ORAL HISTORY PROJECT

Marshall Klaus, MD

Interviewed by Lawrence M. Gartner, MD

January 7, 2000
Berkeley, California

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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 Marshall H. Klaus, MD

DR. GARTNER: This is Dr. Lawrence Gartner interviewing Dr. Marshall Klaus for the American Academy of Pediatrics Origins of Neonatology Project on January 7, in the year 2000, in the home of Dr. Klaus in Berkeley, California.

Marshall this is a 2-part interview but the parts are likely to overlap a good deal. One part will concern you and your personal and professional history and the other part is designed to gain an understanding of how neonatology as a medical discipline originated, developed, and evolved. Your own contribution to that evolution is very important and will be central to this interview. We are also interested in others who contributed to the process and your views of their contributions as well as the nature and importance of those contributions.

Please feel free to expand in any way you want beyond the questions that I ask. I don't want this to be restricted in any way. Follow any track that you think is important or useful in obtaining information about these areas. We will stop for a break periodically and whenever you want to stop just let me know. Let's start with your early personal history. Tell me about your parents, where you were born, siblings, your early life.

DR. KLAUS: Well actually my early life is important to what I became quite interested in. My father [Max Henry Klaus] and mother [Caroline Epstein Klaus] married in, I believe, 1924. My father was older. He was 45 and a physician. My mother was a schoolteacher and 22, so there was quite an age difference. He actually had tried to court 2 other women but my grandmother was a very strong lady and they were rejected. One because the family was a gambling family. Not because of anything wrong with the woman. So this strong mother figure, who was my father's mother, had a lot to do with his ventures in life.

He was a very gregarious physician and unfortunately died when I was 6. He had a kidney stone and several times he asked me to take my shoes off and walk on his back. This was very upsetting to me because I didn't want to hurt him. I said, "You know I am heavy. I'll hurt you." And then after one of these episodes where I walked on his back he went in, had the kidney stone removed, and then developed what I understand to be a septicemia, came home, and died. I never went to the funeral. I do remember that it was a sunny day when he was buried. I have a picture of people coming back from the funeral and touching me on the head. I didn't realized what death was but that episode along with something else that then happened about 6 years later had a lot to do with some of the investigations we did with mother-infant bonding.

Up to 4 or 5 years of age life was good. His death occurred shortly after the beginning of the [Great] Depression. He lost a little apartment that the

family owned. We had to give up our house because he lost that as well. I guess he bought stocks on margin. My mother was left in a very precarious situation. Where there had been all sorts of people always in her house with parties; my father would have poker games down in the basement because they were smoking; it became a very quiet house and very few people visited us except relatives. My mother started teaching school. It was really a great day when there was a substitute position. We had put a sign up, "Rooms for Rent," so people needing rooms would come.

The third difference due to the Depression was that frequently people would come to the door and they asked for food. My mother would have the people come in the back way and we would all eat together in the kitchen. I saw my mother being a very caring person to people in trouble. I notice when I write out checks, I am always giving to these food places like the Berkeley Food and Housing Project. I think I do it because of watching my mother invite these people in. But a couple of times we would see them in the dining room and I would become scared. You know, they were really just walking to the back of the house. I think she had talked to them when they were at the front door. I wasn't watching what was going on.

She developed cancer about a year or 2 later, breast cancer. She was taken care of at the Cleveland Clinic. She had a mastectomy on both sides. She was then given radiation treatment but she was burnt. One day by accident I walked in her room and her whole chest was like raw meat. When I became a physician it was very hard for me to take care of burns. I would have to grit my teeth, you know, as a resident or intern and just do it. The burns were the one thing I had trouble with. I thought that was a burn. I was angry at the Cleveland Clinic. I sort of kept the Cleveland Clinic at a distance, medically. So my early rearing had a lot to do [with my career].

The other point that I finally figured out was that she went blind from a metastases about 6 or 8 months before she died. I have difficulty knowing how long to look at faces; your face for example. I became very interested in the infant observing the mother and the mother observing the infant. It's a piece of work that John [John H. Kennell] and I worked on. But I think it's got a lot to do with my mother's blindness and my uncle and aunt explained that to me.

Things got very out of control. I knew we had to move out of our house. There was an arrangement made with the bank that we wouldn't fight the take over of the house mortgage if he just gave us another 6 to 8 months in the house. The living was difficult having a younger brother [Carl H. Klaus] who was only 2 at the time my father died and only 6 at the time my mother died. He has an absolutely different view of every situation because he didn't appreciate and cannot remember our father except from pictures. Both of us were very clear my mother was wonderful. She never spanked us. She never

got angry. She was the loveliest woman. The reason that we were able to get through all this was that our mother felt that we were absolutely loveable. But he got very upset when my mother got very sick. He set a fire in the kitchen, not to destroy the house, but he was just so, so upset. She was a lovely woman. One of my uncles, my mother's brother, would come every night to cook a special meal for my mother in the last 2 years. So it was not a jolly household.

I really mistook the actions of my uncle on my father's side. My father's brother was a physician. He would come and give my mother a shot. I thought that was just great. I thought that was a shot that would get her all better and it was morphine. He came out every day and gave her some morphine. You can imagine how mixed up I was. I knew the people didn't come and I did not fully understand why people didn't come. So it was a difficult time.

DR. GARTNER: It sounds that way.

DR. KLAUS: **But it had a lot to do with bonding because of 2 things that happened. I got confused because if my mother loved us so much why did she leave us? Why didn't she take better care of herself? A child makes this error. The second was that after my father died, when I was downtown, I used to suddenly see my father on the street ahead of us. I would run and he wasn't there. You know I would imagine him on the sidewalk and would run up there. Yesterday I was listening to something on television about a woman that lost her husband in the Vietnam War. She was describing that when she was downtown she would run up and think she saw her husband, like I did. So I had a number of things that happened with young children.**

Later in my life when John and I began to consult we began a whole study of how mothers manage the loss of a baby. We consulted with a very famous analyst in Cleveland [Erna Furman] who studied the death of infants. And I realized the reason I took a 6-month period on this child development unit was to have experience with her. She was the person in Cleveland who took young children after the death of their parent or parents. [She] would work with them and show the surviving grandparent how to help them. So I sort of used this as a learning experience and a working through period.

DR. GARTNER: Did you talk with this analyst about your own background?

DR. KLAUS: No. I took that child development fellowship, it wasn't a fellowship it was like part of a residency, in Cleveland in the third year. This was a therapeutic nursery school modeled after Anna Freud. Anna Freud would come every other year and spend several months. Later I am going to tell you about 2 episodes that were very memorable and changed what John and I did.

DR. GARTNER: John being John Kennell?

DR. KLAUS: Kennell, yes. When I went to the nursery school these were children with all kinds of problems. There were eating problems and a lot of bigger problems, but no psychotic children. The most disturbed child was a child with cerebral palsy, the daughter of an analyst. She had sleep problems or something like that. Each child was seen by an analyst once, twice, or 3 times a week, and the mother was also seen. We had all our interns go there for a month. I was there for 6 months. You would spend an hour during each week with an analyst asking you, "What did this mean when you did this with this child?" So this was an experience I had.

DR. GARTNER: You had the training in that?

DR. KLAUS: Yes, so I questioned whether I wanted to become a child psychiatrist. I applied to Menninger [The Menninger Clinic] and got in but I didn't take it.

DR. GARTNER: Let's go back a little bit to your earlier childhood. When were you born?

DR. KLAUS: 1927. June 6, 1927.

DR. GARTNER: And what hospital or at home?

DR. KLAUS: Lutheran Hospital.

DR. GARTNER: In Cleveland?

DR. KLAUS: In the hospital where my father and uncle practiced. I was a very special baby of this 45 year old. I was dressed like my father often. It's interesting though, I felt that I didn't add and subtract quickly enough for him. I didn't think I was too smart. He would ask me questions, "Marshall--

DR. GARTNER: Testing you?

DR. KLAUS: Yes. But for both parents my brother [Carl] and I knew that we were absolutely loved. When he was born he had some sort of rash. I said, "I thought you could pick out a better baby." My father used to put him in permanganate. It would make him turn purple. He had to have a permanganate bath. He must have had some allergy on his legs. I said, "Maybe you could take him back?" So we had sibling rivalry.

DR. GARTNER: And he was born 5 years after you?

DR. KLAUS: Yes. He is a writer. He is an absolutely elegant writer and was a professor for 40 years at The University of Iowa Writers' Workshop. I am really quite proud to see the beautiful things he writes. I wish I could write that well.

DR. GARTNER: Are you still close with him?

DR. KLAUS: Yes. We still get into tussles but in general we are close.

DR. GARTNER: Tell me about your education. Now after your parents both died, whom did you go to live with?

DR. KLAUS: I went to live with very somber, serious relatives on the Klaus side. There was a big difference. On the Klaus side all the relatives are 25, 30 years older than the Epsteins, my mother's family. The Epsteins are fun. They taught me how to play baseball. But the Klauses are serious. The Epstein grandfather came from Russia and the Klaus grandfather came from Austria-Hungry. The foods were very different. While the Klauses ate the kind of food you eat in very fine restaurants in Germany, the other food was eclectic and would be called Jewish food--foods from Russia like borscht. So there are 2 different kinds of food. They had different belief systems.

Each side thought that they would do the right thing. There was a first cousin who was going to adopt us. She becomes very important in the story of our lives. When my mother was dying, she would take us on weekends. She didn't have any children. She is Aunt Ada Polster. She lived until just recently. She would bring us to her apartment and give us everything that we wanted. She put us in the living room in a bed that came out of a wall. Everything was devoted to us on those weekends. She and her husband, Bernie Polster, were very special people. They were like an island of sanity and an island of normality. We were brought there about every 3 weeks for the next 10 or 15 years. When I was in medical school I got polio. The family we were living with didn't want me to come back. It was a Klaus. They got frightened because they had grandchildren. So she took me back into her living room for 3 months when I was recuperating and going to medical school. I had this arm in a brace and all sorts of apparatus. She took care of me. So she is always in the background. Then I took care of her in the last 5, 6 years of her life. Unfortunately I wasn't in Cleveland. But we all arranged to take care of her. She was on my mother's side.

DR. GARTNER: She was interested in adopting you but didn't?

DR. KLAUS: She didn't.

DR. GARTNER: What happened then?

DR. KLAUS: I never got the history of this. There were some strange things that came up. I'll just give you that part of it. We could move into a house with my father's brother Dr. Manny Klaus. Very serious fellow but absolutely devoted to my brother and me. He never had any children. My grandma vetoed several of the women he was going to marry, like she vetoed my father. So he never married. But he still had a number of women friends. He also had heart trouble. When I was older I would drive him and I met several of his women friends. They were very nice women.

In order to adopt us he had to have a woman in the household. His sister came. There were 4 brothers and then 1 sister, Celia Dreschler. And Celia was a tough lady compared to my mother. I had this clear picture of my mother. This woman who never got mad at us. Celia got mad at us. She would wake me up with a cold washrag. She lived mainly in the poorest part of the west side of Cleveland. There were 7 beer parlors within sight. We lived in a building that my uncle owned with offices on the other side of the apartment. We played with the checkerboards in the floor of the hallway when the building was locked. We lived in this very old area and could see strange things going on. As I looked out the window there were always women coming into one of the apartment buildings down below. That must have been a whorehouse. I became not afraid of drunk people because my job was to go down all the stairs in the office building at night and help the men out who would come in during the winter to get out of the cold. This was when I was 12. Sometimes when the conveyor that moved the coal from the bin to the furnace didn't work I would go down, open the furnace door for the building, and shovel the coal. So it was a very different life.

But my uncle, the physician, solely devoted his life to our rearing. He had heart trouble and he was 65. He yelled at me only once when I was slugging my brother. He said, "Marshall, don't hurt your brother. Stop it." He gave us everything. He gave us music lessons with the harshest teacher. As soon as summer would come we would go to camp. He must have paid for a van to come down into the inner city and pick us up and take us out in the country. The first camp was just the things we wanted to do. We liked to play baseball and ride horses so that's all we'd do all day. This camp had horses and baseball and a little swimming. Then he got more sophisticated with the camp so we went way on the east side and a station wagon would come and pick up just my brother and I and drive us for miles and miles. My brother loved him like a father.

He died when I was 18 and my brother was 13. He left a complicated will which said that the estate was devoted to our rearing until we finished school, college or university, whatever we went to. The other monies were left to his brothers and his sister. They were a little hurt because the money was left in fifths. We got two fifths, my brother got a fifth and I got a fifth at the end of

the whole business. When we finished school they were very old and in general their children got the funds.

As part of the will we had to live with a Klaus because of a misconception of my uncle that somebody on the other side of the family was not being fair to us. So a brother who was not too interested in us took over. We had to move quite a distance. We lived in the attic and the john was in the basement. We never ate with the family; we ate ahead of the family. The uncle got in quite a tussle with my brother. He said, "What do you think this place is, a summer resort?" when he saw my brother going around in his shorts. He had a daughter. He was worried that we would contaminate his daughter, our first cousin. We actually became very close friends over the years with his daughter, with his two daughters. I used to babysit for his oldest daughter.

DR. GARTNER: That was on the better side of Cleveland?

DR. KLAUS: It was supposedly the better side. It was not easy. It was much harder for my brother. He was only 13 and he had to tolerate a very strange kind of living where we were a part of the family.

[With Manny and Celia] lunch was the main meal. We would come home from the school and my uncle would have some of his patients eat with us. It was very interesting around a big round table. My aunt Celia who was about 65 would get up at 6 in the morning and cook 2 pies for us. Everyday had a specialty. If it was Thursday, it would be spaghetti. If it's Friday, we were served salmon casserole with peas. Tuesday it was something else. It rotated every 7 days. And there was a maid, Ann Pluhar. So we have all sorts of interesting things. Ada and her Bernie would always take us every 3 weeks for a weekend, for a special weekend. She was my mother's first cousin. So life was not bad up until 18. Then I was in college so it was different.

DR. GARTNER: Tell me about your education. You went to the public schools?

DR. KLAUS: Went to a public school but I can tell you that in our public school the most common place to go was to jail. It was an inner city school. I wanted to feel like I was part of the group so I got into boxing. Unfortunately, I kept moving and I won the match. That was a tough thing to happen because I really got punched in the second match. Then I got into wrestling and I made the same mistake. I won the first match then I really got floored the second time. There were some excellent teachers but as I went through I wasn't too interested. I don't think I had a lot of friends like you would have had in your schools.

DR. GARTNER: And you went through high school?

DR. KLAUS: Yes. Then I went to Case Western Reserve University. I went in the summers to get through quickly because I wanted to see if I could get into medical school. I applied at the end of [the] third year and didn't get in the first time I applied. But I did get in the next year. Sadly, my uncle had died. I knew he would have loved to know that I got into medical school.

DR. GARTNER: You went to Case for medical school?

DR. KLAUS: Case Western Reserve.

DR. GARTNER: What's your earliest recollection of when you became interested in becoming a physician?

DR. KLAUS: Oh, from my early life. I mean I saw my uncle and my father. That's what I wanted to do. Period. I didn't have any alternatives. I wasn't good with my hands and I knew [I] was not going down that street.

DR. GARTNER: Okay. How about pediatrics? How did that come into your life?

DR. KLAUS: Sam [Samuel] Spector and Charlie McKann would have rounds starting at 9 o'clock. Starting in the second year I realized that I could go to that conference. That was a very, very appealing conference. Sam Spector would check early in the morning who was admitted, what was the problem, and he had a fantastic clinical conference. Charlie McKann was equally good. The total faculty by the way was 7 full-time people. Walter Heymann was there but at 1 o'clock he would go to his office in the medical building. Many of these people would go to an office and see complicated patients. But at the morning conference Sam and Charlie McKann would ask everybody questions in the audience. If you went you might be asked a question.

DR. GARTNER: Even of the medical students?

DR. KLAUS: Oh yes. But the room was filled with people. The cases were very, very interesting. Remember Charlie McKann had given gamma globulin for preventing measles. He was one of the shining lights. I then took a residency there, an internship. He got into big trouble. He had a neurologist working for him who was shunting damaged CNS [Central Nervous System] babies. Shunting the arterial blood into the venous circulation to improve the quality of the infant [and] raising the IQ [Intelligence Quotient] of the child. This was called the Shunt operation.

DR. GARTNER: I never heard of this.

DR. KLAUS: The medical school had just turned over completely. There was a new dean. All the older professors retired. Eleven new chairmen were hired. This was the beginning of a whole new curriculum. This was when I had finished the medical school and I was an intern. Everything changed.

Charlie McKann was one of the new professors but he left for Jefferson [Jefferson Medical College, Thomas Jefferson University]. It was discovered there weren't accurate records on these patients. Their IQ's were not shooting up like some of the early reports had noted. This was before Human Rights/Ethics Committees. It was really interesting to be present within the system to see this happening. And to see all the mistakes that we should not make in the future. It was a good lesson. It was tough because Charlie McKann was a fantastic teacher. He was one of the most vivid teachers. A lot of the techniques that I saw Sam use probably, in part, came from Charlie. Sam had come down from the University of Michigan in Ann Arbor. Everybody took the internship to get those 2 teachers.

DR. GARTNER: Sam was a fantastic teacher. Now after you graduated the medical school you took your internship and residency at Case Western Reserve and - -.

DR. KLAUS: Medical school was a real lesson. There everybody was on a par. I was a little frightened in the first month or 2 whether I could keep up with these people who were really bright. That was not a problem. But I had never tested my metal--my abilities.

DR. GARTNER: But you passed.

DR. KLAUS: I guess you are right. I actually even got AOA [Alpha Omega Alpha] there.

DR. GARTNER: Well that's important. What happened in residency? What were the major influences there? Who was chairman?

DR. KLAUS: Sam became acting chairman.

[tape stopped]

Bill Wallace [William M. Wallace] came to Cleveland at that time, at the end of my internship. He was a fresh light, so different from Charlie McKann. Charlie McKann and Sam were from another era compared to Bill Wallace. Bill Wallace was always interested in trying to understand how a system worked. So I had the great good fortune of having the clinical background with Sam Spector and Charlie McKann but a science background from Bill

Wallace. It was magnificent. He was a really special man. He had gone through the war, a tough part of the war in Europe and Italy. He was sensitive.

He was especially interested in what goes on inside of the cell. The electrolytes inside the cell. I can remember one very special area. We had always given bicarbonate in my internship dependent on the pH of the blood. One day we were making rounds and he said to me, "You know Marshall, I think that these children might do a little better if they got less bicarbonate." He went over the explanation for why. If you slow down the breathing, you are going to really change the milieu inside of the cell by making the CO_2 higher. The inside of the cell is going to become more acid. If you slow this breathing down you may not do the things you really want to do. It was so hard for me because I had this one way of thinking--if you admit these terribly acidonic diarrhea patients and work up the blood pressure and volume and urine output, you give them a poultice of this bicarbonate. Here was another way of thinking. When you are an intern you solidify your ideas too early. It was so hard. I thought he may be a good labman but this is really way off. I went on for several months and then finally tried what he suggested. Bill [William] Weil showed me. He brought Bill Weil and he brought Fred Robbins [Frederick Chapman Robbins] over to County Hospital [Cuyahoga County Hospital]. I realized these people do know something. There were less convulsions after the repair when you use less bicarbonate. It was a real lesson for me.

DR. GARTNER: Was that the beginning of your interest in research or had you been interested in research before that?

DR. KLAUS: I was always interested [in] why things happened. I did no research in high school or college. I became very interested in questions. When I was a chief resident the best part was spending time with Bill Wallace. It was like a mentorship. He would go in his office and be reading *Science* magazine. He would be all curled up in a chair. He would be talking about all sorts of social issues. He was just the man for Reserve at that time. This was when they had committees teaching the organ systems.

DR. GARTNER: All integrated teaching?

DR. KLAUS: Yes. You taught in a committee. You didn't just stand up and give a lecture. The lecture was all planned. Two or 3 people on your committee would sit in on your lecture to see if it fit in. I didn't go to the medical school then. I attended the last year of the old system.

DR. GARTNER: That was the medical school?

DR. KLAUS: That is a good question. I would say that is about the time I became very interested in research. At night I did a project. In the second year I admitted several children with Henoch-Schonlein purpura. They had the red cells and I wondered if that was the etiology of chronic renal disease. I got the names of 30 patients who had Henoch-Schonlein many, many years ago. There was a system where if you sent a letter with a certain kind of stamp the post office would trace these people back through all sorts of addresses. I got 30 or 40 people and we found chronic renal disease in several of these Henoch-Schonlein patients. I submitted it to the SPR [Society for Pediatric Research] and I wasn't accepted. Albert Einstein had a similar paper and they were accepted. We got ours in *Pediatrics*. I worked with Ralph Wedgwood [Ralph J. P. Wedgwood] on the paper. [Wedgwood RJ, Klaus MH. Anaphylactoid purpura (Schonlein-Henoch syndrome); a long-term follow-up study with special reference to renal involvement. *Pediatrics*. 1955;16:196-206.]

DR. GARTNER: So that was your first publication?

DR. KLAUS: My first publication. At that time I wasn't going to stay in academic medicine so I let Ralph be listed as the first person. It wasn't important to me. But it was my idea and I traced them down.

DR. GARTNER: So when did you get interested in academics and pediatric research?

DR. KLAUS: Well I went into the service in 1955.

DR. GARTNER: Immediately after residency?

DR. KLAUS: No, after about 6 to 8 months. I had contracted polio. In the third year [of] medical school, in summer, there was a big polio epidemic, especially in the Amish community. They brought them in buggies from the Amish community. I remember walking around asking "[Can you] raise your arm? Can you swallow? Stand up?" They were nice to me. They kept me at the medical school hospital near the rest of my family. I was going to marry but I got polio and it was delayed. I got married at around Christmas time with the big brace and everything.

DR. GARTNER: And your arms have a residual effect?

DR. KLAUS: Yes, the arms, the back, and the leg. The one leg is thin. It is all on the right side. But I had finished pediatrics and had an extra 3 months. I spent the 3 months in bed. That was a real lesson for me, to spend 3 months in a hospital. It was very interesting. I'm appreciative of people in hospital.

DR. GARTNER: And then after that you went into the military?

DR. KLAUS: There were 2 episodes in the medical residency that were very important to the future. Anna Freud came when I was a first-year resident. Anna Freud came to talk at the Academy of Medicine [Academy of Medicine of Cleveland and Northern Ohio] at lunchtime on a Friday. She talked on children going out of London during World War II and what it meant for a child to leave London during the bombing. She described children who in the summertime wore a muffler and their rubber boots because their mothers [had] said, "When you go outside you have to wear boots, a muffler, and a hat." These children would do this because of the loss of a mother figure in this period. She related this to hospitalization and what hospitalization meant. At that time, this was in 1952, the children's hospital in Cleveland, like all the children's hospitals, had visiting hours once a week for a half an hour on Saturday. She came and spoke on hospitalization and the significance of hospitalization on a Friday. The next Monday Bill Wallace changed the hospital rules and there was visiting every day. Good for him. Can you imagine the change over! She gave a second talk the next Friday. The auditorium must have held 400-500 people. It was filled. They were sitting on the floor. She was then a young woman. Later in my life I visited her at her father's home. She would have sessions with British pediatricians and I got in for a session when I took a sabbatical.

A second thing happened in Cleveland. Bill Wallace said we ought to have one floor open for parents to live in. He gets cots and parents are living in by the end of the second week. I was the senior resident on the third floor where this change occurred. We very quickly noticed that these mothers became exhausted after 3 or 4 days. We had to suggest that they go home for 5 or 6 hours. But apart from that it worked beautifully.

Later the preemie nursery was not correct. Now I'm working on the full term, the perinatal period. We have to change the perinatal period. We're not doing the right thing. The care we're giving does not make sense biologically. To see it so successful, and then 20 years later to go to Germany and see Germany still just visiting once a day for a couple of hours. I realized that we were living in something like a temple. The hospital was like a part of society, but it was like an old church. It had to move with our understanding of biology.

DR. GARTNER: Right.

DR. KLAUS: One Sunday I came to make rounds with Bill Wallace. He was very proud of getting his children with diabetes to start to calculate their insulin, and to give their shot. Anna Freud shows up for Sunday morning rounds at 10 o'clock. There are just the 3 of us on the rounds.

DR. GARTNER: My goodness.

DR. KLAUS: You know she looked like my Aunt Celia. She had a housedress on. It went down almost to her ankles. It was a dress your grandmother wore in the house. That is what she wore into the children's hospital. But if you've been in England, this is sort of the way people acted. It's the way you are at home.

DR. GARTNER: Not formally.

DR. KLAUS: She didn't dress up in any formal way.

DR. GARTNER: Right.

DR. KLAUS: We came to the diabetic children [and] he showed her what he had been doing. I will never forget what she said. She said, "This brings up a very interesting question. When should a child take over his own health, the care of his body? When does he recognize the self?" If you think about self-psychology, here she was relating to him, on a Sunday morning, in a housedress, with a very profound question. Years later when I was a preceptor with Spock [Benjamin Spock] and John Kennell we used to go once a year with first-year medical students to meet 4 diabetic young people who were about 25 years old. They had been diabetic for a period. Another time we had a group for the whole year. There were 8 students, 1 social worker, and myself or John. Spock ran the whole program. These diabetics had started to give insulin early and they were so damn compulsive. I thought back to what Anna Freud said. It was so right. It was too early for these guys. It was very important that they learn, but it was too much in their lives. Even though you don't want the blood sugar to go too high, it was a little too early for them to take over.

DR. GARTNER: To take over that responsibility.

DR. KLAUS: For those 4 men. Every year I would remember that and discuss this with the students. Those were the most important events. I met through Bill Wallace a lot of people that were very meaningful in the internship and residency when he came. People like Fred Robbins, Bob Schwartz [Robert A. Schwartz], Eli Gold, and Ted Mortimer [Edward Mortimer, Jr.]. Fred brought an elegant group, a very tight group. The group with Bill Wallace was looser. Anything could happen. People would yell. Sometimes I thought people were getting out of order, you know what I mean?

DR. GARTNER: Right.

D**R. KLAUS: But he permitted a great deal of latitude. For me he was just the right person at that time.**

DR. GARTNER: When did you begin research, or training in research?

DR. KLAUS: Just incidentally, when I came out of service, it was at Travis Air Force Base. Some of the friends I made there are the friends that are living here in the Bay area. Then I went into practice in Novato. Novato was in Marin County. We had 2 children by then. I married Lois Krieger, a biologist and a chemist, who later became an anthropologist. [She was] a lovely, lovely woman with black hair. She had lost her mother shortly after she was born. It was a really difficult thing because in some ways she thought she killed her mother by being born. Nobody ever explained things to her. Actually, her mother aspirated during her birth. She was intubated. She was given anesthesia. She died 9 months later of some sort of chronic pneumonia. Her father was a great guy but just lost it for a year or 2. He was an electrician and later became a lawyer.

Lois is a fantastic mother. I now see my daughters and son caring for their children the same way, especially my daughter. She even reads the book exactly the way Lois read books to our kids. She acts. She doesn't like to hear him cry. She picks up this little guy, Ben, whenever he cries. That's the way Lois raised our children. So, it's a very close replica, and Laura calls Lois.

So, we came out here to Novato. We bought our first house. We had lived in very cramped quarters. Two bedrooms in the upstairs of a 2-family house. I went into practice there with a wonderful pediatrician named Earl Siegel. I left practice in about 2 years. He left practice several years later and went into public health. He became a very famous professor of maternal and child health in North Carolina. He trained at Berkeley [University of California at Berkeley] and then ran the department in North Carolina at the University of North Carolina at Chapel Hill. He was given the Martha May Eliot Award from the American Public Health Association. He did a lot of work and actually worked on some bonding issues. He was a very, very fine researcher.

DR. GARTNER: When you were in practice with him during that period of time, did you talk about…

DR. KLAUS: We talked about--

DR. GARTNER: …these issues?

DR. KLAUS: We did all sorts of things. I carried around my microscope and did white counts in the hall--all sorts of crazy things. We did

throat cultures. I knew I missed a lot of things. When you have 40, 50 patients you can't really catch everything. So I decided to go into academic medicine. I touched bases with Stanford [University] and, what's her name, Gross? She just left.

DR. GARTNER: Toby Gross?

DR. KLAUS: Toby Gross, within the city. I would visit her and talk with her. I tried to get a position where I would be half time in Terra Linda which is near San Rafael. It never worked out.

Then I made the plunge. I decided why not become a cardiologist, that's pretty quick. It's 3 years. So I went to the CVRI [University of California, San Francisco Cardiovascular Research Institute], where Abe Rudolph [Abraham M. Rudolph] eventually went. I thought, well, I will do it in a short time. Cardiology was terrible. Abe was not there yet. There was an older Englishman. He was absolutely worthless unless you wanted to learn a lot about research. But the research was not quality research.

After a month I changed over to pulmonology. Kenneth Cross was there from England. Bill Tooley [William H. Tooley] had just started. He had left his practice in Berkeley. Kurt Weisser from Switzerland was starting. I was in the first group of fellows of the CVRI. All of these fellows really did something later, mainly in pulmonary medicine. That was the most exciting life, when we lived in Novato. I traveled out every morning. Eventually, we moved to Mill Valley, a little closer to CVRI. I would say it was like 97% research for the next 4 years. When I first came in, I had been busy practicing and I seemed to be capable and able to do it.

Kenneth Cross was exactly the opposite of Bill Wallace. He sort of led the group. He told people what to do. They had been working for about 3 months. They were into fantastically interesting projects. They had a Grass recorder. They were recording all sorts of pressures on an 8 channel Grass recorder. They were applying pressures from a tank, constant pressures. They would take a very young baby and apply a pressure of 2 centimeters or 5 centimeters, a very small pressure. It produced an apnea, a Hering-Breuer reflex. The apneas were terribly long, and the apneas initiated with a gasp. You would apply this very low pressure and there would be a gasp from the baby. There were 2 things that were happening. One, there was a gasp and secondly there is this long pause. It was the most interesting thing because this was reflex respiratory physiology in a newborn infant.

He [Kenneth Cross] had come over from England for 1 year but all sorts of people came for the 3 or 4 years I was there. Geoffrey Dawes [Geoffrey S. Dawes] came very frequently from England. Every prominent physiologist of note came.

We had the whole 13th floor in the CVRI. He and Julius Comroe [Julius H. Comroe] taught our group individually. He would see us twice a week. He had a basic physiology course. Then he would see us on Saturday morning before the special conferences where each faculty member presented. He would stop the faculty member in the middle to show his good teaching. He said, "I don't understand what you said up to now, do you mind repeating this?" This would be one of his full-time faculty. He would ask the most questions. It was fascinating, this process. We would meet him every Saturday morning for an hour and a half, something like that. Then the conference would go on. My style of teaching of my fellows was very close to this style.

My mentor for the first year was Kenneth Cross. He was a bit controlling. The second mentor was the person I spent the longest time with. Bill [Tooley] and I spent the longest time with John Clements [John Allen Clements]. So I spent 3 years in John's lab and office. He had a desk, but the room was not that big. The room was barely three quarters this size. I had a bench over here, he was here. About 9:15 he said, "Let's go down and have coffee Marshall." We'd go down to have coffee and we might come back at 3:30. He'd be calculating all sorts of things. In the beginning I couldn't understand everything he was calculating.

Then I realized that I could learn things by going to the park, to the Golden Gate Park by myself. I just walked down there by myself and I imagined possible next steps. I would suggest to my fellows when I came to Cleveland, "You are in fellowship. What you want to do here is to understand the limits of your field. This is time for you to grow; to figure out what you want to do." Then I realized I had to assign them to a basic scientist, so every one of my fellows I tried to get attached to a basic scientist. I used the same model that I saw Julius Comroe using because every one of the fellows were assigned to an established scientist.

The other thing is all sorts of pediatricians came. A lot of people came during that time from various places for a year or 6 months. There were excellent internists. The young internists were far superior.

This is the time I meet Julien Hoffman and his colleague Abe Guz [Abraham Guz]. They moved in a treadmill for dogs next to our lab. They became very close friends for my wife and I. We started to gain very precious people who we kept in contact with our whole lives. Julie used to visit us frequently in Nuvato and Marin before he married the second time. He has 2 children. You know Julien?

DR. GARTNER: Julien?

DR. KLAUS: **Hoffman.**

DR. GARTNER: Hoffman, yes.

DR. KLAUS: **He is Abe's right hand.**

DR. GARTNER: Yes, I know Julien very well. He taught me statistics..

DR. KLAUS: **That's what he taught us.**

DR. GARTNER: Right, he's a wonderful teacher.

DR. KLAUS: **But that's the quality of the internal medicine people that came to Julius through CVRI. That was where I learned research.**

DR. GARTNER: Good place.

DR. KLAUS: **Oh yes.**

DR. GARTNER: And then what happened? So, when did you finish? What year did you finish?

DR. KLAUS: **I finished in 1961. I went to Cleveland. I went to Mt Sinai Hospital, which was my first mistake. It was a good hospital. Oh, I didn't tell you the most interesting thing. The best thing I did. I had 2 kinds of projects in the lab. After Kenneth Cross left, Bill Tooley and I set up a lab to measure lung compliance, lung volumes. I did a paper on lung volume which was the first on lung volume starting at birth. [Klaus M, Tooley WH, Weaver KH, Clements JA. Lung volume in the newborn infant. *Pediatrics*. 1962;30:111-116.] Changes in lung volume using a technique that had been worked out in adults. I built all this plastic material to go in a plethysmograph. Julius Comroe had a box built for us just like Kenneth's plethysmograph so when he left, we had a plethysmograph. I added to that a device to go down into the plethysmograph just like the adult measurement is made. Right about this time Nick Nelson [Nicholas M. Nelson] is measuring this in Boston. I got interested in lung volume starting at birth. Then we measured compliance. We measured nitrogen washouts. We did all sorts of things. Bill did the nitrogen washouts. We worked as a team because you have to have 2, 3 people. We had 2 or 3 abstracts every SPR [Society for Pediatric Research] meeting. Bill is good to work with in some ways but I wish he had written up all of the work. Because 10 years later these studies will be written up, repeated, and then published in journals. We had it published in symposiums and things like that. We did publish the lung volume work.**

But the main work [while I was] with John Clements was that I got the idea of getting a lung and seeing if we could find the surfactant. There was a wonderful biochemist, a very fine internist, who ran the CVRI later after Julius Comroe left. These long sessions that I had with John Clements in the lunchroom were very, very valuable. I became very interested in surfactant. Bill Tooley and I did 2 things. We were continuing the work with normal, healthy, full term babies, really assessing pulmonary physiology. That is the lung volume work,etc. Weaver [Karl H. Weaver] joined us. He is a pediatrician. He is retired from the University of Maryland at Baltimore medical school [University of Maryland School of Medicine].

I went to the slaughterhouse and got myself a lung and simply washed the airways and the lung. With the help of Dick Havel [Richard J. Havel] I began to learn some biochemistry. I spun the lung material, and did a lipid extract. I continued to follow where the surfactant material was using one of John Clement's small balances. He had taught Mary Ellen Avery how to build one. We had all sorts of balances in the lab. One of the interesting things is I then had to move away. I had a lab and an animal in another area of the medical school where I did this [in] isolation because it got too crowded. I would get 2, 3 lungs a week, washing them and following them.

DR. GARTNER: Animal lungs?

DR. KLAUS: Cow lungs. I would have the lipids move on these glass plates. All of these techniques were new to me. Then I would take each of the lipids off the glass plates and test it. I completely lost the surfactant; one of phospholipids had the surfactant in it. We published this in the *Proceedings of the National Academy*. [Klaus M, Clements J, Havel R. Composition of surface-active material isolated from beef lung. *Proc Natl Acad Sci USA*. 1961;47:1858-1859.] Dick [Richard] Havel had shown me. He's an internist working on lipid metabolism. About 3 months before this, Richard Pattle in England came out with a completely different method of separating out the composition. He had other evidence from infrared spectra that the active ingredient of surfactant was a type of lecithin We got it 3 months later by using a different technique. Then Caroline Piel, you know the nephrologist?

DR. GARTNER: Yes.

DR. KLAUS: She had one of the early electron microscopes. One day, we're down at the lunchroom and I said, "What would the EM of the lung look like?" So I went to the library and I found a big book with EMs of the lung. I brought the book back to the lunchroom. John and I are poring over this. We could see that what looked like mitochondria, [actually] looked like what you could think of as a membrane. So then the question came, "Could we isolate those membranes?" That was more physiology. We isolated those.

I went to Denver to talk to Oscar Reiss [Oscar K. Reiss]. This process involved connecting with all sorts of all people. He was a biochemist. The question was, "How could I get these organelles out of the cell?" So we got them out. Then the question was, "How could we prove that organelle was making the surfactant?" We did a vagotomy in an animal and we have 3 different ways of getting rid of the surfactant and then seeing if the EM changes. The EM changed when the lung appeared to have no surfactant.

DR. GARTNER: Right.

DR. KLAUS: So we have an EM. We have the surfactant for the animal model. We have data suggesting what organelle is making it in 1962.

DR. GARTNER: That's wonderful!

DR. KLAUS: So at that time Bill was slated to stay on in the faculty. They finally recognized that there's another fellow in the lab, and I got to be an associate staff member at the CVRI before I left. I was an associate for about a year.

I went down to La Jolla because when the seal dives, he collapses his lungs. One of the explanations of this relates to the fact we have big alveoli and small alveoli and a variable surface tension between them. One of the big findings of John Clements was that there's a variable surface tension in each unit. He demonstrated that the surface tension of this material is different depending on how it is compressed. So the question is, "How can the seal and a porpoise collapse their lungs?" Our lungs don't collapse easily. You need to use special techniques of breathing only oxygen, getting rid of the nitrogen and then absorbing the oxygen. So I went down to work with Per Scholander [Per Fredrik Scholander] at your place, the Oceanographic Institute [Scripps Institution of Oceanography, University of California, San Diego].

DR. GARTNER: Right.

DR. KLAUS: I spent a summer there with my family. We rented a house on La Jolla Shores Drive. I remember the rent, it was $300 a month.

DR. GARTNER: It's gone up a little since then.

DR. KLAUS: Probably $300 a day.

DR. GARTNER: Could be.

DR. KLAUS: The house had 3 bedrooms. It was a small house. That's where I met Bob Hamburger [Robert N Hamburger] and Sonia.

They were just starting a medical school there. That was a very good experience because I was on my own. The other question I dealt with concerns the gas bladder. The gas bladder of a fish is the analog of the lung. So I had 2 parts to the project. One is to fish off the dock, get myself a fish, then find the gas bladder in the lab. Then measure the surface tension inside the gas bladder. It is the flotation device which makes the fish able to go up and down. We found some surfactant material in the gas bladder. We never published it. We should have published it.

We did one thing that was hard for me. We went on an expedition all night on one of their boats. It is very expensive so what you do is gather up a group of investigators, and for 1 hour you do 1 person's work. For the next 2 hours you do somebody else's work. The whole group of investigators is tuned-in that they were now going to do Per Scholander's work. We're going to get flying fish. And you know, he studied how, when the seal dived, the heart rate of the seal drops from a 180 to 10. This raised the question, "What happens to the flying fish when he comes out of water? Does his heart rate go down?" So, we caught fish using a net. We put a light down by the water. The fish are flying. Then we catch them with the net. Then we bring them on the boat and we put an electrode in their neck. Then we put them back out with the electrode. Well, they wouldn't fly.

DR. GARTNER: Imagine.

DR. KLAUS: Heavy thing for a fish to fly with electrodes. We did this for about 2 hours. At the end of 2 hours Per Scholander changed the process. Scholander is a Swedish or Norwegian investigator [Norwegian]. We took the fish out of the water and removed the electrode. When we put him back in, he flies. We're looking at that, and at the end of the flight we do a lactate, a blood lactate. So while doing this, you know trying to catch the fish, he wanted to get Black Cormorants. What happened to Black Cormorants when they dived in the water? By the way, they all have lactates. That's exactly the reverse. The same thing happens when they dive in the water as the seals. And the fish--when they fly the lactate goes up, and their heart rate drops. That was one set of studies I remember well. In my studies we wanted to get a baby sea lion. A sea lion lung.

DR. GARTNER: A sea lion, not a seal?

DR. KLAUS: Seal, excuse me, seal. That was the death of the seal. That was the part that was hard.

DR. GARTNER: Okay.

DR. KLAUS: That seal lung had the same characteristics as the human lung. We did a pressure volume curve. We did some other things

with the lung. So that was a little bit of sideline. But when you worked with Comroe you were never worried about the money to go down there, or anything like that. If you were a fellow you were in a very special position.

DR. GARTNER: He provided. He had the resources.

DR. KLAUS: He would provide. When Kenneth Cross needed another plethysmograph, he got another plethysmograph. I don't know where the money came from. He had a man who made equipment and he showed us how to make equipment. Then once a week we did an adult patient. I put an adult patient through pulmonary function studies.

DR. GARTNER: I'd like to come back to the seal who was diving. Did you ever find out how the seal collapsed its lung?

DR. KLAUS: Never, never fully explained it. We think it's anatomical. That the tubes are little bigger. The geometry of the lung explained it pretty well. They had the same surfactant that we have.

DR. GARTNER: So, when you finished your fellowship…

DR. KLAUS: I went to Cleveland.

DR. GARTNER: You went to Cleveland.

DR. KLAUS: I got 2 R01s [National Institutes of Health Research Project Grant Program (R01)]. One for pulmonary function studies in the newborn. I did that with Bud Sweet [Avron Y. Sweet]. He was at Metro [Cleveland Metropolitan General Hospital]. He was with Fred Robbins. We worked at Sinai Hospital. The discoverer of the clamp, Goldblatt [Harry Goldblatt] was still there. They had a very fine science lab. It was a medical school hospital so we got students. I began to participate with Ben Spock then and John Kennell. At that time there was nothing about mother-infant attachment or bonding. I was not involved in bonding yet. Everything was surfactant. We made a surfactant with Ricker and Company.

One day Fred Robbins called me up and says, "There's a man here from Singapore. He's got a hospital which delivers 150 babies a day." It was just after I had isolated the surfactant. Ricker made us some dipalmitoyl with lechithin that we could spray. We put it up in a Freon preparation that we could spray in the lungs. Fred introduced me to Wong Hock Boon, who was a professor of pediatrics in Singapore. I invited him over for supper. Lois didn't make a Chinese meal, but the kids were fascinated because we had chicken and a vegetable and potatoes. He took and mixed all of this together like it was Chinese cooking. It was winter time and he came in a coat that went down to his shoes. It wasn't that cold but he was dressed like that. He

explained to us that we could come out and see the place. I called John Clements and I said, "John, we've got a place to test the surfactant." I kept in touch with John because we had worked together. They talked to Comroe who in a short time arranged the whole funding. Within a week we had monies to fly to Singapore. We began a series of many trips to Singapore. They were letting a lot of babies die. There was no intensive care nursery. So, we moved a complete four-bedded intensive care nursery with an 8 channel Grass recorder to Singapore.

DR. GARTNER: My goodness.

DR. KLAUS: We put the protocol through human rights in the United States. I was doing this work with Bud Sweet. So, I had a R01 for the surfactant and I had an R01 for the respiratory function measurements. Bud and I did some nice work measuring the lung compliance along with lung volume. Then you can calculate the elasticity in a proper way because you knew where you were in the pressure volume curve.

DR. GARTNER: Right.

DR. KLAUS: We continued to do those studies. We had several publications. I don't have them here, they were not very earthshaking. I do have this publication. It was the most unusual thing. There were riots once in a while in Singapore at that time. The Chinese rioted in their district. And I got little worried taking my 4 children and Lois. I should have, because they would have learned a lot.

We went there and we rented a pasha's house. There were 12 people. There was Ernie Cotton [Ernest K. Cotton] from Denver. He had been at the CVRI, a respiratory physiologist, neonatologist. [There were also] Bud Sweet, Bill Tooley(inaudible), John Clements—well, John Clements was a lab person. We had 12 people. I remember women investigators that Bill brought, very nice people. It was a great group. We divided into 2 teams. Bill was having some asthma, and some other things, so he and John and other people were on during the day. Bud Sweet and I were alone at night. Now, what this meant was that we had 4 sick babies. This hospital delivered 150 babies a day. And the laundry was hung outside.

DR. GARTNER: That's a lot of diapers.

DR. KLAUS: I have pictures and slides that are unbelievable. We got a jeep from the University of California. They had a program over in Singapore. So, we used the jeep. The jeep would take us down to the hospital, and pick us up, and that's all we did. We had 4 servants at the house. We had 2 Ah Quis. One Ah Qui is a cook, and the other Ah Qui is the gardener. We had 2 other people. Somebody else did the laundry. But we

all were dislocated from our lives. For the first 10 days, even though we had 150 babies a day, we had no baby with a respiratory disorder. However, we noticed when the babies die in the nursery, they're packaged. When at the end of the night babies were packaged, they're dead. They were put on the floor. Little babies, they were probably less than 1,000 grams.

On the tenth day we get our first respiratory distress patient. The Chinese women don't cry at all. They are walking around. At any one time there were 24 women in labor. They are all walking around as a group. The whole room is smelling of amniotic fluid because they are leaking the amniotic fluid. They deliver these women in one room, a room twice as big as this room. They're being delivered by midwives. It was a social, cultural, and physiological experience.

DR. GARTNER: Did you administer the surfactant to these…

DR. KLAUS: We had the surfactant in little vials. We also measured every 4 hours. We measured lung volume, elasticity, and pulmonary blood flow. Before I had left, we had developed a method for measuring the instantaneous pulmonary blood flow, similar to the method used by one of Comroe's interns in Philadelphia. You could measure the nitrous oxide. You measure volume change. You can see the volume change on your plethysmograph. I learned a lot of physiology and mathematics. John and Bill had been working together. They came with another concept of the respiratory distress syndrome as a vascular problem rather than a surfactant problem. Bill and John came with another idea. We measured the instantaneous pulmonary blood flow. By the way, when we finished all these studies we did a whole supplement for *Pediatrics* which took a long, long, long time to write. [Chu J, Clements JA, Cotton, EK, Klaus MH, Sweet AY, Tooley WH. Neonatal pulmonary ischemia. Part I. Clinical and physiological studies. *Pediatrics*. 1967;40(suppl):709-782.]

This was at the time that I had gone to Stanford. I stayed in Sinai and then Kretchmer [Norman Kretchmer] asked me to come to Stanford. That's where I met Phil Sunshine [Philip Sunshine].

Q: Um, um.

A: I was intrigued with Norm Kretchmer. He had so many ideas. One of them related to something we were measuring with seals and sea lions. You know, he was very interested in the milk--the milk having such a high fat content. Somebody was along on the trip to measure sea lion milk.

I was delighted to come there. My family was so happy to come back to California. One thing happened in Cleveland which was a real problem. My sister-in-law developed cancer, mesothelioma. She was a librarian and

worked on the top floor where there was asbestos. She was dying during this period. It was a terrible 2 years. We felt that we were abandoning my brother-in-law. We were very close because we lived upstairs, and he lived downstairs. He had 2 children. He was Lois's brother. It was very hard to leave Cleveland because he was alone now. He became during this period very close to Eli Gold, and lived in the same street. Eli and Addie were very close to my brother-in-law and remained close their entire lives. In fact, they're going to Arizona together in a couple of weeks.

DR. GARTNER: Nice.

DR. KLAUS: We introduced them to Eli and Addie. I must say that during my whole time in Cleveland the department of pediatrics was a wonderful department. Fred was a real leader. And so was Bill Wallace. They were very different. Fred is more methodical. Those people, Ted Mortimer, Schwartz, they're really fine physicians. And morally and ethically were unique people you needed to watch practice pediatrics.

DR. GARTNER: So, was Bob, Bob Schwartz?

DR. KLAUS: Bob Schwartz. The father of Schwartz in St. Louis.

DR. GARTNER: Yes. Were you back on the faculty in Cleveland for how long?

DR. KLAUS: Two years.

DR. GARTNER: And then you went to Stanford?

DR. KLAUS: But, I was at Sinai. I was not at the medical school [in Cleveland].

DR. GARTNER: Then you went to Stanford after that?

DR. KLAUS: Yes.

DR. GARTNER: And you were at Stanford for how long?

DR. KLAUS: For 3 years.

DR. GARTNER: 3 years.

DR. KLAUS: Stanford was a very important time. In this place I had lots of preemies to care for. Lou Gluck had run that nursery.

DR. GARTNER: No.

DR. KLAUS: Way back?

DR. GARTNER: No, Louis was at…

DR. KLAUS: Who was running the nursery at Stanford when I got there? Did Louis Gluck spend some time there?

DR. GARTNER: I don't remember him being there.

DR. KLAUS: But he was there for several years.

DR. GARTNER: I don't know who. I should know.

DR. KLAUS: Anyway, I came to Stanford and people were interested. We did surfactant work. They knew I was interested in sea lion lungs. I knew about the fat in the milk. I was intrigued. He had this information about lactase in the gut. It's like a puzzle being put together. Bob Greenberg [Robert E Greenberg] presented. He had a wonderful faculty. He had this NIH clinical science preemie nursery. That was what I was in charge of. All sorts of investigators from all over the university were doing studies. There was somebody from medicine and infectious disease studying the nasal cultures. Somebody else was studying sleep wake cycles in preemies, etc.

[tape stopped]

So, I could bring my little R01 to Stanford. One of my responsibilities was to follow the preemies. It was the biggest examining room I've ever had. I had a fair amount of experience. I practiced for four and a half years with normal babies and mothers, and sick babies. In this large room I examined normal preemies after discharge. The room was as big as this dining room. There's a table here, an examining table. There's a mother's seat way over there with Life magazines. We didn't set it up that way. That was the way the room was. I went over to examine the baby and very quickly I noticed the mother stayed over there, on the chair. I began to make observations of the preemie mothers. After my first observation. I called Rose Grobstein. Kretchmer really set up everything and Rose was the social worker there just for the clinical center. It was a preemie clinical center within the Stanford preemie nursery. Up to 4 or 6 babies who were in the nursery could be labeled as being in our clinical center for study.

The other thing I learned was about was evaluation of research projects. I was on the committee with a lot of good people deciding which projects we would do. The human rights part of it became very important on the evaluation of various projects. I can remember 2 incidents. [First] being

asked to use a respirator of a company. It wasn't Isolette, but it was another big company. I had fellows at Stanford. We checked the respirator, one of the respirators they wanted us to use experimentally. The pressure was not what it read. There was nothing on the respirator that did what it said it would do.

DR. GARTNER: I remember those respirators.

DR. KLAUS: I became very leery of every project. I remember there was one project where they wanted us to use a milk not from one of the traditional milk companies. I don't know, it was Carnation or somebody brought us the milk. They had fed it to animals. When we looked at the data, they didn't have very much data on animals. So we asked for some more data. We asked to look at the slices of various organs and [to] look at the cytology. There were bizarre changes in the kidney. The kidney had hydropic degeneration after 1 week on this formula. It turns out there was no choline in the formula. I had asked for another week and I felt so glad asking for that other week. I realized how tricky this whole system was for infants. It was a real lesson.

There are a lot of good people who worked there. A lot of psychologists and other people who worked on behavior in the unit. It was good to work with Phil Sunshine. Phil Sunshine is a very, very good person to work with. He's got enormous amount of energy and is not afraid to do any hard work. Norm Kretchmer was not Bill Wallace and I was used to another kind of leader. You know Norm?

DR. GARTNER: Oh, yes.

DR. KLAUS: I didn't get on as smoothly as maybe I could have. Let me say that this is where I got very interested and I began to watch mothers more closely. Now mothers didn't come into the nursery. At that time the mothers didn't come into the nursery until the baby was ready to go home. Then they'd come into a little room, and be with their baby for a short time. Then God must have sent me this mother and said, "Marshall, if you don't get this mother, you're going to miss it. You're going to miss it." Kevin's mother had waited for 5 years to have her baby. The baby came from Kaiser--big baby, 4 pounds. It had respiratory distress, and the PCO_2 [partial pressure of carbon dioxide] began to go up. We had a respirator project. We put the baby on a respirator and it flew. It did very well. Probably with CPAP [Continuous Positive Airway Pressure] we could have done without the respirator but CPAP was not there yet. After about a day or 2 the baby got better, came off the respirator, and I was pleased. I didn't think anything about the baby. Then, about 2, 3 weeks, 4 weeks later, Carol, the head nurse, came to me. She said, "You know Kevin's mother can't feed Kevin. We can feed him. He's not the easiest feeder, but we can feed him.

Can you make any suggestions?" I made some suggestions. Three days later she came to me, you know she's a bright nurse. We can get milk in but nobody else can. The mother can't.

DR. GARTNER: This was bottle-feeding, not breast-feeding?

DR. KLAUS: Bottle, this was bottle feeding. So I said, "Can I watch what goes on and sit with the mother?" There were 2, red, modern rocking chairs. What's the modern furniture company in Kalamazoo, Michigan? Red, orange, very famous, they're in museums. Anyway, they put in 2 red rockers and she sat in one and I sat on the other. Every time the baby is starting to take milk, she pulls the bottle out. I had been with this group for about 6 months, you remember, in the child development group. I knew it's best not to say anything, let's just watch. She keeps doing it. I was about ready to say, "Oh, you don't want to pull it out," when she picks up the baby. She looks at the baby, she said, "Are you mine? Are you alive? Are you really mine?" It's a hit on the head, you know.

DR. GARTNER: Yes, right.

DR. KLAUS: Then I thought to myself when I was examining normal babies, the mother stands right next to you. I didn't tell you that. She wipes the baby. She doesn't want you to do the tongue blade, you know in the mouth. If the baby cries, you're checking the hips, she's soothing the baby. She comes with 12 diapers and all sorts of equipment, and 2 bottles, and everything. These preemie mothers were over there reading the *Life* magazine. They seem to be disconnected in this very big room from the babies. Thankfully, there were *Life* magazines there. Thankfully, the room was so big, because it was exaggerated, the difference that I remembered from the normal baby and mother. Then I began, and this was a very difficult task, to switch my whole interest from the baby to the mother. I found that an extraordinarily important move, to switch my view. It was a dyad. But I first had a look at the mother. I got Rose interested. Rose is wonderful, Rose Grobstein. She's still alive. Her husband was the Dean of the medical school, that's the Grobstein.

DR. GARTNER: I knew the name.

DR. KLAUS: They were separated at the time. She has 2 wonderful children. A daughter and a son who is a fabulous biologist. I touch bases with her just every several years, but not recently. We went back to Kevin's mother. She was happily married. She had waited 5 years to have this baby. When the baby was born at Kaiser [Kaiser Permanente], she saw the baby as dusky and blue. When they pick up a baby in the Stanford program they would bring the incubator near the mother to show how the baby was doing. They were thoughtful about it. She remembers seeing the chest suck in and

she couldn't imagine that her baby would live. So while we're so happy that the baby got better off the respirator, she's mourning the loss of the baby.

We began to try to work this out. What was going on in this woman? You can draw it on the board, she's going downhill. We got a little sad, and a little upset, but then quickly, he was only a short time on the respirator and improved. She had partly mourned his death. Then she had this baby back. Well, she didn't want him to go home until she felt confident. We put the baby on a study protocol. She didn't want to take the baby home right away. This was right around Christmas. This was a 5 pound, 8 ounce baby. It could have gone home. It was not 2 kilos, it was 2,500. It was the middle of January before she decided to get everything ready. She became overwhelmed within a week or 2 with the care of the baby at home. It was a terribly difficult experience for her to take care of this baby. It was an exaggerated situation.

Then I began to walk around the nursery and talk to other mothers. We joined forces with 2 people, Cliff Barnett [Clifford R. Barnett], an anthropologist, and Herb Leiderman [P. Herbert Leiderman], a deprivation psychiatrist at Stanford. For six months, Rose, Cliff, Herb, and I met, and we tried to define the problem. We met once a week for 5, 6 hours and finally we applied to the center for a study where we would close the nursery completely and no mother would visit, except the traditional way. Then at the end of 3 or 4 months when all the mothers had cleared out, we'd open the nursery and mothers could visit. We had this guy taking cultures. So we had cultures in the nursery with and without visiting. I can tell you the cultures are different. The babies have less pathogenic organisms when their mothers are visiting.

DR. GARTNER: How do you explain that?

DR. KLAUS: Well, they're bringing in, good bacteria. When I come to see the baby, if I'd been in a sick ward my nose is loaded with other pathogens. We started a study, which we published in *Pediatrics.* Barnett CR, Leiderman PH, Grobstein R, Klaus M. Neonatal separation: the maternal side of interactional deprivation. [*Pediatrics.* 1970;45:197-205.] That's the beginning of the bonding work. During this period Kennell is sneaking mothers into the preemie nursery in Cleveland. This study took a long time to do and we don't necessarily agree on everything at the end of this study. Rose and I feel that there were some differences, but there's no startling differences. There is however a difference in order to get in the study. One of the criteria was that the mother plans to keep her baby. It turns out that 2 of the mothers in the control group give their baby up for adoption. I have to look this up, but I think there were 50 or 25 in each group. Nobody in the early contact group gives her baby up. We begin to notice things. First of all, we noticed that mothers wash more than doctors

and more than nurses. Mothers and fathers wash thoroughly. And the first 3 visits are different. I noticed that when they put their hands in, they touch like this, like they're checking the cake.

DR. GARTNER: You mean when they put their hand in the incubator?

DR. KLAUS: Yes. They don't touch like this or, you don't see the palm in the first 3 visits. Later on, when I go back to Cleveland, John and I have students every summer. All our Reserve students are supposed to do research in the summer. There are grants for this. We then begin our group of students. The first guy we got had a Dad who worked for Eastman Kodak. He had gotten one of the first time-lapse cameras. We told them that we saw this poking and could we verify it? Then we said, "Well, we don't know what normal mothers do." So when I go to Cleveland, we do a study. There's this student, Zuehlke [Steven Zuehlke]. There's a student, Plumb [Nancy Plumb]. There's John. [The study was on normal human behavior at the first contact. [Klaus M, Kennell J, Plumb N, Zuehlke S. Human maternal behavior at the first contact with her young. *Pediatrics.* 1970;46:187-192.] We have a group of 13 normal mothers and then we have a group of preemie mothers. I can tell you [that] if you in the first hour put the preemie baby down right next to the mother, you undress the baby, you put a heat panel, that was [how they touched]. We went over to the maternity unit. He's there with his camera taking pictures. The mother starts poking extremities, just like the preemie mother, for about a minute or 2 minutes. Then she switches starting about the fourth minute, to include the face and the trunk. And she starts palming everything. We recorded their voice. We had a tape recorder under the bed. Eighty-five percent of what they said was related to the eyes. Please open your eyes. If you look at me, I know you love me. Please look at me, look at me. They're all talking. Every mother spent most of their time talking about the baby's eyes. Now, remember this, because it becomes a very important issue, remember my mother and the eyes. But this student, Zuehlke notices something else. The preemie mothers in Cleveland and preemie mothers everywhere, they're going down like this, like they're sighting it like a golf ball. You know, they're sighting the face of the baby. What they're doing is shown in the Mary Cassatt picture. Turn your head, they're lining their head up in the same parallel plane of rotation.

DR. GARTNER: With the eyes?

DR. KLAUS: So that they get in the same parallel plane of rotation. If the baby's got his head down like this, they have to get way down by the bed. So they're trying to make an interaction with the baby. I'm skipping way ahead of something. But it's very important to some new work. We look in the literature, this is just past the 60's. Peter Wolff at Harvard, and Prechtl [Heinz Prechtl] in Holland have discovered that the human infant has 6 states of consciousness, 1) deep sleep, 2) rapid eye movement sleep,

3)waking up, 4) quite alert, 5) active alert, and 6) crying. But then they have the quiet alert state, where they hold their fist up. Then a fellow in Denver, a psychiatrist, Robert Emde, points out that in the first 48 minutes of life the baby is in quiet alert with his eyes open. He's able to do all these things. So there's a beautiful matching between the mother's tape recording of the eyes, and the human infant's ability to follow and imitate.

Then I realized that there's a whole system here, and that the mother had a match. They were matched. The human infant must be carried around. All other primates are carried around when they're babies. We must be carried around. So what we have in the system was like what Anna Freud questioned. In other words, we're doing something wrong. When I saw Bill Wallace change the hospital, this unit is not fitting the dyad. But it was very important for me to do this to start a change at Stanford in how the babies are cared for. When I came to Cleveland, we just teamed up, John and I, because we were absolutely ready. He had looked at one aspect of sneaking them in and seeing a very different outcome. He had done some other studies which I could show you. He's very gentle. You know John?

DR. GARTNER: Oh, yes.

DR. KLAUS: A very gentle man and he was a wonderful colleague. He had the spirit of inquiry that I saw in John Clements. Not the science that John had but a really great colleague to work with.

DR. GARTNER: And you're still close friends.

DR. KLAUS: Oh yes, we still write together, but we don't do research together. We stopped at about 1992. We went in different paths. Both on the same problem, but I'm working more on the doula. He is working on the outcome of the doula. It's very, very important, terribly important. I'll come to that.

DR. GARTNER: That brings you up to the time when you went back to Cleveland.

DR. KLAUS: Cleveland, when I went back to Cleveland…

DR. GARTNER: What year was that?

DR. KLAUS: Two reasons I went back. First, I wanted to stay at Stanford, but I didn't want to stay unless I was an associate professor on a tenure track and the whole business. Also, we didn't just get on. I didn't have an easy time with Norm. I liked him as a scientist and I thought he was a good person and he was. But he was different than I was used to. I wanted to go back to be with Bill. Bill needed somebody in the nursery. He didn't

have anybody. John was running the nursery, but he had no experience in respiratory physiology, respirators, or anything. So I went back to Cleveland. That was in 1967. That was a very good experience. Because John was ready.

Then we repeated the same study, it was important to repeat it. We did 50 preemie babies where mothers had early contact, and 50 without. Then we started to wonder what about full-term mothers? Then there was a lot of criticism about death. When we presented this material about preemies people asked, "Is it better to have loved and lost than never to have loved at all?" The question came, "If preemies are dying so much, isn't it a little naughty to let the mother get close to the baby? A baby that may die." So that became a whole research question which we took up and fit my interest in death and mourning because I had never mourned the loss of my mother. That's one of the problems that children have, never mourning, not fully mourning the loss. [I didn't mourn] either my father or mother. Erna Furman was the person, the psychiatrist, that John and I worked with on this project. We didn't initially work with her. The paper is Kennell [JH], Slyter [H], [Klaus MH.] The mourning response of parents to the death of a newborn infant. [*N Engl J Med.* 1970;283:344-349.] Slyter was the medical student. We always had a medical student. Howard Slyter, who became a neurologist. From the time I began to see that fitting with states of consciousness, I have felt that this is one big puzzle. Maybe at the end I can tell you how I think the puzzle fits together. Then how we should change it.

DR. GARTNER: Oh, good, okay.

DR. KLAUS: You know what I mean. Because I'm still involved in trying to change it.

DR. GARTNER: Yes, I know. So this is the beginning of your work on bonding?

DR. KLAUS: It began in Stanford and then it continued and …

DR. GARTNER: Where did the word bonding come from? I mean. it's very central to this whole concept.

DR. KLAUS: Remember it's the end of the Vietnam War. This is the time where young people are really different. I have a Vietnam daughter in a sense, you know. She doesn't want to earn too much money. She doesn't want a plush living quarters. Her hair is a little bit longer. There's a whole new culture, the culture is changing.

When John and I got together, I was invited to visit and talk at Chapel Hill. There was a very famous psychologist whose great work was studying

different animal mothers. There is all sorts of work on animal mothers, from little mice all the way up to big elephants, a great deal of knowledge. I'm going to have to go searching for her name. [Harriet Rheingold] But we got interested in this whole question of a sensitive period. What about the normal mother when she doesn't get her baby? What happens if you gave her baby earlier? If the mother got the baby right away? The first thing she went to was a very famous study on goats and sheep by Julius Richmond [Julius B. Richmond]. He had not done the initial studies, but he had gotten involved in these studies a great deal. We read about his studies of goats and sheep. If you take the baby goat away from the mother with rubber gloves so you don't leave a scent, and take it away for an hour and then bring it back, the mother won't care for the baby. So there's what might be called a sensitive period in the goat mother. We began reading about different animal mothers since we had been so involved in surfactant with different animal models. If you cut the vagus in some animals, they don't get pulmonary edema and others do. Each animal species has a different reaction in the nervous system to many of the insults or traumas. So we had to respect this. You could look at other animal species, but then the question is, "What has this got to do with humans? Is it anything to do with humans or is it just in animals?"

So we're starting to read. We're starting to think about other studies. We began to think of what would happen if you gave early contact, suckling, and rooming-in. Would that mother be different? We're starting to measure closely what the mother does during feeding, the 2 groups. The analysis would be on film so we could get it down and do some fine grain analysis. I'm trying to think about what's going on, because so many things were happening at this time. We completed this study with the touching. We got into [a Ronald] McDonald House, the maternity house to do that. That was not too hard, but now we're starting to change normal mothers. Let's stop for a second otherwise we're going to lose my train of thought. I think it would be good to finish the discussion of death.

DR. GARTNER: All right.

DR. KLAUS: Because of the criticism that it might not be good, and reasonable, and ethical to let mothers see babies that die we had to answer this issue if we were going to let mothers into the preemie nursery. Howard Slyter, he was an excellent student for the project. John and I kept track of every baby that died in McDonald House. Some mothers had early contact. We were now repeating the study from Stanford. Some mothers didn't have contact. So we had 2 groups of mothers whose babies died, and we could then…

DR. GARTNER: And these were randomly allocated early?

DR. KLAUS: **Randomly allocated. Then we could follow them. The criteria for this study were all mothers that didn't have a baby with a malformation. We took out all the malformations. We took out all babies that wouldn't survive anyway. We were left with this group of normal babies from 500 grams up to 10 pounds. We had a wide range of baby sizes and conditions, and causes of death. Whether the baby lived for 5 minutes, whether the baby had lived for 3 weeks and was 10 pounds, you know, the mother went through a prolonged period of mourning and grief. That was one of the gists of the paper. She had already gotten some kind of attachment to this baby. The question is, was she attached or bonded? We got the word bonding from the animal studies. Bonding is the attachment from the mother to the infant. Attachment that John Bowlby studied, or Selma [H.] Fraiberg, how was the infant tied to the mother. So, we picked the word bonding from the animal research laboratory because we were using it in this direction, from mother to infant or father to infant. We picked the other word. Attachment was already a part of the literature of Bowlby, and Mary Ainsworth. So that was how the words were chosen.**

We also began to see and understand that if the mother held the baby, and dressed the baby, and the baby died, there was a healthier resolution. We did notice a difference in religions. The Catholic mothers seemed to have a shorter period of prolonged grief, 6 months. By the way, the mothers wanted to go to the grave. They had milk spurting.

We started at that time a very important group. We started a grief group in 1971 or 1972, somewhere around there. After we knew the pain that these mothers were going through we set up a group which met once every month from 7:30 to 10:30 and is still going on. John is still running it, so it's going 25 years. When we set this group up, I have to think of the name because at the same time grief groups were being set up all over the country. They have similar names. We get mothers involved. We had leadership. We don't lead the groups. But the groups don't go well unless we're there, and we don't say a word. That's a whole other story and I don't know if we want to get into it. One of the areas that moved the fastest if you follow the change in the hospital, one of the biggest changes that happened very rapidly all over our country, was opening up the death of a baby to the family. When a baby died in the nursery, it used to be that the baby was taken away. Nobody even knew the baby died. Remember?

DR. GARTNER: Yes, I remember it well.

DR. KLAUS: **When we came out with that paper many other people began to talk about this issue. Grief was opened up now. Remember that this famous Swiss woman physician [Elizabeth Kubler-Ross] who was going around talking about death in adults? She actually came to Western Reserve each year to talk to the new medical students. So this is occurring when**

there's a sense the hospital had taken birth away from the family. And death had been taken away. Now death was being brought back to the family. At the same time we still have a delay in the birth being brought back to the family. So there's a symmetry here. But I think the reason that the practices moved so quickly was because of society's mood. Death was not so frightening, mainly because of this woman. In fact there was actually a study of this in the Cochrane database [Cochrane Database of Systematic Reviews]. If the mother has a picture of her baby, the dead baby; and part of the hair, little piece of the hair; and helps dress the baby and clean the baby up after the death; that mother has a more normal grief pattern. Because in order to grieve the loss, you have to appreciate the profound loss. So when you see the baby and hold the baby, the loss is clarified. So this is a Cochrane database study, where some do and some don't. It's a very interesting study. There's actual data.

Now, some people have carried this to the extreme. It has to be watched. They try to have every mother do this. You have to always let the mother decide if she wants to hold the dead baby, even see the dead baby. But it's good that you get a picture of the baby. Also that you get some remembrance, hair, a little part of the bonnet, something on the baby, this little shirt from the baby something from the baby for later. But a recent investigator, Leon, [I. G. Leon] noted that a few times it was being pushed without the mother [giving permission]. Then we run into trouble. You can never push a mother. We noted the same thing. You cannot push a mother into the nursery unless she's ready. We noticed this at Stanford. One mother had been almost pushed by someone into the nursery to touch her baby. She had quite a reaction and needed help afterwards. [They thought] it's so good everybody should do it, you know. She wasn't ready to see the baby.

Now, since that time, we've asked mothers months later [what did you see] when you first saw the baby. Remember they're touching like this. We're wondering, why are they touching like this? But you can't ask why you're touching like this when they're touching like this. You have to ask this sometime later. So we asked mothers this sometime later. "What did you see when you saw your baby?" They saw a plucked chicken, a skinned animal. They didn't see a human infant. They felt guilty that they had produced it. They all feel guilty. They're feeling guilty that they didn't do something right. They have many things that they didn't do right, they feel. They didn't take 1 vitamin pill. We taught house officers how to interview about this. If you say, "Oh, 1 vitamin pill doesn't matter," they stop talking. But if you let them go on and say, "Tell me more," or "What else were you thinking," they will tell you, "Well, I think it was too much exercise, or we had intercourse, or I shouldn't have gone swimming and that's why the preemie came." Then it comes out because I didn't go to church. We made a series of films for doctors, John and I.

DR. GARTNER: Yes, I remember them well.

DR. KLAUS: The Academy wouldn't okay them unless we could explain that these were not bad things. We said if you talk and say, "Why that it's okay." They stop. You've interfered with the open-ended interview.

DR. GARTNER: Right.

DR. KLAUS: Once they heard that, then they gave us an approval. Oh, and they wanted us to say that the hospital was not at fault. When you see the mother asking, "Why didn't you use more oxygen? Why didn't you start the respirator earlier? Why didn't you do this…?" The people who viewed it in the Academy said, "Well, why didn't you say it wasn't important? Get the hospital off the hook." There are a lot of very interesting episodes. We got our first big problem with the Academy of Pediatrics, I believe, or the AMA [American Medical Association]. We weren't even invited to a meeting. I think the AMA said that every mother should have the baby. You should resuscitate the baby, get the baby pink, dried, then the mother should have 10 minutes for bonding. We got heavily criticized as if this was our formula. So this is the first bit of criticism coming about this. The other was related to the death of a baby. That by having early contact with a sick baby, or seeing a baby in the nursery, we were promoting a lot of mourning. So we answered that.

DR. GARTNER: Well, I remember your teaching tape about death in the newborn as a very important and very useful tool. I remember using it for a lot of seminars and teaching as a lot of people do.

DR. KLAUS: We made 1 for death, [1] for preemies, and [1] for malformations. Similac distributed the first 2. We still have the malformation tape, which is quite good--where John is interviewing a mother, some superb interviewing. I can use it now. I show the tape and I say, "What do you think of Dr. Kennell? Would you change him?" It's wonderfully useful. He's just listening, and listening, and suddenly the lady said, "I wish I would die and I wish the baby would die with me." You know, it showed the depth of the pain. This was a Down syndrome baby, and a Down without too many malformations. It was a wonderful tape he made. He's a wonderful listener.

DR. GARTNER: Let me just go back a bit before we get too far along. I just wanted to explore a little bit more some of the issues about your development as a neonatologist. Can you think back to when you first thought of yourself as a neonatologist or thought of newborn medicine as your area? When did that happen?

DR. KLAUS: In 1962, when I came back to Cleveland, I didn't think of myself as a neonatologist even though I had taken care of a number of sick babies. At Stanford, I began to see myself that way. I saw Phil with a broader knowledge of some newborn areas than I have. I learned a lot from Phil, Phil Sunshine, and other people who came into the nursery.

I had a very interesting thing happen to me. Claudine Amiel-Tison from France came to Stanford with her husband. He was studying something in hematology. We got to be friends. She showed me the French neurologic scheme. Then I could see there's a whole world in these babies. It all fit together when I heard Peter Wolff and Prechtl tell me about the states of consciousness. They have different times of consciousness. We've been friends for years. I taught her how to put babies on respirators and she taught me how to do the French neurologic scheme. There's a whole body of knowledge. When she taught it to me I was actually a slow learner. She had a fast movie, so I said, "Help me with this." So she made stick figure diagrams which I think Dubowitz [Lilly Dubowitz and Victor Dubowitz] used. So if you look at the Dubowitz [drawings], you remember those things that are in all the books.

DR. GARTNER: I remember the figures very well. Arms like this…

DR. KLAUS: It was a very pleasant experience to see her. To realize all over Europe they're thinking differently. I had worked for several years and one of the agreements was not so much a big salary, at Reserve as an associate professor I think I got $18,000 in 1972, but it was a sabbatical after 2 years. The saddest thing was that Bill Wallace dropped dead shortly after I got there of a heart attack. That was a disaster for me. It was so sad. He became a bit like a father. Not a father figure, I mean he didn't act like he was my father. I mean not having had a father, he was very helpful to watch.

DR. GARTNER: Let me go back again to all the early development in neonatology in the early 1960's, when you began to think of yourself as focusing on newborn care. How would you have defined the field of neonatology?

DR. KLAUS: By the way I picked newborns because I could thump the chest. I have a good hand. I can suture with this hand, but I can't deliver babies easily. But I can take care of little babies and that's why I went into pediatrics. That was [the] reason for pediatrics to be honest because I was going to be an internist. So after the polio, it was pediatrics. Then I focused down on little babies. I think the field became neonatology in the 1960's. Because when I came back to Reserve in 1967, after 3 years, we're starting to get a group together. Bud Sweet is at Metro with Fred Robbins. When we decided to have a meeting we get Leo Stern from Quebec. We get Bill Silverman [William A. Silverman] from Columbia. We started to have little quiet meetings nobody knows about. There are just 6 or so of us.

I have to think of who is at these meetings. They are not ever published. We meet for 1 day and we talk. Everybody comes together at night. We have a dinner. We talk around the dinner about what's happening. They're just northeast in the United States. It's less than 10 people. So Leo, Bill Silverman, Bud Sweet, myself, and I'm trying to think of who else. There are several other people there. So we're meeting as neonatologists there.

DR. GARTNER: Did you talk of yourselves as being specialists in newborn care?

DR. KLAUS: No. We're all working with babies and with research related to newborns. We're keeping very close track of Millie Stahlman [Mildred T. Stahlman] and Mel [Mary Ellen] Avery. There are other meetings occurring. Ross Laboratories held meetings that were useful at this time because of respiratory things. Bill Tooley is starting to get very intensive. He has a passion. When Bill was working with babies, almost no baby died. He didn't agree at all with Bill Silverman's ideas of how far to go. I don't think they ever contested it. But who else? But we never published anything. We talked about what we were doing, procedures and techniques.

DR. GARTNER: By that time were you all just doing newborn care? Had you all given up the care of older children?

DR. KLAUS: Right, none of us were caring for older children.

DR. GARTNER: So you had evolved already?

DR. KLAUS: What happened is that the respirator comes in to being. It's hard to run a respirator. You need training to do the respirator. So you start to have a specialized service. What Bill Wallace wanted from me when I came back was the techniques that I had learned in 2 or 3 places. In the Singapore Study, Bud Sweet and I were on for 12 hours at night. We were nursing the babies. We were running respirators. We were picking the babies up. We were nurses all night. Every 4 hours we were doing respiratory function and pulmonary blood flow so we could measure these things. Respiratory physiology was the instigator. The understanding of respiratory physiology by all of the lung people initially made the field of neonatology. Then cardiology came in. But then remember at the same time you were with Abe and they were developing a whole system for those babies. I think that the initial scientific studies with Silverman on different temperatures were the beginning, a major beginning for clinical research. That was to me the most important of all the studies. Mel's findings that it wasn't all sorts of fibrinogens or other things but that surfactant was involved, was the key.

DR. GARTNER: What about the evolution from the premature care, the premature nursery, to the neonatal intensive care unit. That's the transition that obviously went with the developments of the neonatology as a medical specialty.

DR. KLAUS: I think that there were some people that were unusually skilled in caring for babies. I have certain fellows that could care for babies. Belton Meyer, who settled in Arizona, was one of the most observant and skilled clinicians I have ever worked with. And I think there are many others. I think of Usher's [Robert Usher] ability to show the superiority of certain procedures.

I think that England was far ahead of us. Their mortality in the late 1960s was far superior to ours. I am trying to think of the hospital. We began to start connecting with Europe at that time, in the late 1960s. They didn't touch very sick babies. They left babies with dirty diapers. We were changing the diapers, especially of little babies. At various PO_2s they had a better survival rate, even without the respirator. So if you didn't have a respirator, you got more babies through if you used the English method. You could see that certain techniques would get certain babies through, these very little babies with respiratory distress.

DR. GARTNER: It would mainly reduce trauma?

DR. KLAUS: Reduced trauma. Oh, what was his name? We met many, many times. He's now studying inter-cerebral metabolism at slightly lower temperatures in asphyxiated babies using NMR [Nuclear Magnetic Resonance Imaging].

DR. GARTNER: NMR? I wonder who that is?

DR. GARTNER: If you let me look at a book, I can fill that name in.

DR. GARTNER: Well, we'll fill it in at a later time.

DR. KLAUS: Do other people have these problems with names?

DR. GARTNER: I do. I mean we all do.

DR. KLAUS: It'll come in a few minutes.

DR. GARTNER: You and Av [Avroy] Fanaroff wrote an early book on neonatal intensive care, a little red book.

DR. KLAUS: *Care of the High-Risk Neonate*. [Klaus MH, Fanaroff AA. *Care of the High Risk Neonate.* Philadelphia, PA: Saunders; 1973.]

DR. GARTNER: *Care of the High-Risk Neonate*, was that the beginning of neonatal intensive care? Had anyone written a book about neonatal intensive care or care of the high-risk infant?

DR. KLAUS: There was an English book by an older woman, but it wasn't intensive care. It's a wonderful history. What we did was write a 92-page book for house officers on how to care when you come to the intensive care nursery. We had bilirubin. We had temperature control. It had many other chapters. We heard that somebody had taken our $1 book, it cost us $1 to Xerox the 92 pages, and we were just giving it out. We hadn't gotten any rights on it and somebody picked up the book and published 5,000 copies in the South. I can't tell you who did it either. So then we said maybe somebody will find this book valuable. We went to the Education Department. Reserve had a whole department of medical education. It was funded with a Carnegie [Carnegie Corporation of New York] grant and a Commonwealth [Commonwealth Fund] grant. They had a big Commonwealth grant for education. As they're changing the curriculum, they're trying to measure the value of the changes. If you're going to start clinical medicine with the patient early in training and you're taking a whole morning away, then you have to give that morning back somewhere. They gave it back in the fourth year. But how do you teach research medicine, basic sciences in the last year?

Every year there were 3 days when the whole faculty left for the country. We would just talk about these things. When I came back the curriculum was going ahead full blast. I was put on the pulmonary committee. Our committee would work, and work, and work on all the lectures in pulmonary. We lowered the time on infectious disease and raised the time on physiology; less TB [tuberculosis] and more about physiology. Then I was on the reproductive committee and I ran that. It was very interesting because you do all sorts of cross-patterning in the medical school. If you look at that book, that book has 3 neonatologists who consult throughout the whole book. And…

DR. GARTNER: Who were they?

DR. KLAUS: Leo Stern, I have the book here. We can bring it down. Shall I bring it down?

DR. GARTNER: Yes, why don't you bring it down.

[recording off]

DR. KLAUS: He said he was interested in this chart of ours. What we did with the first …

DR. GARTNER: And what year is this? This is the first edition?

DR. KLAUS: This is the first edition. It is actually a new copy. Jerry [Gerard B.] Odell, Sam [Samuel] Prod'hum and Leo were the first critical commentators. I think it is 1973.

DR. GARTNER: Was that the first book of this type that is on care of the sick newborn? At least it's the first one I used.

DR. KLAUS: I'd have to ask Av. One of the most interesting things was the commentaries in this book. This was a new idea. We'd been very disappointed in our bonding books that other people hadn't picked it up. It went to Japan, this book. This book was read chapter by chapter. It was translated into Japanese. Nobody in Japan has ever criticized a writer of a chapter. And when they got to this and it got criticism, it stopped everybody.

DR. GARTNER: Very un-Japanese.

DR. KLAUS: Toru Takeuchi brought it to Osaka. He has translated this book and our other book. He's translated all of our books into Japanese. He said this was the first time he had a book with the criticism in it. They're all waiting for the criticism. We thought that this was a way [to increase attention]. The medical school people said if you get the criticism, you're going to get great interest. It really did. Other people haven't put it in. It's hard to put in by the way, because everybody's "right now." We just finished another edition and a lot of people were late. We're not having an easy time getting the critiques in. It's a big job to get these critiques in. Now we have individual critiques. Let's see if the second edition [1979] includes critiques. Oh look at the commenters; Gabriel Duc, [Maureen] Hack, Hull so you see, immediately, we got up to…

DR. GARTNER: Big numbers.

DR. KLAUS: Big numbers. We're using ex-fellows. I don't know what I'm going to see here, I don't remember.

DR. GARTNER: Ah there you go, comments.

DR. KLAUS: Stan [L. Stanley] James, Jeffrey Maisels, [George H.] McCracken [Jr.], Gautier again. They want questions at the end of the book and cases. The field is moving but there are no right answers here. This time we wanted to put in the Cochrane database answers for some of these questions. We haven't done it properly. I think the Cochrane database is going to come into these books.

DR. GARTNER: That will be good.

DR. KLAUS: These are big jobs.

DR. GARTNER: Oh I'm sure. What's the publication date of the third edition?

DR. KLAUS: Let's see, the third one is 1986. There's a 1993 someplace in the house.

DR. GARTNER: That's a fourth edition?

DR. KLAUS: Yes. There's a fifth edition.

DR. GARTNER: There's a fifth edition on the way?

DR. KLAUS: It's done.

DR. GARTNER: Oh it's done

DR. KLAUS: It's with the press. It won't be out until the end of 2000 [2001]. We hoped that Mel [Mary Ellen Avery] and other people might pick [up] the idea of the criticism but they didn't.

DR. GARTNER: You think going through this series of 5 editions of the book, when the fifth one comes out, will provide a sort of a history, a continuum of how neonatology evolved, developed from a scientific perspective?

DR. KLAUS: A little bit, partly, partly yes.

DR. GARTNER: I would think so. It would be useful.

DR. KLAUS: John Clements and Julius Comroe got involved. They got very interested in illustrations. Notice this spread. This is the picture that intrigued us. John Kennell and I have talked about that picture for hours. The question always is, "What is the left hand of the baby doing in those pictures? Why is he doing that? He's reaching up to his mother."

DR. GARTNER: He's reaching up to his mother's lips?

DR. KLAUS: Yes. What is he saying? Is he just touching her lips? Is he saying "You can suck on my fingers, I'm sucking on your nipple." John Clements is trying to explain with very clear drawings. This illustration came really from Av. We tried to present the information using not just data, but illustrations, and in all sorts of forms that people could learn from.

DR. GARTNER: Now I remember the illustrations being very good.

DR. KLAUS: Oh, that's the first edition. On this one we spent the longest time. We learnt a lot about the dissociation curve. Each one of these was painted.

DR. GARTNER: These were real learning experiences for all of you to learn how long to see a return.

DR. KLAUS: Here it shows the criteria that we used to evaluate babies. The criteria were put here to have the people start looking at the mother. This is our head nurse, Rose, holding the baby and not looking at the baby. So the research material that we're looking at is creeping into the care taking. The research is being applied. Trying to understand when we look at a mother, what are we going to look at? The critical ideas of Mel, Kretchmer, and Julius Comroe, and things I heard in conferences were used to help fellows. They were also used in these books. At the end there are critical questions and cases to answer.

The Reserve Medical Education Department, I think, had the Carnegie Foundation pay to make 40 copies of the book. You know Xerox them. We had 10 for nurses, 10 for neonatal fellows, 10 for general pediatricians. What was the last? There were 40 books and I have 1 somewhere. They were paid to read it and see what didn't make sense. Then they were changed. By the way, the critics were very helpful. If the critics wrote back and said "You've got to change this," [we changed it].

The reason we got into critics to begin with was we were nervous about putting out a book where we weren't clear on all the areas. So we got the critics to look at it. They corrected mistakes, mistakes in thinking, areas that people didn't know. We had one man who said he was going to sue us. The author of one chapter was going to sue us if certain comments were left in from the critical commenters.

DR. GARTNER: Oh dear, what did you do?

DR. KLAUS: Well, we took it out. It was easier than facing a suit.

DR. GARTNER: So each of the chapters was written by different authors?

DR. KLAUS: Well, no. We wrote some but hematology had to be somebody else. Claudine Tison we thought was better than we were. We wrote a number of the chapters. You can see which ones we wrote. We wrote respiration, mothers, and temperature control. We felt we could handle those.

DR. GARTNER: Well, it's a wonderful book. I remember using the first edition and it was really all understandable. Let's talk more about your own individual research. Scholarly work that you focused on after your return to Case Western Reserve. The work you did with John Kennell and others starting with the late 1970's.

DR. KLAUS: Sure. By this time of course I have stopped doing respiratory physiology completely and running the intensive care nursery. A special interest of mine is having fellows. We had 4 or 5 fellows over this whole period in Cleveland and 2 in Stanford. We ended up with nearly 35 fellows. We were very fortunate to get really excellent candidates, people like John Kattwinkel or Richard Martin, Maureen Hack, Avroy Fanaroff. Every one of the fellows is connected with a nursery except one. He is involved in teaching in a medical school, important medical teaching, Dr. Howard Gruber. So the fellows have really done well. Many of them have run and been in charge of a large nursery, such as Roberto Sosa in Florida.

DR. GARTNER: Are they all [in the] United States?

DR. KLAUS: No, we had a number go back to other countries. Jose Diaz is running the nursery in Uruguay in the medical school. We have a neonatologist who just left neonatology after 25 years in Argentina, Buenos Aires. Roberto Sosa was the main neonatologist in Guatemala for the period before he moved up and became director in the medical school in St. Petersburg, Florida. We had a wonderful fellow from Brazil who was with us for 4 years. He did elegant work on breastfeeding, Manoel De Carvalho. Manoel De Carvalho did come from England, where he trained, so he came already trained, but he was a fellow with us. He did these wonderful studies on volume which show how volume increases with increase in feeding frequency. He led a charmed life with the nurses because he's a big, tall, and handsome fellow. You know him?

DR. GARTNER: Yes, I know him.

DR. KLAUS: When he began to go on the ward, all the nurses wanted to know "What was his name? Who was he? Where did we get him from?"

DR. GARTNER: He's a fine fellow.

DR. KLAUS: Yes.

DR. GARTNER: Why don't you tell us a little bit more about how your work on early infant behavior/ maternal behavior has evolved over the last 20 years. That's a very important part of your scholarly life.

DR. KLAUS: **In 1972 I took a sabbatical with Prod'hom who in my mind ran the most exciting nursery in Europe. Our family moved to Lausanne. At the same time, I had a small grant from NIH and WHO [World Health Organization], to visit nurseries throughout Europe, including Israel. [The grant was] to look at what they were doing that was unique and was not known in the west. I'll just mention that one of the things I saw which stood out for me was nasal CPAP [continuous positive airway pressure]. They were using IV [intravenous] tubing. When I came home after the year, we started with our bioengineering division at CWRU. They put together a molded plastic piece. John Kattwinkel worked on that in our unit.**

There were a number of points in my visiting. I visited Russia for 2 weeks, Belgium, all around Holland, Sweden. It was really quite a thorough tour. I made a report to NIH about this. I thought it was immensely valuable. I didn't go into the Eastern Bloc very much. In 1980 I went to Poland for 2 weeks with a quite a group of people, including Haggerty [Robert J. Haggerty] and a number of neat people, Brazelton [T. Berry Brazelton] and others.

I was terribly distressed to see what was going on in Russia. It's still going on today, in most of the units. Mothers labor together and they're treated very poorly in labor. Even though Lamaze [Fernand Lamaze] came from France he was heavily influenced by some of the practices in the Soviet Union. All over the Eastern Bloc the mothers don't get the babies right away, it is many hours. Even though the WHO has come out in favor of units that are baby-friendly, that really hasn't spread as much as you'd think to the Eastern Bloc. It was quite distressing to know.

Now in some of the countries things have changed, for example, Estonia. It has been a sister of Finland for a long period of time. So when Estonia became free, the Swedes and the Finns went over there in large numbers. They really changed Estonian perinatal care. Estonia's care is closer to Sweden than we are. They have early contact, suckling, and rooming-in at the medical school hospital. The baby crawls to the breast. The baby stays on the breast for an hour and a half. One of the things they noticed is the immense amount of stooling by most of the babies. So the babies are nursing very frequently and as they nurse more frequently, they get the reflex of stooling. They are getting rid of tons of bilirubin and there are far fewer bilirubin problems. You can see that when you link up the baby with the mother very early and allow the baby to crawl to the breast or get to the breast and suckle frequently. You close the nursery, the whole system will work much better. It's much less complicated. We really haven't taken advantage of the reflexes built in to get rid of the meconium and the bilirubin.

I was on sabbatical in Lausanne and they gave me the attic of the children's hospital. A wonderful room, just a beautiful room, where I could overlook most of Lausanne. John Kennell came over for several weeks and we wrote together. I had been able to have lots of time and we wrote *Maternal Infant Bonding* and published it in '76. [Klaus MH, Kennell, JH. *Maternal-Infant Bonding: The Impact of Early Separation or Loss on Family Development.* St Louis, MO: Mosby, 1976.] This was the book that I told you I was very happy with until I showed it to my daughter Lisa. She did all of the editorial work afterwards when she showed me it needed a little bit more work.

In that book we made an error. It's a very important error to clarify. We had evidence through a study published in the *New England Journal of Medicine.* A very small study by Klaus, Jerauld, McAlpine, Steffa, Kennell, "Maternal attachment, the importance of the first postpartum days." [Klaus MH, Jerauld R, Kreger NC, McAlpine W, Steffa M, Kennell J. Maternal attachment. Importance of the first post-partum days. *N Engl J Med.* 1972;286:460-463.] In the book we suggest that this early period is unique for the mother and baby. That she's open to change and that it's a critical period. That word "critical" was a major error. It's a "sensitive" period. Critical means if it doesn't occur, all is lost. That created an immense amount of problems which continue even to this day because nobody has read after that book.

Some psychologists have taken us to the wall and wanted to hang us saying that isn't true. There is a series of articles. A person who on a certain day in 1982 began a series of papers. The first began in *Psychology Today.* Then within a month or two something came out in *Pediatrics,* then *Journal of Pediatrics,* and then several psychology journals. There was a barrage of material suggesting that we were comparing humans with animals. That we had made a series of technical mistakes in several studies. Now the book *Maternal Infant Bonding* had, even in 1973, several other studies. These have a lot to do with the Baby-Friendly Initiative [Baby-Friendly Hospital Initiative]. I can't date this, the numbers of these studies, but by 1982 we published the second book called *Parent Infant Bonding,* we added the father. [Klaus MH, Kennell JH. *Parent-Infant Bonding.* St Louis, MO: Mosby, 1982.] Maybe I could bring these books down for a second. We don't use the word critical. The critical period in biology is like thalidomide--thalidomide occurring on a certain day. If we had only used the word sensitive--sensitive period, sensitive moment-- that the mothers especially are open to change. But also change in a positive direction or a negative direction. So, if she's not well cared for either during the labor or delivery or the period afterwards, things may not go well for her. I'm going to just mention that by 1982 there were 9 separate studies, and we have a diagram of these. They looked at whether the mother having early contact, suckling, and rooming-in alters her later behavior with respect to breastfeeding.

Tackling that question had to do with one of my fellows, Roberto Sosa. He said, "Why don't you stop doing touchy-feely things and get on to something really important like breastfeeding?" He suggested, "Why don't you come to my country, Guatemala. We can set up studies in the medical school hospital and the social security hospitals. Look at whether these activities alter later breastfeeding. Because this would really affect the health of the child for a long period in the first year of life."

It was an amazingly good suggestion. Even though it was a tumultuous time in Guatemala and included an enormously difficult earthquake with a lot of loss of life, it was a very useful area to explore. First, the costs were low. We were able to get excellent research people who were working for Brazelton. Brazelton had stopped working down there and we were able to pick up these schoolteachers who did a lot of work with us. We started bonding studies. We started in 1973. Lois, Peggy Kennell, and John and I went down for a meeting they had. We spoke at the Central American Pediatrics Society. We looked over the situation. The professors of pediatrics in the medical school were pleased to have us start a project. We went and worked under INCAP, Institute of Nutrition of Central America and Panama. We didn't work in the behavior division but we worked in infectious disease with Leonardo Mata, who was a superb infectious disease person. He added many nice studies. Probably incorrectly, we have put several of these studies in 3 different CIBA Symposiums which didn't allow them to be read as easily as if they were put in journals. That was a technical mistake to make them only available in various symposiums. I'd like to show you one of the diagrams for one second.

These meetings were wonderful. They involved people like Brazelton, [Myron] Hofer, John Bowlby, all of the people that did these studies in various areas of the world. R. A. Hinde, the very famous behaviors guy, and Judy Dunn, M. PapouSek, and Jay [S.] Rosenblatt whose very life has been involved in animal behavior.

The department that I was wanting to talk to you about was Ann Stewart at the University College Hospital, London. The unit that was so good with the care of small babies. These were wonderful meetings, but we paid a price by putting the material here because it wasn't as easily seen.

DR. GARTNER: And this has not been published in journals since?

DR. KLAUS: This one, this paper has. But not all of the papers. The gist of the work was that in 8 out of the 9 studies of mothers who had early contact with suckling there was significantly more breastfeeding later. For example, in one of the studies if the mothers had early suckling and breastfeeding for the first hour of life, 50% of those mothers were breastfeeding at 6 months versus 18% of the controls. In 6 out of the 9 this

difference was significant. So, it wasn't significant in all the groups and in one group it was reversed. But that became I think the basis for the Baby-Friendly Initiative, certainly 2 of the 10 points in the Baby-Friendly Initiative.

Recently in 1990, a Swedish group in early human development explored this more closely. They watched the group of babies and mothers in the first hour of life. Certain of the babies got to the nipple in the first hour. They then kept track. Some of the mothers' nipples had been touched and others had not in the first hour by the lips of their own baby. Mothers who had the baby touch the nipple in the first hour, spent 100 minutes more on day 1, 2, 3 and 4 with their babies, in their own room. In days 2 and 3 it was significantly different than the controls. So they had a different behavior simply by the lips of their own baby touching their own nipple. This appears to be releasing oxytocin and affecting behavior for oxytocin receptors in the brain and also oxytocin receptors in other parts of the mother's body. So there is some sense now to those studies. Some physiological and biochemical sense that these early moments are important.

One of the objections to this was not just the word critical. There were 2 studies done in Pittsburgh, and in some other cities in Europe, in which there was a control. These studies were done in middle class mothers. Some mothers got the baby only after 30, 40 minutes or after a certain period of time, I think it was an hour. The experimental mothers got the baby in the first hour of life. However, when you read the study closely, the control mothers had their babies in the first 5 minutes. They weren't exactly the same. They didn't think that 5 minutes had that effect. We don't know. The control studies tried to say that this was incorrect. Whether 5 minutes is enough time. If a mother holds the baby for 5 minutes is that enough time to change this middle class group of mothers so they become like the experimental mothers who have the baby in the whole 60 minutes. So there's a lot of detailed discussion which I just can't go over in such a short time.

However, it's now nearly 18 years later, and two or three bits of information are terribly important.

Abandonment of babies in the maternity hospital by the mother is well known to occur in many countries. Surprisingly, after the Baby-Friendly Initiative abandonment in the Thai Hospital from went from 33 per 10,000 to 1 per 10, 000. In Costa Rica it went from nine and one half babies per 10,000 to one and one half babies per 10,000. In the Russian Hospital, it went from 50 babies per 10,000 to 28 babies per 10,000. At the same time in other hospitals because of the financial difficulties in Russia right after the Gorbachev [Mikhail Gorbachev] change over, the abandonment rate is going up while the abandonment rate in this hospital that had a Baby-Friendly Initiative is going down. You mentioned to me recently that you heard a

Canadian, Beverley Chalmers, present data that with early contact, suckling, and rooming-in there was a distinct increase in breastfeeding and a decrease in disease.

DR. GARTNER: Correct.

DR KLAUS: So there are changes with early contact, suckling, and breastfeeding suggesting that this early period is a sensitive period. Now the other evidence that we have is quite extensive. Dr. Kennell has just finished the study in Houston which is very dramatic. Mothers had a doula or a control. The control was either an epidural or control with no epidural. They went to the house 2 months later and looked at the behavior of the mothers. They were completely blinded as to whether the mothers had a doula, or they had a control [with no epidural], or they had an epidural. The study was of 110 mothers, 35 in each group. Surprisingly, mothers who had a doula were more sensitive, caring, and perceptive to their own baby's needs on very quantitative analysis. There was much more appropriate interaction in 4 out of the 5 sequences that they studied. They studied the mother right when they walked into the house; as the mother was preparing for the daily exam; during the daily exam; a feeding; and then one other sequence. This is a very standardized group of observations.

There are several other observations., Specifically one we got in Johannesburg, there again by Beverly Chalmers, showing that mothers who had a doula during labor became close to their baby, began to feel the baby was theirs, at the third day compared to the ninth day in the control. When asked to compare their baby with a standard baby they were significantly different. They thought their babies were more handsome, beautiful, and stronger. Control mothers felt their baby was almost as strong, beautiful, and so forth. There was significantly less depression in the mothers who had a doula at labor.

I think the data is becoming very strong that starting before the birth of the baby there is this unique period where the mother is open to change. That our entire perinatal period has to be reviewed. We must make this period a uniquely pleasing and appropriate period because [the] mother is open to change in a positive or negative direction. I would say this is the most important concept that John and I have worked on. We are quite excited that as the years have gone on I have other data to support this. I think that it's a time where we can take young women who have been mis-mothered by their own family, or abused by their own family, and raise their level of consciousness about themselves so it becomes much more positive. I think it's a time where we can make very positive changes in their life.

I don't know the extent, the length of this period. Is it 10 days or 2 weeks? Winnicott [Donald W. Winnicott] writes about this period and it is very

important to read his writings in the 1950's and 1960's from England. He said that one cannot really understand a mother at the time of pregnancy unless one appreciates that there is a unique time where she goes into the special state that he called primary maternal preoccupation. It was awhile before we appreciated that primary maternal preoccupation is another way of saying it's a sensitive period. So I think that we must change maternity care practices now.

I quickly began to mention the doula. We again rented a big house in Guatemala. We were going to make sure that none of the students got sick. We had 5 students. The house was the house of a movie producer. It had 2 pools and was very gracious years and years ago but it had fallen into some disrepair. We hired a cook to specifically cook for the students and ourselves so that we wouldn't eat in the streets and get sick. I should say that very quickly the students didn't like the food and they ate in the street [and] they were often sick. The first day we were there we heard bullets, guns going off. It was only after the fourth or fifth day that we realized that we had rented a house in rebel territory. We had a student whose parents were part of a big pharmaceutical company and would have been great to be captured by the guerillas.

We had a Volkswagen bus and we took every mother home. We had over 150 mothers. We followed all these patients for 6 months. And in the 6 months each family moved an average of 7 times. We missed out following 2 mothers out of the 150. I owe this to the students. I really learned a lot on how to do a complicated study. This was the bonding study where some mothers got the baby right at birth and other mothers got the baby at 8 hours. The hospital was so pleased by the results that during the time we were gone they closed the nursery completely and put all the babies with the mothers. The rules they had actually were quite ample, very, very ample.

Our infectious disease person measured that there was a 17 fold drop in the spread of infection, postpartum infections, once they did away with the newborn nursery. In the newborn nursery they were so crowned. They were delivering 55 babies a day in each of these hospitals. So there was a baby, a baby, a baby, a baby. There was a trolley, a two-story trolley, that brought the babies out. There was no way to keep 55 babies without nudging them up to another baby. So when you put the baby with the mother you reduce infection. If we have postpartum infection we close the nursery. Our model from the Unites States didn't fit very well with Guatemala or any part of South America. I think that when we get closer to the ideal setup for the mother and baby we affect not only parent bonding and breastfeeding, we affect infectious disease in the unit and we affect bilirubin. As we get closer to the correct answer, other problems will disappear.

DR. GARTNER: You said that there had been some negative commentary or criticism on the bonding concept, bonding work. You want to go into that little bit more?

DR. KLAUS: There is an implication in some of our early writings when we used the word critical that if the mother did not get the baby in the first hour all was lost. It suggested bonding was like an epoxy glue rather than a slow acting sticky substance. A number of the criticisms revolved around time in the first hour. A part of this I can blame on the AMA suggesting that after you dry the baby, and the baby was warm, the mother should have 10 minutes of bonding. We didn't have anything to do with that. We weren't at the meeting. It just appeared from the AMA. So we can't be blamed for that. We can be blamed for the use of the word critical which we changed in all our writing after that. The criticism had to with this other group of studies which were unable to show the same findings that we did, when they gave 5 minutes. But that was before we knew anything about infant abandonment, anything about the studies when you give sensitive care to the mother during labor. We gave a full-dress answer in the *Journal of Pediatrics* and *Pediatrics.* But I want to describe for a moment the historical background for the doula.

DR. GARTNER: Okay.

DR. KLAUS: What happened was one of our students in the first group was named Wendy Fried. I had known her as a little girl. She had gotten into the Western Reserve Medical School. She had not started medical school. She is a very warm and caring person. Some 25 years later she is a terribly skilled psychiatrist in Seattle. She did not follow our instructions about admission to the study. Our instructions were to sign up mothers to the bonding studies at 2 cm dilatation when they were admitted, and then to leave the room. The mothers were laboring 5 mothers to a room. About every 10 minutes or 15 minutes a nurse would come by and listen with a stethoscope to the fetal heart. Nobody was with the mothers. Their family was not with them. When she admitted the patient for the bonding studies she felt it was necessary not to leave the mother alone. So she stayed with the first 10 mothers she admitted after she joined this study. Even though we had told her that she was not to stay with the mother. When we found out we were very upset, John and I, because there goes 10 mothers. We had a couple hundred mothers and 10 is at least 5% of those mothers. Before we got too angry, thank goodness, we looked at the charts.

The last time any change had occurred in this maternity unit was in 1940. They had 1 delivery room and everything was focused on cleaning the delivery room between patients. They were delivering 55 patients and they had only 1 room so they were mainly washing this delivery room down over and over again. They were not around. They wanted to make sure every

delivery occurred in the delivery room. Three of the 10 mothers Wendy stayed with delivered in bed. After the delivery in these 3 mothers milk spurted from their breasts. We had never seen this. The labors were very short. Then we said we've got to study this later. But Wendy, you've got to go back to leaving the room. This is how we discovered the doula. So it was really serendipity with Wendy Fried not following instructions. She is I believe pregnant now and she is going to get her own doula.

DR. GARTNER: Now what year was that?

DR. KLAUS: **1975. Roberto Sosa did the study. He was still in Guatemala. He was in charge of that study as a fellow. The first study was published in the *New England Journal of Medicine*, we liked that publication. There are now 15 publications, all randomized trials. Where is this study? Sosa, Kennell, Klaus, [Steven S.] Robertson, and Juan Urrutia. [Sosa R, Kennell J, Klaus M, Robertson S, Urrutia J. The effect of a supportive companion on perinatal problems, length of labor, and mother-infant interaction. *N Engl J Med.* 1980;303:597-600.] Urrutia is an INCAP man. He was a fantastic infectious disease person who worked with us on the project. Steve Robertson was our statistician. I think this was a very important study. The Canadian obstetrician society wrote and recommended that with the data now available all mothers should have a continuous caring woman along with the husband. This is supported by recommendation by the Cochrane database; and evidence there are no risks and many benefits including a significantly reduced section rate, shortened length of labor, and reduction in forceps. They point out that this means making many changes in obstetrical care practices on the floor. I actually am sending a letter Monday to the perinatal community hopeful this will become a general recommendation in United States.**

The second part of this is that it appears that 2 months later these mothers are different. So there are maternal benefits, then as you change the mother you get benefits to the infant. So the Academy of Pediatrics portion of this committee should recommend this simply because of more breastfeeding as an example. Breastfeeding is 52% compared to 29% in one of the studies. So this is a pediatric reason to have a doula. Now about this time Phyllis joined our group. It is 1982. Phyllis why don't you come in?

DR. GARTNER: Were you married by then?

DR. KLAUS: We married in 1982. We have been married for about 18, yes, 18 years. Eighteen years Sunday.

DR. GARTNER: Happy Anniversary.

DR. KLAUS: I have a film. We made a film in 1976 and we made a film last year. Would you like copies of the films for the record?

DR. GARTNER: Oh, yes. Is it a videotape?

DR. KLAUS: It is a videotape.

DR. GARTNER: We would love to have them for the records.

DR. KLAUS: I can give you one of the videotapes. I have to make a copy of it.

DR. GARTNER: Okay.

DR. KLAUS: I have only one copy.

DR. GARTNER: Yes, please send them.

DR. KLAUS: Yes.

DR. GARTNER: Yes, we would love to have those. It will be very nice to accompany the oral history. In fact, any of the tapes that you have, that you either can make a copy or spare, I know the Academy would like to have in the archive.

DR. KLAUS: I actually have the big tapes. I have the original tapes that John and I made. That you know. That you saw in the death tape and those others. They actually were made on film and then we had to take them from the film to make videos. So we have 16 mm films. I don't know if you want to lug all those back. You have to think about that. Maybe I can try to get you a video copy of that.

DR. GARTNER: Either that or if you actually want to have a permanent archive of that material I know the academy archive would be very happy to have them and store them carefully.

DR. KLAUS: I think I would. They are at Children's Hospital [University Hospitals Rainbow Babies & Children's Hospital] and I think they would be safer at the Academy. That's a very good idea for these papers.

DR. GARTNER: We have [a] professional archivist there. He catalogs everything and everything gets stored carefully.

DR. KLAUS: It would be very interesting to look at those tapes a 100 years from now and see how we were taking care of mothers and babies.

DR. GARTNER: Oh yes. When I came to the University of Chicago we discovered 16 mm movies that [Joseph Bolivar] DeLee made back in the early period of the twentieth century. We thought they were all going to be in pieces and destroyed. It turns out that they were all fine.

DR. KLAUS: I think we better make an arrangement to ship them by UPS if you give me the address.

DR. GARTNER: I will give you the address and arrange to ship them. I'll tell John [John Zwicky] to look for them.

DR. KLAUS: You'll give me the address. Right now I will give you a little take home package that you can take with you.

DR. GARTNER: I will take some home. That would be great.

DR. KLAUS: Phyllis and I actually wrote together a book that really began with Maureen Hack. Maureen Hack was a fellow. She had come from Israel and South Africa. She is a terribly talented pediatrician. She was very much like Al. I think the English trained and South African trained pediatrician is a little cut above where we end up at the end of the residency. When John Kennell and I began to work together we had one of the most elegant teachers in Robert Fantz [Robert L. Fantz] as we moved more and more into behavior. Robert Fantz was close to Harry Harlow [Harry Frederick Harlow] in respect by most of the psychologists. He had studied vision in the chicken. In papers in 1962 and 1964. just as we were beginning to enter this area, he determined very clearly that human infants could see. They liked sharp edges. They liked circles more than squares. He and his colleagues went through systematically. All of this is published in one science paper after another. We would see Robert Fantz once a week for about 4 or 5 hours. We would go over all sorts of technical issues with our studies. We also had Barbara Korsch [Barbara M. Korsch] as an advisor, a distant advisor. Robert Fantz was our advisor. Erna Furman was an advisor in psychoanalytic theory related to death. So we had a number of very talented behaviorists. We also hired from Cornell two of their outstanding graduates. First Mary Anne Trause who had gotten a PhD. So we already had a built in behavioral statistician. The peak experience occurred for 6-8 years when we had Steve Robertson [Steven S. Robertson]. Steve Robertson was an engineer and had graduated from Cornell with a PhD. Now he is professor and head of the child development department back at Cornell. He worked for us maybe for 9 years. We had advisors during this whole rough period that I want to thank. They kept us pretty straight.

When Phyllis and I were married we took on a task that I absolutely enjoyed immensely. Maybe Phyllis we can get the books. They are back there in the bedroom. Let me get 3 books to show you.

DR. GARTNER: Having a good collection of books around here is very nice.

DR. KLAUS: This is actually still a good book. [Klaus MH, Klaus PH. *The Amazing Newborn.* Reading, PA: Addison Wesley; 1985.] Pick this up and look at the critical comments--we used the critical comments.

DR. GARTNER: In this?

DR. KLAUS: Yes. In the first book look at the comment and look at the critical comments. Yes, critical comment are in the first book. When we first got married I have to tell you this was an act of love. We went up to northern Michigan and began to write this book. We took the film from 1976. [We] took the pictures off the film. We wrote this book which we should have written earlier. This has actually been a hobby. It is true that I have been very interested in infants. But I would like to state clearly here that John Kennell and I did not do any studies on infants. Neither did Phyllis. We were very interested in the mother. But I was so intrigued with the idea that I had never seen any of these observations [in print]. I have never made any of these observations myself. I wanted pediatricians really to know about these. I think that this is a deficit. That a large number of pediatricians are not aware of what is available in the infant.

Maybe I can show you for just a minute a few shots I have of this film here. Later I can show you that film. Babies will reach out. Here is the baby is reaching out. Picture by picture and he reaches out to what he is looking at, which is the mother's nose. This is a newborn baby. Babies are terribly talented. If pediatricians were fully aware of this they would never leave the baby in the newborn nursery all alone without its mother. They'd put the baby right in the same bed. I don't think the baby should be in a separate bed. I think that it should be right in the mother's bed. I feel very strongly about that.

DR. GARTNER: We, of course, know all about the controversy over this issue of a shared bed.

DR. KLAUS: Oh yes. We had followed that with great interest. Let's take that up in a short time. That's a very important question. The reason that this book was so pleasurable is that Phyllis began to practice at Michigan State [University]. She practiced in our house. We'd get up at 6:30 in the morning and we'd try to write. I got the idea from hearing about Hemingway. We tried to write 2 paragraphs. Let's see if we can write 2 paragraphs. Well sometimes we'd write 2 pages. We'd get up and before breakfast we would walk around the block. I carried a piece of paper. Say we were just writing on motion--babies' movement. There is a whole chapter on movement. So I would write that we are going to write about Robertson's

[Steve Robertson] studies of movements. Then Phyllis also had some good ideas. What do you want to talk about now Phyllis? You're a part of this. What are you thinking about? Go ahead.

MRS KLAUS: It was an exciting and very creative time because from our 2 different perspectives we would then brainstorm ideas, certainly based on the research, but also our own experience. I think that the walking and talking was really generating a lot of thinking. Ideas that we would then go back and put into some form that was readable. I think that was an exciting time.

DR. KLAUS: I want to say that Phyllis gave us the idea that if you walk you are mainly using your right brain and you get all the ideas. We would write just a line. We would do our best to do the best sentence we could, in the right order. My brother helped me with writing. He said, "You've got to have a good outline." So before we did any chapter we would just work on the outline. We'd get the best outline of the chapter. We would spend a lot of time on every word before breakfast, sometimes after breakfast. Then I would leave Phyllis. But her day was not all filled with patients. She would take this manuscript and I'd come home at 6 or 7 o'clock and it was wonderful. She had picked out all the better words. So that best passages in this book are hers. I maybe can find a sentence she wrote just to show you.

MRS. KLAUS: I think what was so exciting was when I had seen Marshall's 1976 films I showed them to high school children who really knew nothing about babies. They were often in the situation [of having babies] some of them. I had pregnant teens and so on. They were absolutely enthralled with what they saw. How the baby could see. How the baby could respond. It was so moving. I actually borrowed the film from Case Western Reserve and I showed it maybe 20 times to the same class. They kept wanting to see it. So when I hooked up with Marshall it really struck me. In those days it was common to have videos available for people. It struck me that we needed to have a book that people could really savor. Using pictures as a focus because pictures can say so much. Another factor for me was that in much of our training early on we very much saw the infant as a reflexive organism. What was so powerful was to begin to see the responsivity, the interaction, the emotional attunement that was taking place. That was a whole other dimension of this little human being right from birth. That's what Marshall had seen and what we were trying to portray even in the writing. That was an exciting time.

DR. KLAUS: The other part of this that made it so exciting was that nobody knew this in internship, residency, or anytime. This is a sentence that I know Phyllis worked on. These are two paragraphs. By recognizing the different states and realizing when they occur and what the expected

responses are in each, parents not only can get to know their infant, but also can provide most sensitively for her needs. For instance, when a baby is whimpering lightly and stirring in active sleep, a parent who is aware that this occurs in thirty-minute cycles will not rush to feed or change the baby unless this gentle activity turns into the active awake state and crying starts.

With their brilliant observation, they will have allowed us to perceive order in what formally seemed to be random behavior. Once we understand and recognize the six patterns of newborn behavior the mysterious shifting involved of these new young ones began to make much more sense. I am sure that Phyllis did those 2 paragraphs.

DR. GARTNER: At this time you were chairing the Department [of Pediatrics and Human Development (College of Human Medicine)] at Michigan State?

DR. KLAUS: Yes.

DR. GARTNER: And what year was this book?

DR. KLAUS: In 1982 and I came out of here in 1987. So this was the first book. Phyllis began to be acquainted with John Kennell. We began to concern ourselves with trying to write a book about the doula. Phyllis, John, Peggy, and I would meet up in northern Michigan. In a city called Frankfurt, in a old resort. In a little hotel that had very narrow beds. They served wonderful food. They had a lake. We would go up there for weekends. We started working up there on the book *Mothering the Mother*. [Klaus MH, Kennell JH, Klaus PH. *Mothering the Mother: how a doula can help you have a shorter, easier, and healthier birth.* Reading, MA: Addison Wesley, 1993.] This was published in 1985. This was on the doula. John joined us in this book. We were 3 people writing on "how a doula can help you have a shorter, easier, and healthier birth." In the bonding study books we had Jay [S.] Rosenblatt help us. He is an animal behaviorist so did the whole chapter on animal behavior. Roberta [A.] Ballard helped us about childbirth. She ran the childbirth unit at Mt Zion Hospital. We had a lot of help from other people to make sure that the work was reasonable.

In this book we try to show a number of issues that are not clear to everyone and that's the sensitive period. In other words, the more you mother the mother, the more she is able to care for her baby in a more sensitive, caring way. If you go back in history to the care of the mother before they moved into hospital, all mothers had women in the community who never left them. The mother was never left alone. They were always skilled women [around]. When we went back in history and in other societies. In 127 out of 128 cultures there were women with the mother, who were not midwives, that

gave her support. The more we looked we found that we were not the first person to come up with this idea. There were statistical evidences of differences in behavior, and in obstetrical outcomes, and improved maternal behavior towards the baby. This had been accomplished many, many times by an enormous number of non-industrialized, agricultural communities that realized that it was important to have a woman with the mother. It is very unusual in other societies, primarily one society where there is data. There are 189 cultures that everybody agrees are non-Western. They are agricultural, non-industrial, or hunting and gathering. It's an impressive number to only find one society without this practice. It is unusual.

DR. GARTNER: What do they call them, what is the translation of what they call them in other cultures?

MRS. KLAUS: The traditional midwife is a dias in Egypt. That is the word that is often used. The whole concept here is that the midwife herself often wants the support of another woman. They would be mother or the mother-in-law or sisters. Often somebody who had much experience in childbirth. I interviewed a group of 9 dias in Egypt. These were wonderful women who maybe delivered 7 or 8 babies a night they are so busy. But they would show how the women would surround the mother and sing with her, and chat with her, and help her into different positions. She would never be left alone. She would be totally supported and they absolutely recognize the importance of this. But of course this is true in many countries. We isolated women which was a mistake.

DR. GARTNER: Actually isolated babies.

DR. KLAUS: Yes. In order to bring back this tradition it should be noted, and most physicians don't know this, that midwives were more successful in 1918 and 1919 than obstetricians. In the Baltimore meeting of the obstetrical society and in [meetings in] Philadelphia obstetricians are stating clearly that unless we improve our care and become at least as good as the midwife we are going lose out here. Not only does the doula hold the mother but she also teaches the mother different positions. For example, the posterior position we were talking of, with complicated Scanzoni maneuver to remove the baby. With most midwives it is well known that if you have a posterior position and you get on your hands and knees. in about 10 or 15 minutes the baby will rotate by himself. In this book *Mothering The Mother* we put in a lot of different pictures. Here is actually a picture of a physician in labor with a doula.

Right now they are part of a study with in Sweden with the pharmacologist and physician. The study is going on in Stockholm, Sweden at Stockholm South Hospital. They are using the doula. They have hired some doulas and they are looking at the mechanism of action. She believes that there is a

great deal of touching, holding, and massage. This is inducing an oxytocin surge. Oxytocin when you put it into the spinal fluid will significantly raise the pain threshold. Raises the pain threshold; makes the mother slightly sleepy; significantly euphoric; and develops a closeness between the mother and the doula become very close and the mother speaks about the doula as a unique individual in her life. The doula also develops a closeness. What Kerstin Uvnas Moberg is doing is measuring oxytocin levels, estrogen levels, and also adrenalin and nor-adrenalin levels to see if we can pinpoint what might be changing with the presence of a doula. So we continue to try and understand this process.

DR. GARTNER: Do you see the doula's role in continuing after the birth of the baby?

DR. KLAUS: For short time. In adolescent mothers I would think that it might be good to continue it for 6 weeks. There is beautiful work at the University of Chicago. Also in Michigan some of Selma Fraiberg's work in Upper Michigan where they had a doula-like woman with young mothers during early pregnancy. They got marked reduction in repeat pregnancies, mothers having repeat babies. The abuse apparently went way down but there is no controlled trial. Phyllis, you are close to this. What do you think of the position of the doula after birth?

MRS. KLAUS: We are aware that a woman needs support after the birth as well. There is a strong movement now in this country for developing what is called the postpartum doula. The studies have all been on the labor doula and the effect both obstetrically and on breastfeeding. I think the major effect is the psychological effect. We named our book *Mothering the Mother.* I just want to refer to that because we also feel that this support is in a sense internalized in the new mother. She begins to feel that nurturing that is occurring for her. It opens that part herself that then becomes more able to nurture her baby. So I look at it as a sort of a cascade effect. If she has had difficult mothering or difficulty in her life, it often helps her to be re-mothered in some way. That she feels better about herself. She feels valued. She feels important. This does have an effect on how she feels about herself as a mother. However, so many of our young families are totally isolated. The dad can stay home for 5 days or a week and then the women are often left on their own. So all of us have been concerned, I'm sure you and others, about the postpartum period.

DR. GARTNER: Right.

MRS. KLAUS: So this group of women throughout the country have been training lay women to be postpartum doulas. Not to become medical people at all but simply be a support at home. To make sure that the mother/baby dyad is working well. To know how to refer if they see there is

problem. To come in and do even some housework. It may be to tend the other children so that this new mother and baby really have some rest time. That they feel that they are not alone. Women will say, just as they did through labor, "We could not have done it without her." It is like, "Oh, the angel has arrived today. I can't wait. I m so tired." You know, all of the things that go on after birth. So this role of support, and that is what we are talking about, emotional and physical support, is present. And often [it is] somewhat practical support. Certainly in that period practical support is important also.

DR. GARTNER: Thank you.

DR. KLAUS: John and I had to split up. That was a big separation. It was actually a bigger separation than I had with John Clements or the other people I had to leave because we worked so closely together. The last paper I think we did in '91 or '92.

We do write together. In '95 Phyllis, John, and I went up to Seattle to--which island?

MRS. KLAUS: Salt Spring Island. You and I were working for many, many years and then he joined us.

DR. KLAUS: We each wrote chapters. Then we gathered together on Salt Spring Island…

MRS. KLAUS: And kind of completed…

DR. KLAUS: a more up-to-date bonding book with all the studies that had been going on. [Klaus MH, Kennell JH, Klaus PH. *Bonding: Building the Foundations of Secure Attachment and Independence.* Reading, MA: Addison Wesley; 1995.] Again, we have pictures. I'll just show you one set of pictures where the baby is going skin-to–skin. This is a preemie showing different kangaroo positioning. These are pictures coming from Argentina, from my old colleagues there, and then from Sweden. We obtained these nice pictures from Sweden showing the crawling of the baby.

DR. GARTNER: Oh, is that from [Lennart] Righard?

DR. KLAUS: Yes. Here's a picture. There are 4 pictures from Righard that we were able to include.

MRS. KLAUS: We always wanted to make sure that our doulas know about breastfeeding. [That they] understand how to help the mother to be sensitive to this, and to be a support. Their support during the postpartum period has often made the difference for many women to feel relaxed enough

to have good breastfeeding experience. In this whole period that we're talking about the support is so important.

DR. KLAUS: This is the fourth bonding [publication] that we wrote, for the first time without commentary by other people. Then Phyllis and I became again interested in the amazing newborn and persuaded J & J [Johnson & Johnson]to put up money for the film. We have a new film called *The Amazing Talents of the Newborn*. [*Amazing Talents of the Newborn.* [Clifton, NJ]: Johnson & Johnson Pediatric Institute; 1998.] It necessitated a new book and we replaced the other amazing book. [Klaus MH, Klaus PH. *Your Amazing Newborn.* Reading, MA: Perseus Books; 1998.] This is more of a hobby. I wanted to show you 2 things that we are so proud of. We have almost a 110 new pictures in this book. We added several chapters. I just want to show you in slow motion the crawl. Instead of seeing it in about 20 seconds, here's what a baby does. We actually have 15 pictures over 45 minutes as the baby sort of slowly makes his way. It's very important to see it in single pictures. We imported a photographer from New York City who actually stayed in our house for a month. We have 16 families in this area. The other is the grandfather chapter which is quite unique. The photographer caught this. She saw something going on and I didn't see anything. These are 15 pictures taken in 30 seconds. So there is a picture here every 2 seconds. I don't know if you've seen these before.

DR. GARTNER: I haven't seen these.

DR. KLAUS: This is the interaction. You want to show him Phyllis?

MRS. KLAUS: Yes.

DR. KLAUS: What we put together [is] like a puzzle. It only fits when you put it in numbered order. Each picture has a number you see.

DR. GARTNER: Right.

MRS. KLAUS: All of these interactions, of course, are when the baby is in the quiet awake state. So that's what is important to know. They are resting on a on the bed. The baby becomes very interested in his grandfather. As we write this obviously there is a playful interaction where they look eye-to-eye. As the grandfather begins to smile, the baby notices his smile. The grandfather kind of opens his mouth and then the baby opens his mouth. This little imitation is going on but it's a response, it' not just a reflex. He's taking it in. The grandfather has a great deal of fun with that. He is delighted. The little baby is again looking eye-to-eye. He is also delighted here. But then, this is what is so interesting, and it happened many times with these babies, he began to reach for the grandfather's mouth.

DR. KLAUS: **While the game is being played.**

MRS. KLAUS: **The grandfather continues to play. He opened his mouth wider because he is sort of astonished. And look at that baby. That little baby with great energy follows and opens his mouth wider. He is just totally delighted. This is a little over a week old baby. They are taking wonderful delight in each other. He throws his head back and opens his mouth and so on. Now the grandfather is so interested he raises his eyebrows. The baby follows with his eyebrows. It's so much fun. It's these minute little interactions of responsiveness that they are taking up in an emotional level. Now grandfather puckers his lips. It is all sort of natural. The baby focuses on his mouth and begins to pucker his lips. Now they are both so pleased. Here the baby quiets down. This is terribly important. With all newborns we tried to help parents to see that the baby can only give so much energy to this and needs to have that space to quiet down and not be prodded to continue. The grandfather is very sensitive to this. He paces himself to the baby allowing the newborn, little Jordan, to turn away. This is so important. We try to emphasize this. They need a rest period.**

DR. GARTNER: That's wonderful. I feel you are quite incredible.

DR. KLAUS: **So, here's the film. This you can take home with you. Or do you have that?**

DR. GARTNER: I may have this. Is this is the one where 1,000 copies went to the academy?

DR. KLAUS: **Yes.**

DR. GARTNER: Then they have it also. But I wouldn't mind having another one.

DR. KLAUS: **Okay.**

DR. GARTNER: Thank you.

DR. KLAUS: **Sure.**

DR. GARTNER: Great.

DR. KLAUS: **It might be nice to think about the Academy having these books in their archive.**

DR. GARTNER: Oh, they would love to have the books. I don't know whether they bought them for the library there or not but archive copies would be good.

DR. KLAUS: Because these are books that I really made for pediatricians.

DR. GARTNER: Really?

DR. KLAUS: It mainly went out to parents, nurses, and child psychologists. It didn't go out to pediatricians.

DR. GARTNER: I was going to ask you who you wrote these for. Because in some ways they are written for parents and yet certain pediatricians should be reading them.

DR. KLAUS: I thought that the pediatricians would get an enormous amount out of these books, and especially these 2 on bonding.

DR. GARTNER: Do you have any idea whether pediatricians are reading them?

DR. KLAUS: Small numbers.

MRS. KLAUS: Child development people are interested.

DR. KLAUS: The 2 "amazing" books are different because they are a hobby. It's not our basic research. The basic research is the bonding and mothering the mother. Though we're interested in the mother's side of the interaction, we are [also] interested in the other aspect. That as you understand the process, you have to bring this dyad together. You have to bring the mother and baby together. It might have a profound effect on society. You know right now in the Ainsworth Strange Situation. About 65% of the normal babies in our country are securely attached. The question is, "Will they be securely attached if the care was altered? Would a higher percentage of these babies become securely attached?"

There is in the literature a fantastically interesting observation by a woman, Anisfeld [Elizabeth Anisfeld] [Anisfeld E, Casper V, Nozyce M, Cunningham N. Does infant carrying promote attachment? An experimental study of the effects of increased physical contact on the development of attachment. *Child Dev.* 1990;61:1617-1627.] at Columbia, who gave half of the mothers, randomly, a snuggly to carry the baby face to face [on the chest]. The control half got a plastic infant seat. She follows the mother for 3 months. They put a mileage meter in the snuggly. At 3 months the mothers who got the snuggly have walked a long distance with these babies. The mothers are much more sensitive to the babies' needs. These are first-time, poor mothers who wanted to keep their baby. But at 13 months 83% of the snuggly

mothers are securely attached. In the control mothers who got the plastic infant seats the babies are 38% securely attached.

DR. GARTNER: I find it most disturbing to see people walking with these plastic things in the hall. I used to see it in the hall at the hospital all the time. I got so upset I often commented to Carol [Gartner] about it. I am not surprised. This is Liz Anisfeld?

DR. KLAUS: Right; a bright woman.

DR. GARTNER: She was a colleague of mine at Einstein [Albert Einstein College of Medicine].

DR. KLAUS: Oh! You know her.

DR. GARTNER: Oh yes. We did some work together.

DR. KLAUS: She is really a very impressive woman.

DR. GARTNER: Oh yes. She did a lot of good work. She was in the Kennedy Center at Einstein. [The Rose F. Kennedy University Center for Excellence in Developmental Disabilities]

DR. KLAUS: She is a pro.

DR. GARTNER: Yes.

DR. KLAUS: She actually had done another study on bonding which is one of the best. It was done in about '83 or '84. [Anisfeld E, Lipper E. Early contact, social support, and mother-infant bonding. *Pediatrics.* 1983;72:79-83.] She took mothers who wanted to keep their babies. Half of them got early contact. They were very different with their babies 3 or 4 months later. So she is one of the people who studied this area.

DR. GARTNER: Yes, she is very good. After you left Michigan State you then came out to California.

DR. KLAUS: I got an appointment at the University of California but I was at Oakland Children's Hospital [Children's Hospital and Research Center Oakland]. They have the largest collection in this area of children in hospital. They have a tremendous interest in their residency program. They have 400-500 applications from Americans. [They have] superb staff in general. They have a lot of connections in joint research with Cal and Stanford both. I became Director of Academic Medicine there. It was a little bit easier life. With Abe [Abraham Rudolph] we made this one of the teaching centers. It already was taking many Cal students but we did the

clerkship there. The students loved it at Children's Hospital. They are very caring of students. I spent a lot of time with medical students and also residents. It was a much easier job. [It] allowed me to write some of these books and stop worrying about everybody else and go back to research. So that's what I have been doing.

DR. GARTNER: Still affiliated there?

DR. KLAUS: In '93 or '94, at the age of around 66, I left Children's Hospital permanently. I spend about half of my time writing. I was asked to start a perinatal yearbook, *The Year book of Neonatal, Perinatal Medicine.* For ten years from 1987 to 1996 I did the year book of perinatal medicine with Av [Avroy Fanaroff]. He is a fantastic colleague who writes beautifully and reads thoroughly. Now I actually miss seeing all those papers every Tuesday, big pack of papers.

I am trying to do 2 things. To make the prenatal period much more appropriate to the biology and the physiology of both the mother and the infant, and it isn't now. So my goal in the coming years is to try to do that. The second thing is to see if we can change the system, say in Romania. Can we reduce the 40,000 infants that are abandoned each year by applying early contact suckling, rooming–in, and the doula? With Arthur Eidelman [Arthur I. Eidelman] we are just beginning to write our first grant proposal to get this started. We are continuing to work in Chile on doulas. Can we train the mother's mother in 5 hours to be a doula? Because doulas in some areas are hard to obtain. We just finished doing 400 mothers. I think it has been 400 mothers in Chile--Santiago, Chile.

DR. GARTNER: Four hundred mothers with the grandmother as the doula?

DR. KLAUS: Half with the grandmother and half with the control. The control is the grandmother without training. So we have 2 or 3 studies going on. There are so many things new with the doula we have to update that book. We did that with 5 studies. Now we have 15. We have new studies relating to the improved parenting 2 months later. So it becomes much stronger that our country should have our mothers given much more support during the labor by another woman. Now this woman could be the midwife. It could be the nurse, one-to-one. The other point is that I would very much like to see pediatricians become aware of these important areas because they all fit together. As you support the mother more, you are going to get more breastfeeding. As you get more breastfeeding, you are going to get less infection. So it all fits together like a wonderful puzzle.

DR. GARTNER: It does. Well, let me ask you some questions that are a little bit more general about neonatology. You have mentioned the importance of the pulmonary developmental issues and surfactant. Clearly those are very

important. Certainly the early attachment/bonding issues and parenting issues are important. What other areas have really been major research advances in neonatology going back to the 50s, 60s, and 70s? What have been in your view the major research advances?

DR. KLAUS: Well, I think that [we have] a much better understanding of each area of your body. Now we are beginning to understand the kidneys develop very quickly, very early.

DR. GARTNER: Right.

DR. KLAUS: There was a lot of work in your own unit and Albert Einstein on the kidney. So the kidney certainly. The GI was much later. But the GI has caught up remarkably with investigators all over the world making real contributions first through animal work and then through very specific feeding studies. These feeding studies actually started very, very early. There has been a constant number of feeding studies going on for a long, long period, from early pediatrics, as to what should be fed to the small baby. So as you are going throughout the body if you think about the heart, the heart came in rather late. Came in again through your university. So much in the studies of Rudolph and all the cardiologists in the country collaborating on diagnostic techniques. Here technology really advanced the whole field so that catheterization is not as necessary in so many conditions with all the new technologies available. I think that the brain has lagged. I think that we have been slow to think of techniques especially with how to handle asphyxia conditions. I think we are just starting to have some inkling that slight cooling after delivery to babies who have been asphyxiated might improve the outcome of the babies.

I have been very self-centered in my discussions because all sorts of people have been working throughout this whole period on better care, the neurologic situations and the behavioral situations. Berry Brazelton is probably one of the most outstanding workers but we spoke earlier of a number of people who work in behavior. There is actually a whole new generation of people just devoted to the preemie's development, probably the result of BPD [bronchopulmonary dysplasia]. All of the problems everybody has with bronchopulmonary dysplasia. One of the saddest things at Stanford was that after we had a big respiratory program, a number of these babies developed the first cases of BPD. I remember the radiologist we sent all those x-rays to became famous because of the diseases we produced with too much oxygen, too many respirators.

So it's a very good question you asked. It reminds me of horses. In the amusement parks there used to be an old ride. There would be 6 to 8 horses. One horse would go ahead, and then another horse. If you were in the lead at the end you got to stay another round. I think that these fields have often

gone dependent on 1 person or 2 people thinking of not just the technology but clever ways of approaching the problem. I think of people, here again mentioning Abe Rudolph. A number of people who have taken certain situations. I do think that we are terribly excited about the advances that might be made in genetics. I think we may have some problems once we know a part of the puzzle, how do we change the outcome. How are we going to change the genetic pattern in so many cells to make a change, say in cystic fibrosis? We can't get the genes in. We are sort of stuck at the moment unless we know how to get the genes in.

DR. GARTNER: That will break through one day, somebody will figure out the technology for that.

DR. KLAUS: Yes.

DR. GARTNER: What about the translation of basic research into clinical application? That's one of the things you were just mentioning in a sense. We understand a lot about the genetic mechanisms. Yet we haven't yet translated that into clinical application. But there have been translations of basic science in to clinical applications. Where do you think that the major changes were over the last 30 years, 40 years?

DR. KLAUS: I am just thinking of the neglected ones and the biggest neglected one is the social. I think that we don't understand why social status has such an important role to play in the incidence of prematurity. We have to somehow understand how to apply and improve the economic and social care for our mothers early on. That probably will net us the biggest gains in the near future in reducing prematurity. You know at lunch you mentioned that we really haven't been able to budge the prematurity rates. We did as we improved social and economic status in this country. But a number of the schools of public health have pointed out that a large amount of the improvement is because of the improvement in our economy. I think that we have to approach this issue first and foremost.

DR. GARTNER: While we are talking about the economic issues in relation to prematurity, how do you feel about the economic issues with regard to neonatal intensive care. It has been a very expensive item and is it worth it? Should we be putting more money into neonatal intensive care? Have we put too much into neonatal intensive care? Is a million dollars for a small preemie justified?

DR. KLAUS: You know, I live very close to Oregon where the health programs have numbers. Certain health issues, such as trying to produce a new baby, has a low status compared to immunization. So a lot of money is going into immunization. I wonder if it's really right if you have a baby between 500 and 600 grams to blithely go ahead and care for this baby when we have such a high percentage of babies from that group who continue to be

damaged. We are not improving in that area. I would say that I think that the parents, who in the end are going to have to take care of this baby, should make the final decision. I think that they shouldn't be criticized if they decide to let the baby die. This is specifically between 500 and 750 because I think that's where we are losing. That's where I think we are spending money without understanding the full issue. The parents are left out of being able to turn the respirator off. So I would say that this is the area that we have to have more flexibility. It's a very complicated social, ethical issue that I would like to get into. We've taken on much more difficult issues. So I think this is the time where a society is able to approach this problem. If you talk about after it is 800 grams I think it becomes a different question. I don't think we should resuscitate babies under 500 grams. There gestational age is 22 weeks or something like that.

DR. GARTNER: Are you saying there is a lower limit in gestational age and birth date beyond which we are not going to be able to push the frontier?

DR. KLAUS: Well, that I don't know. I just don't know. I think when we try to make that decision in the nursery, we are treading on other people's property. That property is their personal life. Because if the baby doesn't turn out right, I am not there, none of the neonatologists are there to take care of that baby. That's the father and mother who will struggle their whole lives and we know that could be devastating to many, many precarious families. So I am very leery and I think that we are being cruel to many families by not giving them the choice. I stand by Silverman in giving families much more choice in this area. In several of the nurseries that I have been in the problem is actually the opposite. The families know that that baby is hydrocephalic and they would like to continue.

DR. GARTNER: A sad experience.

DR. KLAUS: You know this baby is not going to live. There is no brain. Yet the family wants to continue. At the hospital that I have been working at they tell me that the problem was actually the opposite. They wanted babies who had no future to live.

DR. GARTNER: We've had this numerous times and had to go to court.

DR. KLAUS: Right.

DR. GARTNER: The family would essentially not allow us to shut off the respiratory in a child which clearly had no hope. We got another month or so.

DR. KLAUS: You have a very thoughtful person in Chicago.

DR. GARTNER: John Lantos [John D. Lantos].

DR. KLAUS: Yes, and I think that the work he is doing is very important. It is difficult work. Maybe we should read him and Bill Silverman a bit more closely.

DR. GARTNER: I had an interesting experience many years ago when I was at Einstein. I had a preemie that wasn't a small preemie. [It] was a bigger preemie, but ended up with severe cerebral palsy and retardation; badly damaged baby. The mother brought the baby back to follow-up clinic regularly. I got to know her very well. We talked about what kind of a burden this was and so forth. She said something which made me sort of rethink the whole issue. She said that she saw this child as a gift to her. That her life had no meaning before. She is an inner city mother, very poor family, and said her life had no meaning until she had this child. Now she had someone to really care for, somebody who truly needed her. Some of the reluctance, or the refusal of parents to shut off respirators, even knowing what the outcome may be, whether short or long [may be due to this]. Perhaps we don't really fully understand what's going in this. We need to do more analysis.

MRS. KLAUS: These ethical issues and the psychological issues really intermingle here. Here is a woman during pregnancy that might have been able to be helped to understand who she is, what her needs are, and what she might be projecting onto a baby. Because in a sense needing a baby to take care of one's own needs is really not the healthiest way to approach a baby. That baby can never fulfill that mother's needs. That intermingles with her own psychology that hasn't been resolved, whatever pain she has in her life. But the second piece is that the science comes in at the same time giving false hope to parents. With all the incredible advancements we can save your baby, you know, for ever. We can do all of these wonderful things in the nursery. It's confusing because you can't do everything. So parents are caught in the different belief systems of the time. One belief system is we can do everything we can to save that baby and then when you can't, well but may be you can so we better join that idea. So you know parents are also caught up in the message they have been given that we have these means to make life prolonged. At the same time you had the psychology of this particular woman which is not uncommon for people who have a background of very little or other hurts in their lives. These are difficult issues. I don't have the answer. I think that when we look at it, we separate out where is it really coming from. So it isn't mothers and fathers are saying, "Well we must keep this baby alive." Where did they get that idea that a 500 gm baby could, should stay alive? You know they got that from somewhere. Fifty years ago nobody would have ever thought of it or heard of it. They would have had to go through grief, mourning, and honor what they did have in that short life.

DR. GARTNER: Did we give it to them? Did we, as neonatologists?

DR. KLAUS: I think the newspapers and our enthusiasm gave them the idea. You know, I think that the society hasn't a clear idea that we can't heal all things that appear to be able to be healed. And that we are aging.

DR. GARTNER: But I think one of the sort of underlying philosophies of neonatologists is that there are no areas. That we can do it all. I mean, we may not be able to do it all today but tomorrow we'll be able to do it. Isn't that what neonatology is all about?

DR. KLAUS: And if you have a baby with a bad heart, you just get a new heart from another baby. There is no end to our abilities. We know better.

DR. GARTNER: Only as we get older. We touched on obstetricians, but we really didn't talk about the role of the obstetrician in relation the development of neonatology and the whole perinatal concept.

DR. KLAUS: It is interesting how the American neonatologists have become quite enthusiastic about the Cochrane database and the collection of data and assessment of what is proper care. It is surprising that we don't see more of this in American obstetrics, especially in reproductive physiology. There continues to be an enormous selection of procedures and techniques for slowly growing babies; for mothers who have lost one baby after another; for those who had one premature [baby] after another. We don't see the collection and materials that I know of going on way up in Vermont and the other places. I don't know, is there a center like that for obstetrical reproductive obstetricians?

DR. GARTNER: I really don't know. I don't have any answer.

DR. KLAUS: Because when I go around to obstetrical units I don't see the evidence-based practice thinking that I do in England and other parts of Canada. Canada has really grabbed a hold of evidence-based practice--family practice, pediatrics, and neonatology. A Canadian obstetrician said to me we ought to have doulas. We ought to have one-to-one midwives, one-to-one nurses, or we ought to have doulas with the mothers. They had gone ahead. The educational caregivers in our country are ahead of our obstetricians and many physicians in demanding a closer look at evidence-based practice and making a model of what they think obstetrics should be in this country.

MRS. KLAUS: I am working with women around their childbirth experience and many women are traumatized today. I just had a woman this week call me. The baby was born a week ago and she had a wonderful birth. We had practiced. She was able to do self-hypnosis so she had no pain. She

had a 9 pound baby, no episiotomy, no tear, first baby. Everything was well and she was so deeply into her experience. After the baby was born, they took the baby away for an hour. She was waiting for that baby to be on her chest. They said there was little meconium in the fluid but nothing wrong with the baby. The baby was fine. They didn't intubate the baby. They just said they wanted to watch it. Took that baby completely away. She never held that baby for over an hour. This whole week she has been having nightmares that somebody stole her baby. From having had a wonderful birth, nobody tuned-in to what she needed right then, which was, "I need my baby."

DR. KLAUS: **But she wrote that on a birth plan?**

MRS. KLAUS: **Wrote it on a birth plan. She had a doula. She had good people. She even heard them talking about what a great labor it was in the corner of the room. She was alone without her baby. People are just not tuning-in. Here she is traumatized. We are going to work with this. She will get over it. But she didn't need that.**

DR. GARTNER: Was that the obstetrician's fault? Or the neonatologist's? Nurse's?

MRS. KLAUS: **The belief that there was a little meconium and you better make sure. But the baby was fine. I spoke to the husband. He said the baby was fine but he felt intimidated to say, "Could she have the baby?" They were so well-educated and the system took over.**

DR. GARTNER: The power.

DR. KLAUS: **This is where we need the Baby Friendly Initiative. I think the way to get into this is to show the power of that intervention. There some very nice data from 1980 from Earl Siegel's unit and from O'Connor [Susan O'Connor] at Vanderbilt [Vanderbilt University Medical Center]. [Siegel E, Bauman KE, Schaefer ES, Saunders MM, Ingram DD. Hospital and home support during infancy: impact on maternal attachment, child abuse and neglect, and health care utilization. *Pediatrics.* 1980;66:183-190. and O'Connor S, Vietze P, Sherrod K, Sandler HM, Gerrity S, Altemeier WA. Mother-infant interaction and child development after rooming-in: comparison of high-risk and low-risk mothers. *Prev Hum Serv.* 1982;1:25-43.] There are 2 studies in which nearly 500 mothers had 12 to 15 extra hours of contact with the babies. In the O'Connor work it's 300 babies and it's not the first hour. It's 6 hours on day 1 and 6 hours on day 2. Then in the Earl Siegel work it is 200 mothers with an additional contact in the first hour of life, then 5 hours on days 1, 2, and 3. If you put both studies together there was a P equal to 054. There is a reduction in abuse in the next year to 17 months. Most all of the mothers were followed. So that sits alone. It was**

finished in 1980 in the same journal and has not been replicated. What we need are bigger numbers but my hunch is that we're producing some of the abuse because of our procedures and techniques like this with high risk mothers.

DR. GARTNER: What do you think obstetrics, anesthesia, epidurals, etc. are doing to maternal behavior, to infant behavior, to initial bonding?

DR. KLAUS: You know that if you give an epidural to a goat--I can be highly criticized for this--there is a reflex. When the cervix is dilated it turns on oxytocin in the goat and the sheep. If the goat mother doesn't feel this because she has had an epidural she is not interested in her babies. There are nice studies on this from Cambridge. A number, a large number, of lactation consultants tell me that 25% of the mothers who get an epidural, their babies open the mouth at the breast but then they don't suck properly for 1, 2, 3 days. Now what we are missing is we don't have that data today on milder amounts, a smaller dose of epidural. The only data that we have on breastfeeding goes back many years where the dose of the epidural was quite high. We don't have any strong randomized trials to back up the statements of the lactation consultants. We have to collect more information on the epidural. I think that it's surprising my colleagues, the anesthesiologists, haven't often come clean with first the problems with epidurals. The fact that the mother can have headaches afterwards and secondly there can be fever if it's an early epidural. If one has an epidural before 5 centimeters there is a good chance that there is an increased incidence of caesarian section. They don't really come clean [that] if you have a late epidural you are not going to increase the section rate. If you have the epidural say after 7, 8 centimeters, that's not going to be a problem. So I think we have to get our colleagues inline. There's a lot of material in the papers about the joy of epidural without any discussion of the downside.

DR. GARTNER: Right. What do you think is driving this enormous increase in epidurals? Certainly in our hospital 90% or better of the births are epidural assisted. What do you think is driving that? The mothers? Is it the newspapers? Is it the anesthesiologists? Is it economics?

DR. KLAUS: I think it's increasing the hospital income. It's increasing the anesthesiologist's income. I think they are fooling themselves but they know all the upside and downside of this situation. We don't know the full extent of problems but they certainly denied any effect on temperature for quite sometime, even though it is been known for 10 years. It is a situation that is quite complex.

DR. GARTNER: Let me turn to a different topic, the whole issue of education in neonatology. You've trained 35 fellows, obviously very successfully. How do you feel now about fellowships in neonatology? Are we

training too many? Should we be training as many clinical neonatologists? Do we need more training? What should the content of the fellowship program be? How do you feel about that? I'm sure you've given a lot of thought to this.

DR. KLAUS: That's a very good question. When we were training neonatologists it was just the beginning. We were very fortunate to get a large number of really talented candidates. So my focus in neonatology was to train researchers. Av [Avroy A. Fanaroff] and I did not want to take people who would not continue in research in a strong way. We felt that they should have at least 5 years of training and that the third, fourth and fifth years they would be assistant professors in our department. Because they needed 5 years to be able to successfully get a R01. They had to work for 5 years on a productive research area to catch-up with all the PhD's who were way ahead of them. I don't know if we need newborn intensive care people in all normal newborn nurseries. I don't know the answer to that. I know a lot of neonatologists are mainly doing a great deal of normal newborn work. I think we have to think that out because it's very expensive.

If we think about the needs of society and how to spend money, maybe it's better to have a trained neonatal intensive care nurse caring for these babies. I know that will not please pediatricians in the Academy but neonatal intensive care nurses are very skilled women. If the baby has a problem, they can handle it. They're more patient with mothers and are able to express to families maybe better than some neonatal intensive care people can. I know this is harsh, but there has to be more humanistic approaches in the whole system.

I would say the biggest change I see coming in intensive care units is that 10, 20 years from today we will become much more like Argentina, Ethiopia, and parts of Brazil where the mother will live-in and take care of her own premature baby. I do want to mention this. We don't have to do it in the fancy, expensive way that we're doing it now. I think that the mothers I saw inside a hospital in Argentina lived in a dormitory. They had family-style serving of breakfast, lunch, and supper. A large number of mothers don't have to have the plush surroundings of a $150, $200 room. They can live in a dormitory or in a McDonald House attached to the hospital at $5, $10 a day. So we have to think of where we have to give expensive care. Then we may get a lot more breastfeeding. And a mother who takes the baby home and knows every little bit of that baby. I would say the next big change that would occur here might be the development of another kind of hospitalization in all of the empty spaces in our big hospitals. That is to remodel them for some type of, not quite dormitory-style, but we might have 4 mothers to a room, not 10 or 20. We can think about serving cheap healthy foods family style so that there's no bringing out trays. The woman picks out what she'd like from 3, 4 big bowls.

DR. GARTNER: What do you think of Levin's [Adik Levin] concept of what he's doing in Estonia, that's along the same line?

DR. KLAUS: Well, that's a very good question. We have visited. I visited him about 8 years ago just before the Eastern Bloc was opened up. I was with a group of talented people who were speaking in Helsinki. There's a boat from Helsinki to Estonia which takes about 5 to 8 hours. I don't remember exactly the number of hours. We went over to see the situation there. I was amazed to see how mothers lived-in and cared for their preemies. Well, he has really modernized this a great deal with beautiful wooden beds. As soon as the babies are off the respirator the babies come down to what we know as intensive care watched by a group of nurses in a nursery. Within a day or so that baby will then go into a room with its mother, if it's stable. It's striking how quickly they move into that situation. I think he has something. I'd probably move a little bit slower, instead of 2 days I'd make it 4 or 5 days, to make sure they're really stable. But I think we haven't appreciated the power of the mother and all of the other parts of the mother to the baby's health. So I think he's leading the way in an interesting fashion.

DR. GARTNER: I think so also. [There are a] couple of other areas I just wanted to ask about. What about the role of women in neonatology and medicine in general? How has this evolved? More women are certainly involved in pediatrics. Are they entering into neonatology?

DR. KLAUS: I don't know. I know that Av had a large number of women. I think that you can be quite human as a male or female. I've seen terribly sensitive men and terribly sensitive women. I don't know if there are more of one than the other.

DR. GARTNER: I guess the other issue that has been touched on a little bit before has to do with the general pediatrician. We as neonatologists have essentially taken over so much of newborn care, not only neonatal intensive care, but even intermediate levels and in some places what would we call well-baby or general neonatal care. The general pediatrician has either been pushed out or walked away. How do you feel about that? What's happened there? Should we get the general pediatricians back into the nursery, into neonatal intensive care? What should their role be? How should we involve them? Should they be involved?

DR. KLAUS: I would think that both the family practitioner and the general pediatrician should be very closely tied to childbirth centers. The high risk obstetrics [units] for the little babies are not the ideal places to put family practitioners. In a very short time a family practitioner or a general pediatrician can become terribly skilled in caring for sick babies. The problem is 5 years later when he's only caring for 1 sick baby. They can

quickly, in a week or 2, become very skilled in the intubation and the immediate resuscitation. It's the long term. I would think that you'd want to have somebody always on the team night and day who can intubate. It's a small number of normal babies who are going to need it. These people will probably be much better at spending more time listening to the mother, having skills that we don't see in the intensivist. It's like the emergency room doctor who enjoys the emergency and the intensities. He enjoys the experience of very big changes in physiology. When I speak to family practitioners, they're generally enjoying the work with the family. They are very skilled with the family, putting the puzzle together, and seeing what normality is. I think that we shouldn't rid them of that. I think they should be attached to the childbirth unit. We could have one of the midwives always on the job who can intubate or something like that so they don't feel impotent when they're there.

DR. GARTNER: Right. So, so you feel that they should be involved.

DR. KLAUS: Last year I went to several family practitioner units. Family practice people receive a lot of training in behavioral medicine. Phyllis worked in the Department of Family Medicine at Michigan State. She taught all of them interviewing technique. Went and sat and watched them learn interviewing, and worked with them, so I know a bit about this. I talked to Jack Medalie and a number of other people about this. I think our pediatric people don't get enough experience in that area, especially in the clinic. I think we have to listen and watch our residents interview and talk to parents. We need people, psychologists working with them more closely.

DR. GARTNER: I think you've really answered a lot of this already but you've mentioned a number of people who are really pioneers and great contributors to neonatology. Are there any others that you haven't mentioned that you think were important contributors to the field, either through their research or through teaching?

DR. KLAUS: Oh, my golly, I think of Jack Rudolph [Arnold Jack Rudolph] in his work on skin and his great interest in the newborn. His colleague, Murdina Desmond [Murdina M. Desmond]. That was really quite a group. I think of the French school. There was a Frenchman who worked with Claudine Tison. What's his name? [It] began with an M, a good friend of, Norman Kretchmer. They had a whole school of good neonatology people especially focused on neurologic development. I think 2 women that stand out so much. The school of Millie Stahlman and, not only her, her group in Nashville. And the whole group of people in Sweden. I think Sweden has a unique group of neonatologists and researchers that far outstrips other countries. When I think of England I think of Reynolds [E. O. R. Reynolds]. That was the person I was trying to think of. He had a nursery with much better survival than anybody in the United States. Ann Stewart still works

with him. That was the unit. There were several outstanding temperature people, I'd have to go look up all the names. I think England had superb neonatologists, less so in Japan and South America. They weren't quite as involved. The Swiss were involved especially around, not Geneva, but around Prod'hom's group and [Emile] Gautier. There was one unique man who came to Bill Silverman's unit and went to Zurich.

DR. GARTNER: Gabriel Duc.

DR. KLAUS: Gabriel Duc stands out. There's a large group of people all around. In Lyons there were 2 great Frenchmen that I got to know. I can't quickly come up with their names. They appeared at all the meetings, research meetings and other meetings that we went to. So it's a big crew that contributed to all of this.

I haven't kept up in the last years with this. It's been a unique experience for me. I gained so much from being with a certain number of people. You know what I mean. Kenneth Cross was one sort of leader. John Clements was a very different person. Bill Wallace was a hero for me.

I think we haven't talked about the fluid and electrolyte people, the metabolic group. Their work doesn't apply so much because it applies to only a small group of, quite unique individual patients. Bob Schwartz [Robert A. Schwartz] ought to be mentioned in this whole story and all of the metabolic people who surround him. Cornblath [Marvin Cornblath] and Schwartz, When you think of Schwartz you think of Cornblath. They added a lot.

DR. GARTNER: Marv Cornblath was our son's pediatrician when we were in Baltimore. Marv was really my introduction to neonatology.

DR. KLAUS: Yes, well, he's a good man.

DR. GARTNER: He's wonderful.

DR. KLAUS: Where is he now?

DR. GARTNER: I don't know where he lives now.

DR. KLAUS: Did he retire and everything?

DR. GARTNER: I think so. Although he's still involved in some of the carbohydrates. There is a lot of revision of the recommendations on…

DR. KLAUS: Sugar?

DR. GARTNER: …on hypoglycemia. He's still in there reviewing the stuff.

DR. KLAUS: Is he at NIH?

DR. GARTNER: No. He's been out of institutional work. He was in practice for a while but I don't know that he still is.

DR. KLAUS: Where was he in practice? In Washington?

DR. GARTNER: I don't know. Somewhere in Maryland I thought, but I'm not sure.

DR. KLAUS: There are 2 people at NIH that deserve a lot of mention. The pharmacology team at NIH and NICHD [Eunice Kennedy Shriver National Institute of Child Health and Human Development]. What's her name? A nice French woman who used to be with Norm and the Buffalo pharmacologists.

DR. GARTNER: Oh, Sumner Yaffe [Sumner J. Yaffe].

DR. KLAUS: Sumner Yaffe and his associate. What's her name?

DR. GARTNER: Katz.

DR. KLAUS: Yes, she helped with one of my babies, my own babies, Charlotte Katz. Those 2 ought to be mentioned.

DR. GARTNER: Yes, they've contributed a great deal and funded a lot of research.

DR. KLAUS: I don't know who got the idea for these summit conferences. What do you call them? They're not summits.

DR. GARTNER: Oh, the Consensus Development Conferences [NIH Consensus Development Conference Program].

DR. KLAUS: Yes, that's it. They often arrive late though. I would have thought they should have gotten to betamethasone a little earlier.

DR. GARTNER: They wait until they think they have enough research to base it on.

DR. KLAUS: Those have added to pediatrics. It was good to fund these randomized trials in neonatology that they're funding. You know, the 8 units that do studies. That's a nice technique of gathering it together. It cost lots more though than the English spend on the same amount of work.

DR. GARTNER: That's true, but by putting it together you get your results a lot quicker.

DR. KLAUS: Yes.

DR. GARTNER: Larger numbers.

DR. KLAUS: That's a big addition.

DR. GARTNER: That's a good point. What do you see neonatology looking like 20 years from now? Just say it's 2020. What is it going to look like?

DR. KLAUS: I see that there are going to be mothers with the babies all the time. I think that there will be more neonatal intensive nurses who are taking the place of house staff. I think it's hard to train so many house staff. I think it's hard to train so much house staff without some complications in care. When I see these nurses care, they are so good. They can put catheters in the finest little tributaries. So I see very skilled nurses.

I see the units not looking so medical. When I went to Missouri I saw a unit that looked and felt like I was in somebody's upstairs bedroom on a rainy day in Cleveland, without the lights on. The unit was quiet. I looked and the babies' eyes were open [and] looking around. I think there will be fewer lights. I think it's going to be looking more home-like and less medical in a growing very small baby unit. You know what I mean? Mothers being with the babies. A lot more breastfeeding. We probably are going to spend a lot of money caring for these mothers but we don't have to. I think we can do it very cheaply. We've got to think of it differently because we are doing intensive care and the mothers don't have to be getting intensive care. They can be getting another kind of care and living in a Ronald McDonald unit which is quite nice. They can be very close. So I would think that every baby will have a mother there three quarters of the time.

DR. GARTNER: So, you're actually seeing a lower technology for the growers?

DR. KLAUS: For the growers it won't be all medical. We'll be turning off the lights at night. There are very interesting things happening when you turn the light off, especially a couple of weeks before delivery. There'll be much more thought about the brain development of these babies, and an understanding of the brain development. We might be turning babies down and off between 500 and 700 [grams]. I don't think we're going to be floating them in water.

DR. GARTNER: You don't have liquid ventilation in any event?

DR. KLAUS: I don't, no.

DR. GARTNER: I had great hopes for that at one point.

DR. KLAUS: Did you?

DR. GARTNER: It turns out not to work as well as I had hoped it would. I thought that was the answer to BPD. I think that it had too many of its own complications.

For the intensive care baby, for the really sick small baby, what do you see in the way of future technology, future management styles? Where is it going to go? Keep moving ahead with technology? Some work, some don't work. What do you think the future technology in neonatology is going to look like?

DR. KLAUS: Haven't thought a lot about it. I can't add anything.

DR. GARTNER: Okay. Good enough.

DR. KLAUS: It's so hard just to think about the family and the mother and the diet. I haven't gone in that direction.

DR. GARTNER: We've covered just about everything that I can think of. What advice would you give to a young pediatric resident in the second year? Something about his future. Would you advise him to become a neonatologist?

DR. KLAUS: He has to tell me what he wanted to do. I think he has to decide.

DR. GARTNER: But if he was interested in it, and he said, "Should I go?"

DR. KLAUS: Small babies?

DR. GARTNER: Small babies and sick babies, that sort of thing. Should I become a neonatologist? Is that a good choice? Is that a good future for me?

DR. KLAUS: I don't know. I don't think I'd want to.

DR. GARTNER: Well, that was my next question. Would you choose, if you were back in your days as a resident and were…

DR. KLAUS: Oh, my golly, what a tough question.

DR. GARTNER: Would you do it again?

DR. KLAUS: **What a tough question.**

DR. GARTNER: Well, what would you do?

DR. KLAUS: **Well, I don't know.**

DR. GARTNER: With all the experience and knowledge you have…

DR. KLAUS: **I have never thought about that. Have you ever thought about that? That's a hard question.**

DR. GARTNER: I have thought about it.

DR. KLAUS: **Oh, I haven't. Oh, that's not such an easy question.**

DR. GARTNER: No.

DR. KLAUS: **If I had a good arm I would be interested in obstetrics. The excitement to me would be in obstetrics. I would think about the delivering of the baby. That would have supposed that I would have a normal arm. With this arm I don't know what I'd do. I'd have to think more about it. I'd be very interested in just doing more research if I had to do it again.**

DR. GARTNER: Research in neonatology or behavior?

DR. KLAUS: **I don't know which 1 of the 2. It could be neonatology.**

DR. GARTNER: I gather you would not like to be a chairman again.

DR. KLAUS: **No, no, no. I mean no, I wouldn't say that.**

DR. GARTNER: What have we left out? Is there anything that you would like to add, bring in, that we didn't talk about? Anything critical?

DR. KLAUS: **I don't know. I think that it's a great group of people that we've been associated with over the years. I wonder about all the motivations as to why we became so interested in little babies. I thought of some wild ideas.**

DR. GARTNER: Like what?

DR. KLAUS: **Well, you know it's a way of controlling. It's a small organism. Do we pick this for reasons that are much more complex than we had ever thought about? Do you know what I mean?**

DR. GARTNER: Oh, I'm sure that's true.

DR. KLAUS: Are there many reasons that people that become neonatologists?

DR. GARTNER: I'm sure everyone has their own, their personal reasons now for choosing it. I'm not sure what the universal reason is.

DR. KLAUS: No. I'm very interested in changing the present practices. I don't know how easy it's going to be because they're going to look so different. We're going to get a lot of people balking on leaving the mother with the baby, you know Phyllis' situation. We're going to have difficulty getting another person into the maternity hospital. They're going to think that it's going to cost more bringing in another person.

DR. GARTNER: I'm sure that's going to be a major issue we can all expect. Unless you can show that you save money down the line.

DR. KLAUS: I can show that. Because if you calculate that you can cut the section rate in half, and this is what you can do--from the 20s down to 11 or 12 for every 100 babies. The quick way of thinking about it is if you just think about numbers in 100. If you drop it from 20 to 10, and each section costs you about $8,000, you save $80,000. But you have to buy doulas for 100 which would cost you $200 times 100 which is $20,000. At a cost of $20,000, you still save $60,000.

And you're going to have less epidurals, and less is effective if you can drop section rate. This is not in a Kaiser like operation. This is where an HMO [Health Maintenance Organization] is buying this from a hospital. You can save money.

DR. GARTNER: That's just in the perinatal period.

DR. KLAUS: Yes.

DR. GARTNER: As your research shows, there are savings that continue on beyond that--more breastfeeding, fewer infections, fewer hospitalizations, better learning and behavior on the part of the mother and the baby.

DR. KLAUS: And then [there is] the baby. I think the most exciting thing will be helping mothers in the society care for babies in an easier fashion. I think mothers are abandoned in our society. The mother-in-law and mother come each for a week, 10 days, and then mothers are left pretty much on their own. Then suddenly these women have to go back to work, so many of them have to go back to work. So maybe one of our new presidential candidates will change this a bit.

DR. GARTNER: Don't count on it. Anything else?

MRS. KLAUS: Oh, I think we should look around now at the picture over there, and the other objects and things that Marshall would like to show us.

DR. GARTNER: Okay. Would you like to show us, through the house and what things you have?

DR. KLAUS: We do have lots of mothers and babies. Let's see what you would like to see. This is a very special statue for us. This is a statue I believe from Thailand. I have to look this up in this book. A woman buys these statues and then she throws them into the river and the heads all break off. I can't even remember where I got that.

DR. GARTNER: So this is one that was thrown into the river?

DR. KLAUS: We recovered it. I have this in one of my books I liked it so much. We got very interested in all these. We saved photographs. All sorts of photographs, but this is in our book somewhere.

[tape stopped]

DR. GARTNER: Why do they destroy them?

DR. KLAUS: Don't know.

DR. GARTNER: Interesting.

DR. KLAUS: My guess is that the image of the baby is not the real baby. The real baby is not what they ever imagine. Here's another figure. This is a figure that was given to me, I think it's an Eskimo figure.

DR. GARTNER: That's what it looks like.

DR. KLAUS: I can't hold this very long. But we've been interested in mothers and babies. I saved different ones. I forgot where this comes from, but here's another nice mother and baby. They're not looking at each other, I guess. I have one here that I like. I'm especially interested where the mother and baby are looking at each other. Here's a more abstract one. It's really quite abstract. I'm interested in pregnancy--oh another abstract [figure]. Let me go back, I have to do something here. You know, I have to put all of these so they don't break in an earthquake.

DR. GARTNER: Yes, I did that for some of our things, not everything.

DR. KLAUS: Let me go back and put something on the table. I have a favorite on my dresser.

[tape stopped]

DR. GARTNER: This is from where in Russia?

DR. KLAUS: Russia, I don't know where in Russia. It almost looks like something from an Eskimo area, look at it.

DR. GARTNER: Quite interesting.

MRS. KLAUS: Ah, got it.

DR. GARTNER: Okay.

MRS. KLAUS: What's that?

DR. KLAUS: Looks like it might be almost Eskimo.

DR. GARTNER: Yes.

DR. KLAUS: Look at it close up.

[tape stopped]

The usual glasses and things. I just saw it in other people's houses. I didn't know what to do, you know, when I was a little boy. What to do with all my parents' things.

[tape stopped]

DR. GARTNER: Well, let me thank you very much Marshall, for taking all this time and all this enormous effort to share with us your history, your thoughts, and really very exciting work that you're still doing. We all appreciate what you've contributed so enormously to pediatrics and neonatology. Also express our thanks to Phyllis for also sharing in this and for joining in the taping. I want to thank Carol Gartner who has done the video photography and the still photography for the session.

DR. KLAUS: Oh, I have to say it's an honor to be recorded by you 2 very talented people--an English writer, and a talented professor of pediatrics. I was honored that you wanted to come and see all the craziness that I've gone through. Phyllis and I are delighted to have you here, so thank you both.

MRS. KLAUS: **We have enjoyed it very much.**

DR. GARTNER: Thank you.

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Curriculum Vitae

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Education:

Institution and Location	Degree	Year Conferred	Field of Study
Western Reserve University	B.S.	1947	
Western Reserve University	M.D.	1951	Medicine
Babies & Children's Hospital, Cleveland		1951-52	Intern Pediatrics
Babies & Children's Hospital, Cleveland		1952-54	Resident Pediatrics
Cardiovascular Research Inst., UCSF		1959-62	Physiology (Pulmonary)

1988 to present, Adjunct Prof. of Pediatrics, University of California San Francisco
1988 to 1993, Director of Academic Affairs, Children's Hospital Oakland
1982-87, Professor and Chairman of the Dept. of Pediatrics and Human Development, College of Human Medicine, Michigan State University, East Lansing, MI.
1973-81, Professor of Pediatrics, Case Western Reserve University School of Medicine; Director of the Premature and Newborn Nurseries, University Hospitals of Cleveland, OH.
1967-73, Associate Professor of Pediatrics, Case Western Reserve University; Director of the Premature and Newborn Nurseries.
1964-67, Assistant Professor of Pediatrics, Stanford University School of Medicine, Palo Alto, CA; Director, Clinical Research Center for Premature Infants, Stanford Medical Center, Palo Alto, CA.
1962-64, Assistant Professor of Pediatrics, Case Western Reserve University.
1958-61, Clinical Instructor, Dept. of Pediatrics, UCSF.

Awards and Honorary Lectures:
Semper Lecture Swedish Pediatric Society, Goteberg, 1974. Visiting Professor, Santiago, Chile, 1975. James Overall Visiting Prof., Vanderbilt Univ., 1976. Visiting Professor, Western Australia, Perth, 1977. Windermere Lecture, British Pediatric Society, 1978. Queen Elizabeth II Lecture, Canadian Pediatric Society, 1979. The Lydia Rapaport Lectures, Smith College, 1981. Marce Society Lectures, England ,1986. The Emilio Soto Lecture, 1987. Birdsong Lecture, Univ. of Virginia, 1989. Royal Maternity Belfast Honorary OB Lecture, 1990. Norwegian Society of Perinatal Medicine, Norway, 1990. 10th International Congress of Psychosomatic OB, Sweden, 1992. National Board of Medical Examiners, 1981-84. W.H.O. Maternal & Child Health, Consultant, 1976, 1982-85. Virginia Larsen Award, 1974. John H. Kennell, M.D. and Marshall H. Klaus, M.D., The Anderson Aldrich Award in Child Development for Outstanding Contributions to the Field of Child Development, American Academy of Pediatrics, 1984. Distinguished Alumni Award, Case Western Reserve Univ., 1985. Marshall Klaus Award, American Academy of Pediatrics, October 18, 1998. The Special Board of Trustees Service Award of CWRU (Medical Alumni) 2002. The Landmark Award of the Academy of Pediatrics, October, 2002. Carola Warburg Rothschild Award of the Maternity Center Association, 2003, John Kennell and Marshall Klaus.
Beaven Lecture, Rochester Medical School, June 2, 2003.
NYU Postgraduate Medical School, Jack Cary Eichenbaum Memorial Lecture, September 19, 2003.
The Theodor Hellbruegge Foundation awarded the 2005 Arnold Lucius Gesell Prize to John Kennell, Marshall Klaus, and Phyllis Klaus for extraordinary work, especially their pioneering studies of parental bonding. Munich, Germany, 2005.

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