ORAL HISTORY PROJECT

Mary Ellen Avery, MD

Interviewed by
Lawrence M. Gartner, MD

April 4, 1998
Chicago, Illinois

This interview was supported by donations from:
Merton R. Bernfield, MD
George W. Brumley, MD
Michael F. Epstein, MD

https://www.aap.org/pediatrichistorycenter

Mary Ellen Avery, MD

Interviewed by Lawrence M. Gartner, MD

Preface	i
About the Interviewer	ii
Interview of Mary Ellen Avery, MD	1
Index of Interview	65
Curriculum Vitae, Mary Ellen Avery, MD	67

PREFACE

Oral history has its roots in the sharing of stories which has occurred throughout the centuries. It is a primary source of historical data, gathering information from living individuals via recorded interviews. Outstanding pediatricians and other leaders in child health care are being interviewed as part of the Oral History Project at the Pediatric History Center of the American Academy of Pediatrics. Under the direction of the Historical Archives Advisory Committee, its purpose is to record and preserve the recollections of those who have made important contributions to the advancement of the health care of children through the collection of spoken memories and personal narrations.

This volume is the written record of one oral history interview. The reader is reminded that this is a verbatim transcript of spoken rather than written prose. It is intended to supplement other available sources of information about the individuals, organizations, institutions, and events that are discussed. The use of face-to-face interviews provides a unique opportunity to capture a firsthand, eyewitness account of events in an interactive session. Its importance lies less in the recitation of facts, names, and dates than in the interpretation of these by the speaker.

ABOUT THE INTERVIEWER

Lawrence M. Gartner, MD

Lawrence M. Gartner was born and grew up in Brooklyn, New York. His undergraduate education was at Columbia University, followed by medical education at Johns Hopkins University, where he received his medical degree in 1958 and pediatric internship from 1958 to 1959. Returning to New York, he continued his pediatric residency at the Albert Einstein College of Medicine, where he was Chief Resident in Pediatrics from 1961-62. He continued at Einstein, doing a fellowship in hepatology, neonatology and research. In 1964 he became a faculty member, rising to Professor of Pediatrics and Director of the Divisions of Neonatology and Gastroenterology and of the Pediatric Clinical Research Center. During this period he carried out a major research program in neonatal bilirubin metabolism. In 1980, he became Professor and Chairman of the Department of Pediatrics at The University of Chicago and Director of Wyler Children's Hospital. In 1998, Dr. Gartner retired from the University of Chicago. He now lives and works from his ranch in Valley Center, California (San Diego), continuing lecturing and writing in neonatal jaundice, breastfeeding and history of neonatology.

In 1956, he married Carol B. Gartner, who subsequently became Professor of English at Purdue University and Dean of the College of Arts and Sciences at the Calumet campus. She also writes and lectures on the history of medicine, sometimes with her husband. She also assists in the oral history project, with specific responsibility for the video recording and photographs that accompany each oral history. They have two children, Alex Gartner, a movie producer, and Madeline Gartner, a breast and endocrine surgeon.

Interview of Mary Ellen Avery, MD

DR. GARTNER: This is April 4, 1998. This is Lawrence Gartner interviewing Dr. Mary Ellen Avery in Chicago. This is tape one, side one.

[Recording interruption.]

DR. GARTNER: The purpose of this neonatology oral history program is to record for future historical research the information contained in the memories of those who founded the field of neonatology and contributed to its direction and development. In addition, we're interested in recording personal information about the field's leaders, so that we can better understand the nature and origins of their contributions as leaders. You're among the group of those who created neonatology as an academic, clinical and scientific discipline within pediatrics, and I'm most grateful to you, Mel, for agreeing to share your ideas, your memories and your analyses of the field of neonatology with all of us. Carol [B.] Gartner, my wife, will be participating in this taping, and handling the video and the still camera, and also asking some of the questions as she listens to us and adds to the questioning. What I would like to start with first is personal background about you, your career, and then later we'll move into the issues relating directly to neonatology. There is no time limit to the interview, except that we have essentially one day to do it in, and we want to be as complete and comprehensive as we can. But please break whenever you want to break, and feel that this is a very relaxed experience for both of us. The [American] Academy [of Pediatrics] is also taking oral histories of women in pediatrics to gain insight into their roles and challenges. To avoid a second taping of you as a woman in pediatrics, I'm going to include questions specifically relating to women in pediatrics, so there's an extra piece in here that the men don't get quite in as much detail, but they get some of it. The primary recording for archival purposes is the audiotape, and that will be transcribed into a print version. The editing process is not intended to delete or alter any of the components, but only to ensure accuracy in the transcription of names, dates, and other information. If there is any segment that you feel is so sensitive that you do not want it to be revealed until a later time, that section can be sequestered, but we actually hope that all of the transcription will be available to scholars without restriction. The videotaping is an enhancement to enable those who want to see how this was done, and to see the individual in motion at future times, but it is not the major archival record. You have given me a whole collection of photographs, and later on we'll look at some of those photographs, and you can tell us what's on each of those photographs. We'll make copies later for the Academy archives.

What I'd like to start with now is some of the background of you, your early life, and how you entered this world. Start with your birth, your parents, siblings if there are any, family life, early schooling.

DR. AVERY: Well, thank you very much. Obviously, this is a pleasure. Reminiscing becomes increasingly interesting to one with age, and

it's obvious that I am now over 70, so I do a lot of reminiscing. But I'd like to have a little preface to this whole event. You used the word one of the "founders." I don't view myself that way. In fact, pediatrics started really with an interest in infants on the part of our predecessors 50 years before us, or more. You remember Thomas Morgan Rotch and his percentage feedings. I remember [Kenneth D.] Blackfan and his humidifying rooms to keep babies' heat losses minimal. These were the founders. I think also of [Harry H.] Gordon and [Samuel Z.] Levine. And when you said the first scientific aspects, I would say that they tried very hard to measure oxygen consumption and energy expenditures, and to think of composition of feedings. I guess it was at Cornell [University Medical College]. I think that they were indeed among the founders. I also think of Richard [L.] Day and Bill [William A.] Silverman working at Columbia-Presbyterian [Medical Center] with Virginia Apgar, whose interest in the newborn can't be denied. All of these people preceded me. And some of them were my teachers, of course. Briefly, Bill Silverman and Dick Day one summer at Columbia, and of course Harry Gordon when he moved to Johns Hopkins [Hospital] as chief of neonatology. The word hadn't been used then, but he was in fact in charge of the nurseries at Johns Hopkins, the Harriet Lane Home, when I was an intern and a resident. But preceding him had been Janet Hardy, who was very much interested in newborn infants, and to this date is following up on some of the studies that she had done earlier, and continues to publish very interesting aspects now of adolescence and young mothers who once were the babies that she was concerned with. So I have had the good fortune to know personally a good many of the people I consider the founders. And that's the tip of the iceberg. But I haven't done my homework on this and apologies to all the others who surely were in the picture at the time. So can I call that the preface?

DR. GARTNER: That certainly is a fine preface, actually.

DR. AVERY: I then will respond to your quest for my origins. My parents were both on the east coast and both from modest backgrounds. My mother's ancestry was Scottish, and my father's was English. The lineage isn't all well worked out. They married, I think, in 1923, when my mother was the principal of a school in Newark, New Jersey, and my father was working in the cotton goods business as a salesman. They married and moved to Bucks County [Pennsylvania] into a lovely farmhouse. They never thought they had as good living ever since, [laughs] because they loved that farmhouse. But they couldn't afford it at the time and moved to a small apartment in Moorestown, New Jersey, where my sister was born, my older sister, four years before I was, and they struggled. In those days, about I think in the 1930s, my father lost his vision, most of it, and it was never clear why. But he'd been an upholsterer years before. He had to leave school in the 8th grade to help support his family, and working with the Pullman Company with the dust and dirt in Wilmington, Delaware, he was exposed,

I'm sure, to lots of problems, but TB [tuberculosis] probably was one of them. I think his tuberculosis uveitis progressed. He then decided that the only thing he could do, since he was probably unemployable in the depression with no vision, was to start his own business. Which he did in Philadelphia. There are many steps in the middle here, but it was a pretty remarkable matter. He borrowed $2,000, as I recall he told me once, which was in 1930-something, 1931 or 1932, quite a bit of money in those days, and was able to develop a manufacturing company for cotton goods. He was interested in canvas products, interested in awnings, finally shower curtains and other things. His story is that he had the good fortune to make good friends with people who owned mills in the south who would give him credit to get fabrics that he could process in his factory. Then he got interested in jobbing at one point, had an office in New York on 40 Worth Street, where the cotton goods industry was centered, and the business grew. It was never a huge business. I think at the maximum it was about 100 employees, but it made it possible for our family to live in a nice little house in Moorestown, New Jersey, and for my sister and me to go to a private school, both parents being very much interested in education. Particularly my father, who so wanted one and was not able to have it. But self education is still a good possibility in the lives of many people. That's about where I could pause and say is there anything more you want about that ancestry, so to speak?

DR. GARTNER: Your mother was obviously a teacher and a principal.

DR. AVERY: Yes.

DR. GARTNER: Did she continue in her role as a teacher?

DR. AVERY: No, and that I think is a very important question, because I think that she always regretted doing what was the custom in those days, staying home and taking care of the children, which she did. She managed to later on develop a number of interests and was active on various boards in Moorestown, where we lived all of their lives subsequently. She read a lot, and she read to my father, because he couldn't read. That's another piece of my own story. When I was growing up, I read to my father the stock market, which has been a major hobby of mine ever since. [Laughs] To my advantage, I might add.

DR. GARTNER: Especially recently.

DR. AVERY: He was always interested in the cotton futures. He'd come home from work, and he needed to know, and he couldn't read. So while mother was cooking dinner, I was reading the cotton futures. That's a slight exaggeration, but it does set the tone of our very happy household with many pleasant memories of interactions with both parents. My mother was always there when I came home from school. Meals were always ready

on time. She always got up and got breakfast. I was never neglected, [laughs] never lacked for lots and lots of parental love and support, with a sister who was extremely talented. She went to Wellesley College, and then had a nervous breakdown, they called it then, but came around out of what in retrospect was a depression, graduated from college, married and had children, who are my nieces and nephews, who are my sort of surrogate family. Unfortunately, she died of breast cancer in her mid-50s, at the time when the youngest child was about five, I think. Her husband remarried, and they are, all of them, close to me now, as the now surviving member of the Avery quartet that started out in 1920, I guess it was 1921, because I think my sister was born in 1923.

DR. GARTNER: And your parents you said have since passed away.

DR. AVERY: Yes.

DR. GARTNER: When did they die? How old were they?

DR. AVERY: Both of them in the 1970s. I don't remember their exact ages. I think my father was about 80, and my mother about 84, or so. My sister died shortly thereafter, so it was a rough decade for me personally.

DR. GARTNER: How many nieces and nephews do you have, your sister's children?

DR. AVERY: I have seven now.

DR. GARTNER: Seven? Including grand-nephews, or are these all the same generation?

DR. AVERY: Oh, now wait a minute. My sister had three children. The seventh is the grand level.

DR. GARTNER: The grand level, yes.

DR. AVERY: Yes. I'm a grand aunt. And the important part of all that is a summer home in Maine. In 1935, my family, living in suburban Philadelphia where summers were very hot and unpleasant pre-air conditioning, decided to go to Maine and rented a house there for a few years. They finally bought one on a wonderful lake in the middle of Maine, near Augusta. We spent our summers there, the family, and now I continue to go up, not only in the summers. One of the reasons I am in Boston is that I can get to Maine in three and a half hours. And that is really for all of us, home.

DR. GARTNER: What town is the house in?

DR. AVERY: Well, it's called Readfield, and it's near Kents Hill and Fayette, and you haven't heard of any of them.

DR. GARTNER: No, I haven't heard of any of those.

DR. AVERY: Well, they're little farm communities, but Kents Hill has a school, a boys' school, which is a private school. The lake is moderately inhabited. I can return to that at another time if you want, because it's still a very contemporary occupation. If you need more transition to summers in Maine — I guess we'll see.

DR. GARTNER: Why don't you tell us about summers in Maine now, we'll go back.

DR. AVERY: You want to follow that pathway?

DR. GARTNER: Yes, let's not drop that.

DR. AVERY: Yes. Well, here again, it was the family, with usually a friend who helped with the driving, because then my father couldn't drive. My mother was rather timid about driving and didn't like to, so we always had company in Maine. When you're on a lake, you do those things that you do on a lake — having canoes and little sailboats, and little outboard motors, go fishing, and lots of swimming, because the lakes in Maine become quite swimmable in July and August. You come to know all the people that live on the lake, and they become among your best friends, because summertime you're playing together, enjoying common interests and everybody's pretty relaxed. They and their children are still up there. These places tend to stay in families. So the subsequent generations all do get to know each other. Some of us have assumed a rather large interest in the State of Maine and the environment, and you can imagine we have as a high priority protecting the environment of the lake. The water is so clear you can see bottom at ten feet, and it's quite drinkable. It maintains itself pretty much. We, through the years, took ourselves from a rather semi-camping experience to now four houses in a little compound, with plenty of plumbing and electricity, and even heating and insulation, so that I can go up in the winter and go ice fishing. I leave my insulated house and go ice fishing. Not very often. We're within an hour and a half of the ski slopes in Maine, and the rest of the family comes up. They're more energetic than I am. They do the big time things like skiing. I do enjoy just sitting by the fire and looking at the lake, as time goes on.

DR. GARTNER: Nice thing to do. Do you chop a hole in the ice yourself?

DR. AVERY: Well, no, I have friends that drill it.

DR. GARTNER: They drill it for you.

DR. AVERY: The local farmers all look after me. It's marvelous. People go in and open up the house and turn the heat on and set the fire. I announce when I'm coming, expecting they'll do this, mind you. But they do. And they do all the housekeeping and the changing of sheets, and I effectively have a very lovely kind of way of getting away from whatever I want to get away from in Boston. There are certain stresses and strains in one's professional life, and having a retreat, I think, is enormously important. As children grow up and move to different parts of the country, and as parents die, there isn't a home so to speak, The family home in Moorestown is no longer mine, and the place that all the memories are is where we were all together, and that goes on and on.

DR. GARTNER: I've heard of that for many families.

DR. AVERY: Yes.

DR. GARTNER: That the summer place is the important one. Those are very nice memories you have, indeed. Tell me a little bit about the early influences in your life — the people who influenced you in addition to your parents, in terms of education, career, your own aspirations.

DR. AVERY: Well, a lot of my mother's friends, not surprisingly, were school teachers, and several in particular were very close friends of the family. My father's friends were everybody who lived in Moorestown, physicians and lawyers. He had lots of business people. He became very prominent in the Boy Scouts [of America] movement. He was never a scout leader, but he was one of the directors, and also contributed generously to it. He liked to be involved in the training of young people. Later, he became very much interested in the Girl Scouts [of the United States of America] movement, for reasons that in retrospect I find rather amusing. He made tents, and pretty soon he was making all the tents for all the Girl Scouts in America. The tents would always be put up in Maine to see if they leaked or whatever. So we were designing tents in the summer for the Girl Scouts of America. He also was very interested in the Presbyterian Church [(U.S.A.)] and was an elder, and spent a fair amount of time on church business. He was interested in community business. He was on the Moorestown Improvement Association that effectively zoned the community. It was an old Quaker town, and they were going to put the New Jersey Turnpike right through it. Every time I go down the New Jersey Turnpike, I notice that it bends around a little bit in the Philadelphia area. He got it moved out of Moorestown. [Laughs]

DR. GARTNER: Well, good for him.

DR. AVERY: Closer to Mount Laurel. Well, he and his friends did in those days. They were interested in maintaining the atmosphere of an old Quaker town with old trees, and so on, and not having it destroyed by what would be predictably a lot of noise, and so on. I think that many people who live in small communities do get together, and the people of Moorestown needed a leader, and he was a natural.

DR. GARTNER: Did he ever run for elected office?

DR. AVERY: No, no, because of his vision, I think, he didn't do that. He was named Man of the Year a few times. He was a Rotarian, very active Rotarian. I think all of these things were what made up for the lack of formal education. It was in his interactions with other people that he got his stimulus, so he was quite a role model. My mother, of course, was very interested in optimizing the education of her daughters. A little aside is that I apparently started kindergarten in January of 1933. The way I found that out was that just a month ago my old school, Moorestown Friends School, invited me back in a couple of weeks to give a little talk about what Moorestown Friends School meant to me. My kindergarten teacher is still alive, so she sent me a letter and told me that she remembered when I started kindergarten in 1933, and she's coming to hear my little talk. So this will be a fun thing.

DR. GARTNER: That's wonderful. That's incredible.

DR. AVERY: She's living in a nursing home in Medford. Not a nursing home, a retirement home, so she's going to be able to come, and I'm looking forward very much to that little reunion. But she did mention that I had started in January. I realize now I had forgotten that I so much wanted to go to school, but I couldn't go until I became six, and that was in May, and that would have meant almost losing a year. Only my mother could tell you how and why she did it, but she got the school to change its rules so I could start. The only thing I could think of was she may have wanted to get me out of the house, [laughs] for one reason or another. The next thing she did was note that when I was in the sixth grade, I guess, fifth grade, sixth grade, somewhere along there, I was beginning to get bored with school. I remember well that I was finishing everything rather fast — I tend to do that — and was not being challenged very much, so she convinced them to push me up a year. So I skipped. I think I skipped seventh grade. I managed to skip a year and a half of school, which got me graduating a little early. But that was my mother sort of watching this child get restless, or bored or whatever, and solved the problem for me. I fit in well and did fine, of course, and went on to Wheaton College.

DR. GARTNER: When did you first think about medicine as a career? Was this a childhood thought or did this occur later on?

DR. AVERY: I think it's true, and I've answered this question enough times so maybe it wasn't true, but I think it's true. I think memory may be a little defective here. But I loved the Doctor Kildare movies. [Laughs] Now of course Dr. Kildare was a "he" and all that, but it didn't matter. What he was doing as a doctor was very interesting to me. I also liked my pediatrician enormously. This was Dr. Emlen Stokes, Joseph [L.] Stokes [Jr.] of University of Pennsylvania's brother, who delivered me. He was doing family practice in Moorestown, New Jersey, and I enjoyed him greatly. The third stimulation came from Dr. Emily [P.] Bacon, who was the professor of pediatrics at Woman's Medical College, whose family lived next door to our family, and she visited frequently. I found that Emily Bacon — who incidentally never married, but had a remarkable career, one of the women who really went after public health and the rest at her time — was a very exciting person, and so much happier than my mother, who was sitting at home raising me. I felt that way, and I just was attracted to the idea of a career. The marriage issue was in the picture, I guess. I met, subsequently at Wheaton College, many women who were single, who were also exciting and stimulating people. I think collectively this said to me, even at the time, that being in medicine would fulfill almost everything I wanted, which was science, which I loved, but which also was people centered. And I had plenty of role models.

DR. GARTNER: Sounds that way.

DR. AVERY: Subsequently, many more. Obviously, Helen Taussig became a close personal friend when I was in pediatrics at Johns Hopkins. Harriet Guild was another good friend. The women physicians sort of tended to be supportive to the young women in medicine, probably far more than we do now, but it's another era. In that era, there were only four women in the class, and they could afford to give time to all four of us. It wasn't all that difficult. They were tremendously interesting people, and I learned a lot from them. So, that's mentoring.

DR. CAROL GARTNER: I was just going to ask if at that time it seemed that medicine and marriage for women really couldn't fit. For all of the people who didn't marry, did this seem the way it had to be?

DR. AVERY: Oh, no. It wasn't the way it had to be. Georgeanna Seegar Jones and Howard [W.] Jones [Jr.] were a wonderful couple. Both pioneers in in-vitro fertilization by the way, both in the department of OB/GYN [obstetrics/gynecology] at Johns Hopkins, also very good friends. And Caroline Bedell Thomas, who was a prominent internist. One of the women

who really got women sort of launched at Hopkins, because her association with, is it Carey, the president of Bryn Mawr [College].

DR. Carol GARTNER: [M.] Carey Thomas.

DR. AVERY: Yes, Carey Thomas. There was a relationship there. Carey Thomas had been one of the people that founded Johns Hopkins. She dictated, by way of [Mary] Elizabeth Garrett, that Hopkins was compelled by the woman's funds to admit women on an equal basis with men. So it was the one medical school where there really were senior distinguished women, and at least half of them were married. I mentioned the marriage thing, I guess, partly reflecting the fact that I think my mother would have given anything to have the opportunity to do what I was doing. I think she was being so supportive in this regard, that I sort of went my way.

DR. GARTNER: Had you married, do you think your career would have been different?

DR. AVERY: I will never know the answer to that. [Laughs]

DR. GARTNER: Yes, I think you're right.

DR. AVERY: There are plenty of women. I think Edith Potter must be one of those that we should mention, whom I think was married. I don't know about family, but you probably can tell me.

DR. GARTNER: Yes. She was married. I don't know anything more about her.

DR. AVERY: She, of course, was the leading pathologist of the fetus and newborn in the world. If you want to know about a pioneer, it was Edith Potter, a generation before me. But I had met her and did know her. She was certainly a strong, committed leader.

DR. GARTNER: When did you first think about pediatrics? Did pediatrics come along with your thoughts about medicine? Was that one and the same from the beginning?

DR. AVERY: Not quite. But Emily Bacon would take me on rounds in premature nurseries at Woman's Medical College, and I decided that I loved the idea of working with little babies, but that was in the back of my mind. I think I had an open mind in medical school. I ruled out surgery instantly. I would have been a disaster. But in terms of internal medicine or pediatrics, it became pretty apparent that I was just not so impressed with internists and their relationship to their patients in those days. In Baltimore in particular, there was clearly a kind of hierarchy that was so apparent. I felt that the pediatricians had a different mindset. I can't put

this in words very easily, but I liked them better. And I thought if I was going to spend my life, I'd rather spend it with pediatricians than internists. [Laughs]

DR. GARTNER: I understand that.

DR. AVERY: With singular exceptions here and there on both ends, but that's one of the things. I just enjoyed, particularly, the challenge of newborns, because it was obvious they were being neglected. So that was like a magnet.

DR. GARTNER: We'll get back to more about the neonatology in a little while. What about your experience at Wheaton College, what was that like?

DR. AVERY: That was very positive. It was a small women's college. Not Wheaton, Illinois, it's Wheaton, Massachusetts.

DR. GARTNER: Right.

DR. AVERY: There were about 500 students at the time. I thought that I wanted a small supportive kind of atmosphere. I was just very scared to leave home. I was very much a home person, and I didn't want to get lost in a big university or a big city. Wheaton's sort of out in the country, a little too much out in the country in some respects, but there it was, and it seemed more home-like. I knew that it didn't have the academic credentials that a Bryn Mawr would have, Bryn Mawr was an option, but I was a little scared. I didn't even particularly want to be in what would be the best college. I think I thought I could be a bigger fish in a smaller pond. I kind of needed to be a big fish for some reason or other. I didn't want to get lost. If I was going to go into medical school, which then was a strong clear signal of mine, I knew that grades were going to be important, and I thought maybe I could wing it at Wheaton. They did have a very strong chemistry department, so I majored in chemistry, because I knew it was a strong department.

DR. GARTNER: How did you happen to pick Wheaton among the many small schools? Was there a family connection?

DR. AVERY: Not at all. Nobody in my family had gone to college before my sister and I did, and she started at Wellesley, but then she finished up at New Jersey College for Women [now known as Douglass Residential College at Rutgers University]. Well, I didn't want to go to Wellesley, because my sister had a breakdown there. So that was very much in my mind. If she, who had enormous talent, had a problem at Wellesley, maybe I'd better go to a college that wasn't quite that rigorous. So I deliberately picked Wheaton. I liked the campus. I liked the fact that it was in New England,

and almost all my friends from Moorestown Friends School went to women's colleges. That's what you did in those days. There were a couple that went to Vassar [College], Smith [College], they went to [Mount] Holyoke [College]. A couple of them went to Earlham [College], which was co-ed, but thinking back, I guess two went to Bryn Mawr. This was what women did. And the men went to Amherst [College], and Williams [College], and other New England colleges. You see, we're sitting outside Philadelphia, and there's a sort of trend. Some schools tend to send people to some institutions, well Moorestown Friends School sent people to Wheaton. I wasn't the first to go. There were several people, and several after me from Moorestown Friends. It was on the list, "the approved institutions for young ladies."

[Laughter]

DR. GARTNER: I see. Interesting.

DR. AVERY: What would have happened if I had gone to the University of Chicago?

DR. GARTNER: I don't know. You'd probably be the same person you are now. But you'll never know.

DR. AVERY: You never know.

DR. GARTNER: What about medical school? Tell us about getting into medical school, and what the medical school experience was like.

DR. AVERY: That was coldly calculated. Taking the courses that I knew would stand me in good stead with medicine — chemistry and biology and so on. Actually, also I always took an extra course every year. I kind of wanted to get my money's worth, so I always had some history, and loved Greek, and a few other things that were a little bit unusual. So I had a nice balanced liberal arts education, which I viewed as being a strength to a medical school. But I also decided I'd go to the very best medical school I possibly could, and that I might not even go into medicine if I couldn't be the best I could possibly be. Anticipating the discrimination, which was well recognized at the time, I thought that I would have a very hard time overcoming it unless I could stand up, and for the sake of my own self-confidence say, "I know as much as you know. I've been to the best school I could get into." And Emily Bacon had gone to Johns Hopkins [University School of Medicine]. That did it. I applied to Johns Hopkins, and two or three others, and Johns Hopkins was the first one to accept me. I figured they may have made a mistake, but I accepted so fast by return mail for fear they'd change their mind. [Laughs] That's why I went to Johns Hopkins.

DR. CAROL GARTNER: But you had changed your feeling. You said you didn't want to go to Wellesley because of the strain, and yet Hopkins you didn't see as a problem.

DR. AVERY: Good point, but I regained my self-confidence when I graduated from Wheaton summa cum laude. I realized that I was a competitor by then. I wasn't sure when I was in high school. But I winged it through Wheaton, and in good style, and then I had more confidence.

DR. GARTNER: Good. What was Johns Hopkins like as a medical school? In what year did you enter?

DR. AVERY: 1948. No, wait a minute. Yes. I'm going to my 50th college reunion this spring. I graduated from Johns Hopkins four years after 1948, which was 1952. Those dates I'm pretty sure of. Well, the four of us, the four women — there were only four women in the class — lived in the "hen house" with older women students. That is to say, the fourth year, third year people were also living in the same place. This was marvelous, because we were kind of supported by our people one year ahead of us. I've always thought that most learning comes from the people who are just a little bit ahead of you. They know where you stand and where you're coming from. And the conversations over the dinner table, and casually in the living quarters, so to speak, of this row house on North Broadway, 800 North Broadway, in poor, poor Baltimore —

DR. GARTNER: Yes, I remember it well.

DR. AVERY: — was homelike to me. We had a wonderful time. I don't think I ever laughed so hard. The women were picked on, but we all made fun of it. We would come home and we would — you know, we had our way of being supportive. We had nicknames for most of the "SOBs" on the faculty, and that's all right. We loved them, and we hated them, and we did all kinds of good things. Then of course, the men had their houses nearby, so our social life was splendid. We did lots of things together. I enjoyed the men in the class, and the women in the class, and I still stay close to them. I don't miss a reunion at Hopkins. In fact, I was the commencement speaker at Hopkins last year.

DR. GARTNER: Were you? How wonderful.

DR. AVERY: Yes. Hopkins has been very good to me. I've been on the Board of Trustees of the University, and I have had a lot of input through Visiting Committee to the hospital. All along I've maintained an active involvement with Hopkins.

DR. GARTNER: Wonderful. Who were the other three women in your class?

DR. AVERY: One of them was Betty Hay, Elizabeth [D.] Hay, professor of and chairman of anatomy at Harvard. She and I don't see much of each other, but we do on occasion. It's fun to know that two of the four — Well, she became the first woman head of a basic science department at Harvard, and I was the first woman in charge of a major clinical department. So the two of us have had something in common through the years. Patricia [A.] McIntyre was another one, an internist. I've sort of lost track of her. I don't think she's being very active now. Laura [J.] Montague went into OB/GYN. She came from Houston, and then found she didn't like medicine at all, and so she stopped, and that was it. She became an art collector.

DR. CAROL GARTNER: Did she graduate?

DR. AVERY: Yes. But of course, Gertrude Stein had essentially done the same thing, only she didn't graduate.

DR. GARTNER: That's right.

DR. AVERY: She came within a month of it or something, but you know the Gertrude Stein story probably better than I.

DR. GARTNER: Well, I know the story.

DR. AVERY: I was just going to say that I think it was true that a good many women didn't pursue their careers. This was thrown up at us all the time. "Why should we educate a woman. She'll never be a doctor. She'll go have a family or something." The wife of the professor of medicine did exactly that. And another woman married the chairman of anatomy and dropped out of medical school. I mean, there really was a drop out, and still is, for perfectly good reasons. But what nobody says is how many men drop out.

DR. GARTNER: I was going to say, there are men who do the same thing.

DR. AVERY: There are quite a few for perfectly good reasons. No other profession makes you sign a contract to follow it faithfully all your life. Well of course, we didn't sign a contract, but there were social pressures I felt that said, "Look, you've got a good education. You'd better use it." And I accepted that. I never resented it. I enjoyed my education, and I wanted to use it.

DR. GARTNER: How was your treatment as a woman? You said that there were sort of episodes or things that happened during medical school. Do you remember any particular incidents or examples of how you were treated as a woman?

DR. AVERY: Well, nothing horrendous or headline making, except the kinds of things that I think are still operative. I think if women are in a group of men, it seems harder to get a word in edgewise. First, your voice is a little high, and you're not heard sometimes. And/or it's pretty well documented that men are quick to respond, and women generally tend to think things through a little more. This did operate to produce some, I think. Well, it's not really discrimination, but a little frustrating at times, not to be heard. One or two times a few of the faculty I disliked the most would always interrupt me. If I started to say something that made any sense at all, boom, he'd come in and take over the conversation. I look to you on this. Has this happened to you?

DR. CAROL GARTNER: Yes.

DR. AVERY: It's annoying, and it is discriminatory, but it's not lethal. It's just life. And it's a little annoying sometimes to be in the presence of men telling their men's jokes. I, first of all, don't always understand them, and secondly, don't think they're very funny. But I can always go to the ladies room or get out of the fire. If the language gets too rough, I just avoid it.

DR. GARTNER: Well, let's move on to pediatric training, internship, residency. Tell us a little bit about that.

DR. AVERY: Well, there was a strong drive to go into pediatrics, and I liked Harriet Lane so much that there was no question that's where I wanted to have an internship. But I also applied to Children's Hospital Boston, and I forget where else. I guess it was Babies [and Children's Hospital of New York], because I had had a good experience there during one summer at Columbia. Why did I choose Hopkins? Well, once again, they made it very clear they wanted me, and the other people weren't so clear. In fact, Children's just never answered the mail. [Laughs]

DR. GARTNER: How rude.

DR. AVERY: I didn't get turned down, I got totally ignored. [Laughs] But Hopkins made it clear, and I thought, "Always go where you're wanted." That strikes me that's a good sort of rule of life. Don't deliberately swim upstream if you can swim downstream. The experience was outstanding, and partly because of an outstanding house staff. We

really did in those days have some tremendous people. They were still around when you came along. You know.

DR. GARTNER: Oh, yes.

DR. AVERY: Lawson Wilkins, and I continue to mention Helen Taussig. I should talk about Henry [Murray] Seidel, who was my chief resident. What a great human being. William [H.] Zinkham. These were wonderful people who liked to teach, who loved what they were doing, and it was quite contagious.

DR. GARTNER: That was the faculty at the time you were there?

DR. AVERY: Yes, that's right. But fellow house officers, equally outstanding. Among the leaders of American medicine today. It is really extraordinary.

DR. GARTNER: Who were some of the house officers that you remember at the time?

DR. AVERY: Oh my. Well some of them were my classmates, I think Henry [N.] Wagner [Jr.] was in radiology, and he was fabulous. The women I've already mentioned. Jim [James W.] Bartlett was a great favorite of mine, in fact, my best beau through most of medical school. We've kept in touch through the years. He became a psychiatrist, and then dean of the — Now was he dean? He was the chief of the hospital at Strong Memorial Hospital [medical director, Strong Memorial Hospital, Rochester, NY and associate dean, University of Rochester School of Medicine & Dentistry], I guess, and became dean of the medical school in Pakistan, in Karachi. One of the Aga Kahn's places, a teaching hospital. He was the dean of that for a number of years. He had his interest in overseas just as I do, and this is a continuing, ongoing friendship. Stewart [M.] Wolff became a very active ophthalmologist in Baltimore. He was a good friend. I could go on. I liked them all. Those are my fellow students mostly. Tom [Thomas A.] Stamey, I think is one of the major figures in urology in this country. And Jack [Julius H.] Jacobsen [II]. You remember him?

DR. GARTNER: No.

DR. AVERY: Well, Jack Jacobsen was a classmate. He became the chief of surgery at Mount Sinai [Medical Center] in New York, vascular surgery, and was the first person to do vascular, small vessel —

DR. GARTNER: Endarterectomy?

DR. AVERY: No, under the microscope that made coronary bypass surgery sort of possible. I mean, he was a pioneer in the vascular surgery area. I still see him now. I saw him a couple weeks ago, because he's on some sort of committee for the Harvard School of Public Health.

[End of Tape 1, Side A]

DR. GARTNER: You finished your residency in Pediatrics at Hopkins in 1957 and left for a fellowship at Harvard, is that right? Who was Chair of the Hopkins Pediatric Department at that time?

DR. AVERY: After Robert E. Cooke. Well I left while Robert E. Cooke was there. The geneticist from Harvard, John [W.] Littlefield, was there until the present time. And George [J.] Dover is apparently the chief at Hopkins, whom I don't know very well.

DR. GARTNER: And Frank [A.] Oski was in there.

DR. AVERY: Frank Oski was in the interval there, after Littlefield and before Dover, I think. Yes.

DR. CAROL GARTNER: When you started your internship it was Cooke?

DR. AVERY: No, it was [Francis F.] Schwentker.

DR. GARTNER: Let's see, after your internship did you continue on through your residency at Hopkins?

DR. AVERY: Yes. There was a break. One month after I started my internship, they did some routine tuberculin testing. Almost blew my arm off.

DR. GARTNER: Oh, dear.

DR. AVERY: So I got packed off to the Trudeau Sanatorium in Saranac Lake [New York], because that's where doctors went when they had TB. I was dreadfully upset by that. It was one of the most difficult times of my life, because I was totally asymptomatic. It was my Gohn complex they were diagnosing, really, and yet they insisted I stay in bed, flat on my back, for six months before I was allowed to do anything. Because that's the way they did it. This was all at the intake session. I signed out before I ever got into bed, because I couldn't get any answers that made any sense at all about why you have to lie on your back. Why can't you sit up? No answers. Even limited as to letters you could write. Just rest, rest, rest. The only tentative answer I got was, "Well, you know if you have a wound you don't keep opening it and closing it." I mean, I didn't think that had a

damn thing to do with the lung. They did put me on the INH [Isoniazid] and PAS [paraaminosalicylic acid] and streptomycin. No, I'm sorry, streptomycin and PAS, not INH, but streptomycin and PAS. I felt I could take those drugs at home as well as they could give them to me. And I would go stark raving mad. Then some of the patients came to show me what a wonderful time they had. They took me aside and said, "Oh, don't worry, you don't have to stay in bed. Wait until all the staff goes home, and then we get up and have a good time." And I thought, "Damn it. If I'm going to spend my life up here in Saranac Lake to get well, I'm not going — " [Laughs] I just couldn't believe it, what this was. I didn't like the whole, or any part of it, so I left. And Saranac Lake closed within six months after I left.

DR. GARTNER: Really.

DR. AVERY: [Laughs] It was the tail end. Obviously, the new understanding of pulmonary disease was coming into focus. But I did stay in bed at home for about three or four months, because I was scared. I couldn't understand it, but those guys were supposed to know what they were talking about, and I wasn't that much of a rebel. My family was glad to have me at home.

DR. GARTNER: I'm sure that was more comfortable.

DR. AVERY: Then when I realized that staying in bed seemed totally ridiculous. I packed a suitcase of streptomycin and PAS, and another suitcase of clothes and went to Europe. I decided to sleep 12 hours a night and spend 12 hours every day wherever I was seeing things. I did that for three months. And that was my first and most wonderful trip to Europe.

DR. GARTNER: Great.

DR. AVERY: With a friend. So it was nice.

DR. GARTNER: And then you came back and went back to the internship?

DR. AVERY: No, just part time. Then the following July, I guess, I picked up.

DR. GARTNER: And you did residency.

DR. AVERY: Yes.

DR. GARTNER: So you didn't have to repeat the internship?

DR. AVERY: No. I'd only had one month, but I came in as a junior resident. Then I stayed. I did a senior residency twice, and I never wanted to leave it. I wanted to be a senior resident forever and ever and ever, because in those days the senior resident really ran the show.

DR. GARTNER: Yes, I remember.

DR. AVERY: I mean, you know, it was a tremendous challenge. The attendings came in for one hour, three days a week, and the rest of the time it was ours.

DR. GARTNER: It was yours.

DR. AVERY: [Laughs]

DR. GARTNER: Now when you were my resident, when I was a student, were you in your second senior resident year?

DR. AVERY: Tell me the year.

DR. GARTNER: Well let's see, it must have been, I entered in 1954, so it would have been sometime in 1956, 1957.

DR. AVERY: That would have been my second year as senior resident. Yes, because in 1957, I went to Harvard School of Public Health.

DR. GARTNER: So it was at the end of your time at Hopkins in that training?

DR. AVERY: Yes.

DR. GARTNER: What was pediatrics like in that period of time, as you saw it as a house officer from the hospital perspective, which was obviously what you were seeing?

DR. AVERY: Yes. Well, I thought it was very exciting because it was the beginning of the scientific era. Remember Lawson Wilkins had really deduced how to suppress adrenal hyperplasia by cortisone. Cortisone was just coming in, was doing wonderful things for our nephrotics, which wasn't well understand. But there was this real attempt to get at the science, and I knew that was absolutely going to be transforming it. Everybody knew that. Harold [E.] Harrison was doing great things, working out how Vitamin D worked and looking at the renal rickets as well. Brilliant teaching was going on. Here was Helen Taussig, dyslectic, deaf, diagnosing congenital heart disease. [Laughs] And not being at all excited when [Richard J.] Bing came in and wanted to catheterize the patients to get the pressures. The

difference was that she was so skillful with the fluoroscope, compensatory I'm sure for the dyslexia and so on, that she could diagnose them without the catheter. But very few people could, with her skill. So of course, she got sort of pushed aside when the catheter people came along. I remember feeling sort of embittered because I was a big fan of hers. But I soon realized that there was some reason to make some measurements, and the world was, the cardiac world was transformed. It was right after [Andre Frederic] Cournand and [Dickinson Woodruff] Richards [Jr.] had done the first cardiac catheterization. It was coming into play in children then.

DR. GARTNER: That was an exciting time.

DR. AVERY: You remember these things?

DR. GARTNER: I remember Lawson Wilkins presenting his first findings in the amphitheater, and it was really unbelievable to hear this.

DR. AVERY: And the enthusiasm he had for it. Of course you know who his fellows were. Mel [Melvin M.] Grumbach and Jud [Judson J.] Van Wyk and Al [Alfred M.] Bongiovanni. He attracted the brightest young people in the world to come and work with him. And Helen Taussig had the brightest fellows, who subsequently established the field of congenital heart disease. Even Alex [Alexander S.] Nadas came down and spent a little time with her, although he was never a fellow. They were contemporaries, and he was busy establishing cardiology at Boston Children's. We were in a place where we knew great advances were being made under our eyes, with one big exception. Nothing good was happening to newborns.

DR. GARTNER: That's probably true.

DR. AVERY: So I defined it as the last frontier.

DR. GARTNER: What do you remember about newborn care in that period when you were a house officer?

DR. AVERY: Well, first it was the lightest rotation of all, because there were only three things you could do. You could write the feeding orders, which were almost automatic, returnments consisting of evaporated milk 2:3 with 5% Dextri-Maltose.

DR. GARTNER: Dextri-Maltose.

DR. AVERY: And for premature infants it was half skim milk with added carbohydrate, called Alacta.

DR. GARTNER: Remember it well.

DR. AVERY: [Laughs] I always wondered, and I could ask you as an expert in infant feeding, why we don't in the developing countries where we have such concerns about this, think of taking milk, half skimming it, and putting some glucose in it, [laughs] and giving it to premature babies who have no other source of milk?

DR. GARTNER: Well, it obviously worked. I think the new formulas are actually better, but —

DR. AVERY: [Laughs] But I think if your back's to the wall, you can do pretty good things with ordinary cow's milk.

DR. GARTNER: Yes, I think you can.

DR. AVERY: Yes, I agree that you don't want to give an excess protein load, but probably preemie Alacta was not a very good idea.

DR. GARTNER: No, it was not a good idea.

DR. AVERY: That was a Gordon and Levine mistake, if anything I think, because it did overload them with the amino acids they couldn't metabolize so well. We made some of the measurements that demonstrated tyrosinemia in those babies. But that was part of the fact that nobody had made the measurements to know what kind of milk the babies needed. The first thing I did was grab a hold of my classmate, John [H.] Menkes, who became professor of neurology in California [University of California, Los Angeles], and he and I put together a little protocol. He measured the amino acids, and we changed the dietary protocol in infants.

DR. GARTNER: Right. It was my job to tell Dr. Gordon that Alacta was no longer going to be made.

DR. AVERY: [Laughs] Oh, really. I never had that piece of information.

DR. GARTNER: His response to me was, "I don't know how we're going to feed preemies then."

DR. AVERY: Well, we still have something to learn, I suspect. But as far as that, going back to what you could do in the nurseries, you could write the formulas, and if you thought they were sick you could give them some antibiotics. But we couldn't measure anything in the blood, because they didn't have enough blood. Everything took 5 or 10 cc, so in the production of micro-chemistries we had transformation of it. We didn't know how. We didn't even know what blood gases were. We had no

ventilators. There wasn't anything to do. Keep them warm, and of course we made some mistakes there, too, probably.

DR. GARTNER: Yes. I remember putting them on rocker beds. Do you remember the rocker beds?

DR. AVERY: Oh, yes, yes.

DR. GARTNER: That seemed to be the only therapy we had for respiratory problems.

DR. AVERY: Well, it wasn't.

DR. GARTNER: It wasn't. [Laughs]

DR. AVERY: It wasn't a ventilator, because the angle didn't work. Did you know about the Bloxsom [Air-Lock] apparatus?

DR. GARTNER: Yes.

DR. AVERY: Well, that was the dumbest thing that was ever created. Here was this cylindrical thing. You put the baby, the whole baby in it, and you slammed it shut. You cycled the pressure three times a minute, and felt you were ventilating babies. Well, the babies all became pink because they put a lot of oxygen in, and oxygen diffused across the skin. Their circulation was so lousy that the oxygenated blood stayed there, so they were pink. A few babies survived. But the chief resident, Tom [Thomas E.] Reichelderfer was running the perspective controlled trial of the Bloxsom versus the Isolette. This was irrational behavior. Totally irrational. I don't think I knew it to that degree at the time, because I was an intern doing what I was told, pretty much. In retrospect, I'm appalled. [Laughs]

DR. GARTNER: Well, I'm appalled by a lot of things that happened then. But who was the chief of the nursery service, or the preemie unit at the time?

DR. AVERY: Well it was Janet Hardy originally, and then it was Harry Gordon.

DR. GARTNER: So, Harry Gordon. When you were a house officer it was Dr. Gordon?

DR. AVERY: Yes, and Alexander [J. 'Buck'] Schaffer, of course, was the great attending, and [Milton Markowitz] who was in practice. Alexander Schaffer became my hero, for many reasons. First, he was Edwards [Albert] Park's chief resident, and he introduced me to Dr. Park. We would go out Sundays and sit and be amused by the Parks, who served

tea and gave us of their hospitality, which was legendary. That was all because Schaffer wanted me to come to know Ned Park. And I, of course, felt that was just one of the great opportunities of my life. All that period, Schaffer was writing his book. Nights he worked in the library. Got up early in the morning, I think he did, and read, then would go and do rounds at the hospital for women, whatever it was called, in Baltimore. It was a women's hospital.

DR. GARTNER: Yes, it was Women's Hospital.

DR. AVERY: He always had a fellow who worked with him in the hospital, because he maintained a private practice in pediatrics. But he was so fascinated by newborns that he described what he saw, and these became the many cases that were part of his textbook, *Diseases of the Newborn*. As he was doing that, I was sort of contributing a case now and then. I had nothing really to do with the first edition. That was [Milton] Markowitz, and Schaffer. And [Jeffrey M.] Perlman, I think, was part of that, too. I returned to Baltimore in 1959. In the early 1960s, the second edition was coming along, maybe about 1964, and I, by then, had learned a little pulmonary physiology. So Buck Schaffer asked me if I would write the section on the lung. Oh, I was so flattered. Then as time went on, we developed a wonderful, warm friendship. We complemented each other's skills and knew it. He was the clinician I will never, ever be, but I, by then, had learned some science, which he hadn't had the opportunity to learn, and I could plug in things. He asked me to become the co-author, and so I did. It went through a history, at which the present is the seventh edition which will appear in June, but it will be [H. William] Taeusch [Jr.] and [Roberta A.] Ballard writing *Avery's Diseases of the Newborn*. Up until then I made it *Schaffer's Diseases of the Newborn* by Avery, then Avery and Taeusch, and then Taeusch. With each edition there had been a change in leadership, and I am not the major editor of this. I just put my hand in here and there. They decided that Schaffer has been dead so many years that nobody remembers him. And maybe there is a time, like in Holt's textbook, they finally gave it another name. [*Holt's The Diseases of Infancy and Childhood* published in 1897, and continuously since then, now as *Rudolph's Pediatrics* with the 17th edition in press.]

DR. GARTNER: Yes, *Rudolph's*.

DR. AVERY: Yes, and Nelson's [*Nelson Textbook of Pediatrics*] is now [by] [Richard E.] Behrman, ok. And Schaffer's is now Avery. And I think after that it will be whoever is doing the work, if textbooks are to exist. They seem to be, but with access to information over the internet and so on, I don't know whether there's going to be a need for 1500 pages on the newborn, or whether people will all just push the buttons on the computer and get the answers on the screen.

DR. GARTNER: We may still have textbooks, but perhaps in the form of a disk.

DR. AVERY: Yes, and also there's a great desire now on the part of our students to just have little monographs that are paperbacks that are cheaper. Any textbook would be over $100, probably $150 now, and they're big and heavy. They don't like to lug them around in their backpacks. So the market isn't students. The market is practicing pediatricians, libraries, and fellows, often who are studying for boards.

DR. GARTNER: Tell us a little bit more about after you finished residency, your next step in your training.

DR. AVERY: How about this being a natural breakpoint?

DR. GARTNER: Ok.

[Recording Interruption]

DR. GARTNER: Now we'd like to sort of finish up with the house staff training period. Tell us a little bit more about some of the activities you were involved in as house officer.

DR. AVERY: Well, among the most memorable were the opportunities to do a little clinical research. I'd be happy to share some of those thoughts. One day I was in the outpatient department, a little, I think several month-old black infant was brought in with profound anemia. In those days, we did all of our own red blood cell smears, and I decided I would pull a smear. I found the most extraordinary collection of fragmented red cells. This was something I quickly called for help, and the help I called was Hugh [W.] Josephs, who had been the hematologist at the time. It turned out that this child was rather profoundly anemic, was having some hemolysis. The long and the short of it was, we went promptly to the rest of the family who had hereditary elliptocytosis. But it hadn't been known that was anything more than a morphological artifact, an interesting, but non-important finding called ovalocytosis. It wasn't known that there could be episodes of hemolysis in that condition. Turns out that there really aren't very many, but this child also was iron deficient. The combination of the iron deficiency and the hereditary elliptocytosis was something that we decided was worth reporting. I then went out to the home, making a house call, because I wanted as many relatives as possible to get a family tree. They one Sunday collected all the family. They sat around the living room, and I pricked fingers and pulled smears. [Laughs] This was so much fun, and the family was so nice and cooperative. The mother worked in the cafeteria at Hopkins. I sort of knew her. It turns out

that one member of the family had Hemoglobin C trait. So we had the first case of Hemoglobin C and elliptocytosis, which [laughs] was interesting and didn't really matter to the child. It was a useful observation, because nobody knew whether it would matter to the child, although you could reason that it might not. Well, I published that paper in *Pediatrics*, "Hereditary Elliptocytosis [Associated] with Increased Hemolysis." It was Josephs and Avery. It was Josephs who really figured out what was going on, but it was my general observation.

DR. GARTNER: That was your first paper.

DR. AVERY: That's the first paper I ever published. Then the second one was under my name, on elliptocytosis and C. I published that in *The Bulletin* of the Johns Hopkins Hospital [*The Johns Hopkins Hospital Bulletin*]. Both papers have been long since forgotten, but not by me. I really thought of going into hematology at the time, because I found it so interesting. The next paper was an observation in the nursery of an infant who had a mass in the flank and subsequently, I don't remember exactly the sequence here, but died. Meanwhile we had diagnosed a renal vein thrombosis. There had been hematuria, and the child lost the kidney. But I made a mental note of that, because it was a pretty unusual finding, and the child was the infant of a diabetic mother. At the time no one had made the association, but I went through the literature in the basement library of the old Harriet Lane and found an *Acta Paediatrica* journal where there had been two cases reported of renal vein thrombosis of infants of diabetic mothers. I think maybe we found one other somehow, but then I had reason to believe that there could be a causal relationship. I got very much interested in infants of diabetic mothers and learned that they had decreased body water from some work that had been done — published in *Acta Paediatrica* at any rate, and that this was certainly a contributing issue. There were other things that may or may not have been confirmed subsequently, but people over at the Deaconess Hospital [now Beth Israel Deaconess Medical Center] had thought that the capillary beds of some of these infants were convoluted in ways that were abnormal, at least we quoted the work. But I had the fun of going from an initial observation to asking the next set of questions. And that, of course, is the process of clinical research. But in an environment where everybody around was encouraging. They had a little session for house staff research, and I was invited to give my little paper. Harold Harrison was the judge or something of this little exercise, and he was very complimentary, though I got all this reinforcement for noticing something different and asking, "What is it?" And I've been doing that the rest of my life. But I can picture being in other environments where somebody would have said, "Oh well, babies do that," or "This can't be very important, go on and do your work." You can be put down easily. But Hopkins in those days did not put you down.

DR. GARTNER: Not at all. The encouragement to do research I remember very well.

DR. AVERY: Yes.

DR. GARTNER: From the medical school on through. When had you thought about research? Had you thought about being an investigator when you went to medical school?

DR. AVERY: I don't think so. I don't think I knew that there was such a thing as academic medicine. I discovered all of this in the course of four years and said, "Hey that's for me."

DR. GARTNER: So it was really Hopkins that turned you on to the research.

DR. AVERY: Yes.

DR. GARTNER: That's great. Was there another paper you did when you were house officer?

DR. AVERY: Yes. The fourth paper was [granulomatous] reticuloendotheliosis, now called histiocytosis X. But in those days, I wrote the paper on the course and prognosis, because of one patient of Harriet Guild's who came in with the most profound moth eaten skull I'd ever seen. The child had been seen before by Schwentker four or five years earlier, as I recall, presenting with glands in the neck, but had been lost to follow-up. He was sent back, I forget what indication, but the x-rays showed the body was riddled with these granulomas, like eosinophilic granuloma, but it was called Hand–Schuller–Christian disease, and full blown. I took on the care of that child. We were the first to use cortisol, cortisone, and, of course, it did two things — it melted the granulomas and it allowed the skull to harden. The x-rays improved. But we had significant cortisol toxicity in that child, who I have followed to this day. Obviously, I don't see her anymore. She married and had her own children, and so on, but she's had a series of really serious complications of glucocorticoid excess, which I feel very sorry about. But at the time, it was really a tradeoff between life and death. She never quite understood what this disease was, because we didn't either, but it looked sort of like tumors, so she thinks she is a survivor of cancer. She participates in her hometown in Pennsylvania with groups that are raising money to fight cancer and so on, and she comes in as the role model survivor. [Laughs] But she sends me a Christmas card. She's had children, I have pictures. I think she has grandchildren. I get a little information from her once a year. I'm glad to have the opportunity to give this little vignette, because it's one of the great joys of being a pediatrician. If you can have a life span long enough to follow some of your patients, it's

fascinating to see what things you knew so well in the newborn play out in the older child.

DR. GARTNER: That's right. You get the whole life span as a neonatologist, or I guess as a pediatrician. Anything else about house officer days that we should cover, or should we move on?

DR. AVERY: I don't have them on the tip of my tongue.

DR. GARTNER: Ok, well let's move on then to what happened after you finished with residency.

DR. AVERY: It was a complicated decision to know what aspects of research I wanted to go into. But remember, I was struck by the lack of knowledge about the babies, so I wanted to do something with newborns. I had read Clement [A.] Smith's book, [*The*] *Physiology of the Newborn Infant*, and it really was a stirring experience, because it was clear that he, in his experiences in Europe and so on, and his knowing [Sir Joseph] Barcroft personally, and the great English physiologists [Robert Alexander] McCance and [Elsie M.] Widdowson and the rest of the group, that he learned a lot from them. And he's just a very skillful writer. He actually taught English before he went to medical school. And *The Physiology of the Newborn Infant* was one of the most exciting books I'd ever read. So one summer as I was coming down from Maine, I said to myself, "I would like to meet Clement Smith." So I called ahead, and I said, "I'd like to meet you," [laughs] and walked in. And I really went there, I think, to tell him how much I enjoyed his book. But it was in the back of my mind that maybe I might like to work there. I wanted to see if I liked him well enough to ask for a fellowship. Well, I liked him, and I asked for a fellowship. He didn't say yes right away. I went back to Baltimore and spoke to Richard [L.] Riley, then chief of pulmonary medicine, in the department of medicine, whom I knew and liked, and had been corresponding with about my own TB through the years. Why I went to Dick Riley was to say that I wanted to work with the respiratory problems in newborn infants, but I knew I had to learn some physiology. I knew Clement Smith wasn't going to teach me that. So I said "Who in Boston, or who in the world," I think I said, "is the best person to work with on the mechanics of breathing, because the little babies with hyaline membrane disease were struggling to get air into their lungs." I said, "There's a mechanical problem here." And Dick Riley said right away, "The smartest person in the world is Jere Mead, and he's at the Harvard School of Public Health." And I said, "Gee, am I lucky." [Laughs] So I went to the Harvard School of Public Health, and I knocked on Jere Mead's door and said, "Would you like a fellow?" The thing that made this happen wasn't really that either one of them were so excited about me, but that I heard of a special fellowship program of the NIH [National Institutes of Health], where I could get paid directly to go where I wanted to go. "Ah-

hah," I said, "If I go up and show those Bostonians I have my own money, they might like me better."

DR. GARTNER: I'm sure you're right.

DR. AVERY: [Laughs] So they of course had to endorse this as a possibility, but the arrangement was that if I could get a position, then I could apply, and of course, I got it and got the money, and came up to Boston. But I worked with both of them. The physiologists were nine to five types, hands on laboratory types. Peter [A. M.] Auld and others, [Arnold] Jack Rudolph, were fellows with Clement Smith, and they were doing a prospective study to evaluate the Apgar score. Now a little digression about that project. Virginia Apgar had devised the score, and Stan [L. Stanley] James had validated it to some extent with the measurement of pH and PCO2 in these babies, and so it did reflect a degree of acidemia. All of this was sort of predictable, but nobody knew whether it was going to help docs know which babies were going to do well — how predictive it would be. I don't think there was much imagination around the research on the newborn anywhere in pediatrics at that time. I thought this was a singularly dull project. But if I could get over there and work on it, I would be in the delivery room, all night long, oh till midnight or something, sort of volunteering to do the Apgar scores. And that was one of the smartest things I ever did. Because first of all, I was right there with the obstetricians. I was watching the babies' first breath, I was examining the babies right away, and I got the best clinical experience with newborns in the first minutes and hours after birth that anybody ever could have had. Because who else was around at ten o'clock at night when somebody was having a baby. But there I was with my stop watch, and I was making observations like mad, timing the time it took to clear the lung liquid, and going back and doing the reading, and then having the opportunity with the School of Public Health to work with animals. Then I took a mini sabbatical when I got my Markle stuff [John and Mary R. Markle Foundation Scholarships in Medicine], so that I could go to England and pay my way there. I went in as a guest of Leonard [B.] Strang, who had a marvelous program, and Geoffrey [S.] Dawes. I met that whole group of English physiologists and learned how to work with the fetal lamb. I came back, and we got a little lab, and we got lambs and sheep. We made the whole bit. We mapped the development of the fetal lamb lung, and you see from the list of publications, there was a lot of work with fellows. What I was doing was bringing the experience of the English to the American scene, and the lamb model, fortunately, in terms of cardiopulmonary adaptations at birth is very close to the human. There are other ways that they're different, but in this area there are only so many ways you can get the first breath, initiate breathing and have those cardiovascular changes take place, and so we did a lot of that.

DR. GARTNER: That was really breakthrough work.

DR. AVERY: Well, the surface tension part is a whole other story. I'm giving you the sort of setting in which the surface tension business emerged.

DR. GARTNER: And this was all during the time you were in Boston.

DR. AVERY: Well, no. I came to Boston from Hopkins to work with Clement Smith and Jere Mead.

DR. GARTNER: Right. And you were there for how long?

DR. AVERY: In Boston?

DR. GARTNER: In Boston.

DR. AVERY: Two years. Then I returned to my third year fellowship with Dick Riley, who had sent me on to Boston. I had to work with lungs in adults for awhile, but I paid the price. I did it, and then got my own lab and went back to looking at newborn mice, and rabbits, and puppies. Only one experiment with puppies. I couldn't stand sacrificing them. I just couldn't do it. [Laughs] Can you imagine killing a cute little puppy? I could handle goats, and sheep and things, although I eventually had trouble with lambs. Particularly one day in Boston in which we had had a long time looking at the acid base balance of the spinal fluid and the blood, before, during and after the first breath, and of course, the animal didn't die. Of course, they don't take their first breath for a long time, that's the beauty of this preparation, but we let the animal take the first breath. Then sewed it up, and there was this little lamb. I looked at the lamb, and the lamb looked at me. I put it down on the floor and walked away, and damned if the little lamb didn't follow me. He'd bonded. [Laughs] So I gave him to, Ivan Franz who took him out to his farm and raised the lamb. And that was the end of my working with lambs. I let the guys do it. I was just too much of a softie. [Laughs]

DR. GARTNER: They are so sweet.

DR. AVERY: Yes.

DR. GARTNER: I understand that. Well, you explained how you got into interest in the newborn and the challenge of learning about that, since that was a whole new area. When did you see yourself developing into a neonatologist, or at least making newborn medicine truly a specialty? Because it really wasn't a specialty at that time. It wasn't something that you would have necessarily thought of as a career. How did that evolve?

DR. AVERY: Well, of course you realize the word hadn't been coined until Schaffer did about 1964, or so, so I wasn't thinking of it as a specialty, it was just part of pediatrics. But Harry Gordon was working full time with newborns, so the specialist had emerged. No one was thinking of fellowships in neonatology, however, except perhaps if you wanted to think of Clement Smith's program as that. It was mostly clinical. It was Jack Rudolph, and Peter Auld, and I who were the three fellows. And they stayed in the field. As you know Peter is still chief of neonatology at Cornell. Jack died recently, but he had a splendid career in Texas and has published some, what do you call them? Atlases of the newborn, I guess. Marvelous pictures.

DR. GARTNER: Great images. Just recently marketed, right?

DR. AVERY: Very recently. I think he always was collecting pictures of babies. It's going to be a very valuable record and teaching tool, I expect. We all became friends and worked together. There were many distinguished visitors coming through. I think I can tell you about one of the most memorable experiences. Resuscitation of the newborn in those days was with a bag, a self-inflating ambu bag. You would cover the nose and mouth of the baby, and you'd squeeze. That's all we knew how to do. Virginia Apgar was writing about intubating babies, and none of us had ever put a tube down a baby's trachea. Intubating a baby? We didn't know what she was talking about. But she was an anesthesiologist and putting tubes down tracheas was no big deal. So she decided to come up and teach us how to do it. I think also teach us about, and she would just learn how we were evaluating the Apgar score, so there was a close relationship there. Having her come up with her great good humor and so on, and teach us, each of us how to do it, was a very, very important experience when you think about it. It's now, of course, standard to do that and attach them to a ventilator. I, in the meantime, you see, was learning a lot about what we called artificial respiration at the time, because Jim [James L.] Whittenberger was an authority on that. He was chief of physiology at the Harvard School of Public Health, under whom Jere was working. So Jim Whittenberger was an advisor on ventilation and so on, to Edgewood [Chemical Biological Center], and to the U.S. [United States] Army, because during the war you needed to know how to resuscitate people. People were then squeezing on the back, remember?

DR. GARTNER: Oh, yes, very well.

DR. AVERY: Well, you never saved anybody by beating on the back. It just was appalling. So he was the one who transformed the field of resuscitation, and said it has to be through actively —

DR. GARTNER: Inflate, right.

DR. AVERY: Yes, you don't do it by just beating on them. You have to inflate, and the deflation will be passive. If you just press the deflation, all you've got is the expiratory reserve volume, and you're not going to keep people alive that way. Right about 1965, there was a big polio epidemic. Remember I had had 1957 to 1959, as the years I was learning physiology, so I was able to be pretty involved and helpful in the whole business of ventilators. Wait a minute. I'll have to check those dates. Maybe I'm thinking of the mid-1950s. Yes. The mid-1950s was one of the last big polio epidemics.

DR. GARTNER: That's right, because the vaccine was out. That's right.

DR. AVERY: It was ten years earlier. Because in 1957 to 1959, the patients were in the iron lungs. I remember going out and visiting patients with Ben [Benjamin G.] Ferris [Jr.], who was looking after them. He was a pulmonary physiologist and pediatrician. We were given the story of the development of iron lungs, which of course took place at the Harvard School of Public Health. The Drinker respirator was invented there, so there was a large interest in this whole field. I then got awfully much interested in mechanical ventilation, which has stood me in good stead, of course, ever since. Now knowing how to incubate, and now knowing something about ventilators, I could make a dent in that area. I put the first baby in a ventilator in the Boston Lying-In Hospital, and the first, I think the first one at Johns Hopkins, as well, and the first person to measure blood gases on an infant at Johns Hopkins.

DR. GARTNER: Oh, my goodness. Those are major landmarks.

DR. AVERY: Don't you see how I walked into these places at the right time? I mean, everybody wonders about luck, serendipity or something. I've had it in spades.

DR. GARTNER: I think you've also made use of that.

DR. AVERY: Somehow, I've always been at the right place at the right time. Not quite, I've missed a lot of opportunities I'm sure. But here in this instance — the capacity to measure. Somebody else had made the machinery to measure it, the Astrup Apparatus, and here was the baby, and I knew something about ventilation, and I really knew what PCO2 meant. I mean, this was the new language. It wasn't important to know what PCO2 was all about before you could measure it. We had to have micro-chemistries and micro-blood gases and all the rest. There were the babies, and of course the next set of papers just documents what we were doing. We marched in and measured everything in sight.

DR. GARTNER: But you put together the concept.

DR. AVERY: You had to have a hypothesis before you make the measurement, I think. We did a little bit of just plain describing, but most of the time we had an idea we were trying to test.

DR. GARTNER: Was the group, the three of you who were fellows with Clem Smith, was that the first group of neonatology, or what became neonatology fellows? Or was there formal training before?

DR. AVERY: No, there were ones before them. Charles D. Cook and Jim [James E.] Drorbaugh preceded us.

DR. GARTNER: In that program?

DR. AVERY: Yes, that's right. And Petter Karlburg was the one who came over and taught them all how to do it. I mean, the Swedes were way ahead, it was John Lind at the Karolinska Institute, and Petter Karlburg, who figured out how to make all these measurements on the little babies. The people of Boston didn't know anything about it, but Petter came over as a fellow, and instead of coming over and learning, in fact, he came over and taught. And everybody else followed. But I think we gave Petter some of his most fundamental experience with babies, because his work at the Karolinska had been somewhat with babies. John Lind took the first movie, cinema, what am I saying, movie x-ray. I don't remember what the word is for that.

DR. GARTNER: Cineradiography.

DR. AVERY: That's it, of the first breath. As the baby was being born, he had his camera there, and you could see the air going in. Those were classic films. I had one. They weren't of sufficient quality really to use for much. But for the sake of the people doing it, they saw things that had never been seen before, and this was a nice, exciting experience.

DR. GARTNER: And that was all during the period you were in Boston?

DR. AVERY: That preceded. The Karlburg and Lind's work was earlier.

DR. GARTNER: Earlier, yes.

DR. AVERY: But when I had an opportunity, I went to Stockholm to meet John Lind, so I had the pleasure of knowing that great man.

DR. GARTNER: He was a great, yes. He was a great investigator.

DR. AVERY: The person who knew him best was Millie [Mildred T.] Stahlman. She had a fellowship over at the Karolinska. I just dropped in to call.

DR. GARTNER: Interesting. Anything else about the fellowship period before we go back to your return to Hopkins?

DR. AVERY: Why don't you let me have a few minutes to think about that. Want to stop the press here?

DR. GARTNER: Well, you can just keep on talking. We'll come back to it.

DR. AVERY: Well, the fellowship period has a social dimension that you have heard before, but I'll repeat, because it's an amusing illustration of life in 1957. And the year is very important. I had just arrived in Boston, looking for an apartment and all that. Some friend decided that I needed a blind date if I was going to have some fun in Boston. So my friend cooked up an event in Cambridge at the place that Longfellow made famous. It was called the Window Shop I think, but it was under the spreading chestnut tree that I was meeting my blind date, all dressed up for the occasion. Lo and behold, this character emerged looking kind of scruffy — dungarees and sandals and things, the Harvard-type investigator. I was a little bit put off. He didn't seem particularly charming to me, actually, because he was talking non-stop. I think I said, "What do you do?" and one hour later, I had listened through an awful lot of stuff. He was obviously very excited, and I only woke up to one phrase that I'll never forget. He said, "When we had it, we knew we had it. There could be no other solution. The answer was clearly there. That was it." And in my mind I said, "You have to be lying. It cannot be true." So I shut him up, and I started telling him about pulmonary surfactants. After awhile he got bored, [laughs] and that was the end of a fairly brief, rather pleasant summer evening. We never had anything to do with each other in Boston after that. I sort of put it to rest in my mind as not anything I was going to remember until I read the papers very shortly thereafter. This young man, who had had some time in Cambridge, had returned to the chemistry department at Harvard and just won the Nobel Prize for having discovered the structure of DNA.

DR. GARTNER: This young man's name?

DR. AVERY: I never heard of DNA before that. [Laughs]

DR. GARTNER: And this young man's name was?

DR. AVERY: James [D.] Watson.

[End of Tape 1, Side B]

DR. GARTNER: This is tape 2 of our interview with Dr. Mary Ellen Avery, on April 4, and this is side A. Ok.

DR. AVERY: That's how I met Jim Watson. Actually, as I mentioned, *The Double Helix* puts all of this into perspective. He was never very tolerant of Rosie [Rosalind] Franklin, you may recall. [Laughs] His relationship to women was not the relationship I was interested in. And I must say that I reflected often, though, how could I have had the first hand description of probably the most important experiment in the history of biology — the basis of reproduction? How could I have missed the point? I certainly did. I just didn't get it. I think I had so many prejudices in my mind. First of all, his appearance. Second of all, he was so full of himself. He was just not pleasant as far as I was concerned, and that totally drowned out my capacity to understand or to get the flavor of what he was saying. I think this is a very humbling experience, actually. While it's funny, I'm acutely embarrassed. I thought afterwards, what would I have done with a blind date with [Johann Sebastian] Bach?

[Laughter]

DR. AVERY: There are some things that are so much beyond your ordinary life. I was thinking of physiology as making measurements where something sort of correlated with something else. If you could draw a line through it and get a number, you felt pretty smart. I never measured anything that *had* to be that way, it could be no other way. This was a seed change of great magnitude in the exactness of science. I've been sensitive ever since to the highly competitive nature of molecular biology, because when you find the gene, it is the gene. It's all there is to it, and anybody who comes in second, forget it. You get that out of *The Double Helix*. They were driven to get this answer before — the name escapes me on the west coast — Linus [Carl] Pauling.

DR. GARTNER: Pauling, yes.

DR. AVERY: Linus Pauling was after the same thing, and they were so afraid he was going to get the structure before they did, that they rushed into print with a very brief paper. If you've ever read the original, it's a sort of one page paper, but that's all it needed, because it was the exact answer. Isn't that amazing?

DR. GARTNER: Well, you were one of the first to learn about molecular biology.

DR. AVERY: [Laughs] I've been retarded ever since.

DR. GARTNER: Well, shall we go back to the next sequence in your career, and that was the move back to Baltimore, was that the next thing?

DR. AVERY: Yes, all right. I was delighted to go back to Baltimore, even though in those days Baltimore was not the world's most pleasant place to live. They were beginning to tool up to racial strife that became central after the tragic assassination of Martin Luther King [Jr.], and the riots that followed, the burning that followed. I remember the morning after, the city was almost paralyzed, and I decided that I had to get into the hospital, figuring that maybe nobody else would be there to take care of the preemies. I couldn't view it as anything other than an obligation to go in. So I jumped in my car and drove in, hoping I could make it, and I did. I went up to the nursery, and every single nurse was there. And some of them were black. The black people had taken the day off, of course, and I didn't expect they'd be there. I went in because I thought that maybe I could help. I said something to the effect of, "I really didn't expect to see you here. Thank you for coming in," or something like that. And one of them, I'll never forget, said, "Dr. Avery, did you think for a minute we wouldn't be here?" I'll never forget that. Yes.

That's the same nursery where something in a totally different vein happened, but ties in with Virginia Apgar, that I'd like to mention. That is, I frequently was making measurements of things in the nursery, and Virginia Apgar would come in and look for me. She walked in one day, and she didn't see me, but came up to the nurses' station and said, "Where's Mel?" They said something about back there, and she said, "My name is Apgar. I bet you thought I was a thing." [Laughs] We all burst out laughing. I thought that was wonderful.

DR. GARTNER: Was that your first meeting?

DR. AVERY: No. But the nurses didn't recognize her, and of course, I thought that was classic Virginia Apgar. Did I tell you my other Virginia Apgar story?

DR. GARTNER: No, tell us, please.

DR. AVERY: This one may or may not belong on the tape, but it's true. She had given up being professor of anesthesiology and became director of the March of Dimes at a time when polio was not a big problem, but congenital malformations became their theme. And she decided she needed to learn genetics. So she came to Baltimore to take a course in genetics at the School of Public Health, and was living in Baltimore. We were friends, so we had dinner together on occasion. One time we were

going out to dinner, and she came by and said, "I've had the most exciting day of my life. Mel, I now know the difference between the role of the genes and the environment." I said, "Ginny, that must be some course. I thought that the great minds of the world had been pondering that forever. What on earth did you learn today?" And she said, "Oh it is so simple. If the offspring looks like the old man it's the genes. If it looks like the next door neighbor, it's the environment."

[Laughter]

DR. GARTNER: Great story.

DR. AVERY: But Ginny had an endless list of stories and was always such a great, great person to know through the years.

DR. GARTNER: Yes. Well, tell us about your work. You went back to Hopkins —

DR. CAROL GARTNER: What year was it?

DR. AVERY: When she was there?

DR. GARTNER: No, when you went back to Hopkins.

DR. AVERY: Oh, I went back to Hopkins in 1959, and I had a decade there because I moved on to McGill [University] in 1969. In that decade was the evolution of the independent investigator, the transition between fellow, and when I left I was the Eudowood Associate Professor of Pediatrics. Bob Cooke was supportive of what we were doing in that decade, and really, in fact, was the person who nominated me for the Markle. I was the first woman Markle fellow, which is something I seem to have stumbled into over and over again. Five years of support. I think it was something like $5,000 a year, which was big money in those days for me. It gave me, again, the thing I most needed, which was freedom. I wasn't anybody's fellow. I had access to all the talent of Johns Hopkins. And because I'd trained there and so on, I knew people in Baltimore. I knew people at the School of Public Health. They were enormously helpful to me. Anna [M.] Baetjer was one, who became a great friend, a professor of industrial hygiene. And Dick Riley had moved over there then. And Sol [Solbert] Permutt was there. These were first rate pulmonary physiologists. I could not have done what we accomplished without their tremendous support scientifically. We attended all their research conferences. I brought all my fellows over to the school not to miss one of the Riley conferences, and you see that was the key step. I knew I didn't know enough pulmonary physiology to carry on, but I belonged to the American Physiological Society. I went to all of their meetings. And I worked regularly with the people at Hopkins who were the

equivalent of Jere Mead and Whittenberger at Harvard. I had then the access to new ideas and got involved in the control of breathing, which I hadn't touched before, but which was central, obviously, around the time of birth. What do you do to get from a liquid filled lung, which was breathing very intermittently and rapidly, but was not an organ of gas exchange, to within seconds, literally having to become aerated, clear the liquid, and importantly, go on and on and on? And the question I'm still playing with is, I know the first breath is a gasp, but I don't know why the baby knows to go to the second or third or fourth breath — in other words, the onset of rhythmic breathing. I think I'm beginning to grasp, but I'm not there yet. It's still something that I enjoy thinking about. But I had enormous help from those people at the School of Public Health. I continue now to always look for somebody who knows more than I know about something, and try to sit at their feet if I can. That's the reason for going systematically to pediatric meetings. There's always somebody there that knows something I don't know. And that's the advantage of our international meetings, because in those meetings you find somebody who's been thinking with the same goal, but pursuing it from a totally different direction. Which is what happened to me with [Sir Graham C. (Mont)] Liggins, and with Geoff [Geoffrey Donald] Thorburn and many others. Tania [R.] Gunn now, and Peter Gluckman are the current people I work with, because they're interested in the role of hypothermia and protecting the brain during resuscitation. So all the new ideas that are exciting are coming not just from Children's Hospital of Boston, but they're coming from the world. This is the glory of one world, the capacity to jump on a plane and spend the weekend in Chicago, or two weeks in New Zealand, or whatever is thrilling.

DR. CAROL GARTNER: When did you start having fellows?

DR. AVERY: Victor Chernick was my first fellow, and it was in that first year I returned.

DR. CAROL GARTNER: To Hopkins?

DR. AVERY: Yes, so it would have been 1969, that Vic joined me. Vic is now the author of the leading book of respiratory physiology, Chernick's lung book [*Chernick-Mellins Basic Mechanisms of Pediatric Respiratory Disease*] is written by Vic Chernick. He's had a spectacular career in Winnipeg, but he was with me for about five or six years.

DR. GARTNER: Yes, he has. And that was beginning in 1959, or 1969?

DR. AVERY: No, wait a minute. When I returned to Hopkins in 1959, yes. He must have, I'm sorry, he must have joined me from 1959. Yes.

DR. GARTNER: It was 1959.

DR. AVERY: Because he left around 1964 or 1965, as I recall.

DR. GARTNER: Right. Tell us about the evolution of your research during that period of time, starting in 1959, until you left?

DR. AVERY: Yes. I should mention Sue Buckingham was another fellow. Then I had three or four more wonderful people coming. But they were coming to build on the surfactant story. That was what captured their imagination. George [W.] Brumley [Jr.], who had been a chief resident at Children's in Boston, came down. He didn't go across to work with Clement Smith, he came down and worked with me at Hopkins, which was very flattering. And Al [W. Alan] Hobson. These are people, all of whom did great things thereafter. A source of my greatest satisfaction is the fellows who were willing to come and work with me on these problems, because they brought talents that I didn't have, and were anxious to do it themselves, and they latched on to other people. John [H.] Menkes became a member of our group at one point. We weren't exclusively interested in lungs. Bob [Robert A.] deLemos worked out a lot of the mechanics of breathing and mechanical ventilation and became one of the country's leading authorities in that, pioneered high frequency ventilation. He recently died, I'm sorry to say. But he was a splendid person. Colin [S.] Normand came over from England. He'd been with Leonard Strang, but Leonard wanted to know more about surfactant, so he sent Colin. Colin and Jean [M. Smellie] were two of my best friends, whom I'm going to see in Washington in a couple of weeks. We keep in touch. He became professor and chairman at [University of] Southampton, and eventually the dean of the medical school [University of Southhampton School of Medicine]. And on and on it goes to about thirty or forty people whom I am enormously fond of and proud of, because they've each one, I think, done what I did, and that was to just risk it. I mean, go to a new setting and try something, and take advantage of the knowledge of the people around you and move forward. They didn't just stay sheltered. They carved out their own careers. Sometimes they took totally different career paths. Barry [T.] Smith and Martin Post went back to Toronto and spent some time running the nurseries there. But Barry decided what he wanted to do was to improve health care delivery in Canada, so he's dean of the medical school [School of Medicine] at Queens University in Kingston, Ontario. All of this was very satisfying.

DR. GARTNER: This was the period of time when the surfactant story was emerging, when it was developing. Tell us how that began and how it developed during that period of time.

DR. AVERY: It began because I was over at the Lying-In so much of the time, and went to all of the autopsies, and saw that the lungs were airless. This was very unusual. Most lungs after death have air in them, and I was struck by that. I was also interested in surface forces in the lungs because of their role in lung mechanics, and Jere Mead's interest was in that area. All told, I was able to think in terms of what promoted the elastic recoil of the lung, and what stabilized alveoli at end expiration. I was talking about this to Jim Whittenberger, who was a consultant at Edgewood at that time. One army recruit assigned to the problem of pulmonary edema antifoams was John [A.] Clements. Jim Whittenberger knew about John Clements and told me there was a very important, a very interesting young man at Edgewood who was looking at foams and measuring surface tension. In the meantime, I had gotten hold of the article by [Richard E.] Pattle, *Proceedings of the Royal Society B*, a great opus on alveolar wall stability, bubble stability, measuring persistence of bubbles in saline ["Properties, function, and origin of the alveolar lining layer" 1958 Feb 18]. It had just said that surface tension was vanishingly low, in fact, approached zero, which no physical chemist ever believed possible. But there had to be some reason why at the end of expiration the lung doesn't empty itself of air. That was the question. I was pondering that and went to Edgewood one Christmas vacation to meet this John Clements. The same way I went to meet Clement Smith. If I read something that somebody did that's interesting, I decided I've got to know about it. That's why I went to meet [Tetsuro] Fujiwara. It's been the pattern of my life to go ferret out people who are smarter than I am, and then sit around and learn what they have to say, and put it together. So I was the glue for all of this. But the ideas were all there waiting to be glued together. I think of it as analogous to a jigsaw puzzle, where you have a little bit of sky here, a little bit of sea there, and isn't it nice when you get the piece that puts the sky and the sea together. Well all right, that's the pleasure I had with the surface tension story, because I did put it together. The eureka moment was, of course, having read of alveolar stability and realizing that's what the little babies didn't have — they had no air in their lungs, they couldn't make foam. The inspiration was, "Oh, the problem is no foam." But you don't go home and write a paper and say, "No foam," and sign it Mary Ellen. You've got to do something. So I was desperate to find a way to make the measurement. It was John Clements who told me how to make the measurement, but he had never heard of hyaline membrane disease, so this was a wonderful relationship. He knew what I didn't know, and vice versa. Fortunately, in this setting, we became fast friends, not competitors. I think we both profited enormously from the friendship. Not only is it a wonderful thing to have a wonderful friend, but in addition we have continued to help each other. I never fail to give Clements credit, and he never fails to give me credit. And you know it could have been otherwise. There are a lot of people who find themselves in circumstances where it is otherwise, where people are secret about their findings. I think because the things I was

working in were so sort of diffuse in many minds that nobody was quite afraid of a secret. Anything I find I talk about right away, and you know, if you talk to enough people and go to enough meetings and publish enough papers, it's very hard for anybody to steal your idea. I think the way it's stolen is if you don't talk. Of course, in the talking, more ideas emerge, so you can keep growing. But not if I had said to myself, "Look what I have discovered," and then stopped trying to discover more, but tried to pedal the fact. Yes, indeed, I got the idea to look for absence of the surfactant in those babies, but that was just the beginning, and, of course, the field moved because of easy exchange of ideas. I'd like to make this point to young people who tend to guard their knowledge. It's so much nicer and so much more effective not to guard it, but to use it as a stepping stone and let everybody else step on it. Then run the next race, you know?

DR. GARTNER: Is that the problem we have now with modern biology, becoming patented and commercialized? Is that the problem?

DR. AVERY: I think there is a danger there, yes. I think one has to be wary of it.

DR. GARTNER: I see that as a serious problem. So you took this observation about the baby and the knowledge of what kept lungs open. How did you then proceed to understand hyaline membrane disease?

DR. AVERY: Well, I thought I knew as much as anybody knew about hyaline membrane disease, and I was very confident that there was an association here. So I was able to write about it, and the first article was published in the *American Journal of Diseases of Children*, which you must think was an unusual place to publish this kind of information. But the story of that is that Richard Day was then chairman of pediatrics at Pittsburgh, and I had known him from long ago. He invited me out to be a visiting professor, for what reason I don't know. Well, I guess I do know, he had read the — no he hadn't read my paper. But when I told him about what Pattle and Clements had done in my lecture, he was visibly excited, because he said all his life he'd wondered how the lung could possibly work. He knew that you couldn't have a tube filled with liquid and blow bubbles that would all remain open on a tube. If you had ten holes and blew ten bubbles, the smaller one would always empty into the larger one because the Laplace law demanded that happened. The pressure has to be proportional to the surface tension and inversely proportional of the radius of curvature. To keep the pressure constant, meaning keep the alveolus open, you have to have surface tension change when radius changes. If the numerator and the denominator do not change together, then something happens to the pressure. Well this is elementary physics. But I had never heard of the Laplace relationship until I got interested in this topic, so I'm not sure it's

taught in elementary physics, but it's a pretty elementary law. He knew all about it, Dick Day.

DR. GARTNER: Dick Day did. Smart man.

DR. AVERY: Dick Day knew all about it, and he had the eureka moment. He said, "This explains it. This is why the lung works." Without changing surface tension with surface area, it couldn't happen. It's the key to the great design of the lung, which had to mean that the alveolar lining layer had to have very special properties. I showed him the results of my work on the surface balance which copied Clements' work on the surface balance, and said, "This is it. It does it." He was so excited about it. He said, "You have to write it up right away, and I want the paper." He was editor of the *American Journal of Diseases of Children*. Of course, I think I got it in the return mail practically, because it was already written, and I sent it off. He never sent it out for review, and it got published within about two months. And you might say, "Well, why didn't Jere Mead have anything to do with this? The paper was Avery and Mead." Well, Jere Mead systematically denied having anything to do with it, because while he made the film balance, and it was his ideas I was building on, he was such a generous guy that he said he never made the measurements and gave me all the credit. Well that's part of Jere's kindness and genius, but the fact is that I think he allowed his name to be on it because he didn't think anybody would ever publish it. [Laughs] I think he was rather surprised. I think he was glad it was hidden in the *American Journal of Diseases of Children* where none of his buddies would see it, because while he did it, he wasn't sure it was right. He took my word, but he kept saying, "All you've demonstrated is an association. You have not demonstrated cause and effect." And I knew that. He thought it was an epiphenomenon, and of course, eventually so did John Clements, because he thought it was due to hypoperfusion of the lung and neonatal pulmonary ischemia. So, the two senior scientists who had set the stage for this weren't prepared to believe that it was not an epiphenomenon, but was indeed a primary problem. The concept of it being immaturity or delay in maturation was indeed mine, because they weren't thinking in terms of babies. Neither of them was. So I was thinking I knew about physiologic jaundice, enzyme induction. I thought, "You can get over something in three days if you can make it, and something will trigger the capacity to make it." Well, I didn't know that was going to be cortisol at that time, but the rest of it sort of falls into place. In retrospect, it was the opportunity to work with people who were really knowledgeable about babies, and to work with some of the best physiologists in the country, and to take the step from bench to bedside.

DR. GARTNER: Really the wedding of the basic science, basic scientists with the —

DR. AVERY: Yes, and now everybody's talking about translational research, and I'm sitting back and saying, "What the hell do you think I've been doing all my life?" [Laughs]

DR. GARTNER: Yes, I had the same thought. It's not an invention.

DR. AVERY: No. But it's true that the time is ripe, I think, to have much more of it than we have seen in recent years.

DR. GARTNER: Right. Do you want to continue with the —

DR. AVERY: Ooh, no, I want to eat.

DR. GARTNER: You want to eat? Should we break at this point? Ok. Why don't we break at this point? This is a good time.

[Recording Interruption]

DR. GARTNER: Ok, Mel, we'd like to continue with the surfactant story, and if you could, continue with the advances that went into the treatment and prevention aspects, particularly.

DR. AVERY: With pleasure. The question that I've often pondered is, how do you go from the science, the original publication, to having the field move, having your ideas picked up, finding yourself quoted, getting invited to talk about it, and seeing others commit themselves to advancing the story, either through basic science or through getting into clinical trials? I can, I think, summarize that a little bit by saying that the pivotal issue depended on Jere Mead having been invited by Julius [H.] Comroe [Jr.] to the Cardiovascular Research Institute [(CVRI) at University of California, San Francisco] in San Francisco, a place that was preeminent in pulmonary physiology. Julius Comroe, one of the great teachers in the history of pulmonary physiology, recognizing Jere Mead's work, made him a visiting professor. Jere chose to talk about the surfactant and gave me all the credit, as he consistently did. So pretty soon I was invited out to be a visiting professor, a tremendously flattering invitation from the great Julius Comroe. I gave my little speech, and there were two pediatricians in the audience who had wanted to learn more about hyaline membrane disease, and Julius Comroe said to them — Bill [William H.] Tooley and Marshall [H.] Klaus — [laughs] "This is an area that you might be interested in," and they were. Then because I had given all the credit to John Clements for the basic science, which I continue to do, it's his work that made this possible, Julius turned to John Clements and offered him a job. John was still at Edgewood, but Julius decided he needed John Clements, and so John moved and became an established investigator at the American Heart Association in the CVRI, and Tooley and Klaus became his fellows. Once there were the

blessings of the establishment, the road was paved for all of us. Julius Comroe invited me to write review articles for his publications. He consistently quoted me, and in his wonderful book *Retrospectoscope* [1977], gives the whole story of the surfactant in three parts. I think "premature science and immature lungs," or the other way around. At any rate, the whole story is there. This was a book that was very influential. A little yellow book called *Retrospectoscope* that's widely read. It has the history of how ideas move forward. He then in effect announced to the world of serious scientists, internists and the rest, that something important was happening in pediatrics. I think if I had been confined to the blessings of Dick Day and the pediatricians, it wouldn't have moved as fast. It had to get into the mainstream of medical research, and that made the difference. Then I got on the study sections, and there's another bridge to be built there. But let me return to that and carry the surfactant story forward, because we haven't got to the bedside yet.

I had been invited to Japan as the head of a United States committee to visit in Japan at the [United Nations] International Year of the Child and met Fujiwara. He told me about his work. I consulted with him about where to publish it and the rest of it. We became friends. I knew then that the possibility that surfactant deficiency was secondary had never been disproven until Fujiwara poured material expressed from cow's lungs that was surface active, and which led to a very prompt increase in oxygenation, then there couldn't be any further question about what was the primary problem. Now, many steps lead to surfactant deficiency, but that was the final common pathway that made the babies sick. And that led then to vigorous attempts to get various preparations that would be safe and effective for the treatment by installation as a liquid down the endotracheal tube — Fujiwara's singular accomplishment. On relatively few babies, but the effect was so dramatic that it was quickly reproduced by our group and others. They got to the point that there had been some 600 controlled clinical trials as various questions were being asked about different preparations, either purely synthetic that was called Exosurf, or the Fujiwara preparation that was called Survanta, or a preparation made in the Karolinska Institute that was made from pig's lungs and is widely used in Europe, the most widely used there, in fact. There was another preparation of different principles, but used by the Germans. And the Chinese now have their own. So you can see how different groups in different parts of the world have picked up, but each one had to do their controlled clinical trials. [Laughs] Do you give it early? That's called prophylaxis. Do you wait until they get sick? That's called rescue. How many doses should you give? How big should the dose be? The clinical trials examined by trial and error what happens when you have a control group and a treated group, and more or less gave a resounding endorsement to this as an important therapeutic entity, but everyone recognizing that there were some failures. Of course, our current research is directed

toward examining what were the possibilities for those failures. We're making some headway, but that takes us into the future.

I postponed telling you how we got onto the glucocorticoid story, because this was running concurrently with the enthusiasm for surfactant replacement. The history of the recognition that surfactants, or that there is the possibility of this facilitating or enhancing precocious development of the lung, was derived by knowing that Florence Moog's work on the developing intestine showed enhancement in the time of appearance of phosphatase in the epithelium after giving the suckling mice cortisol. Then Sue Buckingham's observation that perhaps, since the lung was derived from the primitive gut, the response in the lung could be analogous to the one in the intestine. And that was put to the test. Along the way, the idea that enzyme induction could make a difference came when I was visiting in New Zealand, and Liggins and I were on the same program in Christchurch, New Zealand. I had given the dullest talk I ever gave about correlations of lung stability with chemical changes and the rest in the developing lamb lung, including histology–structure–function correlations. Just being descriptive of the early fetus and later into its term, and mapping the ontogeny of the surfactant components if you will, and their function. It was a big job, it took a couple of years, and we spent a lot of time on it. It was published in *The Journal of Clinical Investigation*, and it was confirmed by many others since. But I talked about that to a group of pediatricians that probably couldn't have cared less. [Laughs] But Liggins gave the next talk, and he'd been studying the use of glucocorticoid as a possible cause of — Let me correct this. He was studying the use of glucocorticoids in the pregnant ewe to examine whether it had something to do with the initiation of labor. He was an obstetrician, and he published this about 1969, in the *Journal of Endocrinology*. A very interesting idea, because in fact in the lamb, that's just what it does. The lamb's adrenal increases cortisol in pregnancy, and at a certain point it predicts the onset of labor. That does not happen in the woman. But I had known of the possibility of enzyme induction, and so at the coffee break we compared notes. I had said there was no way a lamb could be viable before at least 121 or 122 days. That lung wasn't mature. There was no surfactant there. That's what we had found. And he said, "But when I gave the fetus cortisol, those lambs jumped up and walked around. They had nice normal lungs and they were 127 days." And I thought to myself, "You know, he got it wrong." They were —

DR. GARTNER: 117.

DR. AVERY: They were 117. The ones that were treated acted as if they were 127 days. So there was an acceleration, maturation of the lung, and that of course has been the whole story ever since. It's not just the lamb's lung, but were we ever lucky, because cortisol does not send humans into labor, only sheep. And yet both have responded to this very

fundamental regulator of maturation, taking an organ from being predominantly in a state of cell multiplication to enhanced differentiation so it produces precocious appearance of the premature surfactant, not only in the lamb, but in the mouse, and in the rabbit, and fortunately in the human infant. At a certain period of gestation, it is critical. And it is in our view, a replacement for what would have happened if the lamb hadn't been born so prematurely, because normal development is characterized by a cortisol surge in the last trimester in all of these species, and if you were born before the cortisol surge you cannot make surfactant. But by virtue of air, breathing enzyme induction takes place so that the phospholipid and the protein components of the surfactants are synthesized within a few days after birth, at least after 24 weeks of gestation that is possible most of the time. This is doing for the baby pharmacologically what the baby would have done for himself, if he had to be delivered prematurely. And of course, the time of appearance of one development is variable. There are some infants who have the appearance normally. Just biologic variations have appearance of surfactant earlier in others. Infants of diabetic mothers have a delay. There are genetic differences. There's familial hyaline membrane disease which can occur at a later stage, probably through the absence of one or another component of the surfactant. That's something that's being worked on these days. We do know surfactant protein B deficiency is the cause of pulmonary alveolar proteinosis, for example.

But going back to the cortisol story, there was an interesting aspect to it. The obstetrical community was singularly resistant, in fact, overtly hostile. They were convinced on the basis of studies in rats and so on, that we were going to interfere with brain development, that we might produce malformations, that there might be some delayed unexpected event that couldn't be predicted. They were thinking of diethylstibesterol, the DES story. It took 20 years to realize that wasn't a useful thing to give babies. But on the other hand, DES had been given over a period of weeks or months. We're talking about one or two doses after the onset of labor, or anticipating delivery in the event of section delivery. It's 24 to 48 hours to see an effect, and we weren't giving it in the time when it could be teratogenic in the first trimester, it was just before birth. So I couldn't understand the resistance of the obstetrical community, except that I think some individuals had been interested in other ideas about accelerating lung maturations, such as using estrogens, and that there was just a reluctance to believe it. And the endocrinologists often were very resistant. They thought, "Oh, you pediatricians. You're just throwing cortisol around again." So it was not easy to overcome what in retrospect is a reasonable posture of people. They should be suspicious of something that they don't understand and that's new.

DR. GARTNER: We've gotten burned often enough.

DR. AVERY: But my defense was we didn't pull this bottle off the shelf. There was lots of good science behind this, and lots of good animal studies. I didn't think they should have been so resistant. But that's neither here nor there, it's a fact. It took them an awful long time. It took two big National Institutes of Health consensus conferences. The first after a study that didn't show much effect, and the latter showing very substantial effect, not only on the development of the lung, but on reduction in interventricular hemorrhage, in the maturation of the kidney and the gut. This confirmed the notion that one of the important influences of maturation in the last trimester is adrenal cortical output, particularly cortisone. This is now accepted. In fact, it, on the other hand, was dismissed again when surfactant replacement therapy came in, because they said, "Why should we give glucocorticoids when we can give surfactant?" That caused, principally Alan [H.] Jobe and me to jump on our little bandwagons, or little bully pulpits, or something, to try to say, "Hey, wait a minute. Look carefully at that study. When babies had access to glucocorticoid for more than 12 hours, 24 hours preferably, *and* surfactant replacement therapy, none of them died." I said that Alan Jobe had worked it out, and it's clear that both in the animal model and from that clinical experience that the goal of glucocorticoids is to enhance maturation to increase the surface area gas exchange. So if they have both, you can think of it as glucocorticoids preparing the lung in a way that will include the use of exogenous surfactant therapy, and therefore you need both. But if you are forced into a decision for one or the other, you'll get more mileage out of antenatal glucocorticoids than you will out of postnatal surfactant replacement.

DR. GARTNER: Good point. What's been the long term, or the implications for outcome in the premature infants as a result of both the corticosteroids and the surfactant administration? This has changed neonatology very dramatically.

DR. AVERY: Yes. Well, the licensing of the materials around 1990, and 1991 — Exosurf in 1990, and the other in 1991, Survanta — has resulted in a very enhanced survival of ever smaller premature babies, so that its biggest effect has been under 1,000 grams. But under 1,000 grams represents a significant group of infants who are alive, and therefore has been responsible for the biggest drop in infant mortality that has taken place. We now are at the lowest in the history of our country, and the industrialized world is saying the same thing.

DR. GARTNER: Right.

DR. AVERY: In terms of neonatal mortality. And many other things were happening so that there was a gradual improvement, I think, even in the absence of glucocorticoids and surfactants. But there's little question that there was an acceleration in improvement coincident in time with their wider use, so that clearly more babies are alive. But the next question is, has

this been at a price called cerebral palsy, or blindness or disabling conditions?

[End of Tape 2 Side A]

DR. AVERY: There is nothing appearing that makes it clear, but there is no increase in disabilities, despite the increase in survival. There is still a concern, of course, when you're talking about babies under 26 weeks. Some may be so immature that even with appropriate antenatal glucocorticoids and postnatal surfactant you will improve the organs that benefit from those interventions, but there can still be immaturity of central nervous system function or other problems. We, therefore, have to be very cautious and watching carefully to see if there are any things there that we can prevent, any outcomes that we can prevent, or to suggest that certain times these therapies are inappropriate because the degree of maturity just is such that neither would be effective. I think though if they are effective, the odds are very great that there won't be problems because of that intervention.

There is another little concern about the infants who are getting products from animal lungs, in part because one can never be 100% sure that you don't have a slow virus that may manifest itself with some sort of dysfunction 20 years hence. This did play a role in the delay of licensing of Survanta because of the possibility of the slow viruses that cause the [bovine] spongiform encephalopothy, Creutzfeldt-Jakob disease-like viruses that were found in the beef food chain in England, mad cow disease and the like. The concern was, does an animal preparation put a newborn infant at risk of something dreadful at age 20, or thereabouts? The decision was made by Abbott Laboratories [Inc.] not to use any beef that came from Europe or America, but to go to New Zealand where the similar illness called scrapie had been eradicated by killing all the animals that had it. It would appear that if you could isolate the cows that have been known to be free of scrapie, and not feed them contaminated food, you could have a source of materials that would have an excellent chance of not carrying a slow virus. But that doesn't say it's 100%. The people who are using the porcine material have a very strong case to make that maybe that's safer. It certainly is good, if not a trifle better, in some in vitro studies. And there is a reason why it's porcine. It was a pharmaceutical company in Italy, in Parma where the best prosciutto comes from. The prosciutto people were throwing away the lungs, and so Chiesi [Farmaceutici SpA] pharmaceutical company could have a generous supply of pigs' lungs, which have been the source of Curosurf. But the name Curosurf doesn't come from curing-type surfactant, it comes because the Swedish investigator who worked out the details of this. His name was [Tore] Curstedt. It was named for him.

DR. GARTNER: Oh really. Do you think there's a natural limit to how far back we can push the frontier of premature infant care? Are we reaching that point, or are we going to reach that point?

DR. AVERY: Well, I hate to be a prophet, because I remember hearing myself say 30 years ago that I didn't think any babies under 1500 grams should be resuscitated, because the chances of their survival were so poor. So having been so wrong in the past, I'm a bit humble. But I'm afraid that I still think it's very risky to go below 24 weeks with the present state of knowledge. If it's been a long-awaited pregnancy, you're sure of the dates and the baby seems to be potentially viable, and the parents insist at 23 weeks, we'll cooperate. But the general concern if there's any possibility there's more where that came from, and it's just an issue where they want to run the risk of having a disabled child, than we would not be enthusiastic about even thinking of an artificial placenta or things that we now know, including surfactant replacement. People do talk about artificial placentas, but our state of ignorance about the placenta is so profound that I don't see it, certainly not in my lifetime, and for the foreseeable future. The placenta changes its function in terms of fetal need, from the time it is a blastocyst and undergoes enormously vigorous endogenesis, to getting to be a fully developed organ, from the fetus' point of view an organ of gas exchange, an organ of excretion, an organ of nutrition, and a complete endocrine system that regulates the growth in nine months from a fertilized egg to a baby. Do you think you can match that? [Laughs]

DR. GARTNER: No, I don't think so, and it sounds like what I say about human milk.

DR. AVERY: Yes, right. [Laughs]

DR. GARTNER: Another dynamic process. What about the future of neonatal research with regard to the lung, things like liquid ventilation? Is that going to move this frontier? Is that going to be a way in which we will improve ventilatory efforts with less trauma, with less injury?

DR. AVERY: Well, I think it's a very, very interesting area to look at. I think the preliminary studies show safety, particularly for partial liquid ventilation. In fact, less pressures are required to put liquid in the lung than to put air in the lung, so they reduce some lung injury under some circumstances. We also know that hypoplastic lungs grow through stretch. If you can put some fluid in, and this, of course, would be fluid that has a high oxygen capacity, and make it partial, you can probably help some circumstances where there are hypoplastic lungs, such as in diaphragmatic hernia, where a few babies have been treated this way and with benefit. That's a very small number of babies. The question is will it have a role in extending survival to any groups of babies of any significant numbers? I

think not. But I think if you look at all the conditions for which we're using ECMO [extracorporeal membrane oxygenation] at the present time, you may be better off if you go to liquid ventilation first. That's a possibility. That's still not very many babies.

DR. GARTNER: No, that's a small number.

DR. AVERY: It may be useful as a vehicle to deliver drugs in small amounts. I think the role of perflubrons has not been exhausted. I'm fascinated by it. But I don't see it as likely having an impact on neonatal mortality of measurable degree.

DR. GARTNER: Bronchopulmonary dysplasia has been really the bane of survival for the premature infant. Where do you see that going in the future? Do you think we can eliminate that as a handicap?

DR. AVERY: Of course we can. It's been eliminated in certain centers. It is rarely seen in Columbia–Presbyterian [Medical Center]. It is rarely seen at University College [London] Hospital in England, London. They have lots of small babies. It's been profoundly reduced in incidence in other places around the country. "Not eliminated" is partly dependent on definition. Some 1,000 gram-under babies require some oxygen intake over and above room air past 28 days, and that's one definition of bronchopulmonary dysplasia. So if you redefine it, as some have, as under 37 weeks of oxygen requirement, then you will see that it has profoundly decreased. It's much less common now than it was. I think, my personal bias is, it's largely barotrauma from inappropriate use of ventilators, and from insistence on bagging babies, which is a totally uncontrolled process that can, in some hands, be very damaging to lungs. If you take the notion that bronchopulmonary dysplasia is lung injury postnatally acquired, and begin to think about what you're doing to these babies, I think we can virtually eliminate bronchopulmonary dysplasia.

DR. GARTNER: Good. Well, let's look at some broader issues. We talked, and then you talked a little bit about your own experiences as a woman in medicine. I just wonder, now that we have large numbers of women, certainly in pediatrics and many areas of medicine, where do you now see the major issues for women in pediatrics, and even in neonatology? Where are women going to fit in? What are the problems that they're facing now?

DR. AVERY: I think increasingly the problems are going to be the same for men and women. That the big problems are going to be quality of life compatible with obligation to fulfill the mission of providing good medical care. I'm not sure that we figured that out for either men or women. Women in increasing numbers are taking jobs with HMOs [health maintenance organizations], or getting into a nine to five relationship,

particularly when they have young children, but often for other reasons, as well. That is to say, they don't want to spend their whole life totally immersed in medicine or research. That they're interested in other issues, too. The problem has been labeled a woman's issue, but I noticed that an awful lot of men are doing a lot of childcare, and enjoying it. That's why I think that hospitals and others where young people are training have to look carefully at the schedules, what they demand, how much patient, how much free time. I'm particularly jarred by the statistics on divorce among physicians, which is quite a bit higher, partly, I think, from the workload that's imposed at years shortly after they marry and so on, or because some physicians are so dedicated to their work. I use that word almost in quotation marks — choose to spend long hours in the lab and in the hospital at the expense of family. That's been the case, and I imagine some women are doing the same thing with some husbands at home, particularly if the husbands are not physicians. I see husbands taking days off when women are on the night shifts. It's a very changing scene.

DR. GARTNER: I think it is a difficult time for many people. What about the challenges now of what people are talking about — ever greater competitiveness for grants, for support, for research, at a time when the demands for promotion and for retention, particularly in academia, are dependent on those areas of research, and competition is severe. I hear a lot of young faculty complaining bitterly about those aspects of career development. How do you see those?

DR. AVERY: Do you really think that's new?

DR. GARTNER: No, I don't mean it's new. I'm not even sure whether it's really more intense, but they certainly think it is.

DR. AVERY: Yes. Well, I hear the same things, and I answer this by saying that there's more money for research now in this country than there ever has been in our history, even in proportion to the number of people graduating from medical school, relatively. The NIH has a $13 billion a year budget that it's distributing largely externally, a good bit internally. The private sector wants good health and the fundraising organizations, [American] Lung Association, cancer societies, and the rest, are raising lots of money. People are giving money to their medical schools. Look at the number of new medical school hospitals that are brand new opening up. I don't mean new institutions, but new buildings. Everywhere you go somebody is improving, upgrading their research labs.

DR. GARTNER: Right. This is true.

DR. AVERY: In my own institution, Harvard, there have been four new research buildings, whole buildings built in the last decade. One an old

high school taken over and totally converted to research. The Mass General [Massachusetts General Hospital] has taken over a whole wharf in Charlestown and put extensive laboratories there. So I think the opportunities for young people are probably as great as they've ever been, if not greater. There may be an increasing allure by it because the salaries are pretty competitive. It used to be if you went into research you had to have a bit of independent wealth or wanted to make big sacrifices. People in research aren't making big personal sacrifices. They're being paid respectable salaries. I don't think many are getting wealthy, but some are if they patent some of their products and the like. But the idea of complaining that now things are bad. You never quite want to be on record as saying things are wonderful, because, of course, we never feel we have enough. But I'd like to be a little more objective and say I think there is a limit. I don't know what it is. I hope people continue to support research. I don't think we're very badly off.

DR. GARTNER: Ok. That's a much more encouraging perspective, and I thank you for that. Let's talk a little bit about the origins of neonatology. You mentioned the role of Buck Schaffer in naming, giving neonatology its name. Tell me a little bit about how neonatology as a discipline, or newborn medicine as a discipline developed. How it got named. What were the early origins of that? Who was responsible for it?

DR. AVERY: I really don't feel qualified to offer that. My window on it is that a lot depended on new technologies. Until we had micro-apparatus — and a lot of that was a spin-off from space age research, from defense research and the rest, micro–methodologies, because we had to measure things on astronauts — until we had new technology, we couldn't really claim we had something special to offer. We didn't even have the knowledge base. But once we were participating in the advances in obstetrics, principally through ultrasound, we had a better idea of gestational ages, we knew about prenatal diagnoses, we could do things that weren't done on other age groups. There was a uniqueness to our database, our knowledge, that we were good at, and other people didn't know what was going on. And we took advantage of that and gave ourselves tools. Once we had tools, we began to get some new knowledge. We became good at using ventilators. All of this happened basically in the 1960s, and continues. I think the next great event was, of course, the polymerase chain reaction, because then you could amplify anything you wanted, and we began to see applied genetics come into the picture. We began to be able to look for genes on a drop of blood. The future, of course, is that we'll have our whole genome on something the size of a fingernail. That will be the ultimate prenatal diagnosis, susceptibility and the whole area of screening, which opens up a host of medical, legal and ethical issues which are increasingly being looked at by neonatologists. I think we're way out ahead of the curve here in terms of our interest in applied genetics. So I think the

future of neonatology is going to be almost the center stage of the future of medicine, and the developmental biology as it ties into cancer is the basis of most of the relevant medical research. So I think the pediatricians are in the driver's seat. We ought to be looking very carefully at how the new genetic diagnosis is going to be applied. Who's going to share the data? The genome will be known, but what do you do with it? We should be thinking about educating the public. We have access to the public, because we talk to new mothers and new fathers. We've been the genetic counselors. There are only 1,000 licensed genetic counselors in this country. The pediatricians do the rest of it, for better or for worse. I don't know whether we do it all that well, but the neonatologists do it better than anybody else does it. We may not be very good, but we're better than most, and maybe we'll get smart, and that will be a terribly important social assignment for us.

Then I put on another hat and say, I'd like to think we have a responsibility to the world's children. Many people think we do, too. That's why so many of us get involved with UNICEF [United Nations Children's Fund (formerly United Nations International Children's Emergency Fund)] and other ways of trying to guide agencies into what the needs of children are, as we're doing in Bosnia, and other people have in other parts of the world. This is going to be historically, maybe, the most important thing we ever do. If you share with me a view that the increasing population of the world is a reality, we who have the knowledge to make a 70 year life span fruitful, and to make the outcome of pregnancy usually successful, have the choice of having this done in the focus of what's for the best interest of the child, namely every child should be wanted. And to make sure that every child has the kinds of things that make childhood safe — immunization and the other supportive things. Then if we are focused on that, we're really focusing on the good of mankind. Eventually, we know that if people can be assured of a normal outcome from pregnancy, the fertility rate plummets, and it's the only thing that will make the fertility rate plummet. Because if you think that you have to have ten children in order to have five survive, and that's your only form of social security, if you're living in desperate poverty, you keep having children. That is enormously hard on women. It's lethal to a lot of children. I, personally, am very uncomfortable having this knowledge and knowing that it should be applicable worldwide, and it is not. So I guess that I'm asking for kind of a medical mission to the world by those of us who have access, not only to the knowledge, but the communications capacity to make it universal. I think that's what pediatricians will be doing in the future.

DR. GARTNER: That's a very interesting perspective. How do you see this becoming operational? I think it's something many of us desire. How would you — Would you do it through WHO [World Health Organization] and UNICEF? Do you see it happening in some other way?

DR. AVERY: Well, I think it's a multifactoral response. Of course, WHO now has a magnificent new leader, Dr. [Gro Harlem] Brundtland. No, that's one of her names. I don't have it all.

DR. GARTNER: No, but I don't remember her name right now.

DR. AVERY: But she was the former prime minister of Norway, who is a pediatrician. I think that's a good person to run the World Health Organization. And I think that the international community is behind us, particularly the women of the world. Both in Beijing, and before that in Cairo, some of the most eloquent statements I have ever read on the role of women, were endorsed. They fundamentally have to do with the education of men and women. So anything that operates to increase the level of understanding, education, I think will operate to make everybody want to increase the standard of living. If they do believe what's written in the *Convention on the Rights of the Child* and act on it, it would be a virtual social revolution the likes of which the world has never known. I think our country in fact will endorse it sooner or later. It needs to be ratified by the [United] States [of America (USA)], as you know. But these principles have been enunciated just as in the American Revolution. We had a Bill of Rights. I think we now have the equivalent of a Children's Bill of Rights. And in time, these are so basic human values, I believe people will want to act on them.

DR. GARTNER: The world's needs are certainly clear, but the United States itself right now does not have one of the best neonatal mortality rates, and as a neonatologist, how do you think about that? What do you think we should be doing to improve the US neonatal mortality rate, infant mortality rate?

DR. AVERY: Well, it's not a scientific question, it's a sociologic one, and the sociologic answer is well known. Education and poverty make the difference. Where we are good we are very, very good, and where we are not present, we are horrible. We are not present in certain areas of this country, particularly the Deep South. If you look at the infant neonatal mortality rate state by state, the northern states look just like the rest of the industrialized world. We'd be among the top ten, if not number one. Massachusetts happens to be number one in the United States, I should mention to you. We were kind of pleased with that. But we're not as good as we could be, because even then we know that we have people who are not having adequate access to care. What I'm saying is, we know how to do it. It's not going to take new knowledge or new science. It takes distribution of the knowledge that we have. The great embarrassment is that Washington DC continues to be appalling in this regard with a very high infant mortality rate. With all the resources, they can fix it, but the will doesn't seem to be there. I'm glad you asked the question, because I think we ought to be asking this question of all of our colleagues, and say, "Look, if we know how

to do something, and there's a problem, why don't we solve it?" Well, yes, the answer is political, the answer is organizational, and the answer is motivational. And I guess that's education. I don't know what else to call it.

DR. GARTNER: I think so. I agree with you. We should be doing more. Tell me something about what you're doing now. What are your current activities? You're still writing your books. You're still active teaching, lecturing. Tell me a little bit more about what your current life involves.

DR. AVERY: I'm a total failure at retirement [laughs], because I did retire. I no longer have a salary. But I have an office and a secretary, and believe me that's very important to me, because I can continue to do a lot of things that I've always been doing. I take more time off, I go home earlier. I travel more. I've always traveled a lot, but now I don't have a guilty conscience when I do it. This is the third day I've been here, and I'm not worried about who's covering for me at home, because nobody expects me to be responsible for a patient anymore. In fact, I turned in my license to practice just so I wouldn't even be tempted. But there were two other reasons that were a little bit more personal about turning in my license to practice. The focal length of my glasses is such I can't see an eardrum, and I'm just enough deaf so I can't hear murmurs. I thought, "I don't want a doctor that can't see and hear well." [Laughs] And besides, there are a whole lot of young people that love to take care of babies, and really they don't particularly enjoy my meddling. If I've done my job as a teacher, the thing I better do now is let them have the babies and stop getting in their way. So for all of those sort of psycho, personal, physical reasons I said, "Look, stop playing doctor and turn in your license." [Laughs] And I've done it. Now maybe that's a successful retirement, I'm not sure. You can judge that.

DR. GARTNER: It's a change.

DR. AVERY: It's a change.

DR. GARTNER: Tell me about the books that you're doing now. What stages are they at?

DR. AVERY: The seventh edition of *Diseases of the Newborn*, W.B. Saunders, is going to appear in June, and it's going to be instead of *Schaffer's Diseases of the Newborn, Avery's Diseases of the Newborn.* We had to reflect on that a little bit because Gordon [B.] Avery, no relation, has been the author of a very good textbook of neonatology, and I don't know whether he's coming out with another edition or not. But maybe two Avery's isn't a crowd.

DR. GARTNER: Avery one, Avery two.

[Laughter]

DR. AVERY: So we just let that go, because Dr. Schaffer, alas, has been dead for a number of years, and it seemed totally inappropriate now that Bill Taeusch and Roberta Ballard are on board to keep on doing that. So I got pushed upstairs, and they're doing most of the work. It's multi-authored, and we have some very talented people from all over the country who, fortunately, have submitted some pretty exciting stuff. I think it's a very good book, but I may be prejudiced. However, it goes into three or four languages every edition and continues to be quoted widely enough to make me feel that it should go on. *Pediatric Medicine* is going into its third edition with Lewis [R.] First, who is a perfectly remarkable young man I know, who's now the chairman of pediatrics at [University of] Vermont [College of Medicine]. He has people in his department who are working very hard on this third edition. It's a whole new cast of people who are anxious to get involved in the writing. Lewis is a gifted teacher, and I think will give this book great strength. It's still going to be Avery and First, but in the future it will be First. I hope in several ways.

[Laughter]

DR. GARTNER: How did you come to write a textbook of general pediatrics, or a general textbook of pediatrics?

DR. AVERY: Well, having been a physician-in-chief in Montreal for five years, and then Boston for 11 years, I felt that I had had a spectacular education in general pediatrics. And having chaired the Robert Wood Johnson Foundation program in general pediatrics for ten years, I knew a lot about the issues that were coming up that would affect the production of groups of people that would fill that very important social, epidemiological, applied role in pediatrics, and that the field needed that expertise. We no longer speak of ambulatory doctors. They're not ambulatory. Doctors are doctors, and you take care of patients when they're sick and when they're well. But they bring in the dimension that's so critical about concern for mothers, and families, and adolescents, and violence, and issues that aren't part of my particular area. I'm delighted though that they are working with the schools, and they're helping handicapped children stay out of institutional schools, and that their interface with the community is crucial to pediatrics. It's taking us away from a defined medical role into an advocacy for children role. And that's what the field's doing, and I think it's marvelous, so I'm a tremendous supporter of general pediatrics.

DR. GARTNER: Is that community involvement advocacy role contained in the textbook? Is that a part of the textbook?

DR. AVERY: No, it's not a big part, but it's there. There's a good bit on poison control. That's got both the epidemiologic and the scientific base. Wherever there's a scientific base, we're trying to plug it in. When you get to the fact that the leading cause of death is injuries, and that violence is a big part of that, we do alert everybody to that fact. But I don't know that there's enough information to write many pages about prevention. So we tend then not to think of it as something that's within the guidelines for our book, but we refer to its existence and recommend other books. Otherwise, you'd just be writing a whole 20 volume encyclopedia. I'm more interested in keeping this book wedded to the basic science that's relevant as it applies, and to make sure that we cover diseases. The rest of it, I'll let somebody else write about it.

DR. GARTNER: Good. Let's focus back now on neonatology, but in a broader perspective. We've talked a lot about your role, and about the lung and surfactant and so forth, but if we can get your views on what have been the major other advances in neonatology over the years.

DR. AVERY: Well, let me start with the obstetricians. Diagnostic ultrasound, coupled with abortion when malformations are incompatible with life, has reduced significantly our problems with Spina Bifida and other things. I think also prenatal diagnosis and screening. I think the obstetricians, I may be wrong about this, worked out the relationship with folic acid, or at least applied it. At least that's a perinatal event. They've taken over the word perinatology, you know. They call themselves perinatologists. We don't call ourselves perinatologists. A small aside. But I think they're right, they have an enormous role to play. The safety of cesarean section is something that's tremendously important, and the liberalization of it. Getting rid of concepts of the trial of labor. What a horrendous idea that was. That little premature infants' heads are not very good battering rams. I think they've done a lot to reduce problems of many sorts. I really am delighted that now they're also getting engaged in more fundamental research, too, because the concept of every baby being a wanted baby is in their hands. The latest figures for the United States are that 60% of pregnancies are unintended, and of those, maybe a half are unwanted, and that one in four pregnancies is aborted today. I am certainly strongly pro-choice, but my goal in life is to make abortion unnecessary, so I'm wanting to have more access to RU486. Well, that's for the obstetricians to do, not me. Of course, that's a reversible progesterone blocker, and it's not viewed as a contraceptive, it's a contragestational drug according to its inventor. This is a magnificent advance. In fact, I think [Etienne-Emile] Baulieu has been recognized here.

DR. GARTNER: Here. Yes.

DR. AVERY: When I was president of the American Pediatric Society, I had him on the plenary session, which was my way of saying, "This is the way to go." So those are things I think are really big, but need to be applied more widely, because 25% of pregnancies undergoing abortion is far too many. That's not where the answer is.

DR. GARTNER: True enough.

DR. AVERY: Put the locus of control in the hands of the woman. That's why the morning after pill is so helpful. Nobody needs to know she took it.

DR. GARTNER: That's right.

DR. AVERY: Ok. That's my pet view now. I also think that one of the biggest things, awareness, is our sense of advocacy in general. I think a lot of pediatricians are doing a lot of good work and working with society to enhance immunizations. I think the American Academy of Pediatrics is doing a wonderful job in helping pediatricians know what to do in the community as advocates for children.

DR. GARTNER: And they are. And they are real activists.

DR. AVERY: Yes. I've taken on an activist role against female genital mutilation. We didn't get into that, but I'm trying to get the National Academy of Sciences to endorse a statement that this is a human rights violation. It's a violation of the rights of a child to inflict a surgical procedure without their permission when they're four to ten years old, which is terribly mutilating in some instances, and even fatal. Even while it's not widely practiced in this country, it is practiced in this country, inasmuch as we are the home of immigrants from areas where it is a deeply embedded cultural tradition. Having made this statement to the Institute of Medicine [of the National Academies] and the National Academy of Sciences lately, I have been labeled a cultural imperialist. And neither of them has signed on to a simple declaration that this isn't good for children. [Laughs] And you know, all those old men wish I'd go away.

DR. GARTNER: [Laughs] Well, don't go away.

DR. AVERY: I'm still there. And I will next month, later this month actually, be meeting with them again. And my answer to the charge of being a cultural imperialist, which comes from some of the Black Americans actually, is to have identified a Kenyan obstetrician — manna from heaven — who's at the Harvard School of Public Health. He's a tall, handsome, very black Kenyan obstetrician who is violently opposed to female genital mutilation, because he sees all the problems. I have invited him to join me

at the next meeting of the [National Research] Council of the National Academy of Sciences, and he is going to stand up and describe the problem as he sees it and his work. His pitch is that many Kenyans are violently opposed to this. This isn't Americans coming in and telling them what to do. We aren't being missionaries on this. We are defending the rights of children, and in ways that are signed on to by the countries of the world, including their countries. UNICEF has managed to get most of the African nations to speak out against this. And yet, of course, there's no way to enforce it. It's done secretly and so on. You sound like you're fully aware of this.

DR. GARTNER: I've read recently. There have been a number of articles. I can't remember where I've read them, but there certainly have been a number of descriptions of it.

DR. AVERY: Well, the American Academy of Pediatrics made a statement against it. The American Medical Association made a statement against it, and all I'm trying to do is get the Institute of Medicine and the National Academy of Sciences. I don't know whether I'm going to win or not. I don't lie awake nights thinking about it, but it's the sort of thing that when I see it, and feel strongly about it, I try to do something.

DR. GARTNER: Well, that's wonderful that you are. Can we just go back a little bit to the historical perspective on neonatology, and what were the major developments in moving the field along? Usually they are research and clinical integrated, but which ones would you recall?

DR. AVERY: I guess in principle I've already mentioned the new tools. It takes a cast of players, many of whom you're interviewing. Each one has made his or her own kind of contribution, which they have published, been peer reviewed and so on. The fact that neonatology has become the largest single sub-specialty of pediatrics says that somehow or other what we're doing is attractive to young people. The number of graduates of medical schools opting for pediatric careers is increasing. We had 3,000 people apply to Children's Hospital Boston, or write in and ask for information about it. That is the first encounter. I'm not quite certain of this number, but I think it was something like 600 that did apply. We interviewed something like 250, and that was for 27 openings. Well, my goodness, I'm pretty excited about that. Now that means each of them probably applied to 20 schools.

DR. GARTNER: Or ten anyway.

DR. AVERY: What ever it means, there is a pool out there of talent that's pretty terrific.

DR. GARTNER: Yes. And I'm impressed, also, how good they are. And better, ever better.

DR. AVERY: Oh, my gosh. About half of them are MD-PhDs now.

DR. GARTNER: In the Harvard program?

DR. AVERY: The people we select for our house staffs. But a large number of the medical students are MD-PhDs. There's a five year, six year program. Come to medical school, and you sign up for it. It means they're headed towards wanting to get answers.

DR. GARTNER: Is pediatrics getting their share of the MD-PhDs?

DR. AVERY: [Laughs] More than. More than half the people in our research program are PhDs, not MDs. One of them is Stephen [C.] Harrison, who's the Harrisons of Baltimore's son.

DR. GARTNER: Oh, Helen [C. Harrison] and Harold [E. Harrison].

DR. AVERY: Yes. But we have a group that are doing crystallography. That's sort of getting at the structure.

DR. GARTNER: Structure, right.

DR. AVERY: Structural chemistry, I guess you call it. But science has moved so fast that you have to have some full fledged PhDs to give weight to the science, and also to be continuing consultants. We have them all admixed. And this is working, I think, very well in general. It has its little frictions at times, but we give them pretty much the same pay scale. PhDs kind of like that a lot, and that's why we can get some pretty good ones. The other thing is that the MD brings the questions, and a lot of the PhDs are really wanting their work to be meaningful to people. They deep down inside, just like everybody, want to be helpful. When they see a way in which their work can take off and excite doctors about something, that's good for people. I just showed you some reprints yesterday from Ana [I.] Flores. She's a PhD. She worked with us for five years in our lab. She taught molecular biology to the people in the lab. We kept running in and telling her about babies, and asking could she figure this out? We've always had close interactions. I'm working now with two people at MIT [Massachusetts Institute of Technology]. One who's working on trying to get drugs delivered across skin, who presented at Hot Topics in December, because that might be a very important way to handle things with little babies who have thin skins anyway. The other one is trying to study the principles behind the delivery of surfactants instead of just telling any old person to pour it down the trachea, which is essentially what we've been

doing. [Laughs] What determines the distribution of a liquid in the trachea into the tracheobronchial tree, and ultimately into improving the gas exchange surface? He's done this through modeling. I was his PhD supervisor, but he was working at MIT. I didn't know what I was talking about. He didn't know what either of us were talking about. Because it was an MIT program, they had supervisors, so the top people in the field of surface chemistry and plumbing were the consultants. I was sitting there learning from everybody in sight. This nice young man has written a thesis that's being divvied up in three or four parts and being submitted to publication. I think in another year we'll have a firm theoretical basis with enough testing to write the prescription on how to get surfactants delivered optimally. My personal prediction is that it's going to improve the outcome by at least ten if not 20 percent, because that's the number who don't respond now. I think the reason for non-response is either, we didn't make the right diagnosis, or we had the endotracheal tube in a bronchus or some other place where it shouldn't be. And/or we didn't know whether the optimum conditions existed.

[End of Tape 2, Side B]

DR. GARTNER: We're continuing with the interview of Dr. Mary Ellen Avery on April 4, 1998.

DR. CAROL GARTNER: I was asking about how you saw your role and what your practice was in mentoring younger people. Whether you saw yourself as having any particular either obligation or interest in mentoring women particularly, or whether it was just a general mentoring of younger people? I'd just be interested in hearing you explore that a bit.

DR. AVERY: Well, I would say it's been probably my principal occupation. I have spent more time in my role as a teacher than in any other area. Going to morning reports for 16 years. What I said in connection with the textbooks is that the textbook is an outcome of being involved with teaching. And teaching is mentoring. Usually the teaching is in small groups. It's at the bedside. Sure, some lectures, but most of it has been people I knew well, and/or fellows of whom I initially had two. After that it got to be about six or eight at a time over all those 35 years of research endeavor. So I have been involved with helping people become engaged in research. When I was in Montreal, I devoted every Wednesday afternoon to a conference with the fellows strictly focused on how their research was progressing. My main contribution was that I knew so many people in so many fields that I could make connections. That's what I still do. If you tell me you're interested in something, I'm likely to tell you who else is interested and introduce you. This is what you're doing, I'm sure, all the time. And it's been very rewarding. So yes, mentoring has been my major function.

When you say has it been focused more on women, or has there been a special emphasis on women, I hope not too obviously, because as a physician-in-chief, I couldn't be accused of promoting women more than men. I had to watch out. I didn't bend over backwards, but I was always sensitive to the fact that I had to make sure that the women had an equal shot and got equal pay. And that I accomplished wherever I was. In terms of fellows, sometimes there were no women, sometimes there were two or three, but there have almost always been more men than women, but that was characteristic of the pool in that age. One woman this year in Chicago, Elaine Farrell, was one of my fellows. I guess she's the only one. Richard [L] Nachman was. So there's one and one here. I have tried to be supportive to women behind the scenes in terms of working on committees for women. A group of us met periodically the last few years to see what we could do. We were the ones that raised the money for these scholarships, and we had very little trouble raising it. People were glad to contribute. It was a gift to Harvard Medical School, of course, to go to the scholarship fund. We weren't allowed to say for women. The university lawyers said that that's against the law, but we just happened to choose women. [Laughs]

DR. GARTNER: It's against the law. Interesting.

DR. AVERY: Well, you can't do things that are for one group and not another. They have to be gender neutral.

DR. GARTNER: That's interesting. You've touched on some of your roles such as when you were chairing the two departments. Would you like to elaborate a little bit more on how that experience was? What you feel you achieved during those periods? Would you do it again?

DR. AVERY: [Laughs] Oh my. I never thought I wanted to be a department chair. I think maybe that was rationalization because I never thought anybody would ever ask me. So I was immensely flattered when I was invited to McGill, and I really wanted to go. I think the first few years it was very exhilarating. I think after that it got a little tense. I got polarized vis-à-vis the surgeons in ways I wish I hadn't. That didn't work very well. They were carrying on their private practices in the hospital, and not contributing in the way I thought they should to the well being of the hospital and the pediatricians. But those were issues where I was uptight and didn't do a very good job as a diplomat. I also never learned French, well enough that is, to get along. And that wasn't a very good idea in Quebec at the time. Then when there were so many strikes over and over again, because there were really. The police would go on strike. The house staff would go on strike. This was not just within the hospital, this was Quebec wide, because they were putting in the new system of payment there.

So all the house staff in the province went on strike. The senior staff went on strike. I got terribly irritable when that happened. I really simply couldn't relate to the fact that they would do that. Therefore, I wasn't with them, but I was isolated when I wasn't with them. I don't think this was a very happy time for them or for me, so I was not displeased when I was invited to Boston. [Laughs] In Boston, again, the first five years I think were the best. After that, things began to polarize. People that I had been getting along with, I wasn't getting along with so well. That could have been their fault. It could have been my fault. But there were issues that made it timely for me to leave when I did.

DR. GARTNER: Yes, I know how it is.

DR. AVERY: I don't know what the optimal time is. I think my predecessor Dr. [Charles A.] Janeway was there for 20 years, and a very different style from mine, and seemed to do it. I think maybe I got more anxious to have my way, and other people were more anxious to have the status quo. It's hard to produce change under those circumstances. So it's a tough job. Would I do it again? I think so. But I don't think I'd do it for any longer. I think I'd do it in five year intervals.

[Laughter]

DR. GARTNER: Maybe the non-medical school departments have the right idea when they rotate their chairs.

DR. AVERY: Maybe they do.

DR. GARTNER: Medicine has not done that. You touched a little bit on some of the sort of ethical issues, but we really didn't talk about what the major ethical issues are in neonatology that we've faced in the past, or that are coming up in the future. And there are certainly a lot of them.

DR. AVERY: They spin around the quality of life issue. It's when in neonatology how small is too small when you resuscitate? In other age groups, it has to do with the progressive nature of the disease, and the amount of pain and suffering involved, and the appropriate use of analgesics. I think we've made a lot of headway in the older children, at least of letting them use their —

DR. GARTNER: Control it.

DR. AVERY: — pumping their own morphine when they want it. I think the oncologists know a lot about that. The ethical issues have to do with human research, of course, and we have developed committee mechanisms to deal with that, the Institutional Review Boards. I'm often

uncomfortable about it. I'm not even sure I like the word "consent." If I ask you to consent to something, I'm sort of saying I want you to sign on, and I'm informing you.

DR. GARTNER: I see exactly what you're saying.

DR. AVERY: I would prefer we use the word "choice" and talk about informed choice, under some circumstances. Now, if I think your appendix is about to rupture, you damn well do as I tell you. But if we're talking about prolonging life and other things that aren't as overt, I think most of the time patients, if not patient's parents, should always have a choice. This in the nursery in particular, involves the fact that they're going to live with this problem. I do not invoke full intensive care to show how long I can keep the baby breathing. I like to negotiate those things, and I like to do it in the concept of choice.

DR. GARTNER: Do you think that there are a significant number of our colleagues in neonatology who are pushing for life sustaining efforts no matter what? Is this a problem that neonatology is facing?

DR. AVERY: I think it has been, and I think that a lot of parents have written books about it, where they practically don't listen to the parents. It's kind of the heroic drive to show that you can do it. I think that's changed a lot. At least I think it's much better in our place. But there was a time, you know, when the doctors knew it all, and the patients did as they were told. And that isn't all that long ago. It certainly was when I was an intern and resident, and when I was even a fellow at the Lying-In. The doctors weren't asking the patients whether they wanted to have scopolamine or not for delivery — you're going to have it. [Laughs] We've gotten away from that, I think, but I'm not sure everybody has. I hope that in due time people will understand that parents live with the problem the rest of their lives, and we're just there temporarily. We should not dominate the decision making, but we have an enormous obligation to inform. And then if somebody says, "What would you do, Doctor, if it was you, or your child," I'd tell them the truth. That's what I would do. But I also make it clear that that isn't necessarily the only solution.

DR. GARTNER: We've actually had the other side of the coin, as well, in our nursery, where we've had parents demanding that we continue intensive efforts at full tilt, even when we've said this is futile. This is not going to help, and yet they refuse to allow any reduction. How do you feel about that?

DR. AVERY: I go along with the parents. I discuss that rather intensively in a couple of the case histories in the textbooks, using the case history to make the point, even with something like an anencephalic baby, and I share then, my experience with this. The reason they say no instantly

is because of ignorance. Somebody said there's no such thing as an opponent, there's only an ill-informed citizen. So giving adequate information over time, and giving them time to get over the shock, and to digest what's involved, and to talk to other people whom they trust. I ask them to bring in anybody. Sometimes they bring in the Christian Scientists, sometimes they bring in the rabbi, sometimes they bring in old Uncle Joe. I don't know. But I say, "Who are your family friends? Take some time. We'll support this baby on the ventilator. We'll give the baby optimal medical care while you're thinking this through. Come back and see me tomorrow, and the next day, and the next day." Gradually, of course, you see the baby getting a little worse. And if they can see a baby going downhill, they get the point. Sometimes you're wrong, and the baby goes uphill. But still, I think the answer is, don't force a decision, let it happen. I don't take into consideration hospital expenses or anything else. These issues are much too important for that, because they live with it the rest of their lives, and that means I'll support them in whatever they want. Do you know the famous child at Hopkins that had Down syndrome with duodenal atresia that the [The Joseph P.] Kennedy [Jr.] Foundation put up?

DR. GARTNER: As a case?

DR. AVERY: Yes, as a case movie [*Who Should Survive?: One of the Choices on Our Conscience*]? That was my patient. The parents didn't want that child to live. It was a premature infant, Down syndrome, duodenal atresia, and I went in with an op [operation] permit. I said, "Would you sign for the operation?" probably thinking that way because everybody signs for an operation, and yes, [J.] Alex Haller [Jr.] was perfectly able to fix the duodenal atresia. It wasn't an inoperable thing, but it was a Down syndrome. This was a very tricky dilemma, of course. It became a national cause célèbre. But my view was that the parents were both highly educated. I think the mother was a lawyer, as I recall, but at any rate they were highly educated. They had their family. They were older, and they thought that they simply, personally weren't up to the challenge of living with a child who has this kind of potential life-long handicap. And so I backed off and made my speech, I remember. They brought in the Catholic priest. They were Catholic. I said, "Please talk to your priest," and they did. The priest said that this could be viewed as an extraordinary — using the word extraordinary — means to prolong life, and that they could say no.

DR. GARTNER: Could withhold their permission, right.

DR. AVERY: That that was their right. So the priest said that. I brought in everybody else like the neurologists and the chromosome people, and went through the "let's document everything, let's get all the opinions." And the opinion after a period of time was, 'We won't feed the child, we'll

just keep him hydrated.' And Bob Cooke found out about it, and I almost lost my job. He took the patient right away from me, took it over to the nursery, got full intensive care and the whole bit, and tried to get a court order to save the child's life. I have never been so upset in my life, of course. This was my boss who was feeling utterly differently. And the judge would not give him a court order, so the child died. But he was so upset by it that he got the Kennedys all involved in terms of making this a cause célèbre of what's wrong with life. And he was very sincere about it. He'd had his own retarded children. He was clearly upset.

DR. GARTNER: He was emotionally involved.

DR. AVERY: And I was terribly upset. It was hard enough on me to go through this, even though I was supported by everybody, let alone to have him so upset with me. And to have him take my private patient away from me, he crossed the line there. He hadn't known any of the background of this at the time he made his preemptory decision. He just made it clear to the house staff that this was something that should never, ever be done. And I was kind of hanging out to dry. It wasn't good.

DR. GARTNER: It was a bad time, I'm sure.

DR. AVERY: Yes.

DR. GARTNER: Interesting. Anything else that we didn't cover that you'd like to record for posterity? A message to the next generation of neonatologists perhaps?

DR. AVERY: Oh, well, I would tell any of them that if they want to be interviewed by Larry Gartner any time, that it's a very pleasant experience. If they enjoy talking about themselves and having somebody listen, that's a very pleasant experience — and a very rare one. And that I can only say that I think the future of medicine is in their hands. And the future of bio-science as it affects humanity is in their hands. And that it must be the most satisfying career in the world.

DR. GARTNER: Good. I thank you very much for really a wonderful interview, and lots of meat. I think you have given us an insight into neonatology that we have not had before, so thank you very much. And I wish you the very best.

[End of Interview]

Index

A

Alacta, 19, 20
American Academy of Pediatrics, 1, 56, 57
American Journal of Diseases of Children, 39, 40
American Pediatric Society, 56
American Physiological Society, 35
Apgar score, 27
Apgar, Virginia, 2, 27, 29, 34
Auld, Peter A. M., 27, 29
Avery, Gordon B., 53
Avery's Diseases of the Newborn, 22, 53

B

Bacon, Emily P., 8, 9, 11
Baetjer, Anna M., 35
Ballard, Robert A., 22, 54
Baltimore, Maryland, 9, 12, 15, 22, 26, 34, 35, 58
Barcroft, Joseph, *26*
Bartlett, James W., 15
Baulieu, Etienne-Emile, 55
Behrman, Richard E., 22
Bing, Richard J.. See
Blackfan, Kenneth D., 2
Bloxsom Air-Lock, 21
Bongiovanni, Alfred M., *19*
Boy Scouts of America, 6
Brumley, George W., Jr., 37
Brundtland, Gro Harlem, 52
Buckingham, Sue, 37, 43
Bucks County, Pennsylvania, 2

C

Chernick, Victor, 36
Children's Hospital Boston, 14, 19
Clements, John A., 38, 39, 40, 41
Comroe, Julius H., Jr., 41, 42
Convention on the Rights of the Child, 52
Cook, Charles D., 31
Cooke, Robert E., 16, 35, 64
cortisol, 25, 40, 43, 44
Cournand, Andre Frederic, *19*
Curstedt, Tore, 46

D

Dawes, Geoffrey S., 27
Day, Richard L., 2, 39, 40, 42
deLemos, Robert A., 37
Diseases of the Newborn, *22*
Double Helix, 33
Dover, George J., 16
Drorbaugh, James E., *31*

E

Edgewood Chemical Biological Center, 29, 38, 41
ethical issues, 50, 61

F

Farrell, Elaine, 60
Ferris, Benjamin G. Jr., *30*
First, Lewis R., 54
Flores, Ana I., 58
Franklin, Rosalind, 33
Fujiwara, Tetsura, 38, 42

G

Girl Scouts of the United States of America, 6
Gluckman, Peter, 36
Gordon, Harry H., 2, 20, 21, 29
Grumbach, Melvin M., 19
Guild, Harriet, 8, 25
Gunn, Tania R., 36

H

Haller, J. Alex, Jr., 63
Hardy, Janet, 2, 21
Harriet Lane Home, 2, 14, 24
Harrison, Harold E., 18, 24, 58
Harrison, Helen C., 58
Harrison, Stephen C., 58
Harvard Medical School, 13, 16, 32, 36, 49, 60
Harvard School of Public Health, 16, 18, 26, 27, 29, 30, 34, 35, 36, 56
Hay, Elizabeth D., 13
Hobson, W. Alan, 37

I

Institute of Medicine, 56, 57

J

Jacobsen, Julius H. II, 15
James, L. Stanley, 15, 27
Janeway, Charles A., 61
Jobe, Alan H., 45
John and Mary R. Markle Foundation Scholarships in Medicine, 27, 35
Johns Hopkins Hospital Bulletin, 24
Johns Hopkins University School of Medicine, 2, 8, 9, 11, 12, 14, 24, 30, 35
Josephs, Hugh W., 23, 24

K

Karlburg, Petter, 31
Klaus, Marshall H., 41

L

Levine, Samuel Z., 2, 20
Liggins, Graham C., 36, 43
Lind, John, 31
Littlefield, John W., 16

M

March of Dimes, 34
Markowitz, Milton, 21, 22
Massachusetts Institute of Technology, 58, 59
McCance, Robert Alexander, 26
McGill University, 35, 60
McIntyre, Patricia A., 13
Mead, Jere, 26, 28, 36, 38, 40, 41
Menkes, John H., 20, 37
Montague, Laura J., 13
Moog, Florence, 43
Moorestown Friends School, 7
Moorestown, New Jersey, 2, 3, 6, 7, 8, 11

N

Nachman, Richard L., 60
Nadas, Alexander S., 19
National Academy of Sciences, 56, 57
National Institutes of Health, 26, 45, 49
Newark, New Jersey, 2
Normand, Colin S., 37

O

Oski, Frank A., 16

P

Park, Edwards Albert, 21, 22
Pattle, Richard E., 38, 39
Pauling, Linus Carl, 33
Pediatric Medicine, 54
Perlman, Jeffrey M., 22
Permutt, Solbert, 35
Physiology of the Newborn Infant, *26*
Post, Martin, 37

R

Readfield, Maine, 4, 5, 6, 26
Reichelderfer, Thomas E., 21
Retrospectoscope, 42
Richards, Dickinson Woodruff Jr., 19
Riley, Richard L., 26, 28, 35
Rotch, Thomas Morgan, 2
Rudolph, Arnold Jack, 22, 27, 29

S

Schaffer, Alexander J., 21, 22, 29, 50, 53, 54
Schwentker, Francis F., 16, 25
Seidel, Henry Murray, 15
Silverman, William A., 2
Smellie, Jean M., 37
Smith, Barry T., 37
Smith, Clement A., 11, 26, 27, 28, 29, 31, 37, 38
Stahlman, Mildred T., 32
Stamey, Thomas A., 15
Stein, Gertrude, 13
Stokes, Emlen, 8
Stokes, Joseph L., Jr., 8
Strang, Leonard B., 27, 37
surfactant, pulmonary, 37, 39, 41, 42, 43, 44, 45, 46, 47, 55

T

Taeusch, H. William Jr., 22, 54
Taussig, Helen, 8, 15, 18, 19
Thorburn, Geoffrey Donald, 36
Tooley, William H., 41
Trudeau Sanatorium, 16
tuberculosis, 3, 16, 26

U

United National International Children's Emergency Fund, 51, 57

V

Van Wyk, Judson J., *19*

W

Wagner, Henry N., Jr., 15
Watson, James D., 32, 33
Wheaton College [Massachusetts], 7, 8, 10, 11, 12
Whittenberger, James L., 29, 36
Whittenberger, James W., 38
Wilkins, Lawson, 15, 18, 19
Wolff, Stewart M., 15
World Health Organization, 51, 52

Z

Zinkham, William H., 15

Updated: 9/09/03

CURRICULUM VITAE

Name: Mary Ellen Avery

Date of Birth: May 6, 1927

Place of Birth: Camden, NJ

Education:

1948 AB	Wheaton College, Norton, MA (Summa cum laude)
1952 M.D.	Johns Hopkins University School of Medicine Baltimore, MD

Post Doctoral Training:

Internship and Residencies:

1954	Intern, Pediatrics, Johns Hopkins Hospital
1954-55	Jr. Assistant Resident, Pediatrics Johns Hopkins Hospital
1955-57	Sr. Assistant Resident, Pediatrics Johns Hopkins Hospital

Research Fellowships:

1957-59	Research Fellow, Pediatrics, Harvard Medical School
1959-60	Fellow, Pediatrics, Johns Hopkins Hospital

Licensure and Certification:

Massachusetts License Registration No. 36620
1959 American Board of Pediatrics

Academic Appointments:

1960-64	Assistant Professor of Pediatrics Johns Hopkins University
1964-69	Associate Professor of Pediatrics Johns Hopkins University
1965-69	Eudowood Associate Professor Pulmonary Disease of Children
1969-74	Professor and Chairman, Department of Pediatrics McGill University
1974-96	Thomas Morgan Rotch Professor of Pediatrics Harvard Medical School
1996-97	Thomas Morgan Rotch Distinguished Professor of Pediatrics Harvard Medical School
1997-	Thomas Morgan Rotch Distinguished Professor of Pediatrics, Emerita, Harvard Medical School

Hospital Appointments:

1961-69	Pediatrician-in-Charge, Newborn Nurseries Johns Hopkins Hospital
1969-74	Physician-in-Chief Montreal Children's Hospital
1974-85	Physician-in-Chief The Children's Hospital, Boston
1985-	Physician-in-Chief, Emeritus The Children's Hospital, Boston

Other Professional Positions and Major Visiting Appointments:

1959 Speaker, International Congress Pediatrics, Montreal
1965 Participant, International Congress Pediatrics, Tokyo
1965-85 Trustee, Wheaton College; Vice Chairman of Board, 1980
1968,1982 Visiting Professor, Guest Lecturer
New Zealand Pediatric Society
1971 Speaker, International Congress Pediatrics, Lisbon
1974 Speaker, International Congress Pediatrics, Buenos Aires
1978 Guest Speaker, 100th Anniversary of
Brisbane Children's Hospital, Australia
1979 Head, American Delegation to the International Year
of the Child, Japan
1980 Guest Speaker, Catholic University, Santiago, Chile
1980-84 Trustee, Radcliffe College
1982-88 Trustee, Johns Hopkins University
1982 Participant in CIBA Symposia, London, England
1983 Speaker, International Congress Pediatrics, Manila
1985 Guest, Japan Interface Society, Tokyo Pediatric Society
1985 Guest, Korean Pediatric Society
1985 Invited Speaker, Opening Seoul National University
Children's Hospital
1986 Guest, Brazilian Pediatric Society, Porto Allegro
1986 Guest, Puerto Rican Pediatric Society
1986 Speaker, International Congress Pediatrics, Hawaii
1987 Invited Participant, 100th Anniversary, Birth of A.Ylppo,
Helsinki
1987 Blackwell Visiting Professor of Pediatrics
New Zealand Paediatric Society
1988 Visiting Professor, University of North Carolina
1988-99 Moderator, Ross Conference "Hot Topics in Neonatology",
Washington, DC
1989 Visiting Professor, Memorial University of Newfoundland
1989 Invited Speaker, Latin American Pediatric Conference, UNICEF,
La Habana, Cuba
1989 Invited Speaker, International Congress Pediatrics, Paris
1990 Invited Participant, "Improving the Life Chances of Children
at Risk", Cornell Medical Center
1990 Invited Speaker, International Symposium on Surfactant in
Clinical Practice, Parma, Italy,
1991 Speaker, International Meeting of Actualization in
Pediatrics, Monterrey, Mexico
1991 Invited Speaker, Dedication, NICU, University of Florida
1991 Visiting Professor, Crimea Medical Institute, Simferopol
1991 Invited Speaker, International Congress Perinatology, Tokyo
1991 Visiting Professor, Ministry of Health, Singapore
1991 Consultant, Aga Khan Univ Medical School, Karachi, Pakistan
1992 Invited Speaker, Child Health 2000, Univ British Columbia
1992 Moderator, Symposium Maternal and Child Health, AAAS Annual
Meeting, Chicago
1992 Visiting Professor, Neonatology, University of Pennsylvania
1992 Visiting Professor, Miller Children's Hosp. Long Beach, CA
1992 Invited Speaker, Hong Kong Pediatric Society
1992 Invited Speaker, Australian College of Paediatrics
1992 Invited Speaker, Justice and Child Health: National and
International Perspectives, Cleveland, Ohio
1993 Invited Speaker, National Assoc. of Neonatal Nurses, Boston
1993 Scientific Advisor, IPOKRaTES, Krems, Austria
1993 Invited Speaker, Neonatal Conference, University of Miami
1993 March of Dimes Visiting Prof. Maimonides Children’s Center,
1993 Invited Speaker, New York Perinatal Society
1993 Moderator, Ross Conference Hot Topics in Neonatology, Wash
1994 Invited participant, Canada China Child Health Foundation,

	National Conference on Hospital Management and Services, China
1994	Invited speaker, NIH Consensus Conference, Corticosteroids
1994	Invited Guest, White House Celebration 1994 Nobel Laureates,
1994	Moderator,RossConf.HotTopics in Neonatology, Washington
1995	Invited Speaker, Taiwan Neonatal Society
1995	Invited Plenary Speaker, Child Health 2000, Vancouver
1995	Visiting Professor, Burlington VT
1995	Invited Speaker, Univ. Minnesota, Paul Quie Symposium
1995	Invited Speaker, Swiss Neonatal Society, Lucerne
1995	Floating Congress,Surf.Therapy,Danube,(Vienna, Budapest)
1995	Moderator, Speaker, Hot Topics, Washington, DC
1995	Keynote Speaker, Postgraduate course, Hyderabad, India
1996	Invited Speaker, International Symposium Honoring K. Riegel, Tubingen, Germany
1996	Invited Speaker, Ukraine International Conference of Neonatologists, Odessa
1996	Invited Speaker,IPOKRaTES Scientific Symposium,Krems,Austria
1997	Visiting Professor, Dalhousie University, Nova Scotia
1997	Woodrow Wilson Visiting Fellow, Salem College, NC
1998	Visiting Professor, Queens University, Kingston, Ontario
1998	Floyd Denny Visiting Professor of Pediatrics, UNC Medical School, Chapel Hill
1999	Woodrow Wilson Visiting Fellow, Univ. Maine, Farmington
2000	Woodrow Wilson Visiting Fellow, Washington Jefferson Col,PA
2000	Speaker, Pediatric Research Building Dedication, Washington University, St. Louis
2000	Honorary Guest, Floating Congress on the Rivers Mosel and Rhine (Surfactant 2000)
2001	Visiting Professor, North Central College, Naperville, IL

Honorary Degrees

1974	Honorary Master of Arts Degree, Harvard University
1974	Honorary Doctor of Science Degree, Wheaton College
1975	Honorary Doctor of Science Degree, University of Michigan
1976	Honorary Doctor of Science Degree, Medical College of PA
1976	Honorary Doctor of Science Degree, Trinity College
1977	Honorary Doctor of Science Degree, Albany Medical College (Commencement Speaker)
1978	Honorary Doctor of Science Degree, Medical College Wisconsin
1978	Honorary Doctor of Science Degree, Radcliffe College
1979	Honorary Doctor of Humane Letters Degree, Emmanuel College
1981	Honorary Doctor of Humane Letters Degree, Northeastern Univ.
1983	Honorary Doctor of Science Degree, Russell Sage College
1993	Honorary Doctor of Science Degree,Memorial U of Newfoundland
1999	Honorary Doctor of Humane Letters, Johns Hopkins University
2000	Honorary Doctor of Laws, Queens University at Kingston
2003	Honorary Doctor of Science, University of Southern California

Awards and Honors

1947	Phi Beta Kappa
1960	Alumnae Service Award, Wheaton College
1961-66	John and Mary Markle Scholar in Medical Science
1968	Mead Johnson Award for Pediatric Research
1972	Max Weinstein Award, United Cerebral Palsy
1974	Honorary Member, The Neonatal Society, Great Britain
1978	American Academy Arts and Sciences
1980	Member, Society of Scholars, Johns Hopkins University
1982	Henry D. Chadwick Medal, Massachusetts Thoracic Society

1983	Honorary Member, British Paediatric Society
1984	Edward Livingston Trudeau Medal, American Lung Association
1988	Alpha Omega Alpha, Johns Hopkins University
1991	Virginia Apgar Award, American Academy of Pediatrics
1991	National Medal of Science
1992	International Pediatric Hall of Fame, Miami Children's Hospital
1994	Member, National Academy of Sciences
1995	Research Award, The Medical Foundation, Boston
1997-2000	Member of Council, National Academy of Sciences
1997	Medical Alumnus Award, Johns Hopkins Medical School
1997	Kristine Sandberg Knisely Award, Children's Hospital, PA
1998	Joseph DeLee Humanitarian Award, University of Chicago
1998	March of Dimes - Franklin Delano Roosevelt Award
1998	The Marta Philipson Award, Karolinska Institute, Stockholm
1999	Lifetime Achievement Award, Massachusetts Medical Society
2000	Walsh McDermott Medal, Institute of Medicine
2002	Sheen Award, American College of Surgeons, New Jersey
2003	Alma Dea Morani, MD Renaissance Woman Award, Foundation for the History of Women in Medicine, PA

Invited Lectures:

1969	Amberson Lecture, American Thoracic Society
1969	Tisdall Lecture, Canadian Medical Association
1970	Clausen Lecture, University of Rochester, New York
1972	Amberg-Helmolz Lecture, Mayo Clinic
1972	Stifler Lecture, Maryland Pediatric Society
1973	AOA Lecture, University of Miami
1973	AOA Lecture, University of Oklahoma
1974	Bela Schick Lecture, Mt. Sinai Hospital, New York
1974	John F. Kennedy Memorial Lecture, Georgetown University
1975	Queen Elizabeth II Lecture, Canadian Pediatric Society
1975	Weiskotten Lecture, Syracuse Medical Alumni Association
1975	Mildred Trotter Lecture, Washington University
1975	AOA Lecture, Thomas Jefferson University
1976	Johns Hopkins Student Society Lecture
1976	Julia Jones Lecture, New York Lung Association
1976	Joseph B. Bilderback Lecture, Portland, Oregon
1976	Brennemann Memorial Lectures, Los Angeles, Pediatric Society
1976	AOA Lecture, University of Kentucky
1977	Roger Orson Memorial Lecture, University of Minnesota
1977	Chevalier Jackson Lecture, Am Bronchoesophaolgic Assoc.
1977	Ben Benjamin Lecture, Montreal
1978	AOA Lecture, University of California, San Francisco
1978	Ted Panos Memorial Lecture, University of Arkansas for Medical Sciences
1979	Ethel Dunham, Martha Eliot Lectures, HSPH
1979	Edith Lincoln Memorial Lecture, New York University School of Medicine
1980	Lowell Lecture, Museum of Science, Boston
1980	AOA Lecture, Rush Medical College
1981	Wall-Copeland Lecture, Georgetown University
1981	Arthur McElfresh Lecture, St. Louis University
1981	John Howland Lecture, Johns Hopkins University
1982	Windermere Lecture, British Paediatric Society
1982	Charles E. Culpepper Foundation Visiting Professorship
1983	Theodore L. Badger Lecture, Harvard Medical School
1984	Heritage Foundation Visiting Lecture, University of Alberta
1984	The Harry Bawkin Memorial Lecture
1984	AOA Lecture, Jefferson Medical College

1986 Queen's University Scholar in Residence
1987 Woodrow Wilson Visiting Professor, Union College
1988 Charles McNeil Lecture, Royal College Physicians, Scotland
1988 Lowell Glasgow Visiting Professor, University of Utah
1988 Distinguished Woman Visitor, Carleton College
1990 Invited Speaker, Johns Hopkins Hospital, Centennial Program
1990 Invited Speaker,Pediatric Section, New York Academy Medicine
1990 Invited Speaker, Chicago Pediatric Society
1990 Donald F. Eagan Memorial Lecture, New Orleans
1991 Anna Baetjer Lecture, Johns Hopkins University, Baltimore
1991 E.Kendig Distinguished Professor, Medical College of VA
1992 Ettledorf Lecture, University of Tennessee, Memphis
1992 John Figgis Jewett Memorial Lecture, Mass. Medical Society
1992 John I. Perlstein Memorial Lecture, University of Louisville
1992 Keynote Speaker, Irish-American Pediatric Society, Belfast
1992 Vickers Lecture, Neonatal Society, London, United Kingdom
1992 Margaret Krehbie Memorial Lecture, Rush-Presbyterian,Chicago
1992 Jean Pouliot Telethon of Stars Lecture, Montreal Children's Hospital and Hopital Ste-Justine, Canada
1993 Bradford Lecture, Children's Mercy Hospital, Kansas City
1993 A.Graeme Mitchell Visiting Professor of Pediatrics, Children's Hospital Medical Center, Cincinnati
1993 McCluskey Memorial Lecture, Children's Hosp., Pittsburgh
1993 Fred Heldrich Lecture, St.Agnes Hospital, Baltimore
1993 Richard Fowler Memorial Lecture, New Orleans
1993 LaDonne Heaton Schulman Lecture, Wheaton College, Norton, MA
1994 Fay Golden Kass Lecture, Harvard Medical School, Boston
1995 William H. Tooley Lecture, Univ. California, San Francisco
1995 Professor Bhagat Oration, Sheth G.S. Medical College, India
1995 Professor O.P. Ghai Oration, Hyderabad, India
1996 Hinkle Society Lecture, Hershey Medical Center, Pennsylvania
1996 Atlantic Respirology Conference, Halifax, Nova Scotia
1996 The Leslie Cooper Memorial Lecture, London, England
1997 Johns Hopkins School of Med. Centennial Commencement Speaker
1998 Albany Medical College, Commencement Speaker
1998 Dr. Emilio Soto Lectureship, No.VA Pediatric Society, VA
1999 Blackfan Lecture, Children's Hospital, Boston
2000 Speaker of Honor, Perinatal Symposium, Lubeck, Germany
2001 Dr. Donald V. Eitzman Lectureship, University of Florida
2001 Nils Svenningsen Memorial Lecture, Edinburgh, Scotland
2002 Invited Speaker, Japan Society of Premature and Newborn Medicine, Yokohama, Japan
2002 Dr. Edwin and Elizabeth Shepherd Distinguished Lecture, Savannah, Georgia
2002 Invited Speaker, 2nd International Multidisciplinary Delphi Conference, Delphi, Greece
2002 Fellow, Royal College of Physicians, Edinburgh
2002 Invited Speaker,2ndShanghai International Symp Shanghai,China
2003 Invited Speaker, Pediatric Pulmonary Meeting, Crete

Major Committee Assignments:

1964 Consultant, Department of Health, Education and Welfare, Committee on Nursery Lighting
1965-66 Member, Governor's Committee on Tuberculosis Control
1967-69 Member, Advisory Council on Preventive Medicine
1968-71 Member, Human Embryology Study Section, National Institute of Child Health and Human Development
1969-74 Member, Research Advisory Council, United Cerebral Palsy
1970-72 Member, Long Range Planning Committee, McGill University
1970-74 Member of Council, Medical Research Council of Canada; Executive 1973
1973 Chairman, W.H.O. Technical Advisory Committee on Fetal Organ

	Maturation, Geneva, Switzerland
1974	Cardiopulmonary Diseases, American Heart Foundation
1975-81	Scientific Advisor, Hood Foundation
1976-81, 88-91	Member,Council of Scientific Advisors, PBF Foundation
1977-83	Trustee,Institute for Pediatric Service,Johnson& Johnson Co.
1978-88	Chairman, Advisory Committee for the General Pediatric Academic Development Program of the Robert Wood Johnson Foundation
1979-83	Member, Board of Scientific Counselors, National Heart, Lung and Blood Institute; Chairman, 1980
1981-	Member, Institute of Medicine; 1987-93 Governing Council
1984-88	Member, Maternal and Child Health Research Committee, National Institute of Child Health and Development
1985	Co-Chairman, Approaches for Enhancing Pulmonary Maturation and Preventing Neonatal Respiratory Distress Syndrome in the 1980s, National Heart, Lung and Blood Institute
1986-89	Member,Standing Committee International Pediatric Assoc.
1988-93	Board of Directors, AAAS
1992-	Member, Finance Committee, AAAS
1989-93	Consultant, Food and Drug Administration
1990-91	Chair, Federation of Pediatric Organizations
1990-	Member,Committee on Health & Human Rights, IOM
1993-2001	Member, Board of Directors, The Burroughs Wellcome Fund
1993-	National Research Council, Report Review Committee
1995-	Member, International Advisory Committee, Physicians for Human Rights
1996-99	Chairman, Membership Committee, AAAS
1999-2001	Member, Committee on Nominations, AAAS
1993-2000	Foundation for the National Institutes of Health, Board of Directors
2001-2004	President, The Johns Hopkins Medical and Surgical Association
2003	Nominating Committee, National Academy of Sciences

Selected List of Children's Hospital and Harvard Committees:

1974-84	Staff Executive Committee, Children's Hospital Steering Committee
1974-84	Executive Committee, Department of Pediatrics, HMS
1974-84	Subcommittee of Professors, Harvard Medical School
1974-84	Committee of Department Chairmen, Harvard Medical School
1981	Chairman, Honorary Degrees Committee for the 200th Anniversary, Harvard Medical School
	Multiple Search Committees for both institutions
1988-98	Secretary, Faculty of Medicine, Harvard Medical School
1988-90	Teacher-Clinician Advisory Committee, Harvard Medical School
1990-97	Countway Library, Joint Library Committee, HMS
1997-98	Countway Library Resources Advisory Board
1992-94	President, Alumni Association, Children's Hospital
1993-97	Chair, Clinical Research Committee, Children's Hospital
1998-01	Harvard Medical School, Awards and Honors Committee

Harvard Medical School-Children's Hospital Teaching:

1974-96	Attending Pediatrician Supervising Year 3 and 4 Medical Students, The Children's Hospital, Boston
1987-91	Tutor, New Pathway, Human Systems, Harvard Medical School
1988-	Medical Student Advisor, Harvard Medical School
1994	Faculty, Metabolism and Function:HumanOrgan Systems,YearI HMS
1998-	Faculty, Integrated Systems, Year I, HMS

Editorial Boards:

1965-71	Editorial Board, Pediatrics
1966-72	Editorial Board, American Journal of Physiology
1970-76	Editorial Board, American Review of Respiratory Diseases
1975-84	Editorial Board, Journal of Pediatrics
1975-84	Advisory Board, Harvard Medical School Health Letter
1977-94	Editorial Board, Clinical and Investigative Medicine
1978-82	Editorial Board, Johns Hopkins Medical Journal
1985-	Editorial Board, Medicine
1990-95	Editorial Board, New England Journal of Medicine
1991-94	Editorial Board, Critical Care Medicine
1993-97	International Advisory Board, Acta Paediatrica Japonica

Memberships, Offices and Committee Assignments in Professional Societies:

1960	Member, Society for Pediatric Research; President, 1972
1962	Fellow, American Academy of Pediatrics
1962-68	American Thoracic Society: Member, Committee on Respiratory Diseases in Children, 1962-65; Committee on Research and Fellowships, 1965-66; Chairman, Committee on Fellowships, 1967; Member, Committee on Medical Education, 1968
1964	Member, American Physiological Society
1964-66	Director, Maryland Thoracic Society; Member of Council, 1969
1966-	Member, American Pediatric Society; Member of Council, 1969;
1967-69	Member, Committee on Drugs, American Academy of Pediatrics
1969	Member, Canadian Paediatric Society
1971-74	Member, Canadian Society for Clinical Investigation
1971-74	Member, Fleischner Society
1971	Fellow, American Academy of Arts and Sciences
1973	Fellow, Royal College of Physicians (Canada)
1973	Fellow, American College of Chest Physicians
1973-91	Member, Peripatetic Society
1982	Fellow, American Association for the Advancement of Science
1989-90	President Elect, American Pediatric Society
1990-91	President, American Pediatric Society
1990	Member, The Perinatal Research Society
1993-2001	Member, Albert Lasker Medical Research Awards Jury
2002	President-elect American Association for the Advancement of Science (AAAS)
2004	President, American Association for the Advancement of Science (AAAS)

Experience in International Health:

1969-74	Coordinated pediatric care for Eskimos of the Eastern Arctic, Frobisher Bay, Baffin Island
1969-74	Coordinated pediatric education at founding of new medical school in Nairobi, Kenya, under auspices of Canadian International Development Association and McGill University
1986	Participant, WHO-UNICEF Program, Ankara, Turkey
1986	Member, Council of the Turkish and International Children's Center, Ankara, Turkey
1986-89	Member, Standing Committee, International Pediatric Association
1987	Consultant, Committee on International Health, American Academy of Pediatrics
1991	Consultant, Ministry of Health, Singapore
1993	Invited Participant, Universal Health Conference, Samarkand Uzbekistan
1994-95	Member, NAS-IOM-UNICEF delegation to former Yugoslavia Trieste, Italy Mar 27-31; Nov 18-22; May 24-27, 1995
1997-1998	International Scientific Advisory Committee, XXII International Congress of Pediatrics, Amsterdam

Research Interests:

1. Respiratory problems of the newborn infant
2. Pulmonary surfactant
3. Control of breathing

Major Grant Support (since 1980)

Principal Investigator, Specialized Center of Respiratory Research. National Institutes of Health HL34616. 1981-1991.

BIBLIOGRAPHY

Original Reports:

1. Joseph HW, Avery ME: Heredity elliptocytosis associated with increased hemolysis. **Pediatrics** 1955; 16:741-752.

2. Avery ME: Hereditary elliptocytosis and hemoglobin C trait. **Bull Johns Hopkins Hosp** 1956; 98:184-196.

3. Avery ME, McAfee JG, Guild HG: The course and prognosis of reticuloendotheliosis. (Eosinophilic granuloma, Schuller-Christian disease and Letterer-Siwe disease) **Am J Med** 1957; 22:636-652.

4. Avery ME, Oppenheimer E, Gordon HH: Renal vein thrombosis in newborn infants of diabetic mothers. **N Engl J Med** 1957; 256:1134.

5. Avery ME, Frank NR, Gribetz I: The inflationary force produced by pulmonary vascular distension in excised lungs. The possible relation of this force to that needed to inflate the lungs at birth. **J Clin Invest** 1959; 38:456-462.

6. Avery ME, Mead J: Surface properties in relation to atelectasis and hyaline membrane disease. **Am J Dis Child** 1959; 97:517-523.

7. Gribetz I, Frank NR, Avery ME: Static volume-pressure relations of excised lungs of infants with hyaline membrane disease, newborn and stillborn infants. **J Clin Invest** 1959; 38:2168-2175.

8. Avery ME, Oppenheimer EH: Recent increase in mortality from hyaline membrane disease. **J Pediatr** 1960; 57:553-559.

9. Auld P, Rudolph AJ, Avery ME, Cherry RB, Drorbaugh JE, Kay JL, Smith CA: Responsiveness and resuscitation of the newborn: the use of the Apgar score. **Am J Dis Child** 1961; 101:713-724.

10. Avery ME, Cook CD: Volume pressure relationships of lungs and thorax in fetal, newborn and adult goats. **J Appl Physiol** 1961; 16:1034-1038.

11. Avery ME, Riley MC, Weiss A: The course of bronchiectasis in childhood. **Bull Johns Hopkins Hosp** 1961; 109:20-34.

12. Hustead RF, Avery ME: Observations on mask pressure achieved with the Kreiselman infant resuscitator. **N Engl J Med** 1961; 265:939-941.

13. Avery ME, O'Doherty N: Effects of body-tilting on the resting end-expiratory position of newborn infants. **Pediatrics** 1962; 29:255-260.

14. Buckingham S, Avery ME: The time of appearance of lung surfactant in the foetal mouse. **Nature** 1962; 193:688-689.

15. Avery ME: The alveolar lining layer. A review of the studies on its role in pulmonary mechanics and in the pathogenesis of atelectasis. **Pediatrics** 1962; 30:324-330.

16. Baghdassarian OM, Avery ME, Neuhauser EBD: A form of pulmonary insufficiency in premature infants. Pulmonary dysmaturity? **AJR** 1963; 89:1020-1031.

17. Finkelstein JW, Avery ME: The Pickwickian syndrome. Studies on ventilation and carbohydrate metabolism. Case report of a child who recovered. **Am J Dis Child** 1963; 106:251-257.

18. Mathews D, Avery ME, Jude JR: Closed-chest cardiac massage in the newborn infant. **JAMA** 1963; 183:964-966.

19. Avery ME, Chernick V, Dutton RE, Permutt S: Ventilatory response to inspired carbon dioxide in infants and adults. **J Appl Physiol** 1963; 113:301-319.

20. Chernick V, Avery ME: Spontaneous alveolar rupture at birth. **Pediatrics** 1963; 32:816-824.

21. Menkes J, Avery ME: The metabolism of phenylalanine and tyrosine in the premature infant. **Bull Johns Hopkins Hosp** 1963; 113:301-319.

22. Chernick V, Heldrick F, Avery ME: Periodic breathing of premature infants. **J Pediatr** 1964; 64:330-340.

23. BenschK, Schaefer K, Avery ME:Granular pneumocytes: electron microscopic evidence of their exocrinic function.**Science** 1964; 145:1318-1319.

24. Schaefer KE, Avery ME, Bensch K: Time course of changes in surface tension and morphology of alveolar epithelial cells in CO 2 induced hyaline membrane disease. **J Clin Invest** 1964; 43:2080-2083.

25. Avery ME: Some effects of altered environments: relationships between space medicine and adaptations at birth. **Pediatrics** 1965; 35:345-354.

26. Said S, Avery ME, Davis RK, Banerjee CM, El-Gohary : Pulmonary surface activity in induced pulmonary edema. **J Clin Invest** 1965; 44:458-464.

27. Howatt WF, Avery ME, Humphreys PW, Normand ICS, Reid L, Strang LB: Factors affecting pulmonary surface properties in the foetal lamb. **Clin Sci** 1965; 29:239-284.

28. Avery ME, Chernick V, Young M: Fetal respiratory movements in response to rapid change of CO2 in carotid artery.**J Appl Physiol** 1965; 20:225-227.

29. Chernick V,. Avery ME: Response of premature infants with periodic breathing to ventilatory stimuli. **J Appl Physiol** 1966; 21:434-440.

30. Rowe S, Avery ME: Massive pulmonary hemorrhage in the newborn. II. Clinical considerations. **J Pediatr** 1966; 29:12-20.

31. Avery ME, Baghdassarian O, Gatewood O, Brumley G: Transient tachypnea of the newborn. **Am J Dis Child** 1966; 111:380-385.

32. Hodson WA, Chernick V, Avery ME: A rebreathing method for measurement of arterial carbon-dioxide tension in newborn infants and children. **Lancet** 1966; 1:515-517.

33. Avery ME, Clow CL, Menkes JH, Ramos A, Scriver CR, Stern L, Wasserman BP: Transient tyrosinemia of the newborn. Dietary and clinical aspects. **Pediatrics** 1967; 39:378-384.

34. Brumley GW, Chernick V. Hodson WA, Normand C, Fenner A, Avery ME: Correlations of mechanical stability, morphology, pulmonary surfactant

and phospholipid content in the developing lamb lung. **J Clin Inves** 1967; 46:863-873.

35. Brumley GW, Hodson WA, Avery ME: Lung phospholipids and surface tension correlations in infants with and without hyaline membrane disease and in adults. **Pediatrics** 1967; 40:13-19.

36. Fenner A, Jansson EH, Avery ME: Enhancement of the ventilatory response to carbon dioxide by tube breathing. **Respiration Physiol** 1968; 4:91-100.

37. Hodson WA, Fenner A, Brumley G, Chernick V, Avery ME: Cerebrospinal fluid and blood acid-base relationships in fetal and neonatal lambs and pregnant ewes. **Respiration Physiol** 1968; 4:322-332.

38. Rokos J, Vaeusorn O, Nachman R, Avery ME: Hyaline membrane disease in twins. **Pediatrics** 1968; 42:204.

39. Oppenheimer EH, Avery ME: Clinical-pathological conference, Johns Hopkins Hospital. **J Pediatr** 1968; 73:143-149.

40. deLemos R, Wolfsdorf J, Nachman R, Block AJ, Leiby G, Wilkinson HA, Allen T, Haller JA, Morgan W, Avery ME: Lung injury from oxygen in lambs: the role of artificial ventilation. **Anesthesiology** 1969; 30:609-618.

41. Wolfsdorf J, Swift DL, Avery ME: Mist therapy reconsidered: an evaluation of the respiratory deposition of labeled water aerosols produced by jet and ultrasonic nebulizers. **Pediatrics** 1969; 43: 799-808.

42. White JJ, Brenner H, Avery ME: Umbilical vein collateral circulation: the caput medusae in a newborn infant. **Pediatrics** 1969; 43:391-395.

43. Spear GS, Vaeusorn O, Avery ME, Nachman R, Wolfsdorf J, Bergman RA: Inclusions in terminal air spaces of fetal and neonatal human lung. **Biol Neonat** 1969; 14:344-358.

44. Ballowitz L, Avery ME: Spectral reflectance of the skin: studies on infant and adult humans, Wister and Gunn rats. **Biol Neonat** 1970; 15:348-360.

45. deLemos RA, Shermeta DW, Knelson JH, Kotas RV, Avery ME: Acceleration of appearance of pulmonary surfactant in the fetal lamb by administration of corticosteroids. **Am Rev Resp Dis** 1970; 102:459-461.

46. Kotas RV, Avery ME: Accelerated appearance of pulmonary surfactant in the fetal rabbit. **J Appl Physiol** 1971; 30:358-361.

47. Kotas RV, Fletcher BD, Torday J, Avery ME: Evidence for independent regulators of organ maturation in fetalrabbits. **Pediatrics** 1971;47:57-64.

48. Wang NS, Kotas RV, Avery ME, Thurlbeck WM: Accelerated appearance of osmiophilic bodies in fetal lungs following steroid injection. **J Appl Physiol** 1971; 30:362-365.

49. Aranda JV, Saheb N, Stern L, Avery ME: Arterial oxygen tension and retinal vasoconstriction in newborn infants. **Am J Dis Child** 1971; 122:189-194.

50. Taeusch HW Jr, Avery ME, Sugg J: Premature delivery without accelerated lung maturation in fetal lambs treated with long-acting methyl

prednisolone. **Biol Neonat** 1972; 20:85-92.

51. Taeusch HW Jr, Heitner M, Avery ME: Accelerated lung maturation and increased survival in premature rabbits treated with hydrocortisone. **Am Rev Resp Dis** 1972; 105:971-973.

52. Taeusch HW Jr, Wang NS, Avery ME: Studies on organ maturation: "skin age" as an indicator of"lung age" in fetal rabbits.**Pediatrics** 1972;49:400-405.

53. Taeusch HW Jr, Carson SH, Wang NS, Avery ME: Heroin induction of lung maturation and growth retardation in fetal rabbits. **J Pediatr** 1973; 82:869-875.

54. Carson SH, Taeusch HW Jr, Avery ME: Inhibition of lung cell division after hydrocortisone injection into fetal rabbits. **J Appl Physiol** 1973; 34:660-663.

55. Fletcher BD, Avery ME: The effects of airway occlusion after oxygen breathing on the lungs of newborn infants: radiologic demonstration in the experimental animal. **Radiology** 1973; 109:655-657.

56. Wang NS, Taeusch HW Jr, Thurlbeck WM, Avery ME: A combined scanning and transmission electron microscopic study of alveolar epithelial development of the fetal rabbit lung. **Am J Pathol** 1973; 73:365-376.

57. Kyei-Aboagye K, Hazucha M, Wyszogrodski I, Rubinstein D, Avery ME: The effect of ozone exposure in vivo on the appearance of lung tissue lipids in the endobronchial lavage of rabbits. **Biochem Biophys Res Comm** 1973; 54:907-913.

58. Wyszogrodski I, Taeusch HW Jr, Avery ME: Isoxsuprine-induced alterations of pulmonary pressure-volume relationships in premature rabbits. **Am J Obstet Gynecol** 1974; 119:1107-1111.

59. Taeusch HW Jr, Wyszogrodski I, Wang NS, Avery ME: Pulmonary pressure-volume relationships in premature fetal and newborn rabbits. **J Appl Physiol** 1974; 37:809-813.

60. Wyszogrodski I, Taeusch HW Jr, Kyei-Aboagye K, Avery ME: Mechanical regulation of alveolar surfactant in adult cats; the effects of hyperventilationand end-expiratory pressure in vivo.**Chest** 1975;67:15-16.

61. Wyszogrodski I, Kyei-Aboagye K, Taeusch HW Jr, Avery ME: Surfactant inactivation by hyperventilation: conservation by end-expiratory pressure. **J Appl Physiol** 1975; 38:461-466.

62. Frantz ID, Adler SM, Thach BT, Wyszogrodski I, Fletcher BD, Taeusch HW Jr, Avery ME: The effect of amniotic fluid removal on pulmonary maturation in sheep. **Pediatrics** 1975; 56:474-476.

63. Smith BT, Giroud CJP, Robert M, Avery ME: Insulin antagonism of cortisol action on lecithin synthesis by cultured fetal lung cells. **J Pediatr** 1975; 87:953-955.

64. Robert M, Neff RK, Hubbell JP, Taeusch HW Jr, Avery ME: The association between maternal diabetes and the respiratory distress syndrome in the newborn. **N Engl J Med** 1976; 294:357-360.

65. Brown ER, Stark AR, Sosenko I, Lawson EE, Avery ME: Bronchopulmonary

dysplasia: possible relationship to pulmonary edema. **J Pediatr** 1978; 92:982-984.

66. Taeusch HW Jr, Frigoletto F, Kitzmiller J, Avery ME, Hehre A, Fromm B, Lawson EE, Neff RK: Risk of respiratory distress syndrome after prenatal dexamethasone treatment. **Pediatrics** 1979; 63:64-72.

67. Kotas RV, Avery ME: The influence of sex on fetal rabbit lung maturation and on the response to glucocorticoid. **Am Rev Resp Dis** 1980; 121:377-380.

68. Rendas A, Brown ER, Avery ME, Reid LM: Prematurity, hypoplasia of the pulmonary vascular bed, and hypertension: fatal outcome in a ten-month old infant. **Am Rev Resp Dis** 1980; 121:873-880.

69. Coulter DM, Avery ME: Paradoxical reduction in tissue hydration with weight gain in neonatal rabbit pups. **Pediatr Res** 1980; 14:1122-1126.

70. Torday JS, Nielsen HC, Fencl MdeM, Avery ME: Sex differences in fetal lung maturation. **Am Rev Resp Dis** 1981; 123:205-208.

71. Taeusch HW, Keough KMW, Williams M, Slavin R, Steele E, Lee AS, Phelps D, Kariel N, Floros J, Avery ME: Characterization of bovine surfactant for infants with respiratory distress syndrome. **Pediatrics** 1986; 77:572-581.

72. Avery ME, Tooley WH, Keller JB, Hurd SS, Bryan HM, Cotton RB, Epstein MF, Fitzhardinge PM, Hansen CB, Hansen TN, Hodson WA, James LS, Kitterman JA, Nielsen HC, Poirier TA, Truog WE, Wung JT: Is chronic lung disease in low birth weight infants preventable? A survey of eight centers. **Pediatrics** 1987; 79:26-30.

73. Avery ME: The prevention of the respiratory distress syndrome. **Proceedings of the Royal College of Physicians of Edinburgh** 1989;19:23-28.

74. Kharasch VS, Sweeney TD, Fredberg J, Lehr J, Damokosh AI, Avery ME, Brain J: Pulmonary surfactant as a vehicle for intratracheal delivery of technetium sulfur colloid and pentamidine in hamster lungs. **Am Rev Resp Dis** 144:909-913, 1991.

75. Berger TM, Rifai N, Avery, ME, Frei B: Vitamin C in premature and full-term human neonates. **Redox Report** 2(4)257-262, 1996.

76. Clements JA, Avery ME: Lung Surfactant and Neonatal Respiratory Distress Syndrome. **Respiratory and Critical Care Med:** 157:S59-S66, 1998.

77. Berger TM, Frei B, Rifai N, Avery ME, et al: Early high dose antixoidant vitamins do not prevent bronchopulmonary dysplasia in premature baboons exposed to prolonged hyperoxia: A pilot study. **Pediatr Res** 43:719-726, 1998.

Review Articles, Editorials, Commentaries, etc.

1. Avery ME: Cardiopulmonary changes in respiratory distress. Clinical observation and physiological exploration. (Commentary), **Pediatrics** 1962; 30:859-861.

2. Avery ME, Clements J: Pulmonary surfactant and atelectasis. **Physiology for Physicians** 1963; 1:No. 3 (March).

3. Avery ME: Adaptations at birth: some analogies to space travel. **J Am Women's Assoc** 1964; 64:330-340.

4. Avery ME: Methoden zur Behandlung der Asphyxie des Neugeborenen. **Zentral f Gynak** 1964; 86:772-775.

5. Avery ME, Said S: Surface phenomena in lungs in health and disease. **Medicine** 1965; 44:503-526.

6. Avery ME, Normand ICS: Respiratory physiology in the newborn infant. **Anesthesiology** 1965; 26:510-526.

7. Avery ME, Hodson WA: The first drink reconsidered. **J Pediatr** 1966; 68:1008-1010.

8. Avery ME: Problems in sizing. (Commentary). **Pediatrics** 1967; 39:648.

9. Avery ME: Pulmonary function, deduced from urinary nitrogen tensions. (Commentary). **Pediatrics** 1967; 40:937-938.

10. Avery ME, Wolfsdorf J: Diagnosis and treatment: approaches to newborn infants of tuberculous mothers. **Pediatrics** 1968; 42:519-522.

11. Avery ME: Fate of survivors of hyaline membrane disease. (Editorial). **Pediatrics** 1969; 42:638.

12. Knelson JH, Avery ME: Capillary CO 2 in neonates. (Letter to the Editor). **Pediatrics** 1969; 42:638.

13. Knelson JH, de Lemos RZ, Avery ME: Unusual pulmonary diseases. **Disease-a-Month**, Yearbook Med Publ. Chicago, March 1969.

14. Wolfsdorf J, Avery ME: Tuberculosis in children. Clinical Notes on Respiratory Diseases, 1969; 7:3-10. Published by the American Thoracic Society, New York.

15. Avery ME: In pursuit of understanding the first breath. (The J. Burns Amberson Lecture). **Am Rev Resp Dis** 1969; 100:295-304.

16. Avery ME: Bronchography-an outmoded procedure? (Current Topics). **Pediatrics** 1970; 46:333-334.

17. Avery ME: What is bronchopulmonary dysplasia? (Current Topics). **Human Pathology** 1970; 1:321-322.

18. Avery ME: Prenatal prediction of respiratory distress (Editorial). **Hospital Practic**e, November 1971.

19. Avery ME: Does delivery by section matter to the infant? (Editorial). **N Engl J Med** 1971; 285:917.

20. Avery ME: Prevention of hyaline membrane disease. (Commentary). **Pediatrics** 1972; 50:514-515.

21. Avery ME, Taeusch HW Jr, Wang NS: The lung of the newborn infant. **Scientific American** 1973; 228:74-85.

22. Avery ME: What is new in our understanding of perinatal pulmonary problems? **Pediatr Res** 1973; 7:842-845.

23. Manning P, Avery ME, Ross A: Purulent otitis media: difference between populations in different environments. (Commentary). **Pediatrics** 1974; 53:135-136.

24. Avery ME: Pharmacologic approaches to the acceleration of fetal lung maturation. **Brit Med Bull** 1975; 31:13-17.

25. Avery ME: Prenatal diagnosis and prevention of hyaline membrane disease. (Editorial). **N Engl J Med** 1975; 292:157-158.

26. Avery ME: Considerations on the definition of viability. (Editorial). **N Engl J Med** 1975; 292:206-207.

27. Farrell PM, Avery ME: Hyaline membrane disease. (State of the Art). **Am Rev Resp Dis** 1975; 111:657-658.

28. Avery ME: A pediatrician's perspective. (Editorial). **Anesthesiology** 1975; 43:142-143.

29. Avery ME, Frantz ID III: Intrauterine developmental retardation. (Commentary). **J Pediatr** 1975; 87:956-957.

30. Avery ME, Chernick V: On decision-making surrounding drug therapy: a continuing dilemma. (Editorial). **N Engl J Med** 1977; 296:102-103.

31. Chernick V, Avery ME, Streider DJ: Why intermittent positive pressure when normal inhalations will do? (Editorial).**J Pediatr** 1977; 91:361-362.

32. Avery ME, Frantz ID: To breathe or not to breathe. (Editorial). **N Engl J Med** 1977; 297:781-782.

33. Avery ME: In quest of the prevention of hyaline membrane disease (Chevalier Jackson Lecture). **Ann Otol Rhinol Laryngol** 1977; 86:573.

34. Taeusch HW Jr, Avery ME: Neonatal intensive care: "incomplete solutions." **Harvard Med Alumni Bull** 1978 (September-October).

35. Avery ME: New approaches to old problems in low birth weight infants. United Cerebral Palsy Annual Conference, Boston, April 1978. **Research Report** 3:35-31.

36. Avery ME: Forces of change: which to promote, endure or resist. **Pharos** 1979; 42:2.

37. Avery ME: On replacing the surfactant. (Commentary). **Pediatrics** 1980; 65:1176-1177.

38. Avery ME: Women in medicine, 1979. What are the issues? **J Am Med Women's Assoc** 1981; 36:79-81.

39. Avery ME, Wise P: Continuing challenges in reduction of neonatal mortality. **Am J Dis Child** 1983; 309:107-108.

40. Avery ME, Frantz ID III: To breathe or not to breathe. What have we learned about apneic spells and sudden infant death? **N Engl J Med** 1983; 309:107-108.

41. Avery ME: Introduction, Workshop on Fetal Lung Development. **Pediatr Pulmonol 1** (suppl.) 1985; S2-5.

42. Avery ME: Gender and hormonal regulation surfactant synthesis. **J Jpn Med Soc Biol Interface** 1985; 16:2-4.

43. Avery ME, Aylward G, Creasy R, Little AB, Stripp B: Update on prenatal steroid for prevention of respiratory distress. Report of a conference September 26-28, 1985. **Am J Obstet Gynecol** 1986; 155:2-5.

44. Avery ME, Taeusch HW, Floros J: Surfactant Replacement (Editorial). **N Engl J Med** 1986; 315:825-826.

45. Avery ME, Richardson D: The National Score Card: Deaths from RDS/HMD. **Am J Public Health** 1987; 77:1501.

46. Avery, ME: Oral Rehydration Therapy. **Turkish J Peds** 28:137-40, 1986.

47. Avery ME:Introduction to the Newborn Symposium.**Ped Res** 1990; 27(S):S20.

48. Avery ME, Snyder JD: Oral therapy for acute diarrhea: the underused simple solution. **N Engl J Med** 1990; 323:891-894.

49. McCormick MC, Avery ME: Early arrivals: prospects for premature babies. **Harvard Medical Alumni Bulletin** 1991; 64:10-13.

50. Avery ME: Twenty-five years of progress in hyaline membrane disease. **Critical Care Medicine** 1991; 36:283-287.

51. Avery ME, Merritt TA: Surfactant Replacement Therapy. **N Eng J Med** 1991; 324:910.

52. Avery ME: The care of infants and children. **Acta Paediatrica Hungarica** 1991; 31(2):149-158.

53. Avery ME: American Pediatric Society Presidential Address 1991: How Many? How Small? **Pediatric Research** 1991; 30:299-300.

54. Avery ME: A 50-year overview of perinatal medicine. **Early Human Development** 1992; 29:43-50.

55. Avery ME: Profiles in Pediatrics II: Clement Andrew Smith. **J Pediatr** 1993; 123:486-487.

56. Avery ME: The Impact of Medical Progress on Child Health. **Health Matrix: Journal of Law-Medicine** 1994; 4:65.

57. Avery ME: Historical Overview of Antenatal Steroid Use. **Pediatrics** 1995; 85:133-135.

58. Avery ME, Williams MC: Hats Off to the Francis Family. Editorial. **Am J Respir Crit Care Med** 1995; 151:593-594.

59. Avery ME: Surfactant deficiency in hyaline membrane disease: the story of discovery. **Applied Cardiopulmonary Pathophysiology** 1995;5(S)1:19-22.

60. Avery ME: Are we paying enough attention to mothers' health? "**Global Child Health News and Review**". 1995;1:28.

61. Avery ME: Unnecessary invasion of fetal privacy. Editorial. **Applied Cardiopulmonary Pathophysiology** 1996; 6:1.

62. Avery ME: (Commentary) A controlled trial of antepartum glucocorticoid

treatment for prevention of the respiratory distress syndrome in premature Infants. (by GC Liggins and RN Howie, **Pediatrics** 1972, 50:515-525.) **Pediatrics** 1998; 02:1.

63. Avery ME: Neonatology. **Pediatrics** 1998; 102:270-271.

64. Avery:ME: (Editorial) Care of Mothers and Infants. **Indian J Pediatr** 1998:65, 47-53.

66. Avery ME: We Repeat, 30 Years Later: ORT for Acute Diarrheal Disease is Editorial. **Am Family Physician** 1999; 60:2501-02.

67. Avery ME: Milestones in Pediatric Research. **Biology of the Neonate** 2001;80(suppl 1)3-6.

68. Avery ME: The Story of Neonatology: Personal Perspectives. **Journal of the Japan Society for Premature and Newborn Medicine** 2001; 14:13-16.

Books

1. Avery ME, Fletcher BD: **The Lung and Its Disorders in the Newborn Infant**. WB Saunders, Philadelphia, 1964; 2nd ed. 1968, 3rd ed. 1974, 4th ed. 1981.

2. Schaffer AJ, Avery ME, eds.: **Diseases of the Newborn**. WB Saunders, Philadelphia, 4th ed. 1977.

3. Avery ME, Taeusch HW Jr, eds.: **Schaffer's Diseases of the Newborn.** WB Saunders, Philadelphia, 5th ed. 1984.

4. Taeusch HW Jr, Ballard RA, Avery ME, eds: **Schaffer and Avery's Diseases of the Newborn**. WB Saunders, Philadelphia, 6th ed. 1991; 7th ed., 1998.

5. Avery ME, Litwack G: **Born Early: The story of a premature baby**. Little, Brown and Company, Boston, 1983.

6. Avery ME, First LR, eds: **Pediatric Medicine**. Williams & Wilkins, Baltimore MD, 1989, 2nd ed. 1994.

7. Taeusch HW, Jr, Avery, ME, eds: Pocket edition. **Diseases of the Newborn**. WB Saunders, Philadelphia, 1st ed., 1999.

Chapters in Books

1. Cook CD, Avery ME, Barrie H: Respiratory problems in newborn infants. In: **Advances in Pediatrics** volume XI, pp 11-80. Yearbook Publishers, Chicago, 1960.

2. Avery ME, Buckingham S: Lipoidoses. In: Tice-Harvey **Practice of Medicine**, volume IX, pp 51-55, 1962.

3. Avery ME: Lung mechanics. In: **Yearbook of Science Technology**, pp 310-312. McGraw-Hill, 1963.

4. Avery ME: Respiratory problems of the newborn. In: **The Lung**. International Academy of Pathology Monograph No. 8, pp 54-61. Williams & Wilkins, Baltimore, 1967.

5. Chernick V, Avery ME: The functional basis of respiratory pathology. In: Kendig EL, ed. **Diseases of the Respiratory Tract in Children**, pp 3-53. WB Saunders, Philadelphia, 1967, 2nd ed. 1972.

6. Avery ME: Disorders of the lungs. In: Cooke RE ed.**Biological Bases of Pediatric Practice**. McGraw-Hill, 1968.

7. Avery ME: Pulmonary adaptations at birth. In: **Cardiopulmonary Problems in Childhood**, pp 246-253, 1968.

8. Avery ME: Resuscitation of the newborn infant. In: Gellis S, Kagan B, eds. WB Saunders, Philadelphia, 1969; 2nd ed. 1971.

9. Avery ME, Stern L: Oxygen therapy. In: Shirkey H ed. **Pediatric Therapy** pp 274-278. CV Mosby and Co., St. Louis, 4th ed. 1972.

10. Avery ME: Disorders of respiration. In: Assali N. ed. **Pathophysiology of Gestation**, Vol 3,pp 73-104.Academic Press, New York and London, 1972.

11. Avery ME: The pulmonary surfactant in foetal and neonatal lungs, pp 623-637. Barcroft Symposium, Cambridge University Press, 1973.

12. Avery ME: Mist therapy 1973. In: **Fundamental Problems of Cystic Fibrosis and Related Diseases,** pp 291-302. Symposia Specialists, Miami, 1973.

13. Avery ME: Respiratory distress syndrome: state of the art. In: Villee C ed. **Respiratory Distress Syndrome** pp 1-6. Academic Press New York, 1973.

14. Avery ME: Respiratory distress syndrome. In: Ryan SJ Jr, Smith RE eds. **The Eye in Systemic Disease**, pp 7-13. Grune and Stratton, New York and London, 1974.

15. Avery ME: Differential organ growth in littermate rabbits. In: **Size at Birth.** Ciba Foundation Symposium 27 (New Series), pp 83-97. Association of Scientific Publishers, Amsterdam, 1974.

16. Avery ME: The breath of life. In: **Science Year 1976**, pp 42-53. Field Enterprises Educational Corporation, Chicago, 1975.

17. Avery ME: Problems and progress in perinatology. In Meade GM ed. **Frontiers of Medicine**, pp 21-32. Plenum Press, New York, 1977.

18. Taeusch HW Jr, Avery ME: Regulation of pulmonary alveolar development in late gestation and the perinatal period. In: Hodson A ed. **Development of the Lung** (volume 5). Marcel Dekker, New York, 1977.

19. Avery ME: Mechanisms and drugs accelerating fetal pulmonary maturation. In: **Pre-term Labour**, pp 273-308. Proc. 5th Study Group Royal College Obst & Gyn, London, 1977.

20. Avery ME: Drug effects on lung maturation and function. In: Mirkin BL ed. **Clinical Pharmacology and Therapeutics, A Pediatric Perspective**, pp 185-195. Yearbook Medical Publishers, Chicago, 1978.

21. Avery ME: Models of academic pediatrics: the role of Children's Hospitals. In: Purcell EF ed. **The Current Status and Future of Academic Pediatrics**. Josiah Macy Jr. Foundation, 1981.

22. Avery ME: Pediatrics: The practice of preventive medicine. In: Bowers JZ, King EE eds. **Academic Medicine: Present and Future**. Rockefeller Archive Center Conference, Pocantico Hills, New York, 1983.

23. Avery ME: Can hyaline membrane disease be eradicated? In: Raivio KO

ed. **Respiratory Distress Syndrome.** Sigrid Juselius Symposium, Helsinki, August 9-13, 1982. Academic Press, Inc., London, 1984.

24. Avery ME: Prevention of neonatal RDS by pharmacological methods. In: Robertson B, VanGolde LMG, Batenburg JJ eds. **Pulmonary Surfactant**. Elsevier, New York, 1984.

25. Avery ME; Surfactant Deficiency in Hyaline Membrane Disease: the Story of Discovery. In: Rooth G and Saugstad OD, eds. **The Roots of Perinatal Medicine**. Georg Thieme Verlag Stuttgart, New York, 1985.

26. Avery ME: Pediatrics. In: Dulbecco, R. ed. **Encyclopedia of Human Biology**. Academic Press, California, 1991, second edition, 1997.

27. Avery ME: Historical Perspective: (Pulmonary Surfactants). In: Polin RA, Fox WW eds. **Fetal and Neonatal Physiology, Vol II**. WB Saunders Co., Philadelphia, 1991.

28. Avery ME: A 50-Year Overview of Perinatal Medicine. In: Sakamoto S, Takeda Y eds. **Advances in Perinatal Medicine**. Excerpta Medica, Elsevier Sciences Publishers B.V., Amsterdam, 1992.

29. Avery ME: Consultant. Boynton BR, Carlo WA, Jobe AH eds. **New Therapies for Respiratory Failure**. Cambridge University Press, 1994.

30. Avery ME: Lung Stability and Surface Active Agents. In: Proctor D and Chinard FP eds. **A History of the Physiology of Breathing.** Marcel Dekker, Inc., New York, 1995.

31. Avery ME, Clements JA: Foreword. In: Robertson B and Taeusch HW eds. **Surfactant Therapy for Lung Disease**. Marcel Dekker, Inc., Basel, 1995.

32. Avery ME: Evolving role of women and children in our society. In: Sachs BP, Beard R, Papiernik E, Russell C eds. **Reproductive Health Care for Women and Babies Policy and Ethics**. Oxford University Press, New York, 1995.

33. Avery ME: Foreword. In: Taussig LM, Landau LT, eds. **Pediatric Respiratory Medicine**. Mosby, 1998.

34. Avery ME: Foreword. In: Eichenfield, Frieden IJ, Esterly NB, eds. **Textbook of Neonatal Dermatology.** W B Saunders, 2001.

35. Avery ME: Opening Lecture. What is in the best interest of the child? Second International Multidisciplinary Delphi Conference, Delphi, Greece, 2002.

OTHER:

1. Avery ME: Gertrude B. Elion 1918-1999: A Biographical Memoir. The National Academy Press, Washington, DC, 2000.