

When we reached the point where measurements were converted into wave numbers, a little higher skill than most of the WPA workers could do, was required.

In the meantime, the summer of '38, a Wellesley student was a volunteer worker on the project. This suggested the possibility of

---

*Works Projects Administration (federally funded)

using more volunteers in the summers. Biologists sent students for six weeks or longer each summer to Woods Hole. When those students returned to their colleges, they inspired other students. I realized also the lack of opportunity for women students.

Since we had need for a better quality of workers, and students could not find summer jobs in those Depression years, I suggested to George Harrison that I arrange for college girls, students from women's colleges, to be volunteers for six weeks during the summer for the privilege of what they could learn.

They could audit his course on Practical Spectroscopy, and explore MIT exhibits in the hall, and visit some research labs of cooperating professors.

This plan was in effect for six summers, three before the war and three after, with a total of about 30 students, from the women's colleges -- one from Radcliffe, three from Wellesley, three from Mt. Holyoke -- others from Smith, Vassar, Goucher, Bryn Mawr, and Wilson.

Sopka: That was certainly a memorable experience for the one from Radcliffe -- who is talking to you now.

Weeks: George Harrison named it "The Charm School." And to this day, anyone who knows about it, knows it as the "Charm School."

Also, in the meantime, I had applied for grants to support a research assistant in physics at Wilson College, Fortunately, I received one. By this time, Professor Harrison was using the Bitter Magnet to obtain the Zeeman Effect of the spectral lines of all the elements. Professor Harrison assigned the plates of the Zeeman patterns of the iron spectrum to me for analysis.

With an assistant at Wilson we analyzed the Zeeman patterns of Iron I. The year of 1949-50, when I held a Guggenheim Fellowship, I analyzed the Zeeman patterns for Fe II, Co I, Co II, Zr II, Zr III.

Sopka: Did you spend your Guggenheim year at MIT?

Weeks: I was again, as I had been the first semester of 1937-38, a guest of the physics department at MIT for 1949-50 until the spring. The end of March, I visited spectroscopy laboratories in Europe, including the Zeeman Laboratory in Amsterdam, also Bohr's Laboratory in Copenhagen, Svedberg's in Upsala, Sweden, and Siegbahn's in Stockholm. Siegbahn himself showed me his new 10 meter grating, pointing out the advantages of his over the MIT ten meter grating!

Sopka: Were you able to publish the results of these years of research?

Weeks: These are all published. Except for the Zeeman Effect of Fe I I never published them as separate papers. All were published in the ATOMIC ENERGY LEVELS Vol. II by Charlotte Moore at the Bureau of Standards. Credit, of course, was given to me.

The Zeeman patterns of Fe I were published as part II of a monograph published in 1944 by the American Philosophical Society on Iron. Authors of Part I were Henry Norris Russell and Charlotte Moore Sitterly.

Sopka: I understand your work at Wilson was integrated during the war. Between 1943 and 1945, you were back in Washington, weren't you?

Weeks: Yes. Through my MIT associations I was nominated for jobs with the scientific war effort. In the spring of 1943, the OSRD* wrote asking me whether I would consider going to Washington on a war job. After I agreed to do so, Dr. Bush wrote to the president of Wilson College, Paul Havens, requesting my release. I began the war job July 1943 and remained full time until the summer of '45 as one of the technical aides in the Liaison Office of the OSRD. My chief responsibility was the supervision of the British Report Section. This is so stated in the history of the OSRD. I had a staff of 19, one of whom was a scientific assistant. My first assistant had been an instructor in physics at Wilson. One was a former student who had received a Master's degree in physics at Wellesley.

All scientific and technical documents that came into this country through OSRD channels, cleared through the British Report Section.

Sopka: What kinds of topics were you concerned with? Radar?

Weeks: We covered all topics pertaining to OSRD projects. One Technical Aide was in charge of the Radar Exchange Program, but while he was travelling for several months, it was assigned to me. We had laboratories in England, and later on the Continent. Their correspondence cleared through the British Report Section. It was important that I be kept informed of the interests of the various research groups and where various research problems were being undertaken, because sometimes letters or reports would come in, which would be of value to someone to whom they were not directed.

---

*Office of Scientific Research and Development

Then I had photostats made (remember, xerox did not exist then) and sent to the other persons.

I visited the different war research laboratories in the Cambridge area, Pittsburgh and Rochester, to learn about the work in which they were interested.

Sopka: Were you aware of the Manhattan Project activity?

Weeks: I knew there was some very highly secret thing. The man who wrote the Smyth Report was one of my associates. Every now and then, he would ask me to send a special report to a box number. He told me I was not to use certain words over the telephone (laughter) -- therefore, I knew something was going on, but I was busy with my own assignments.

It was interesting. There were 2000 different documents that cleared through the British Reports Section, the month before D Day. Within 24 hours after the first buzz bomb landed in London, a diagram of that was on my desk.

It was in many ways valuable experience. It was also very, very difficult -- I think it's one of the most difficult jobs that I have ever had. We had at one time both a day shift and a night shift, so I would stay to see the night shift well established before leaving. We were not able to have the best qualified persons to do the clerical work. By this time, one had scraped the bottom of the barrel.

I'll never forget the time when one pouch came in from England, was processed in the usual way, before it was brought to my desk. Then I discovered it was about heavy water and related ideas,that it should have been highly classified and handled differently. Such experiences can be trying.

I think I've failed to mention, too, that years ago, before my brother went to college even, we saw the very first sustained airplane flight, not Kitty Hawk, but the flight at Fort Myer, where the Wright brothers were demonstrating to the armed services the ability of a plane to fly. It was up about an hour. All the Weeks family were there to see it.

To jump from that to World War II, and the contrast and the change was tremendous.

Sopka: You went back to Wilson and taught there till 1956, is that right?

Weeks: I went back to Wilson until 1956. I was approached by the National Science Foundation to take leave of absence again from Wilson for a year, to work on the fellowship program. This I declined.

Later I applied to the National Science Foundation for a grant. I wanted a comparator at Wilson. When I visited the NSF to learn if there was a probability of receiving such a grant, Dr. Raymond Seeger said, "We want to see you. We want you to come down here."

But I was fed up with leaving and returning and clearing up messes in Wilson's Physics Lab. I said no, I will not do it. But we finally agreed to an arrangement whereby I went to Washington and worked there every other week, Thursday, Friday and Saturday and a few days at each vacation. This I did from the fall of '53 until June of '56, when I left Wilson and moved to Wellesley.

Incidentally, the Research Corporation made a grant which covered the cost of a comparator for Wilson College.

Sopka: You did not retire from physics, however.

Weeks: Then I became a physicist at the Ordnance Materials Research Office, located at the Watertown Arsenal, where I remained for eight years. I advised the Ordnance Department on radiological shielding. We had an ordnance committee on shielding of which I was the chairman and the only woman member.

This required visits to different arsenals, the General Dynamics in Texas, and Oak Ridge Laboratories. I visited Los Alamos, Livermore, Berkeley, to discuss with nuclear physicists the relative methods, experimental and theoretical, for determining the shielding properties of materials, especially those to be used in the construction of tanks; a combination of materials that would possess mechanical strength and absorb gamma rays and neutrons.

I had mandatory retirement from the government June 30, 1964, when I was 71 years and 2 months old. Two months later I became a spectroscopist at the Harvard College Observatory and investigated the iron atoms in the vacuum ultraviolet region until the fall of 1976, when I was 83½ years old.

Sopka: At the Harvard Observatory, were you a visiting scientist?

Weeks: No, I was on a part-time basis. I made my own arrangements, that I would work a maximum of 25 hours a week.

Sopka: You've had a long and varied career in the world of physics.

Weeks: My primary interest has been in teaching. Research was secondary, but important for one's professional growth and for growth of one's students.

Tape #2, Side 4

Sopka: I wanted to ask you, from your broad experience in the American physics community, whether you have any comments that you could make on the role of women in the past and their prospects for future participation in the physical sciences?

Weeks: I've said to others, I'm glad I've lived in the period in which I have. Of course, women have not had equal opportunities, but in the old days, women were not the threat and there was not the competition that there is today. It was a much more comfortable atmosphere, I think. Although, at one meeting of The American Physical Society in Washington around maybe 1920, plus or minus, there were a group of women, maybe three, four or five, who were escorted to a table in the hotel dining room, where the banquet was being held, by a courtly gentleman physicist who left us there. Of course, the other women commented and noticed, that we were not taken naturally. That, of course, helped to make us more self-conscious. But in my own personal experience, I thought that the men with whom I worked had a sense of pride that I could do what I was doing. I never had a sense of resentment, with possibly one or two exceptions, in all of my various jobs. I will be glad when women can take themselves naturally, and not be self-conscious of the fact that they are a woman in this field. Never was I made to feel peculiar. that I was a woman in physics. My family never made me feel queer because I liked math and science, nor did any of my teachers ever make me feel it. They took me in their stride. I wish the women today would be able to take their aptitudes in their stride. I had to support myself. I intended to support myself doing interesting things, if I could. But now, the battle goes on between the sexes. I don't like it, and I don't think it is necessary. I think one gets along better if one just goes ahead, develops one's capabilities and finds a position where they can be used. There are various ways of handling life, just as there are various ways in going up a mountain. You can go up the valley way. You can go up the steep way. You can go up a head wall. You can bushwack. No matter which route you choose, you go only 4000 feet if you start at 2000 feet and climb to 6000 feet. I've always felt that I've had to bushwack. There was no regular path. But it takes more skill or luck to bushwack.

Who should object to being required to develop more skill? I feel very strongly about this. Doors were closed to me, but I found there were other doors open.

In general at meetings of The American Physical Society, the women, like the men, hovered around the well-known physicist, hardly noticing any other women physicists. Of course, there were others who were friendly to other and younger women, making them feel comfortable, and introducing the newer and younger women to the more distinguished physicists. In general, this indicates the lack of security most of the women felt.

Sopka: Were women physicists in the generation of which you were part sufficiently scarce, so that you did get to know most of the other people, or not.

Weeks: I have met most of the early women physicists. I was introduced to Margaret Maltby. I knew Isabella Stone, Wellesley, 189-, who, with her sister had a private school for girls in Washington, D.C. I never met Marcia Keith or Janet Clark. However, I knew Elizabeth Land, Edna Carter, Grace Langford, Frances Wick, Louise McDowell, Janet Howell Clark, Mabel Fruhafer, Helen Gilroy, Margaret Shields, Helen Messenger and my contemporaries, Mildred Allen, Alice Armstrong, Dorothy Hayworth and Monica Healea. With few exceptions, all these women taught in women's colleges. Today, young women physicists remark that these early women were not in industrial research labs -- neither were the men, for it is since World War II that industrial labs blossomed.

In those early days, so did the men teach. Physics as a subject was only developed around the turn of the century. The first industrial research laboratory was probably Edison's, which became the General Electric one. So that today, one must understand the period about which one is talking. There are certain women who stand out to me as placing persons ahead, that is, teaching and using the subject as the tool of contact to reach the mind of their students, to teach them something bigger than the subject. There are others who just devote all their time to research, and welcome able, younger persons to work with them, but only if the student is able and helps their professional advancement. Both types are needed, the research worker and the real leader.

Sopka: If a young person who was already drawn to physics came to you today and asked you for advice on what kind of an educational pattern she should follow, would you advise her to go to a women's college or to go to a co-ed institution?

Weeks: Although today the situation is very different than in my day, I still favor a woman's college, in general. But it's not

the same today because in the past, practically every teacher of physics in a woman's college was a woman, although Smith and Bryn Mawr had men. Vassar had one man. Wellesley did not. I think Mt. Holyoke did not. In those days, when one went to a woman's college, one was taught physics by someone who was a professional woman physicist, a role model, someone who would understand one's desire to be a woman physicist. Today, we have both men and women in most of the colleges, but I still think that in the women's colleges, in a subject such as physics, that it's very important to be with persons who understand the problems of the woman scientist.

Sopka: Well, I thank you very much. We've ranged over a number of topics. Is there anything else that you would like to add?

Weeks: I'll add it as a footnote.

AMERICAN INSTITUTE OF PHYSICS

335 EAST 45 STREET, NEW YORK, NEW YORK 10017 • (212) 661-9404

CENTER FOR HISTORY OF PHYSICS
Spencer R. Weart, *Director*
Joan N. Warnow, *Associate Director*

December 30, 1980

Dorothy W. Weeks
28 Dover Road
Wellesley, Massachusetts 02181

Dear Ms. Weeks:

Thanks very much for giving us the correct spellings of names in your interview. We'll make the changes you advise. Again, let me take this chance to thank you for your cooperation in making this interview possible.

Sincerely yours,

Spencer R. Weart

SRW/mas

AMERICAN INSTITUTE OF PHYSICS

335 EAST 45 STREET, NEW YORK, NEW YORK 10017 • (212) 661-9404

CENTER FOR HISTORY OF PHYSICS
Spencer R. Weart, *Director*
Joan N. Warnow, *Associate Director*

December 1, 1980

Miss Dorothy Weeks
28 Dover Road
Wellesley, MA 02181

Dear Miss Weeks:

As you requested, we are enclosing a copy of the final format of the interview which you had kindly given to the AIP's Center for History of Physics. This interview is now deposited in our oral history collection. Future scholars will be able to use this interview as a research tool in accordance with your instructions on the permission form. I trust you won't be bothered if a few typographical and such errors remain; we regard interview transcripts as manuscript material, not equivalent to a printed book, and we expect the scholarly users to exercise good judgment in interpreting the transcript. I'm sure they will find it very helpful.

Thank you for your time and cooperation.

Sincerely yours,

Spencer R. Weart

SRW/mas
Encl.