ORAL HISTORY PROJECT

Samuel Lawrence Katz, MD

Interviewed by
Jeffrey P. Baker, MD, PhD

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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

Jeffrey P. Baker, MD, PhD

Dr Jeffrey P. Baker is Professor of Pediatrics at Duke University School of Medicine. Aside from residency training at the University of Colorado Health Sciences Center in 1985-88, he has received both MD and PhD degrees from Duke University (1984 and 1992 respectively). His PhD , obtained in history of medicine in 1992, produced a dissertation on the history of premature infant care that later translated into his book, The Machine in the Nursery: Incubator Technology and the Origins of Newborn Intensive Care (Johns Hopkins University Press, 1996). He has served as a faculty at Duke University since 1992. Among other responsibilities, Dr. Baker served as Acting Director of the Trent Center for Bioethics, Humanities, and History of Medicine between 2005 and 2007, and since 2005 has been Director of the center's History of Medicine Program. Along with Dr. Howard Pearson, he co-edited and helped write the 75th year anniversary history of the American Academy of Pediatrics, Dedicated to the Health of All Children. His research and writing in medical history has covered a range of topics including neonatal medicine, the rise of preventive pediatrics, vaccines, and most recently autism. Dr. Katz has been an inspiration for Dr. Baker throughout his career, and indeed played a critical role making possible the fellowship that allowed him to pursue a PhD. Indeed, Dr Baker still regards Dr Katz as one of the most thoughtful leaders in medicine he has ever known, able to combine science and policy with a deep commitment to humane medical practice.

Interview of Samuel Lawrence Katz, MD

INTERVIEW PART ONE CONDUCTED ON MARCH 7, 2002.

DR. BAKER: This is Jeffrey P. Baker doing an oral interview for the [American] Academy of Pediatrics with Samuel Katz. Today is March 7, 2002, and we're in Dr. Katz's office this afternoon. I'm very glad to be here, and I appreciate your time.

DR. KATZ: My pleasure.

DR. BAKER: You had a long and full life, and it's hard to know where to start, but I'm just going to go back to the beginning. I know you were born in 1927 in Manchester, New Hampshire.

DR. KATZ: Correct.

DR. BAKER: I wonder if you'd like to tell me anything about your parents, and the people who were most important to you early on.

DR. KATZ: Sure. My parents were very happy people as I remember them. We lived in a wonderfully democratic town. Manchester, New Hampshire was a mill town basically. The Amoskeag [Mills] textile mills were there, which were allegedly the largest cotton textile mills in the world outside of Manchester, England, after which the town had been named. But it was a town with a very pleasant, heterogeneous community. There were a lot of blue-collar mill workers, then there were lot of folks who were professionals, and there were all the other types.

My dad was born in Lithuania, and brought to this country by his older siblings when he was three years of age. He was 21 years younger than his sisters and brothers. They had all migrated to the States. He stayed in Lithuania initially with his parents and was later brought here by one of his older sisters when she came to visit, and was raised in California, which is where she lived. His parents migrated later. He went through high school, but had no further education beyond that. He went to work for something called the Master Carburetor Company and used to put carburetors on racing cars and fire engines. He gave me a wonderful scrapbook with pictures of him and Eddie Rickenbacker and other famous racing drivers of that era.

By the time I came along, obviously, he was out of that. He had relatives in Boston, Mass. [Massachusetts], and traveled east to visit with them. He stopped in Chicago and visited another relative, met a young woman, fell in love, and they married. That was my mother, who was a graduate of a Chicago conservatory of music and a piano teacher.

The two of them made their way east and decided to settle in the area. But he didn't like Boston, and for reasons I've never been quite certain of, they ended up in Manchester, New Hampshire, which was about a one-hour train trip from Boston. This was very convenient, because he went to work with a relative who had what I guess you would call a scrap iron company. They used to buy rails from the railroad that were now out of use and have them re-rolled at a place in Pennsylvania, and then sell them to lightweight organizations. They would go to Costa Rica for banana plantations and things of that sort. Gradually he worked more and more with the Boston and Maine Railroad, and for the New York, New Haven and Hartford [Railroad], and the New York Central [Railroad], which were the railroads in the New England environs at that time.

I have many happy memories of having gone on little switch cars with him to inspect railroad lines, at old lumber camps and things of that sort. They were very, very good parents, and I think I did better than my sister. She was the firstborn; I think they were much stricter with her. By the time I came along, either because I was a male or because I was the second child or both, they were a lot more laissez faire about me. So I think I had a lot more freedom as a youngster, and therefore the advantage of sampling many of the aspects of Manchester.

Because of the mills it had many ethnic communities. There was a large French Canadian community. The folks from Quebec had moved down into the Merrimack valley to Manchester, New Hampshire, and Lowell and Lawrence, Massachusetts where there were mills, and where there were jobs during the depression when the agriculture economy was not good in Quebec. And there was a large Greek community. When I was in school I had many classmates with names like Plato Canotas and Menelaus Aliopoulos, and all the girls were named Helen.

[Laughter]

So we had restaurants — Greek restaurants, Polish restaurants. It was really very nice. Later in life when I got to college, I felt I had had a much broader experience than many of my classmates who'd grown up in Shaker Heights or in one of the New York suburban communities where everyone was sort of a middle class yuppie.

Be that as it may, my mother did not force us to take piano lessons from her. But she made us take piano lessons from a friend, which I remember not with great favor, because I always wanted to be a drummer. Eventually they relented, and I took drum lessons.

That's another aspect of my younger years which I can tell you about if you're interested. My sister was forced to go to private school. She went to parochial elementary school, and she went to Choate Preparatory School before she went off to Cornell [University]. Many of my friends went off to Phillips Exeter [Academy] or St. Paul's [School], but I felt I wanted to stay. And again, as I say, they were very easy with me. They said okay, so I went to Manchester Central High School, the public school, which was really a tremendously nurturing environment for me. I was the head of the student council, the editor of the yearbook, an officer of the class, the valedictorian. I was the big frog in a little pond and enjoyed it very much. At the same time, there were very good teachers and I was very stimulated. I had four years of Latin, and three years of French, and four years of math. As I look back on them, I believe these were schoolteachers who were really devoted to stimulating young people, and it was really a very good experience.

When I got ready to graduate, my folks wanted me, like every bright Jewish boy, to go to Harvard [University]. I said no. The people I knew from previous encounters who went to Harvard; I thought were nerds. And my best friend was going to Dartmouth [College], and I said, "I'm going to Dartmouth." And again, they didn't give me a hard time. They agreed, so I went to Dartmouth with my friend.

DR. BAKER: So they did not have a career path tracked out for you?

DR. KATZ: No.

DR. BAKER: They didn't pressure you to become a doctor?

DR. KATZ: Absolutely not. This comes up later, but I can comment on it now. I had no awareness of medicine at all. None of my close relatives was a

physician. There was one physician in the family, but he was somewhat remote or distant and I had no particular interest in medicine. In fact, with my experience as editor of the yearbook, I thought I was going to be a journalist.

DR. BAKER: [Laughs]

DR. KATZ: Either that or politician. I wasn't sure which.

DR. BAKER: Journalist or a politician?

DR. KATZ: Right. And it may come back to that theme later on.

DR. BAKER: [Laughs] Okay.

DR. KATZ: I may be a little bit of a politician now, but not too much I hope.

I was only 16 when high school finished and I went to Dartmouth. It was the end of World War II, 1944. I turned 17 just after graduation, and I spent two semesters at Dartmouth and did very well academically. But I really felt that I was not socially or emotionally mature enough for college at that point. So again, taking advantage of my parents' very good treatment of me, I convinced them to sign papers so I could join the Navy. At age 17 you could join the Navy at that point.

I went through recruit training camp, which was called Boot Camp at that point, at Sampson Naval Training Station [Base] in Geneva, New York [was located in Sampson, NY in Seneca County]. At the end of training camp, after ten weeks, they gave you these exams and they said, "Oh you're a bright boy. We're going to send you to college." I said, "No, no, I just came from college. I don't want to go to college." Then they said, "Well, next on the list is [US Navy] Hospital Corps Training School. How about that?" I said, "That sounds interesting." So I went off to San Diego Naval Hospital and became a corpsman, which is a little bit like what we call a PA or a physician's assistant today.

DR. BAKER: Okay.

DR. KATZ: That was really the turning point. I loved it. I liked the physicians, the nurses, the whole ambiance working with patients. That was both my first and my committing introduction to medicine.

DR. BAKER: You actually did patient care at that point?

DR. KATZ: Yes. You had a lot of training and then you did it. I ended up as what they called a ward corpsman, taking care of patients. Of course, these were many of the wounded marines and other servicemen from the Pacific at that time. I was trained to be a marine corpsman, what they call the fleet marine corpsman. But fortunately, the war ended at that point. By then it was the summer of 1945. The war ended, and I was just kept working in hospitals. I enjoyed it very much, so that when I was discharged I went back to Dartmouth and decided I was going to go to medical school.

DR. BAKER: It sounds like the thought of becoming a future doctor crystallized before thinking of yourself also as a future scientist?

DR. KATZ: Oh yes. Very, very much so. Absolutely. And it was several very, very distinguished and very friendly physicians in the Navy, or I imagine in the Army. There wasn't the concept of rank there the way there was with line officers. Physicians found it perfectly okay to be friendly with a non commissioned [officer], or as I was called, a pharmacist mate third class. So that not only was I treated nicely, I came to admire several of the people who were there. One of them appeared in my later life when I got to the Mass General [Massachusetts General Hospital], who was a neurosurgeon at Mass General in Boston.

So I went back to school. Many people were coming back out of the service at that point, so the colleges were flooded with more students than they usually accommodated. They were very anxious to get you through as quickly as possible, so I was given credit for my time in boot camp, and my time in corps school. Before I knew it I had enough credits to finish, really having had only a total of about six semesters of college.

At that point, Dartmouth had a two-year medical school, and you could go there after only three years. So I applied there and was accepted, and spent my first two years at Dartmouth Medical School, which again was very, very good because the class was only 24.

DR. BAKER: Twenty four!

DR. KATZ: And there were many more faculty than there were students, so that you had a lot of very good precepting and a lot of individual attention. It was very difficult to escape, and you did your work and prepared, because you knew that with a class of 24 you were going to be very visible.

DR. BAKER: Twenty four in the class. This is 1948 to 1950.

DR. KATZ: Yes.

DR. BAKER: Okay. And did it correspond more or less to the basic science year?

DR. KATZ: That's exactly what it was. It was two years of basic science. You did physical diagnosis and a few things to acquaint you with the clinical aspects, but it was really basic science.

DR. BAKER: I didn't realize there were any. I didn't realize Dartmouth or anyone had a two-year medical school [at that time].

DR. KATZ: Oh, there were many. There were about a dozen. UNC [University of North Carolina] was a two-year medical school until about 1954, I think. The Dakotas had two-year schools. Of course North Carolina isn't as small a state as New Hampshire, North and South Dakota. Missouri had a two-year school. I can't give you the whole list, but there were about a dozen.

At the end of your two years, you sort of sat with the Dean, or before the very end, and he said, "Where do you want to go now?" I said, "Well I guess I'd like to go to Harvard [Medical School]." So they sent you to Harvard for interviews. I think five or six of us from that 24 went on to Harvard. Others went on to Columbia [University, College of Physicians and Surgeons], to Penn [University of Pennsylvania School of Medicine (Penn Medicine)], to Chicago [University of Chicago, Pritzker School of Medicine]. It was a very easy transition, because those schools had lots of room for clinical students, and it was the classic curriculum. You had your two years of basic science, two years of clinical. So they could absorb all sorts of numbers into the hospitals in Boston and the other cities.

DR. BAKER: And how many students would have been in your class at Harvard?

DR. KATZ: One hundred and twenty five.

DR. BAKER: We are closer to what we think of today as a medical school class.

DR. KATZ: Exactly.

DR. BAKER: I wonder if you'd like to comment on that. The clinical experience of a medical student in Harvard then, as compared to what it is today.

DR. KATZ: Right. I found that I had a little bit of savvy of how you walked around a clinic or a ward because of my corpsman experience in the Navy, so it was a relatively easy adjustment. My father had many family members in the Boston area, so that I also had sort of a home base if I needed it, but I really didn't get that involved.

But two other things that I have not commented on fit into the story at that point. First of all, when I was in my latter two years at Dartmouth, one of my very close friends, not a medical student, but an undergraduate friend got married. Now he had a very nice wedding to which I was invited to be part of the groom's party. I met a very nice young woman whom I decided I was going to marry. So at the end of my second year at Dartmouth, moving to Boston, I married Betsy. Betsy and I were married for the next 19 years. We lived in Brighton, Watertown, and Roxbury. We moved around different places where you could afford to rent a place. She was a student at Sarah Lawrence College, but transferred to Boston University to finish up. She got a teaching certificate and began to do some school teaching at that point.

In those clinical years, I pretty much liked everything I did. It was very hard to focus and say, "Well I want to be a physician in practice, a physician in academia, an internist, a surgeon or what." I guess I knew I didn't want to be a surgeon or an obstetrician, but I loved internal medicine. I loved pediatrics. I was particularly taken with psychiatry, because I felt I had been enormously successful with a patient I had taken care of, who was a descendant of Henry James.

DR. BAKER: Truly a descendant, or thought she was a descendant?

DR. KATZ: She claimed to be. I didn't do any genealogical studies.

DR. BAKER: Okay.

DR. KATZ: So when it came time to think about residency training, I decided I would take an internship in internal medicine, since it seemed a good base for whatever I eventually decided to do. Because Betsy and I were there in Boston, I wanted to stay in the Boston hospitals. I had enjoyed my clinical experiences very much at both the Beth Israel Hospital [Beth Israel Deaconess Medical Center] and the Boston City Hospital. Mass General I found a little bit elitist. It didn't thrill me, and similarly the Peter Bent Brigham Hospital [merged with Boston Hospital for Women in 1980 to become Brigham and Women's Hospital]. So I decided to apply to the Beth Israel and the City. I put the Beth Israel first on the matching plan, because it seemed a little more controlled and in balance. The City was great, but you really had to be someone who was willing to work more than the usual hours with far fewer of the usual amenities. When we used to go to the City Hospital as students, we used to steal equipment from the other hospitals that we would bring to the City, because they didn't have plastic syringes or needles. They didn't have so many things. I wasn't quite ready for that, I guess, so I opted for the Beth Israel and was very, very happy.

There was a man named Herman Blumgart, who was the chairman of medicine. Somewhat austere, but a superb clinician and diagnostician. In fact, he was the one who always gave Harvard medical students their very first clinical lecture. He was chosen because he really was wonderful with patients. He was a little less warm with students and residents, but he was really a fine physician.

You had one elective in your internship. You could take neurology, dermatology or pediatrics. At that time, Sydney Gellis ran a pediatrics service at Beth Israel Hospital. There was a ward, a clinic and a very large neonatal service. In fact, the BI at that time was the only complete hospital of the Harvard hospitals in Boston. The Brigham and the General [Mass General] didn't have OB [obstetrics]. Whereas, the Beth Israel had everything. It was a complete hospital by today's definitions. Anyway, I took the pediatric elective with Sydney Gellis, and he was absolutely charismatic. He is obviously the reason I ended up in pediatrics.

I just enjoyed my time so with him, and I went to see Dr. Blumgart after that, having already signed up for a second year in medicine, and said, "Dr. Blumgart, I'm very apologetic, but I think I'd really like to do pediatrics. I know I've signed up, and —" And he looked at me in his wonderful way and said, "That's no problem. There are hundreds of people who would like your job."

[Laughter]

DR. KATZ: And then he said, "Where would you like to go?" I said, "Well I haven't really given it much thought, but I guess the Children's Hospital [Boston]." So he dialed the phone and called his buddy Charlie [Charles A.] Janeway, who was then the chief of pediatrics at Children's, and told him he had a bright young man who wanted to come. Charlie said his residency slots were all full, but if any one became empty I would get the first one. In that era, pediatrics was not frequently something you did your first year out of medical school. You did pathology, or medicine or any one of them, and then you went for your first year of residency to pediatrics.

DR. BAKER: Right.

DR. KATZ: Well, as fate had it, one of my early medical school roommates from Dartmouth, who had transferred with me to Harvard, owed the Army time, and they called him to go to the occupational forces in Germany. So he went off to Germany, and he had this slot at Children's, and I inherited his slot. I moved to Children's in July of that year, 1953. I had obviously made a good choice. I loved it there, loved working with children.

By then, Betsy and I had our first son, who was born there in Boston at the Beth Israel actually. It was just a perfect fit. Again, the hospital was small enough in personnel so you got to know people. People knew you by your name — nurses, physicians, laboratory staff. It was a fascinating array of patients, wonderful attending physicians, and it just made me very happy.

At the same time, I was aware there was a pediatric service at the Mass General, and this was run by man named Allan [M.] Butler. He was considered almost a communist by the rest of the medical establishment, because he believed at that time in universal health insurance and prepaid health plans. These were anathema to most of the medical establishment of that period. You have to realize this is the mid 1950s we're talking about.

DR. BAKER: Yes.

DR. KATZ: And I thought, "Gee, I'd like to go spend some time there." I spoke to Dr. Janeway, and he said, "Sure, we'll arrange it." So I went and spent my second year of pediatrics there at the Mass General under Dr. Butler. And indeed it was a very different environment. He was just as I

say, a very liberal, humane individual. He spent a lot of time focused not just on the pure medical aspects of child development and health, but on the social, educational and environmental aspects, and that to me was a very different picture than existed at Children's. Children's was very scientific, was very stimulating intellectually, but that aspect of it didn't show very much at that point. Whereas at the General, it was still a good caliber of pediatrics, but it had a lot more social implications and interests. So that was a very good year.

DR. BAKER: Dr Butler was a significant role model for you in some ways later on….

DR. KATZ: Yes, yes, absolutely. I really had neglected him in discussions of this sort in the past, but it was really because of him I went to the General, and in no way was it disappointing. He was special.

He was like many of the people in Boston in those days at Harvard. There were lots of jokes about it, but at Harvard you had to come from wealth to be a professor. He was from the Macy family. He was Allan Macy Butler. Now, I don't know which Macy, but some Macy or other. It was typical of Harvard, because he would wear frayed shirts and old suits. You knew he could afford to go to Brooks Brothers everyday and buy something new, but that wasn't part of the guy being in this position. It was very interesting.

I went back to Children's the next year, and Dr. Janeway asked me to be what they called a co-chief resident. There were two chief residents. The other one was a fellow from Iran named Mohsen Ziai, M-O-H-S-E-N Z-I-A-I. He was a very interesting fellow who had been bouncing around the States for years, because he didn't want to go back to Iran. He was very well educated. He had spent time at Hopkins. He had spent time at Harvard and was doing everything possible to stay in States.

DR. BAKER: Understandable.

DR. KATZ: The major thing that happened that summer and fall, which made a great impact on me, was the last epidemic of polio in Boston.

DR. BAKER: I realized that was the time. I was going to ask you about that.

DR. KATZ: That was 1955. There was a huge epidemic. We admitted close to a 1,000 patients to Children's. In fact, the hospital was closed for

anything else, other than emergencies. There were small units kept open, but just about everything else was polio for a good bit of the summer and fall. And that of course awakened an interest in infectious diseases.

DR. BAKER: Can you comment a little bit more about that and how many patients were being treated at a given time, or how many might have been on the ventilator, the respirator?

DR. KATZ: Well, we had the old fashioned iron lungs. If you went up on the Division 37, that was the so-called infectious disease division. But these patients soon began to occupy units all over the hospital. One of the challenging things was that if something went wrong with the electricity, the iron lungs stopped. There was a little handle at the end that you had to use to pump them manually until the electricity went back on.

DR. BAKER: And you would do that along with medical students?

DR. KATZ: Right. Absolutely. We learned to deal with the iron lung. All that was protruding was the patient from the neck up. There were portholes in the side. If you were going to do IVs [intravenous], or do examinations or whatever, you put your arms in through like some of the little incubators they had when we first had intensive care nursery incubators.

We admitted patients of many ages, not just infants and children. Because we had a service that was attuned to infectious disease and polio. There were several older attending physicians, Dr. [R.] Cannon Eley, is the one I remember best. They had lived through successive epidemics of polio and were very knowledgeable about it. So they were able to provide the kind of leadership that attracted patients there.

One of the unique experiences I remember is that one of Dr. Eley's close friends was a cardiologist at the Mass General, and his daughter, who was a young teenager, had symptoms that led the father to think maybe she had polio. Rather than have her come to the emergency ward at Children's and mingle with all the other patients, some of whom might or might not be infected, Dr. Eley decided we would go out to the home. So we drove out in his car. I'll never forget this. Dr. [Edward] Bland was the name of the cardiologist. He was a very well known Boston cardiologist, and one of Paul Dudley White's close associates. I did an LP [lumbar puncture] on this young lady in her bed at home. Needless to say, it was sort of a sagging mattress, so it was not the ideal setting, but thank God I got it very easily,

and I got some spinal fluid. We took it back, and indeed she had a spinal fluid pleocytosis and a modest elevation of protein, and she had polio. So we brought her into the hospital after that.

There were many little events of that sort. Bob [Robert J.] Haggerty, who later became chairman of pediatrics at Rochester [General Hospital], was there then, and he and I delivered a pair of twins from a woman who was in a respirator.

DR. BAKER: No kidding?

DR. KATZ: So these were unique experiences. [Laughs] Not that you would ever have been fully prepared for them, but you sort of coped with the challenges as they arose.

The interesting thing was, which isn't a very good story, is that these twins were taken to our premature nursery. It wasn't called an intensive care nursery; it was just called a premature nursery. They were all kept in separate isolates, supposedly vented to the outside. But Dr. Sidney Kibrick, who was then one of Dr. [John F.] Enders' associates, was very interested. He did cultures on all the infants in that nursery, and within a week, every one of them was excreting polio virus.

DR. BAKER: Oh, gosh.

DR. KATZ: So whether it was poor hand washing or whatever, these twins obviously were infected through passing through the maternal birth canal. They were shedding virus that soon spread. Fortunately, none of them got seriously ill, but one infant ended up with a lower leg paralysis.

DR. BAKER: Do you know what happened afterwards?

DR. KATZ: The twins? No, they did well. But they stayed there for quite a while. I don't remember how premature they were.

Well, obviously, I was getting increasingly interested in infectious diseases, and I went and talked to Dr. Janeway. He had arranged for me to go to London to St. Mary's Hospital. Children's had an exchange program with St. Mary's Hospital in London. One of their registrars would come to Children's for six months, and one of us would go there. He thought it would

be a good experience for me, and I thought it would be a wonderful experience. So we agreed and I went.

Before I went, I was thinking, "What am I going to do when I come back?" Dr. Janeway asked me, "What do you want to do?" I said, "Well, I think infectious disease is very interesting." He said "Why don't you go to the Carnegie Building," which was the building right across from the hospital. It belonged to Children's Hospital. "Talk to my friend John Enders." So I went over. I had never met John.

DR. BAKER: What did you know about Dr. Enders at that point?

DR. KATZ: Oh, I knew he was a Nobel Laureate [1954], but that was all I knew. So I went over and talked to Dr. Enders. He was very, very warm and very accepting, and said, "Oh, why don't we see? You're the chief resident now. Why don't you come over when you have a few free hours and spend some time in the lab with the technicians and the fellows and see if you like it? If you do, then we can see what we can arrange." So indeed I did that after the polio epidemic quieted down at the end of September. So in October, November, December I had occasional afternoon hours when I could go over there. Indeed it was a new world to me, because I hadn't really worked in a lab. I'd done the sort of things you did for laboratory science in your biochemistry and in your microbiology, but this was really fascinating.

I loved it. So I said, "You know, I think I really would like to do this when I come back." And he said, "Well, we'll find some way to get you funded. Why don't you apply to the National Foundation?" What we call today the March of Dimes was then called the National Foundation for Infantile Paralysis [NFIP]. So I applied to them. It was a lot simpler than it is today. They said, "Well we don't interview till the spring, and you're going to be in England in the spring, so what can we do?" Then they said, "Well, you're going to be with John Enders. You'll be all right. We'll give you one year, and then interview afterwards to see if you get a second year."

So I went off to England with this promise of a NFIP fellowship. By then Betsy and I had a second son John, so that both Samuel, who was named after me, and John went. We took off for England. It was before there were many transatlantic flights. It was an era when you flew to Reykjavik in Iceland, and then from there to England. So we went by ship, and that was a delightful experience. You know, it was probably the first time in several years that we'd had so much time together.

END OF TAPE 1, SIDE A

DR. KATZ: So we got to England, and the folks at St. Mary's had very nicely found a flat for us to rent, which was only a few blocks walk from the hospital. It was ideal. It was called Gloucester Square, Flat No. 2 Gloucester Square, and we got ourselves established there. I went over to St. Mary's where the director of the unit was Professor Reginald Lightwood. He was very well known from Lightwood syndrome, which was one of the hypercalcemia disorders. I was a registrar, which was very different than being a resident in Boston. "Registrar" was a very senior responsible individual. You were a 'house physician' for several years, and then you became a registrar. There were junior, middle and senior registrars, and suddenly I, with hardly two full years of pediatrics behind me, was a senior registrar, which was an exalted position.

You were registrar as long as you waited to become a consultant, so that was the big jump. I think it's still that way in the English system, so that my colleagues as registrars were very distinguished people. One was [Sir] Peter Tizard, who went from St. Mary's to be the head. His father was the famous [Sir Henry] Tizard, who did the radar during World War II. But Peter went to Hammersmith [Hospital], where he became the head of the pediatrics unit at the hospital, and then to [University of] Oxford as the head of pediatrics there. John Davis, I don't know where he went from Mary's, but he ended up as the chair at Cambridge. Henry Giles, who became a consultant in Birmingham. John McDonald, who went back to Australia to become the head of pediatrics at [The University of Western Australia in] Perth. So, suddenly a fairly green, junior, young American pediatrician was rushed into the company of a very knowledgeable but very, very warm, very congenial group of individuals. It was a wonderful experience.

DR. BAKER: I knew it was at St. Mary's where [Sir] Almroth [Edward] Wright had his inoculation institute [Innoculation Department]. Was he remembered?

DR. KATZ: Oh, yes. There was the building in which professor Lightwood's office was located. That was the Almroth Wright building, because he was the one that [George] Bernard Shaw panned as "Sir Almost Wright," instead of Sir Almroth Wright, in *The Doctor's Dilemma*. I think it was called the Wright-Fleming Institute [after Alexander Fleming who discovered penicillin at St. Mary's], but it was an allergy, immunology

institute in the building right directly across from the inpatient unit of St. Mary's Hospital.

The nurses were very powerful. The head nurse in any ward was called "sister," and you were to call her by the name of the ward. The children's ward was called Lewis Carroll Ward because the Queen Mother had given them these wonderful tiles of Alice in Wonderland [book *Alice's Adventures in Wonderland* – originally published in 1865] that were all around the walls of the ward. So the ward was Lewis Carroll Ward, and Jean Campbell, who was the head sister, was called Sister Lewis Carroll.

DR. BAKER: [Laughs]

DR. KATZ: And I found myself in a little bit of diplomatic problem in that she didn't like Dr. Lightwood. One of the things that Sister would do in the middle of the morning, at what they called elevenses, would be invite you to her little office in the middle of the ward for coffee, but she would not invite Professor Lightwood. So there was this terrible decision you had to make: who do you offend, Professor Lightwood or Sister Campbell? And you knew very well that she determined more of your life than he did.

[Laughter]

So you went and had coffee at elevenses with Sister Lewis Carroll, Jean Campbell, who turned out to be a wonderful nurse. I learned a lot from her. That was really a remarkable experience.

Although Mary's was part of the National Health Service [NHS], there was a private wing called the Lindo Wing. There were still people in England who wanted to have private care. Most physicians on the health service were divided into what they called elevens. You had eleven sessions a week: two a day, Monday through Friday, and one on Saturday morning. And most of them worked what was called seven or eight elevens, and then in the other three or four they saw private patients in their offices on Harley Street, or wherever they were.

Professor Lightwood always went off for the weekend. He had a farm in Berkshire someplace. You, as the registrar, would be the senior person on call. And I got a call one weekend from Sister Lindo Wing. That is the head nurse of the Lindo Wing. She said, "We have a baby here, newborn, looks very yellow. Would you come over and see the baby?" I went over and saw

the baby, and indeed the baby was very jaundiced, and I suggested we get a bilirubin. We got one and, I don't remember the level, but it was exchange transfusion level. I said to Sister Lindo Wing, "This baby needs an exchange transfusion." She said, "We don't do those here." I said, "Well then, I'll have to take the baby over to Lewis Carroll." "Oh, no; our babies don't go to Lewis Carroll." I said, "Well take your choice. Either I'm going to bring the kid over there…" "Then all right, you can do it here."

Well it turned out that this child was the grandchild of Daphne du Maurier, the author. She was quite a distinguished person in England at that point, and her husband was the man who ran Buckingham palace. He was [Lieutenant-]General [Sir Frederick Arthur Montague] Browning. So this was really high level. [Laughter] The father of the infant was a Welsh Guard. He was captain of the Welsh Guards. I don't know what the mother did. Anyway, we brought the kid over, we did the exchange transfusion, and thank goodness everything went wonderfully well. As a result, a few weeks later I got two letters. One was from the physician down in Kent where they lived, telling me he had seen the infant for follow-up. The infant was doing very well and was a little anemic, so he gave him a "dollop of blood." That was my first encounter with that wonderful English expression, "a dollop."

[Laughter]

DR. BAKER: What is a dollop? You could translate it here as what?

DR. KATZ: Ten ccs, or 7.5, I think. It's more used by cooks. You say you're putting in a dollop of this or that. But I just enjoyed that so much. And from Birdcage Walk, which was where the Welsh Guards barracks were, we got an invitation to the Trooping the Colour, which is the queen's formal annual birthday, where we were invited to sit in the diplomatic stand. So good things came about.

DR. BAKER: [Laughs]

DR. KATZ: I have wonderful memories, obviously, of that time in St. Mary's, because things were not expensive and the exchange was good at that time. We went to symphony, to opera, to ballet every week. There were two wonderful physicians at Mary's, one an orthopedist, and one was an otolaryngologist. The orthopedist was the physician for the ballet at Covent Garden, which was then Margot Fonteyn and Michael Somes. The otolaryngologist was the physician for the opera. He used to tell us funny

stories about how someone would get a hysterical aphonia after the first act, and he would be called. He would spray a little saline into the back of the nasopharynx, and it would be cured.

[Laughter]

We had a wonderful opportunity to sample musical culture, and at the same time, we did some traveling around England, too. That was really a very, very lovely experience, and one which obviously had an influence on things that I was able to initiate many years later here at Duke.

I forgot one very important thing. Betsy had gotten pregnant just before we left for England, and our son David was born in England. As a result, he has dual citizenship and has taken advantage of that on a number of occasions. When he goes to Europe, he goes through the line for the returning home people, rather than foreigners. As an Englishman, in those days I had to go and register him at the American Embassy [London] at Grosvenor Square, and he was put on my passport, and there he was. David is the only one of all our kids who came to Duke [University], and went here to medical school [Duke University School of Medicine]. He is an MD, JD, and that's a whole other chapter we can tell you about later. We'll come back to him.

So when I came back from England, I went into the Enders lab. Again, fortune has favored me in many ways over the years, as I've already pointed out. I got into pediatrics because of Sidney Gellis, into infectious diseases because of the polio experience, to the Enders lab because of Charlie Janeway's friendship with John Enders. When I got to the Enders lab, polio was still going on. Polio was well studied at that point, but the lab was still doing a lot of polio studies. But Dr. Enders had always been much more interested in measles than polio. It had been his first love among the virus infections.

DR. BAKER: Can you tell me why he was already interested in measles in particular?

DR. KATZ: You know, that's a good question. I think it was only because he was aware of the global morbidity and mortality of measles, and considered it a real challenge. He was a PhD. He was not an MD, but he had an intense interest in medicine and in well being, particularly of children, but of everyone. But I think he felt that science was obliged to utilize its abilities

and its talents to better man's lot. And I think that polio was not a sidelight, but it was almost a sidelight with him.

As soon as the work had gone well with polio, he decided it was time to apply the same type of technique, that is cell culture, to measles. It had been tried by others and failed, but again, he was a Connecticut Yankee and an absolutely wonderful human being.

I didn't mention, but I should have, that my father had died at the time I started medical school. So this had a great bearing on my relationship, because Dr. Enders sort of became, not just my scientific father, but my emotional father. We formed a very warm relationship which persisted ever after that. He was very paternal, very lovely.

At the same time, he had some of these wonderful Connecticut Yankee attributes. He'd gone to Yale to college and been an indifferent scholar. The family owned the Hartford National Bank, and they owned one of the insurance companies in Hartford. They were extraordinarily wealthy. They put him into selling real estate when he finished at Yale. He said he couldn't sell a piece of property to someone that he didn't feel he would want.

So he enrolled in graduate school at Harvard and was a student of Celtic philology. Again serendipity, his roommate in the boarding house in Brookline was an Australian microbiologist named Hugh [Kingsley] Ward, and Ward was working in the lab of Hans Zinsser at Harvard Medical School. Enders talked to him about what he was doing, came in and looked through the microscope a few times, and decided this is much more fun than graduate school in English. So he switched and went over and got a PhD under Hans Zinsser. That was how he moved on into microbiology and science. When Children's Hospital decided they could support a research endeavor in microbiology, they asked him to come from the Harvard Medical School, which was three buildings away, to open up a lab at Children's. And that was how the Enders, [Frederick Chapman] Robbins, [Thomas H.] Weller enterprise really began at Children's Boston.

DR. BAKER: You might just comment on the significance of tissue culturing of viruses and his talent for that.

DR. KATZ: Sure. Until the polio work was exploited, most work with viruses went on in animals, animal models, rabbits, or monkeys with polio. It was with monkeys, because they were the only susceptible animals. We know

now it's because of a cellular receptor that monkeys share with man and that other animals don't have. But doing an experiment with polio was very tedious, let alone an expensive enterprise in inoculating monkeys intraspinously, eventually sacrificing them, doing studies of the spinal cord, and passing virus that way.

He and Weller and Robbins obviously adapted the whole concept of cell culture in which to grow viruses. This had been tried by various people previously. I don't know if people had tried with polio, but with other agents, and it was not done in the way they did, which was really to form special explants of tissues. Again classic Enders. I call it — penury is not the right word. There may be a better one that you can think of, but he didn't believe you ever wasted anything. Foreskins abounded. There were plenty of foreskins around, because there were lots of circumcisions being done. And that was what they used to grow fibroblast, from the discarded foreskins. They prepared their tissue cultures from trypsinizing and mincing these foreskins.

DR. BAKER: I always wondered how the decision was made to pick that.

DR. KATZ: Well, I'll tell you the next one in a bit, which is very, very similar with our measles work.

So once the polio was done, he wanted to get back to measles. And there had been a fellow the year previous named Tom [Thomas] Peebles, who again was a pediatrician. Tom had actually been the chief resident at the Mass General in pediatrics when I was a resident there. He had sent Tom out to a number of schools to collect specimens from people with measles, and the famous individual of course was David Edmonston, who was a student at a private school outside of Boston where they had an outbreak of measles. Tom went out and bled and did throat swabs on a number of these individuals.

At that time, the cell culture that proved most amenable was human kidney cells. Well, how do you get human kidney cells? At that time, the standard operation for hydrocephalus was what was called a ventriculoureteral shunt. What the neurosurgeons did was, they sacrificed a kidney and formed a connection between the spinal column and the ureter, or between the subarachnoid space and the ureter, so you peed out your extra spinal fluid.

That was done for a number of years. Interestingly, the leader in that field was a Duke-trained neurosurgeon named Donald Matson, who was then at Children's in Boston and at the Brigham. So for a number of years, that was the standard, and these kids were having unilateral nephrectomies. Well, what happened with those kidneys? Dr. Enders said, "Hey, those would be good to prepare cell cultures. We know that measles virus in children who die, if you look, their inclusion bodies and cells in the kidney look as if they had been infected with measles virus. Let's try those." So they obtained these kidneys, minced them, trypsinized and prepared cell cultures, and these were the cells in which measles virus first grew.

DR. BAKER: No kidding. And he had done that with Peebles? Was that before you got there?

DR. KATZ: The year before I got to the lab. Well first of all it was obvious that human kidney cells weren't going to last forever. Secondly, it might be that that was a natural host cell if you were going to try to work eventually toward a vaccine.

I guess that's another part of the Enders mystique. He was not happy with the way either [Jonas] Salk or [Albert] Sabin had proceeded. He'd given them all the virus, and said, "Go. Go forth, fellas." I think in the back of his mind, he decided he could do a better job, and he was going to do a better job with measles. He was going to find the vaccine for measles. Not looking for glory or anything of that sort, but just the fulfillment of what he felt was a logical scientific approach.

Well first of all, that operation was going to wind down and people weren't going to be sacrificing kidneys for many more years. The next thing you know, classic Enders, if it wasn't foreskins, what was it next? Placentas. Across the street was the Boston Lying-In Hospital [merged to form Boston Hospital for Women in 1966, which merged to form Brigham and Women's Hospital in 1980], where there were 8,000 to 10,000 deliveries a year. The placentas were usually discarded. Later they became interesting to the pharmaceutical firms, because they extracted hormones from placental tissue. But Dr. Enders said, "Well, you know there are those nice amnions that lie in the placenta. Let's do something with them." So we would go and get a placenta, and we would prepare it in the laboratory, peel off the amniotic membrane, separate it from the chorionic membrane and trypsinize the amnion cells. They made beautiful cell cultures, so that's what we began to grow and try different viruses in. After a number of passages of the

measles virus, you know passage from cell to cell to cell culture. It grew well in human amnion cells.

This is where [Milan V.] Milovanovic comes into the picture. I came to the lab very much as a novice. Milovanovic was a distinguished virologist from Belgrade in Yugoslavia. This was still the era of [Josip Broz] Tito, and it had been very difficult for him to get out of Yugoslavia to come to work with Enders. But he was responsible for the production of polio vaccine in Yugoslavia, so they let him come to work with the Nobel Laureate in polio. So he immediately, of course, was put to work on measles, and I became his apprentice. He taught me a lot of the things. He was very knowledgeable and very experienced, I was a green apprentice. But I worked with him, and we cultured measles virus in these amnion cells. Passage on them was still human.

I keep coming back to it, but I have great admiration for Dr. Enders' thoughtful, logical, intuitive approach. He was looking for a vaccine. When you took the virus from human kidney or from human amnion and put it into monkeys, it produced measles. They got fever. They got respiratory symptoms. They got rash. We had to shave them to see the rash. And they got antibodies. They had pretty much the picture of human measles. But he was looking for something that would still produce antibodies, but wouldn't produce disease. He said, "Well you're probably going to have to adapt this virus to a non-human cell type, and it perhaps will lose whatever."

Now in those days you didn't do genomic analysis of viruses, but it'll lose whatever attributes it may have that are responsible for virulence. One of the favorite modalities for culturing viruses before the cell culture era was the embryonated hen's egg. That's the way yellow fever virus had been grown. That's the way mumps had been grown. That's the way influenza had been grown. So he put us to work putting measles virus from human amnion cells into the amniotic sac of the embryonated chick egg. If it grows in human amnions, maybe it will grow in chick amnion. So I learned a lot about how to work with embryonated eggs, which for a non-surgeon was pretty challenging, but Milovanovic was very good, and he taught me how.

DR. BAKER: Had measles been grown in embryonated chick eggs before?

DR. KATZ: There was a period, yes. That's a good question. Joseph [L.] Stokes [Jr.] and colleagues at Children's Hospital in Philadelphia, a number of years before, I think it was Stokes, [Geoffrey] Rake and [Frank] Shaffer,

had allegedly cultured measles virus in embryo. Now, I don't know what or whether they used amniotic sac, allantoic membrane, yolk, but they had felt they had grown it. Again I've not really read their paper, I should have. But when they put it into children, it didn't do anything. It didn't produce any antibodies. It didn't protect them. So that sort of fell by the wayside. But that may have been partly in the back of Dr. Enders' mind, because he knew how that worked, certainly. In the amniotic sac, the measles virus did indeed multiply very well. It didn't produce any visible effect as in amnion or kidney. You could look at the cells under the microscope and see the effects that measles virus produced and titer it, actually. You couldn't in the amniotic sac, but you could harvest the material and put it back into human amnion cells, and then determine that the virus was growing. And by titering it, you could find how much virus was there. It wasn't just persistence, but it was multiplying.

DR. BAKER: Okay.

DR. KATZ: So the next thing we decided was, let's try chick tissues in culture and see what happens. So we went, and we now harvested the embryos from these chickens and collected fibroblast. That we got by trypsinizing the embryos. Then we prepared cell cultures of chick embryo fibroblast and passed the measles virus through that.

Well, initially we weren't certain it was growing at all, but we could back check it into human amnion, and it was growing. But it wasn't producing any effect that we could see, so it was still the secondhand procedure. But after a number of passages, eight or nine passages, lo and behold, we began to see changes in the cells. They were visible macroscopically, or microscopically through the microscope. You didn't need an electron microscope. You could look through an ordinary microscope and see the virus was growing very nicely there and producing cytopathic changes.

Again, Dr. Enders was a wonderful lab mentor. He never had more than five or six people in the lab. He sort of looked down on these people who ran big factories with 30 and 40 fellows and technicians. He was a firm believer that you got more done by having a group who talked to one another and who knew one another. One of the great attractions was that he would come around each day to your lab bench and say, "Well what's new?" and you would be striving so to have something new to show him. First of all, because it was obviously pleasurable, but secondly, he would then sit and talk with you for an hour or so. You would have undivided tutelage from this master.

And it took a few times before I was able to convince him that I could really see changes in these cells. He agreed after a while, and we began to grow and passage the virus in chick embryo cells. It went very successfully.

Well, then we went back to monkeys again. We inoculated one group of monkeys with this virus grown in the chick cells. To a control group of monkeys, we gave human kidney virus. Human kidney virus still produced disease, but the chick embryo virus produced no disease that we can see. No viremia when we checked blood looking for circulating virus; but it did produce antibodies. And then when we challenged them, they were immune. So then the question was: where do you go next?

DR. BAKER: But before you do that, can you give me an idea of how long all this took?

DR. KATZ: [Laughs]

DR. BAKER: How long you spent not only passing through the hen's egg and the chicken embryo system, but you did many, many passages through human renal cells and amniotic cells before that?

DR. KATZ: I'm trying to think. Most of the human kidney cell passages were done before I got into the lab. But I would say that this was sort of 1956 to 1959, about three years. Then we decided that maybe this was the virus now; which had lost its virulence, but retained its immunogenicity. Might this be a successful vaccine? Well the first thing we did, of course, was we gave it to one another subcutaneously. This was in the days before institutional review boards, now IRBs. Well, I should say that before that we prepared vaccines, "virus without any protein," so there would be no immunogenic cross-reactive proteins, and obviously in sterile conditions, and satisfying all bacterial sterility and everything else we knew how to test for. We injected one another, and there were no local or systemic adverse effects.

So the question became: where do you go next? Well there was a school called Walter E. Fernald [State] School [now The Fernald Center]. I think it still exists just outside Waltham, Mass. It was a school which, I guess, would then have been called a school for handicapped children. It was a school for mainly intellectually and neurologically challenged youngsters, a domiciliary place. You parked your youngster there and they lived there for ever after.

They lived in dormitories, and as a result of close living and the situations of the day, they had really severe outbreaks of measles every few years. Not just with morbidity, but with mortality. They had kids who died. So Dr. Enders said, "Why don't we go talk to the people there?" We went and talked to the directorate of the school and told them what we had in mind, and they gave us permission to talk with the parents and the guardians of these children, which we did. We explained what we had in mind, explained to them the seriousness of measles among these children, and they agreed that we should go ahead and test the vaccine.

Now, one thing I've left out, which was not as exciting perhaps as the cell cultures system, was that we had worked out assays for antibody, too. I mentioned that monkeys had antibodies, both complement-fixing antibodies, virus neutralizing antibodies, and hemagglutination-inhibiting antibodies. So that if you had no antibodies, you were susceptible to measles; if you had antibodies you were immune to measles.

DR. BAKER: Right.

DR. KATZ: Measles has been a very reliable virus in that way. There are many attributes of measles that we still don't understand even in the era of genomics and proteomics. Maybe we will in the next few years, but measles has been very, very stable. If you look at measles in the 14th century, what you can read about it, and the measles today, the disease is very similar. If you take the earliest measles virus that was ever cultured back in 1954, and compare it with measles virus from different countries, or from this country in the last few years, the genetics have changed, there are few amino acid changes, but no changes have had any reflection on serologic response or immunologic response. Why that should be I can't explain, because it's an RNA virus, and RNA viruses make a lot of mistakes in their replication. Flu is an RNA virus, and you know how frequently that changes. Other RNA viruses undergo a lot of antigenic drift and shift. Measles has been, fortunately, very, very reliable and very stable.

In any event, we inoculated these youngsters. Ann Holloway was the name of the technician. She was Dr. Enders' favorite technician. I should say that in the early days in the Enders lab, it was "the girls" and "the boys." The technicians were all women, and they were called the girls. The fellows were all male, and they were called the boys. And Dr. Enders was called "the chief." Even today if you spoke to Fred Robbins, or Tom Weller, or me about Dr. Enders, they would start talking to you about the chief.

DR. BAKER: [Laughs]

DR. KATZ: This changed, in that with Milovanovic there was a woman named Anna Mitus, who came to the lab, and I don't know what she was called. She had worked with Dr. Robbins at Case Western Reserve [University], which is why she came to the Enders lab. Later of course, [Catherine] Wilfert [now Wilfert-Katz] came to the lab as a fellow. There were several others in-between, but it sort of was the end of the era.

In my Harvard Medical School class, there were six women. There were no quotas, but there were somehow or other two blacks, six women and ten Jews in each class. No quotas but all of it sort of worked out that way. In fact, I think at one point there were eight women in one class, but there were six or eight women. Anyway, getting back, it wasn't that Dr. Enders in any way was anti-feminist. It was just that that was the system of that era. There were very few women in medical school, so very few women ever came along into the lab. Ann Holloway, as I say, was the number one girl, and she was wonderful.

END OF TAPE 1, SIDE B

DR. KATZ: Ann Holloway and I went out each morning and each afternoon and examined these kids, and we took throat swabs. On alternative days we took blood specimens. We took those back to the lab and looked to find measles virus, either in the nasopharynx or in the blood, which are two places where you find it with relative ease in natural measles; but we never found any. They did a number of them. I think the initial group was just 13. A number of them did develop fevers, but they seemed perfectly fine. In fact, it was a little bit like roseola. Then a number of those who got fever would have fever for a few days. The fever would go away, and they'd get a little rash.

DR. BAKER: But they did markedly well given the fever you mean?

DR. KATZ: Yes. Exactly. They went about their usual activity and didn't seem in any way either to have malaise or to be the least bit inhibited by this. Then after a few weeks, they had antibody in the blood, so that this looked good.

Meanwhile, we had been doing other things which I neglected to mention. When one thought about measles, the one complication that was most dreaded was encephalitis. We didn't know how to test for measles encephalitis in monkeys. I had a lot of experience doing intracisternal, intralumbar and intracerebral taps on monkeys. We injected measles virus into the brain, into the cistern, and into the spinal cord. We had good friends who did the neuropathology when we sacrificed the monkeys. We could never find any evidence that this virus caused any neuropathology. We didn't feel that with a handful of monkeys you could say this virus could never produce encephalitis, but that was the best we could do. If the incidence of encephalitis was one in 500 or one in 1,000, we were never going to be able to do a thousand monkeys.

DR. BAKER: Right.

DR. KATZ: And even with a thousand, you wouldn't satisfy the statistician that was enough, if you have something as rare as that. So, that all loomed as a little bit of anxiety in the back of our minds. But at the same time, these youngsters, when the next outbreak of measles came along in the Fernald School, were all totally protected. None of them developed measles. They had all developed antibodies, as I mentioned.

So at that point, we decided it was time to reach out. We were not in a position to do large clinical trials ourselves. We were basically lab people. I was a clinical, skilled, trained pediatrician, but we weren't in a set up to do a big type clinical protocol.

DR. BAKER: Sure, sure.

DR. KATZ: So, Dr. Enders and I enlisted a number of colleagues, whom we respected around the country, whom we felt were good clinical investigators. One was Saul Krugman at Bellevue [Hospital Center] in New York. One was Fred Robbins, who was then at Case Western Reserve. One was Henry [C.] Kempe, who was at Denver, the University of Colorado [Denver]. One was Bob [Robert J.] Haggerty who was running what was then called the Community Pediatrics Program there at Children's Hospital in Boston. And one was Francis [L.] Black, who was at Yale [University]. They all were very excited by this.

DR. BAKER: This almost reads like a "Who's Who" later on for pediatrics. Did you know them personally before?

DR. KATZ: This is how I got to know them. I didn't previously, no. I had met Dr. Krugman. He had come to the lab to visit, because he read some of our early papers and was very excited about measles. Dr. Robbins I knew because he was an Enders' graduate and would come back to visit. I didn't know Dr. Kempe or Dr. Black, but I got to know them.

DR. BAKER: And did Dr. Enders make the connection or did you recruit them?

DR. KATZ: I have to be honest, I can't remember exactly. I'm sure if I did that, their acceptance was on the basis that it was Enders, not that it was Katz.

DR. BAKER: [Laughs]

DR. KATZ: Oh, that's another thing I forgot. Not that it's important, but I presented our very first study at the meetings of the Society for Pediatric Research. M**ost people went to that, so that was very exiting.**

DR. BAKER: Okay.

DR. KATZ: So some of them may even have contacted us. I can't say with certainty, Jeff. I don't remember. I know, as I say, that Krugman came to visit very early on in the game.

DR. BAKER: It was quite a group, and I have always wondered how they were assembled. (Laughs).

DR. KATZ: Well, you know, it was more on the basis of friendship and the good old boys club, rather than any other system. Again, the studies were repeated in these various settings with the same results, except that most of these studies were done on "normal" children. And again, the same type of results. Children did not have viremia. They didn't have virus in their nasal pharynx. About half of them developed fevers, and half of that half, rashes of one sort or another, usually very benign, very, very evanescent. Things went well.

DR. BAKER: And they also didn't tend to feel constitutionally very ill despite the fever?

DR. KATZ: No. Right. Dr. Robbins' and my own children can tell you. I can't remember at what point, but by then I gave the vaccine virus to our kids. They always get a big kick out of this when we talk about it, and they had no problem with it at all.

DR. BAKER: They joined a long and honorable tradition.

DR. KATZ: Yes. Well, then another tradition of the Enders lab is that anyone legitimate who came to the laboratory to visit, who was interested, could have anything they wanted. So by then, we had been giving the virus to anyone who came who was interested. Dr. Enders' philosophy, with which I totally agreed, was the more people you had working on a problem, the sooner you were going get the answers. We didn't patent things in those days.

DR. BAKER: No.

DR. KATZ: There was no proprietary aspect to it all, so that Dr. [Anatolii] Smorodintsev came from Leningrad, Dr. [Alan Powell] Goffe from England. People came from all over the world, not just from the United States, to ask for cell cultures that they could begin to use, to ask for virus, to ask for serum from monkeys, and to ask for various reagents that would help them to move along with their studies.

DR. BAKER: I don't mean to jump ahead, but a vaccine strain was developed in Russia soon thereafter, too.

DR. KATZ: Well, that's a whole story after itself. That's called Leningrad-16. Dr. Smorodintsev. It's very interesting, because Dr. Smorodintsev came to visit. In the era of microbial genetics, we could have answered the question definitively. In that era, we couldn't, except that within a few months of having visited us, he published a paper describing his work with measles virus in the lab. As you calculate it from what he described having been done, it would have taken several years to reach the level of attenuation that he describes. So we always felt that Leningrad-16 was probably Edmonston; but who cared, if Russian children were going to benefit from it.

And you have to realize that was still a time when Russia was very tight. With Smorodintsev there was another virologist named [V. M.] Zhdanov, and another one named [Valery Ivanovich] Shumakov. When they came to

visit there would be three or four virologists, and another person who was not introduced as a virologist.

[Laughter]

He was obviously the KGB person [The intelligence and internal security agency of the former Soviet Union]. They weren't allowed to come to the States and roam around free on their own. There was a very wonderful virologist at NIH [National Institutes of Health] whose name was Alexi Shelokov, he spoke Russian. He was of Russian descent, and he would come with them, and he always told us this is KGB. Everyone would ask questions, and this guy never asked any questions. Alexi would point out that this was the guard who was accompanying them. The other thing that was very fascinating is that because they were very distinguished virologists, they would be asked to give a lecture in the medical school. They would give a lecture in which they would describe all these great Russian triumphs most of which were totally fallacious.

DR. BAKER: [Laughs]

DR. KATZ: Then they would come back to the lab and begin to ask these questions which revealed, of course, that what they talked about in the lecture was a fairy tale. But they had to speak of the glories of Russian science. It was very bizarre. It's hard to understand for people who didn't live through it what the cold war was like, but this was really in the cold war at this point.

[Laughter]

DR. BAKER: Yes. It's a very interesting period isn't it? Was this roughly the same time when Sabin's vaccine was going to be tested in Russia?

DR. KATZ: Right. That's right. Well, he was already beginning to. Sabin, I think, was born in Poland, and he spoke Polish and Russian.

DR. BAKER: Oh, okay.

DR. KATZ: He had very good relationships with these people, and indeed, his big buddy was Shumakov, who was in Moscow. Smorodintsev was in Leningrad, and again, there was all this competition among them. Shumakov was the political man. He belonged to whatever their equivalent

of the National Academy of Sciences was. But this had a great deal to do with what lab support you got, what equipment you got, what permission you got to do different things. So you could only feel bad for them. You couldn't resent the fact that they made these things up. We could understand that they lived in a system where they had to be out on top or they were out.

DR. BAKER: [Laughs] It was interesting, I imagine.

DR. KATZ: It was very interesting. So we went along at this point and the studies began to be expanded. Many, many pharmaceutical firms got into the act at that point.

DR. BAKER: Yes.

DR. KATZ: Today it's just Merck [Pharmaceuticals], but at that point Parke-Davis [now a division of Pfizer, Inc.], [Eli] Lilly [& Company Limited], Wyeth [Laboratories, Inc.], Merck, Pitman-Moore [Pharmaceuticals, Ltd.] [absorbed into International Minerals and Chemical Corporation]. Companies that don't even make vaccines anymore all seized on this. They saw that measles were something people wanted to have their kids avoid, and they saw this as a good marketing thing. So they all began to work with the Edmonston strain.

DR. BAKER: They also worked with Edmonston strain?

DR. KATZ: Oh, yes.

DR. BAKER: Had anyone of them been working on it prior to that?

DR. KATZ: I think a number of them had been working on measles, but not successfully.

DR. BAKER: So really all those early pharmaceutical measles vaccines are working live from Edmonston.

DR. KATZ: Yes. Now, they did different things. Some of them grew it in dog kidney cells. Some of it was in different ways, but the seed virus was the Edmonston virus. I mean, if you look at the lineage of measles, all but one Japanese strain are really Edmonston, and they're acknowledged as such — except for the Leningrad 16. But the only truly different one was the Japanese one. Let's see, Bill [William] Bellini, who does molecular genetics

at CDC [Centers for Disease Control and Prevention], could probably take all of these — and he has taken many of them — and show that they're all Edmonston. Not that anyone said they weren't, they didn't deny it in any way. Maybe they treated it in different ways.

It did become an issue later, and I'm not sufficiently familiar with the legalities, because I think Merck did patent their vaccine. Of course, that's jumping ahead. A lot of people felt that even though the amount of fever these kids got didn't seem to bother them, this was not going to be a good thing for millions of children. You know we were doing dozens and hundreds. So there were two things that happened. One, and this came pretty much through Saul Krugman, Joe [Joseph] Stokes [Jr.], and others, was that they said you can modify natural measles by giving immune globulin. What if you gave a tiny dose of the immune globulin at the same time you gave the Edmonston virus? And indeed, that's what they did. They gave Edmonston vaccine in one arm, and a tiny dose of immune globulin simultaneously, and indeed it reduced the number of kids who got fevers from 50 or so percent down to ten or 15 percent. So that became the standard for quite a while.

That had one liability, and the liability was that some people didn't pay attention to the dosimetry, and instead of a hundredth of a milliliter of globulin, they would give a tenth of a milliliter. Well, just that difference was enough in some ways to abort the vaccine infection. But that didn't last too long, because at that point a man named Anton [J. F.] Schwarz, who worked at what was then called Pitman-Moore, which I think belonged to [The] Dow Chemical [Company] or something, took the Edmonston virus and passed it many more passages, but at a lower temperature. We had used normal tissue culture temperature, which is from 35 to 37 [Celsius], like normal body temperature. He reasoned, and I think very wisely, that maybe you would select out a different mutant or variant, or get rid of virulence totally by growing it at the lower temperature. He grew it at 32 degrees [Celsius], and indeed that was called the Schwarz vaccine, which again was Edmonston. He made no bones about it, but to differentiate it commercially it was called Schwarz strain. And that indeed proved to be just as benign as the original Edmonston, which was called Edmonston B with globulins. So it avoided the use of globulin and just made it that much simpler.

DR. BAKER: Wasn't there a third strategy, as well which is to make an inactivated vaccine?

DR. KATZ: Well, yes. You're absolutely right. Several groups, including Merck, given the history of polio and other vaccines that worked well, used the same approach that had been used with polio. They treated the virus with formalin and heat, and inactivated it, then gave it as a vaccine. It wasn't as immunogenic, and they had to give two, or most of the times three doses, and you did get an anti-body response that you could measure after three doses. But within a few years, it became apparent that those individuals not only were not protected, but they had an imbalance, and what we would now talk about as Th1/Th2 responses. When they came in contact with measles, they got a very bizarre disease which was called atypical measles, with a much different rash. It was much more peripheral than the usual measles rash. Some of it was hemorrhagic. Sometimes it even had tiny vesicles that looked like smallpox or chickenpox. They got pneumonia, or a pneumonitis at least. Sometimes they had central nervous system obtundation, so that very quickly, that vaccine was withdrawn. But it was around for about four years from 1963 to 1967. Over subsequent years, people who had gotten it kept turning up with this atypical measles.

It was interesting, because Dr. Enders and I both felt that was — not that we anticipated atypical measles — but we felt that inactivated vaccine was not the way to go. That this was a virus that needed to replicate, and you needed to get a good — we didn't again talk about T- versus B-cells — and you needed to get both a T-cell, as well as a B-cell response. You needed to get memory, as well as initial antibody, which is all you got with the inactivated vaccine.

DR. BAKER: And that had been said about Dr. Salk before, right?

DR. KATZ: Right. [Laughs] Right. Exactly. But, you know, measles is different than polio. They are different viruses. So that we never did any studies with inactivated. But some very good people did. David [T.] Karzon, who was then in [University of] Buffalo [School of Medicine], before he went to Vanderbilt [University School of Medicine]. Some folks in Baltimore at the University of Maryland. Dr. Kempe's group did some in Denver, having done the attenuated live virus with us. It was he and Dr. [Vincent A.] Fulginiti, who worked with Dr. Kempe, who did studies. So there were clusters around the country where inactivated was studied. I think in total, by the time they withdrew it, less than a million individuals had received it, but that was still a good cohort. It was a cohort that then was susceptible to the so-called atypical measles, and it was described in many different places.

Probably the best descriptions were by a fellow in Long Island named David Annunziato.

DR. BAKER: I know him.

DR. KATZ: Yes. He's a remarkably good clinician. It was very interesting, because again, one of the places where they used inactivated vaccine was where a very distinguished older pediatrician named Sam [Samuel] Karelitz was the head of pediatrics at [North Shore-]Long Island Jewish Hospital [Health System]. He became a devotee of inactivated vaccine, so a lot of kids in the Long Island area, following his pronouncements, got inactivated vaccine. Annunziato was some place in Long Island, so he saw a lot of these kids and probably wrote the best paper about that.

DR. BAKER: I've seen that. That is a great paper. But still, overall, the incorporation of measles vaccine into routine practice went more smoothly than polio. And in that sense I was saying that Dr. Enders would have been pleased.

DR. KATZ: Oh, yes. He was very pleased. As I say, he again had made a personal commitment to see this through. We went into the whole business with what was then called the Division of Biologics Standards [DBS], which is the FDA [US Food and Drug Administration] group that is now CBER, the Center for Biologics Evaluation and Research, which does vaccine approvals and licensure. We carried it through to there, along with the pharmaceutical firms. We weren't going to manufacture, but to provide the expertise and the knowledge about the whole issue. In 1963, it was licensed.

I should say that even before licensure, we had given papers at various meetings and published papers. One of the people who kept calling me was a man named David Morley, who was an English physician working in Nigeria. And in Nigeria, they not only had severe morbidity, they would have 10 and 15 percent mortality with measles outbreaks. He kept saying, "You have got to come. You have got to come do this study, this vaccine." Well, both Dr. Enders and I agreed that we would not go to Nigeria until the vaccine was approved in the United States; because we were very concerned we could be thought of as using these poor black kids as guinea pigs. "It wasn't even licensed in the United States, what are you doing over there in Nigeria giving it to these poor kids."

Very soon after it was approved in the United States, we agreed to go, and Merck was very helpful. Maurice Hilleman was the head of virus vaccines at

Merck at that point and we had collaborated with him. He was very helpful in providing me with ampulized vaccine, with syringes, with everything we needed. David Morley was very interesting. I shouldn't say was, he's still alive. He was fascinating. He was a British pediatrician who was very concerned with the problems of children in the developing world. He was one of the first pediatricians to work in Nigeria — one of the first developed world pediatricians. He worked in a town called Ilesha, which was a market town about 75 miles from Ibadan. Ibadan [University of Ibadan] was then the only university with a medical school in Nigeria.

We agreed that I would go to Nigeria, and as I say Merck was very helpful in preparing all these materials that I could take with me. I went, and flew to Lagos [Murtala Muhammed International Airport], which was the only big international airport at that time. David met me and we drove to Ilesha. Ilesha was a wonderful little market village. There was a hospital there run by the Wesley Guild, which was a Methodist group from England, and there were 4 or 5 English physicians and their families. It was fascinating to me.

It was my first experience in that sort of environment. The wives taught school for their kids. The hospital was just the way you would read about. It was very clean, but every child who was there had a parent who stayed with him, who did the nursing, who did the laundry, who did the feeding, who did everything. Outside of Ilesha, which was a busy market village of I would have guessed the population might have been 25,000, David had a little dispensary in a place called Imesi [Ile], -I-M-E-S-I, and there was an English sister, Sister Margaret Woodland. She ran that place just the way I described Sister Lewis Carroll running the ward at St. Mary's. She was wonderful, and all the Nigerian mothers respected her greatly.

They had decided that was where we would do the first trial of measles vaccine. So we went to Imesi, and I got to know a number of the staff there. She was the only English nurse, but she had trained a group of Nigerian women who were her assistants. I don't know if they were called nurses or what they were called, but they were very capable. And we did a study of measles vaccine in these children.

One of the things that was of concern was that many of these children had malaria. A number of them had protein malnutrition, and the concern was that this virus was okay in healthy American home-dwelling youngsters, but what was it going do in these kids. And thank goodness it worked out very well. They did very well. Again, we saw these youngsters every day and

examined them, as well as obtaining temperatures and going over them very closely clinically. And they just breezed on through and developed antibodies.

I have a wonderful photo some place of David Morley, and me, and Sister Margaret with all of the mothers and their kids in arms. The mothers, of course, got very well dressed to come to the clinic. That was a special thing. You didn't come in ordinary clothing, so they would have their special cloths and things on. You know, it was for me a wonderful experience.

The other thing that was interesting was that while I was there David Morley's son got measles. He had his own family there, and we hadn't immunized any of the personnel of the hospital. So he had measles like any other child in this country having measles. He was sick, got a rash, he coughed, had conjunctivitis, and he got better. Meanwhile, I saw other kids, Nigerian kids, who got terrible measles, who desquamated, who developed staphylococcal abscesses, who had terrible gastroenteritis, and it was just a very striking contrast to see these kids. Here was this healthy, well-nourished English kid who has measles the way hopefully most kids were to have measles, without terrible complications or problems. So it was very striking, and I think that was really my first introduction to the problems of children in the developing world. It made an indelible impression, so that even today that is of great concern to me, and something both Cathy and I feel very committed to —doing something for children elsewhere.

DR. BAKER: We associate with so much of the studies of the late 1950s in Boston, and this study in Nigeria, this was really the first study in the developing world.

DR. KATZ: It was the very first study. You know, again we ran into [Laughs] a little parochialism. Ibadan, Nigeria had been part of an English colony. It was now free, but most of the professorial group at the University of Ibadan, which was the only medical school, many of them, if not most, were still English. They were quite offended that here were the Americans on their turf.

I think I mentioned to you that people came from all over the world to our lab and got virus. One of them was what was then Burroughs Wellcome [& Co.] [in 1995 Burroughs Wellcome and Glaxo Inc. merged to form GlaxoWellcome, in 2001 GlaxoWellcome and SmithKline Beecham merge to form GlaxoSmithKline]. In the English office of Burroughs Wellcome, there

was a wonderful man named Alan Goffe, G-O-F-F-E, who was the head of their virology program. He had come to the lab, and we'd given him virus. He'd come back to visit a number of times, continued to work with us and learned some of the things that we had already learned.

Their laboratories, the Burroughs Wellcome Labs [Wellcome Research Laboratories], were in Kent in a town called Beckenham. He then developed the strain of vaccine which was called Beckenham something or other [Beckenham 20 vaccine]. Again, it was Edmonston. There was no subterfuge about it, but to identify this as Burroughs Wellcome's, it was Beckenham. Well, the professor of bacteriology or microbiology at Ibadan was very upset when we got there and called Alan Goffe. And you know, about a year after we did our studies, he got Alan Goffe there to do a study with Beckenham vaccine to establish the English foothold in Nigeria's measles prevention. [Laughs]

Alan was a close colleague, and there was no problem from either his point of view or mine, but this man, Patrick Collard, who was the professor of bacteriology was very, very much an Englishman of the old colonial era.

Another 'small world' thing that I just thought of that happened while I was there was that the professor of biochemistry was a Nigerian, and his name was Joseph [C.] Edozien. I met him and spent a little time with him. He was very, very lovely and charming. Well, I'd say about 1990, which would have been about 20 plus years later, when we were already down here in North Carolina, Katie [Catherine], one of our daughters who is a cross country runner, brought one of her best cross country friends home from Chapel Hill High School. This young woman's name was Frances Edozien. I looked and I said, "Frances Edozien is not a common name. What's your father's name?" She said, "Joseph." It turned out he was now the Professor of Nutrition at the [Gillings] School of [Global] Public Health at [the University of North Carolina at] Chapel Hill.

DR. BAKER: How about that? [Laughs]

DR. KATZ: Talk about a small world. So I called Joe, and we talked a bit on the phone. The final chapter with him is even more interesting. The part of Nigeria in which we worked is where most of the people are so called Yoruba. There are the Ibos [Igbos], the Yoruba, the Hausa-Fulani. There are a number of different ethnic groups. I don't know them all, but the Yoruba are the biggest group in Western Nigeria, and at that point they

controlled the government. That was before the military took over, and things looked so good in Nigeria at that point. But about five years ago or so I read in the paper that Joseph Edozien's father who was chief of a particular area in Nigeria had died, that Joe had been elected the new chief [Obi Prof. Joseph Chike Edozien, CFR, JP, the Asagba or traditional ruler of Asaba, Delta State, Nigeria], and he went back to Nigeria. There was a picture of him in the *New York Times* in his tribal robes. Now his kids are still in this country, but he is back there.

DR. BAKER: Isn't that an interesting life there?

DR. KATZ: You know, that's absolutely fascinating. But lo and behold, his son [Anthony Onuora Edozien] is a fellow in infectious diseases at UNC.

DR. BAKER: Talk about a small world.

DR. KATZ: It's a small world when these things happen. But as I say, that experience was remarkable.

DR. BAKER: You were there, was it 1964?

DR. KATZ: Yes. I think it was 1960, 1961.

DR. BAKER: At the time of the first Merck vaccine.

DR. KATZ: Right, yes. The other thing that was happening, of course, is the World Health Organization [WHO] was very excited about measles vaccine, because they appreciated what a killer measles was among children in Africa, in Asia and other parts of developing world. So I began to get involved with committees and consultations with WHO, and to become much more aware of the global burden of measles. They claim there were 6 to 8 million deaths a year around the world from measles. Now I don't think that they would ever go to court and say these are exact, because most of the places they're talking about didn't have the public health infrastructure so you can have that kind of reporting. Whether that's off by 20 percent or 50 percent, who knows. But to me, one of the most gratifying things is that in 2001, they estimate there were between 600,000 and 800,000. So it's really a remarkable reduction, about a 90 percent reduction. We still would like to do better, but it gives me a very, very nice feeling to have been in some way involved.

END OF TAPE 2 SIDE A

DR. KATZ: I keep coming back to it. It isn't that I have false humility or anything. I was really very fortunate that I came along to the right places at the right time. I was only 36 years old when measles vaccine was licensed, and suddenly I became somebody recognized nationally and internationally. I felt a little bit diffident about this, but Dr. Enders was the person who hated meetings. He wanted to go to the lab, do his work, and go home.

DR. BAKER: [Laughs]

DR. KATZ: When there were meetings in Washington that he was invited to, the day before the meeting he would say, "Sam I think I have a little respiratory infection. Would you mind going to Washington?" So at this juncture in my life I found myself testifying. This was before the Armed Forces Epidemiological Board [AFEB], which had funded a good bit of the measles research. There were only two grants in the lab at that point. The AFEB, Armed Force Epidemiological Board, because measles had been a problem in Armed Forces recruiting camps in World War I and World War II, and the NIH. We had two grants, that's all. Again, Dr. Enders did not believe you went out and got money just for money. You got what you needed. He's probably the only man in the history of the NIH who returned money at the end of the year.

DR. BAKER: No way.

DR. KATZ: Absolutely. If the grant budget was X, and he spent X –minus ten, he would send the ten back. The NIH didn't know what to do with it of course.

DR. BAKER: [Laughs]

DR. KATZ: He was a man of total honesty. Well, I would be sent to the Armed Forces Epidemiological Board to report on our work, and here would be sitting John [Rodman] Paul, the epidemiologist from Yale, Albert Sabin, Robert Ward, Gustave Dammin. The great figures of that era. And here was little Sam Katz telling them. I went with great diffidence, but they were, again, very, very cordial. They were very formal during the day, and then they would take me back to their hotel where they all drank Irish whiskey. I learned about Tullamore Dew Irish whiskey at night. Not that I ever became a great fan. I'm not a drinker. I like wine, but not whiskey. But as a result,

there were many such venues in which I appeared. I was the embodiment of the Enders lab.

I had never wanted to claim that I was the hero of measles vaccine. It was a group, and I was just the fortunate representative of the group. It was really a very, very special experience to have been thrust forward into all of these situations, and invited all over the world, and been able to participate in so many different things because of measles being such an important disease of childhood.

DR. BAKER: You mentioned measles and their response in the United States. I'd like to know a little about how it was picked up by the media, and did you feel that it was treated as a priority and people were interested in it?

DR. KATZ: Oh, yes. I can remember when it was licensed, the very week it was licensed, we were invited to New York. I think it was CBS [Broadcasting, Inc.], but I'm not sure, and they had a big television thing with the Surgeon General, with the head of the CDC, with Dr. Enders and me, and a big commentator, Charles Collingwood. That was the name of interviewer. I guess he was the Peter Jennings of his day. We were interviewed on national television, and oh yes, there was a lot made of it.

DR. BAKER: Was that shortly after the *New England Journal* [*of Medicine*] papers were published, or when was that?

DR. KATZ: I think it may have been. I think it was just after licensure. It would have been February or March of 1963.

DR. BAKER: Okay. And there were no press conferences before any papers were published?

DR. KATZ: No. That's very important. That again is typical of John Enders. You don't patent; you don't have press conferences. You announce things by writing a paper in the right journal and getting it published. As a former English graduate student writing papers, you know, you wrote them on yellow lined paper in pencil, and you went over them five or six drafts before they were acceptable to him, which was good training.

DR. BAKER: It's such a remarkable period that you experienced. I don't know if there are any other comments you want to make just about how Dr. Enders

encouraged creativity and critical thinking. It just seems to have been such a fertile place to work at.

DR. KATZ: He was first of all intimate, in that he didn't dilute his talents among a huge group. He kept a small group, and he visited every one of you every day. He traveled very rarely, because he felt that where he wanted to be was in the lab.

There was another funny thing about Dr. Enders. He had been a Navy pilot during World War I, and he never trusted airplanes. He felt they were of the same vintage with those he flew in World War I. [Laughs] He trained pilots at [Naval Air Station] Pensacola, Florida, I think, and never had any faith. He would take the train. Any place he had to go, he would go by train. When he went to Europe, he went by ship.

DR. BAKER: When he got his Nobel Prize?

DR. KATZ: Right. Eventually, he and I did make a couple of trips by plane to Washington, but he was not comfortable. He had no faith in the safety of airplanes. He was not a traveling professor, the classic professor today with slides and a briefcase. He was there everyday, and that was wonderful because, first of all, he had great ideas. Secondly, he had a lot of experience. And third, you wanted to do well, not just for yourself but for him. He inspired you in so many ways, and as I guess I mentioned to you earlier, especially in my case, it was more than just a professional mentoring. He was really a father figure for me. I spent time in his home, and several of my kids became the animal keepers of the monkeys in the animal room.

[Laughter]

He was lovely. One of the other things that is interesting is that this was in the days before plastic laboratory ware, so it was glass. Most of the test tubes, burettes, pipettes were glass, so that you had a wash room where people had that job. They cleaned, they washed, they autoclaved all of it. That was run by a wonderful autocrat named Janis [Lejins]. Janis was a Latvian Shakespearean actor, and he had come to this country after the Russians had moved into Estonia, Lithuania, Latvia, and established himself in the Boston community. Well, there wasn't much work for a Latvian Shakespearean actor. I don't know how he came to Dr. Enders originally. He was there when I came to the lab, but he had gradually assembled a group of other Latvian expatriates, and they ran that glassware room.

That was part of your training in the Enders lab. You learned to do everything from the bottom up, and clean. You spent time in the glassware room learning how glassware was prepared. You made your own tissue culture media, because you were supposed to know what it was all about. This was always so striking in contrast to my colleagues who went to NIH where you picked up the phone and said, "Send me 500 monkey kidney cells cultures," and the tubes arrived. You made them in the Enders lab, so you knew if they were good or bad, why they were, or why things didn't work out. You knew all the ingredients from the very beginning.

One of the funny stories that occurs to me in that regard was the AFEB, the Armed Forces contract. One of things you use in nurturing cell cultures when you first start them is serum. The classic serum today is fetal calf serum. But at that time bovine serum or horse serum were classic. Well, Dr. Enders had worked out an arrangement with the Boston Police Department. They had a handful of horses that they kept out at the Commonwealth Laboratories [Inc.] in Jamaica Plain, and they were trotted out for ceremonial events. When the opera came to town, when some distinguished person came, the policeman would ride horses. But most of the year they sat around out at Jamaica Plain. He had worked out a system where we went out and bled those horses to get our horse serum for the laboratory. The great advantage of it was, of course, that you knew what antibodies, what toxicity, what were the attributes. You had the same horse serum over time, whereas if you bought it commercially, it could differ from lot to lot.

So the agreement was that we provided the food and the hay for those horses. Well the auditor would come from the Armed Forces Epidemiological Board and look at our budget and see hay and oats. "What do you guys do?" He was convinced we were playing polo, or riding to the foxes or the hounds or something. So I had to go and show him each year when he came, because it was always a different one that they sent every year, why there were bills for hay and for horse fodder on our budget.

DR. BAKER: I like that story.

DR. KATZ: But that was again typical of John Enders. Not that he was cheap to get it from the Police Department, but that it was so reliable. These were the same horses, and you knew what to expect. This serum was toxic to WI38 cells, but it was fine for all the other cells. You didn't necessarily know what it was in the given horse serum that might be toxic, but if you got it

from Microbiological Associates, which was the commercial company, you never knew in advance. You had to test it on all your cells when you first got it. [Laughs] I had forgotten about that, but that was really a very interesting sort of thing.

DR. BAKER: That's a very interesting tangent. You picked up many skills along the way I would not have suspected. [Laughs]

DR. KATZ: Oh, absolutely. Well, you know another thing we used to do is, as a special nutrient for cell culture systems we used something that was called beef embryo extract. Well, how did we get beef embryo extract? We went to the slaughterhouse. When they slaughtered pregnant cows, they saved the intact uterus for us. We would bring these back to the laboratory. We had special racks that we hung them on, and we would sterilely extract two things. One, the bovine amniotic fluid which was used as a nutrient, and then we would take out the embryo. That was the boy's job: to go to the slaughter house, get the uterus, and harvest them at the laboratory. But then we gave the embryos to the girls, and they minced them up and prepared a centrifuged embryo extract. They probably contained all sorts of placental growth hormones and things, but they were wonderful for that. The cells flourished in their presence. As I say, we worked from the ground up.

DR. BAKER: That's what it sounds like.

DR. KATZ: You knew exactly what you were working with, what the constituents were, and if anything went wrong, you knew how to go back to find out where the problems might be.

DR. BAKER: And you didn't get all your things by mail order or other laboratory suppliers?

DR. KATZ: Gradually over the years we began to get a few things, but not those things. We got things like standard electrolyte solutions that you used when you made medium in which to grow cells. There was something called Hank's Balanced Salt Solution [HBSS]. It was easier to buy Hank's Balanced Salt Solution than continuing to make it up. It wasn't anything that had unusual organic ingredients; it was just water and electrolytes, which couldn't be bad. A few things like that. There were a few amino acid preparations we used to buy that were particularly good to salt tissue culture medium with, but that about all. Many labs just bought cell cultures from various agencies and companies. If they didn't grow well, they were stuck.

Either they had to go argue that they needed a new lot, or they said you didn't treat it right or something. We didn't have those problems.

DR. BAKER: Very interesting. Well this might be a time to wind back and pick up on you own career again, because we sort of left you in the Enders lab as a fellow.

DR. KATZ: Well, after three years as a fellow, I became a junior faculty member. There was no real infectious disease fellowship program at that time. My program was mainly laboratory, but the faculty member that I mentioned earlier, Sidney Kibrick, was the senior person in the laboratory under Dr. Enders. Again, he had very few people, and Sidney was a trained pediatrician as well as a microbiologist, and so he was the consultant for Children's Hospital. If they had an unusual infectious disease case, he would go see the patient. Gradually he began to take me along, and that was really my clinical infectious disease training. It was very enjoyable, because we would go a couple of times a week in the afternoon, and people from other parts of the Harvard enterprise would come to join us. Infectious disease people from the Beth Israel Hospital and from the Peter Brigham, as well as the Harvard School of Public Health. So we would have a little group of 6 or 8 people, and we would go and see problem patients, and then sit and discuss them. But that was really the extent of any formal or informal clinical infectious disease training that I ever had.

There were no such things as fellowships. Indeed, we started one of the first formal fellowship programs in the country. The NIH, in about 1966 or 1967, began to announce training grants for various specialties. At that time there was a person at the Beth Israel Hospital named David [S.] Feingold. I was the sort of clinical leader then at Children's. By then Dr. Kibrick had left, gone to Boston University, and I was the senior person under Dr. Enders. David Feingold and I applied jointly for a training grant from the NIH and were awarded one. It was called the Combined Beth Israel Children's Hospital Training Program. The reason we did it was, again, we felt that infectious disease covered all age groups. We provided the children's perspective at Children's, and they provided the adult perspective. The fellows who came to the program and trained worked at both places. They would spend X number of months at Beth Israel, and Y number of months at Children's.

DR. BAKER: That was in about 1967?

DR. KATZ: That is 1967 exactly. Good for you. It was the year before I left Boston.

DR. BAKER: So was that parallel with your research fellowship or is that right afterwards?

DR. KATZ: No, it was parallel and continuing afterwards until Dr. Kibrick went over to Boston University.

DR. BAKER: Okay.

DR. KATZ: I can't tell exactly what year that was, but it had probably been mid 1963, 1964, something like that.

DR. BAKER: Then you took a position at Beth Israel immediately after?

DR. KATZ: Well, that very interesting. That gets into the other side of Harvard and Dr. Janeway. My appointment was in pediatrics. Dr. Janeway was the chairman of pediatrics, and he was always looking for a way to get your salary.

[Recording Interruption]

DR. KATZ: As I mentioned, very early on my indoctrination into pediatrics came through Dr. Gellis at Beth Israel. Dr. Gellis at that point left the Beth Israel and went to — well he went initially to Boston City Hospital, which was a BU [Boston University] service as chair of pediatrics there. So there was no one running pediatrics at the Beth Israel. Dr. Janeway said, "Ah ha, there's a salary. You're now the chief of pediatrics at the Beth Israel." So I became the chief of peds, which was a one-person service. I mean there was only one full-time person there.

DR. BAKER: Okay.

DR. KATZ: There were a number of people who participated in attending and who helped out in many ways, but no one else was full time. I was it, as Dr. Gellis had been it, and so that paid my salary of $8,000 a year for being chief of pediatrics. So I would spend the mornings at the Beth Israel most days, and then spend the afternoon and part of the evening over in the lab, in Enders lab.

DR. BAKER: Okay.

DR. KATZ: So I retained my role at the Enders lab, but with more like 70 percent time there and 30 percent time at the Beth Israel.

DR. BAKER: What were you doing in the Enders lab at the point?

DR. KATZ: Well, we were doing a number of things actually. One is that we began to work on rubella. Another thing we got very interested in was the beginning awareness of tumor viruses. One of the wonderful young fellows who had joined us then, Harvey [M.] Shein, began to work on SV40 [Simian Virus 40]. I began to work on the adenoviruses. We found that there were several of the adenoviruses which were tumorogenic in hamsters, so I began to do a lot of work on that.

By then I had graduated to the point where I could have a technician of my own. So I had a wonderful young woman named Ann [P.] Smith, who became my technician. That was how I was able to spend time at the Beth Israel, because I had a technician who was doing a lot of the things that I previously had to do myself. We began to work on tumor induction in hamsters with adenovirus. So that was one thing.

Another thing, I got involved in was studies of antivirals. It was very early on with an awareness that there were compounds being developed and discovered that were potent in vitro, and we began to do both in vitro and some in vivo studies of early antiviral compounds. Also, we got involved in clinical studies of other vaccines that were coming along. Not that we did the lab work. We didn't do any lab work with bacterial vaccines for example, but we got involved fairly early with some of the interest in haemophilus influenzae vaccines. Not the conjugate vaccines, but back in the early poly-saccharide vaccines. We really had a number of things going.

I began to do a lot of the teaching at Harvard Medical School in microbiology. There was a wonderful person named Elmer Pfefferkorn. Elmer was a PhD basic virologist. Absolutely superb. So he and I did team teaching. We taught virology to the Harvard second-year medical students, taught the course and ran the lab. He eventually went to Dartmouth [Medical School] and became the chairman of microbiology there. Just wonderful, wonderful. One of the best teachers I've ever known. It was very apparent to me after several years that he didn't need me. He knew the clinical from listening to me and what he read. He knew the clinical virology

as well as anyone, but we taught together and we loved it. We had a great time. I loved students, and there would be students who would come and work with me in the lab for a month or something of that sort.

I'm going through an evolution at this point, but I am not necessarily putting it to you very articulately. One of the things that characterized younger faculty at Harvard at that time was that you hid from the students, because the way of advancement was not through teaching. The way of advancement was getting grants and doing research. So many, and it's a generalization as faulty as any generalization, but many of the young faculty sort of hid from the students. Closed the doors of their labs and did their work, because that was the key to advancement. I resented that and felt very strongly that we had a commitment to students, and I enjoyed it. So I spent a lot of time with students and got students to come work with us in the lab and to do some clinical infectious disease rotations. Dr. Janeway was a very good teacher himself, and I sort of hoped that he would support this.

He went on sabbatical one year, and David Nathan, who was the young hematologist, and John [F.] Crigler [Jr.], who was a young endocrinologist, and I got together and decided we were going to change the residency program in Boston. Since there was a Boston City Hospital, a Mass General Hospital, and a Children's Hospital program, why didn't we merge them, as the experiences were very different? The City Hospital was a totally different population than Children's, which was different than Mass General. We had it all worked out, and Dr. Janeway came back from sabbatical. It was never implemented, but as I say, increasingly I became committed to teaching students and residents. That was one vector.

The other vector was financial. By then my eldest son Sandy was in high school, and I began to talk to people in my same position at other schools, and discovered that many schools had faculty tuition plans where if you were on the faculty of Vanderbilt, your son got to get free tuition if he went to Vanderbilt. Or even more than that at some schools. They could go to any other college, but they got the support of the local tuition. I went to talk to Dr. Janeway and asked him, "Does Harvard have a plan like this?" He looked at me and said, "Not Harvard." Then he said sort of apologetically, "We had a plan a number of years ago where we would exchange students. If a Princeton student wanted to come to Harvard, then a Harvard student could go to Princeton. They would exchange, and there would be no tuition due, or a Brown student. Everyone wanted to come to Harvard, so it was all out of balance. So it never worked and we canceled it."

DR. BAKER: [Laughs]

DR. KATZ: Well at that point, I was on what was called a Research Career Development Award, an RCDA. I had finished three years at Beth Israel and moved out because I got an RCDA, which paid my salary. An RCDA was an NIH award.

At that time, I think told you my salary at the Beth Israel was $8,000 a year. The RCDAs paid anywhere from $15,000 to $25,000, and I was drawing $15,000. With several children, I felt I could do a little better than that, and the executive secretary at NIAID [National Institute of Allergy and Infectious Disease (part of NIH)] said, "Why don't you draw $25,000? The money is there for you." So I said to Dr. Janeway, "Dr. Janeway, you know the executive secretary says we could really draw $25,000 for my salary instead of $15,000." He looked at me and said, "Oh no. We can't do that." I said, "Why not?" And he said, "It'd put you out of line with all the other assistant professors." Then he looked at me, and this goes back to what I was saying before about the genealogy of Harvard faculty, he said, "Didn't your father leave you any money?"

DR. BAKER: Oh. [Laughs].

DR. KATZ: I suddenly felt embarrassed for my father, and I said, "Well, he left my mother very comfortably. She has no problems; but no, there was no major inheritance." Then he said "What about your father-in-law?" I said, "Dr. Janeway, the last thing I ever plan to do is to live off my father-in-law." He sort of shook his head, and he said, "Too bad." That was when I first began to think maybe I should look for another position.

I had been offered the opportunity to look at many positions. And once again, as I said to you before and I keep repeating, I was a young punk, but I was being offered chairmanships at lots of different places. By then I was almost 40 years old.

DR. BAKER: And you're traveling around the world.

DR. KATZ: Right. Exactly.

DR. BAKER: This as an associate and an assistant clinical professor. Running all these protocols.

DR. KATZ: I was a tutor in medical sciences, I was an assistant professor in pediatrics, and as you say, I had a lot of exposure. I had never felt the least bit interested in any of these, but I began to think, "Well, you know, maybe the time is coming." But there were two things. One was the concern about being someplace where teaching was just as important as research and clinical care. The other was just being very realistic about financial infrastructure with kids getting ready to go to college and all the things that were involved.

So I began to accept invitations. Just a few selective ones to look at the chairs. The two that interested me most were U-Cal, San Francisco [University of California, San Francisco] and Duke [University School of Medicine]. I think I mentioned I'd gotten to know Dr. Kempe because he had participated in some of our early studies. Also one of his daughters had come to visit and stayed with us when she was looking at Radcliffe [Institute for Advanced Study, Harvard University] for a school, and we got to know her fairly well. So Betsy and I became friendly with Dr. and Mrs. Kempe. She was a psychiatrist, a child psychiatrist. They were a wonderful family. They had five daughters. I was a visiting professor there at Colorado, and one way or another I talked to him a bit about what is it like to be a chairman, because he'd been a very successful chairman. He was very, very helpful and gave me a lot of very good insights into the responsibilities, as well the pleasures of being a chairman.

Then I went to [Johns] Hopkins [University], and the chair of pediatrics there was a man named Bob [Robert E.] Cooke. Hopkins had been a very distinguished department of pediatrics, but it had gone into a sort of holding pattern over a period of years. I forget who, but they had a chairman who was a very troubled man. I think he eventually committed suicide. The department had lagged for a number of years, and Bob Cooke had come in from Yale where he had been, and really rebuilt the department to a tremendous level.

He had been invited to Duke when it became apparent that Dr. [Jerome] Harris was going to step down, to visit the department as an outside consultant and give them some ideas about what needed to be done, what were the strengths, what were the weaknesses, etc. So I went to spend an afternoon with him, in which he was very, very helpful, very candid about what was the potential at Duke. What were the strengths already there, what were the weaknesses, what were going to be the problems of a place like that.

I found it very appealing. I came to visit Duke, and I think another thing that I loved about it, and still do, was that the medical school was part of the university. At Harvard, the medical school is in Roxbury, the university is in Cambridge, and there's very little interaction. There is more today, but even so the amount of interaction and dialogue is small. I mean, what I was able to do with Peter [C.] English, and with you, having a faculty member who could be a pediatrician and a historian and live and work in the same institution, would be impossible there. It is so much easier here, and that appealed to me greatly.

Dr. [William G.] Anlyan was then the dean here, and was very supportive. At that point, I decided, "Okay, it's time to make the break. You've had a wonderful time working in the lab, but the things that really move you now are outside the lab — teaching and clinical care." So I decided I would come to Duke.

Unfortunately, that was the decision which ended my first marriage. My first wife was a wonderful mother to our kids. I think in part I'm greatly responsible for this, because I was in many ways married to my work. I was married to her, and I loved my children, loved my home, but I spent a lot of time out of the home, and she would not leave Boston. Her family lived in Boston. She was from Boston. She wouldn't even go visit San Francisco when I went there. That was the only big city that I thought I would have good experience in, but they had similar problems to Harvard in that the undergraduate school was in Berkeley. So it wasn't as attractive to me as Duke, and Duke was very attractive to me. I tried to get her to come to visit Duke. She wouldn't even come to visit, so I finally said, "Well, I'm going to Duke," and I came. And after I came, she did come down and visit once and decided no, she couldn't leave Boston. I flew up weekends to Boston, and it became a more and more difficult situation, and without going into all of my personal things, that resulted eventually in the dissolution of that marriage.

I came to Duke, and because I was here as a single person, I was able to spend a lot of hours every day working, and enjoyed enormously the challenges I found. Dr. Anlyan was very helpful. I was able, as people are apt to do, to know who your friends were that you admired, and within a short period of time I was able to recruit about 8 of my Harvard friends to come and join me here.

DR. BAKER: And how big was the department when you first came here?

DR. KATZ: I can't tell you numbers, but it was a modest size department, and there had been some attenuation.

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DR. KATZ: Well, as I said Dr. Anlyan was very helpful. The history of the pediatric department here was a very interesting one. Because Dr. [Wilburt Cornell] Davison was the first dean, he was also the chair of pediatrics. He was a pediatrician, but he had decided that pediatrics shouldn't be a strong university program. That pediatrics belonged in the community. And he and most of the people, like Jay [Morris] Arena and Angus [M.] McBryde and Arthur [H.] London [Jr.], were distinguished town pediatricians who would come and teach at the medical school, but who maintained their practices in town. Dr. Harris wasn't really the chairman when he first came. Dr. Davison maintained himself as the chairman. But Jerry was really the first full-time person, and he was able to build a smaller department. But Dr. Davison was very tight as far as putting any financial support into the department of pediatrics. So Dr. Harris deserves enormous credit for building what he was able to build. They built cardiology with Maddy [Madison S.] Spach, whom he trained. And they built endocrinology with young people whom he trained. They built various aspects of the department. But when I got there it was pretty thin.

DR. BAKER: Why did Dr. Davison feel that way?

DR. KATZ: I just don't know. Whether he felt it would be competitive to build a strong department with the people in town, or what it was. I don't think he was a supporter of the subspecialty areas of pediatrics. You know his book was *The Complete Pediatrician [: Practical, Diagnostic, Therapeutic And Preventive Pediatrics, For The Use Of Medical Students, Interns, General Practitioners And Pediatricians]* – 1st Edition published by Staples in 1958].

DR. BAKER: Yes.

DR. KATZ: That's what he expected pediatricians to be, like that. You might ask Dr. Harris sometime, but I don't really know. But within a relatively short period of time I was able to recruit Lois. There was no one for example, who ran the clinic. It was run by the residents. I got Lois Pounds to come down, whom I had known at Children's in Boston, to take over the clinic. Tom [Thomas E.] Frothingham came and joined her subsequently. Stuart Handwerger came and headed up endocrinology. John

[F.] Griffith came and headed up neurology. George [W.] Brumley in neonatology. George Lyon, who actually was with me at Harvard, but he had moved to Brandeis [University], came back in hematology/oncology. So that within a relatively few years, I had recruited a number of very good people, who then themselves built programs and were able to recruit others.

Probably the people who were the strongest in helping me when I first came to work were Maddy Spach in pediatric cardiology, who was really a very, very distinguished person nationally in the field, George Brumley in neonatology, and Tom Frothingham when he came. We used to sit together on Saturdays. They were sort of my kitchen cabinet. We would sit and plan what the department needed to be doing. They were enormously helpful to me, and I'll remain ever grateful to them.

I brought an administrator from Boston, which was interesting. There was a woman who was the administrator for the department of biochemistry at Brandeis, and George Lyon, whom I mentioned to you, worked in that department. He had been here as a resident actually, before he went to NIH, and then to Brandeis. He said to me once I began to talk to him about coming back to Duke, "Would you be interested in an administrator?" I had not administrated a department. I'd been in a laboratory with two grants as I told you about. [Laughs] I said, "Yes, I need one." He said, "Well there is this wonderful woman who is Professor [Nathan Oram] Kaplan's administrator, but she wants to move closer to home. She comes from Florida." So I went and met this woman, Edna Royal, who was a real character. She was probably a little bit like Uriah Heep in Charles Dickens. [Laughs] She held the purse strings tight, but she kept us in balance. She was very, very good. She was eccentric to say the least, but very, very helpful. So that was my administrative cadre.

[Laughter]

There was Edna and I, and I had a secretary. That was it, but we got things going. One of the wonderful things, of course, was that the Duke medical students were wonderful. I think now of the people in those first classes that I got. One was John Modlin, who was a medical student, then became a resident. Now he is the chairman of pediatrics at Dartmouth. Another one was Ilana Bellmaker, who was a Harvard student who had come to Duke medical school, she and her husband. He went into psychiatry; she stayed with us in pediatrics. They went to NIH, and then they migrated to Israel.

She is the head of health services for the Negev, for the whole region of southern Israel.

Harvey [J.] Cohen, who was here getting an MD/PhD, came and spent time with us. I can't think of what he was working on, superoxide dismutase maybe. He was owed the service time and was sent to the National Institute of Environmental and Health Sciences [NIEHS], which made him again a part of Duke. He came and spent time with us. He is now the chairman at Stanford [University]. A wonderful guy, a hematologist now.

Working with Duke students was so much fun, and I really fulfilled some of the hopes I had had as a chairman in those days. As I said, there was one administrator in the department. There are more administrators now than there were faculty then. But I was able to administer the department, to foster research among these younger people, and to teach. I did morning report everyday. I had a class on Saturday morning with the medical students in pediatrics, and I loved it. You know it was what I had hoped might be true. And as mentioned, the interactions with folks at the [Duke] Divinity School, with folks in the department of psychology, with folks in the department of history, with biomedical engineering, were so readily available. You really could do the things I had hoped would be possible when I first looked at the Duke.

DR. BAKER: You were certainly recognized for your teaching on a number of occasions; that might include by my class too.

[Laughter]

DR. KATZ: Thank you.

Well, you know one of the other things that attracted me here was Floyd [W.] Denny [Jr.]. Floyd was the chairman at the University in North Carolina at Chapel Hill. I knew him because he was the infectious disease person, and I'd known him on the national scene. I knew very few people in Duke, to be honest, when I first came here. I knew more people at the University of North Carolina, because as I mentioned, it also had been a 2-year medical school. So I had classmates at Harvard who came from UNC, and then went back to UNC, or who went into practice here. So I knew a good number of people, although not so many of them right here at Duke.

But I soon found that the faculty at Duke were very welcoming. They were delighted to see the flourishing of a department of pediatrics. Jim [James B.] Wyngaarden was the chairman of medicine, and again a very scholarly person, but also a very helpful person in many ways. We were able to do a number of things between medicine and pediatrics, between Duke pediatrics and UNC pediatrics. Within a very short time, neonatology between Duke and UNC was very collegial. Endocrinology had joint journal clubs.

When we got Debbie [Deborah Welt] Kredich to start in rheumatology, she ran a fellowship program. It was both UNC and Duke. In fact, she used to go over there because they had no rheumatologist and see their rheumatology patients until they recruited a rheumatologist.

In infectious diseases, Cathy Wilfert took over the program. When she got her first grant for HIV in the early 1980s, she included UNC and Wake [Forest University School of Medicine], which was then Bowman Gray, in the grants so that she was supporting programs there. Every single group in the department had some relationships. We had infectious disease conference one month at Chapel Hill, one month at Durham, back and forth.

The only group I could never get to work together was the cardiologists. They're like the surgeons. I would talk with Maddy, and I loved Maddy, but I would talk to him, and he'd say, "We do 375 caths [cardiac catherizations] a year, they only do 120. We have a recognized fellowship program, they don't." I once sponsored a dinner and had the cardiologists from UNC pediatrics, and those from Duke have dinner together. They hardly knew how to talk to one another. So I gave up on that.

[Laughter]

DR. BAKER: But you had a lot of success with the institution.

DR. KATZ: We had a lot of success with other areas where things just sort of coalesced and worked very well, but that was in part because Floyd was such a good person. The other thing that was important was that the town pediatricians were very good. This was the legacy of Dr. Davison, I have to give him credit. We worked out a system where they could admit patients directly to the pediatric service. Not a lot of them did that. Will [William L.] London would do it occasionally. His uncle Arthur London, who was the founder of the practice, would. Bailey Webb and some of the people in what was then the McBryde practice would do that. I think we had wonderful

relationships with the town pediatricians. For a while, we even established a program where a resident would go to [Dr.] London. The London office had one slot for a Duke resident. He had his or her own room, his array of patients, a nurse who supported him, and that went on for a number of years.

Unfortunately, it fell through after a while because of some of the changes in medical economics, and the requirements of the [American] Board of Pediatrics, etc. But it was a very nice program, and I think many of the people who passed through, as a result, chose careers in practice in pediatrics. That was very much something that I enjoyed.

Another thing that happened, which I guess we mentioned previously, was that because I had so admired the St. Mary's Hospital/Children's Hospital exchange, when Richard Moxon became the chair at [the University of] Oxford, we established a Duke-Oxford residency exchange, which is now in its sixteenth year. Richard Moxon was a friend who did a lot of his training in this country at Hopkins in infectious diseases.

By then, I had begun to know the people of what was then Burroughs Wellcome, which later became GlaxoWellcome and is now GlaxoSmithKline. They had an independent foundation which was supported by funds from the Burroughs Wellcome company. Knowing that they had a relationship with Burroughs Wellcome in England, I saw a natural fit.

I went to them, and we applied for and received the grant to support the Duke-Oxford exchange. Then later when Glaxo bought Burroughs Wellcome, they spun off the Burroughs Wellcome [Fund] foundation as a totally independent 501(c)3 organization, so it has no connection to any other company. At that time we went to them and applied for and received an endowment to support it. So we have an endowment that supports the exchange. It doesn't cost the department much at all, or the department of Oxford.

Again, I think the people who have gone through that have really felt that they benefited from both sides. I think the English residents contribute to our program just by being here and rubbing shoulders with our American residents. Our residents get a lot from it, finding out how things are, even if they don't go to England themselves. Only one person a year does that, obviously, but I think it has been very beneficial.

The other thing that happened was that Dr. Wilfert established an infectious disease fellowship. I think our second fellow came to us from Children's in Boston, and he was from the American University of Beirut [AUB]. His name was Ziad [H.] Idriss, and Ziad was with us for several years and then went back to teach as an assistant professor at AUB.

[Recording Interruption]

DR. KATZ: I was talking about Ziad Idriss. He went back and became a faculty member, and that was when all the wars began with Syria, and Israel and Lebanon. So he came back here for a while, and then he went back again. He was back and forth a number of times. But as a result, he began to send one of the AUB medical students each year to apply for residency training here. He would select someone who was interested in pediatrics and whom he thought was particularly good. So in addition to the Oxford person, most years we had a Lebanese resident. Not that they are necessarily Lebanese, but all the people at AUB, are from the Middle East.

A resident from AUB came almost every year. This is the legacy of Dr. Idriss, who eventually gave up and moved to Bethesda [Georgetown University] and is there now. The dean of the medical school there is a good friend, and several of our former AUB residents are faculty members there. Salman Mroueh in pulmonary. Oh gosh, I am blocking the name of the fellow with infections diseases [Ghassan Dbaibo], but we have at least three faculty members there now who were our former residents, including Rosemary Boustany in genetics. Despite all the hostilities and all the problems, that continues.

Raia Asaab this year is one of the AUB residents. Several of them have stayed in this country. Ramsay Fuleihan is a faculty member at Yale. There is another one who is a faculty member at Emory. There's another one who is a faculty member at Harvard. Things have not been good in Lebanon, so for some of them this has been, if you will, an introduction to what eventually is an escape. We've never sent residents there; that was never part of the arrangement. I think that the arrangement has worked out quite well. Providing more than just a US [United States] perspective has been something that I have enjoyed and felt has enriched the department.

DR. BAKER: That draws on your earlier experience at St. Mary's and your own experience in Nigeria.

DR. KATZ: Right, right. Oh, of course.

DR. BAKER: You have a very international experience.

DR. KATZ: And we've certainly had fellows, not as many residents. We just had those two successions of residents. We had a good number of fellows from Kenya, from China, from the Philippines, and from other countries. I think they bring to the program a perspective which otherwise might be a little too parochial.

DR. BAKER: I think you also attracted a very distinguished infectious disease attending, Cathy Wilfert. Do you want to comment any more about her?

DR. KATZ: Well, I knew Cathy in Boston. She was a fellow in the Enders lab. She'd been a resident at Children's in Boston. She was in one of those classes I mentioned where there were six or eight women at Harvard Medical School. Interestingly enough, her class, the class of 1962, turned out more infectious disease physicians than any other class in the history of Harvard Medical School. We've never quite figured out why. They are all over the place.

Cathy was previously married, and she and her husband had been divorced several years before I came here. Actually, no they did not, I am sorry. They divorced about the time I came here, because I could not offer her a job which I wanted to, because I couldn't get a job for her husband who is an internist. They were offered jobs at Salt Lake City, the University of Utah. He took it, and at that point she decided to leave him. So she stayed on at Harvard. After a couple of years at Harvard, I was able to attract her to come down here in infectious disease. David Lang was the head of the infectious disease, another person I had recruited from Harvard. He went on to become chairman of pediatrics of the University of Maryland.

She then became chief of infectious diseases. Here were two divorced people, she and I both interested in infectious diseases, and we found that we had more than a professional interest in one another, and eventually we got married. And that's been a happy story ever since. I always felt a little guilty that because I had distinguished myself in infectious diseases, she sort of got in my shadow occasionally. I tried very hard to let her have her own glory, which she certainly has developed in the most recent years with her work in pediatric AIDS [acquired immune deficiency syndrome]. That's

been very gratifying for me to see, not just the national, but the international recognition she has had in that area.

She was wonderful and built a very good division, and has had a succession of superb fellows, who again have done various things, both in academics and in the pharmaceutical industry. Pediatric infectious disease people don't go into practice by and large. It is not an area that's conducive to supporting oneself in practice. So I'd say almost all of them are either in the university or in the academic setting like NIH or CDC, and one or two in the pharmaceutical industry.

It is interesting that there was no one here in infectious disease. So I was really the first person to bring someone in as the chairman. I realized as a chairman I couldn't myself build a division of infectious diseases. But I brought David Lang who began, and then Cathy who continued and greatly enhanced the development. There was no pediatric neurology. That was why I brought John Griffith. That's not fair to say. There was a part-time person, a very nice guy named Jim [James] Renuart, who really was employed by the state and ran a program out at [Whitaker School in] Butner, which was for handicapped youngsters. But he would come in and do some attending and some teaching. There was a person in adult neurology, who was also pediatric trained, Marcel Kinsbourne. So there were a couple of part-timers, if you will. But John Griffith became the first full-timer in pediatric neurology, and again was very admired by the people in adult neurology. So we were able to build good bridges in that way. You know, pediatrics was changing, and I think I was fortunate to be in my position at that time to take advantage of it.

DR. BAKER: Could you elaborate on that?

DR. KATZ: Pediatrics was changing in a number of ways. First of all of course, people began to appreciate that many of the diseases of adults began in childhood. The best example I can cite is cystic fibrosis [CF]. We would have 35 year old patients on the pediatric ward with cystic fibrosis, because the adult pulmonary people didn't know anything about it, or didn't want to know anything about it. We would send these patients, the adults, and they would come back a few visits later and say, "I know more about CF than these guys do. Don't send me to them." So it took a while, but we gradually built a liaison with the adult pulmonary people so they became more knowledgeable, interested and involved, and that transition occurred.

The same thing happened with congenital heart disease. With the corrective surgery, there are young people living to be old people with repaired congenital hearts, who may need all sorts of changes, services or medications. Again, we've been able to develop a joint program with congenital hearts, and the pediatric and the adult group.

That brings to mind another thing that I felt very proud of, and that was the introduction of black residents in faculty. When I came here, there was no one, no black faculty. There was a wonderful pediatrician in town named Bill [William A.] Cleland, and I brought him on the faculty. He was in practice much the way Jay Arena and Angus McBryde were. But he came, and probably was the most faithful attendee of teaching conferences of anyone, including the full-time faculty. I think, in part because of his presence, we were then able to attract a number of residents. Brenda [E.] Armstrong, who's now our dean of admissions, as well as a pediatric cardiologist. [W.] LaDell Douglas who was with us for a number of years, and now is down in Jacksonville. Del [Delbert R.] Wigfall in nephrology. I felt it was important not just as a sign of affirmative action, but because so many of our patients were black youngsters. And I think there was a degree of confidence for them in seeing some of their own folks there, not just as physicians, hopefully as role models. They don't all have to be basketball players. They can have other aspirations. I felt that was very important.

When I first came, the clinic waiting room was divided, and I didn't quite understand why. I discovered they did it when the black waiting room and the white waiting room were separate. Now, fortunately, that has gone by the board; but they still had the wall division. So I had to get permission to clear down the separation between the two.

The other thing that was different about Duke at that time was that there was a marked separation of private and public patients. The Duke system had grown and thrived with what was called the PDC or the Private Diagnostic Clinic. For adults this meant you went to totally different places, and saw different physicians. If you were a private patient you went to the PDC, if you were a public patient you went to the clinic. They were different geographically, different in their staff. I was able to convince the administration that we could have one program in pediatrics and that you could have PDC patients, in the sense their billing was different; but they saw the same residents, the same faculty, they came to the same clinics, the same examining rooms. This was 1969-1970. It seems so hard even to envision today, but that was the system.

DR. BAKER: Interesting picture of those waiting rooms. Was pediatrics the first department to break down that distinction?

DR. KATZ: Yes, absolutely.

DR. BAKER: That's an important legacy.

DR. KATZ: I think that we were the only department for a while that did what I mentioned about the town pediatricians having admitting privileges. Eventually OB [obstetrics] established the same thing, because they saw that there were town obstetricians who had high risk patients who needed the facilities and the expertise of an institution. They agreed that they would allow town obstetricians to admit their high risk patients to Duke for delivery, for care, and they would jointly be managed by a Duke physician, as well as a town physician. That went on for a number of years. Unfortunately, it has been lost again now for lots of other reasons, but I felt it was a very important thing. There were lots of other aspects.

There was no such thing as a social worker at Duke when I came here. I always thought from my previous training, you didn't ask about social workers. They were like running water. I discovered that my predecessor in medicine, or Jim Wyngaarden's predecessor, Dr. [Eugene A.] Stead had decided social workers weren't necessary and were a pain in the butt. So he had gotten rid of them all. I hired the first social worker of our era, and within a few months we had a whole group of social workers in the medical center. And I am pleased to say that the other services began to appreciate that they really had something to contribute to the management and care of patients, so that Duke built a social work department. But there was none in the early 1970s certainly.

The same thing was true of child recreation. There was a very nice little play room across from the pediatric ward which was staffed by community volunteers who came in one hour an afternoon every other day or something. We were very fortunate again. We got a grant from the Mary Duke Biddle Foundation to hire a full-time child recreation supervisor, and that program soon thrived very, very beautifully and has worked along very nicely over the years. As you are well aware of it, I don't have to go into it in any detail.

DR. BAKER: And the ward has changed, too. Including the change in hospitals. Did you still have an open ward when you came here? The old Howland ward?

DR. KATZ: Oh, yes. The old Howland. Well, when I came here there were two pediatric wards, Howland, which was pediatric medicine, and Matas, which was pediatric surgery. There was no pediatric surgeon. That was another battle I had to fight for a number of years, to convince my colleague chairman of surgery that there really were things that were different about children, and that we needed the pediatric surgeon. Once he hired one, it worked beautifully. Then all the subspecialties in surgery — orthopedics, ENT [ear, nose and throat], cardiovascular surgery, neurosurgery — we were able to develop them once we had a pediatric surgeon. Our first one was Dr. Howard [C.] Filston, who was wonderful. We even reached a point of confrontation once where Dr. Spach, the chair of our pediatric cardiology division, and I told the chairman of surgery that we were going to send all our cardiology patients who needed surgery to Alabama unless he got us a pediatric cardiovascular surgeon, which he did very soon thereafter.

One of the other things that greatly pleased me was the fact that once I got here, I was accepted by the pediatrics chairs around the country as belonging to the club. I was a new boy on the block, but they welcomed me. I soon found that I was very active in what is called AMSPDC today, the Association of Medical School Pediatric Department Chairs, eventually becoming the president of AMSPDC. I enjoyed it very much, because I found it was very helpful sharing what one could do with your colleagues who were in different institutions and different settings.

[Recording Interruption]

DR. KATZ: I became active in the national Society for Pediatric Research, AMSPDC and the American Pediatric Society, where I was president one year. The others, of course, were more in the realm of infectious disease — the Infectious Disease Society of America [IDSA], the Pediatric Infectious Diseases Society [PIDS]. I think that was helpful not just to me, but to the department. I think the department gained a lot of recognition and our residents and our fellows found that they had many avenues opened to them as they began to look at positions and opportunities. Similarly, I was always a firm believer, as you well know personally, in encouraging our students who wanted to do pediatrics to think of going places other than Duke, though we would love to have them if they wanted to stay and they were first class. Nevertheless, I felt broadening one's horizons by going to Colorado, or going to Boston, or going to Philadelphia or Seattle had merit. Because if they came back they brought something that we didn't have that they had picked

up and acquired during their time elsewhere. I don't like to see a place get too inbred.

DR. BAKER: That's right. You also encouraged medical students, as I recall, in their fourth year to take a non-pediatric rotation?

DR. KATZ: Right. If they were going to go into pediatrics, I felt that they would spend the rest of their lives in pediatrics, and there were things that would be helpful in pediatrics that frequently were not available in standard residency. Like orthopedics for example, which is so much a part of children's health care. Most places don't offer much exposure to orthopedics for pediatrics residents. You are quite right. Yes, I felt that was an important aspect of what we should be encouraging students to do.

DR. BAKER: You were doing all these groups, and you also found time to co-author infectious disease textbooks?

DR. KATZ: Well, I'd say of all the things I have done and enjoyed, that's the thing I liked least. I find it tedious to write chapters for textbooks. I enjoy the material; I love new material. I love the interactions, but I've always found writing chapters something that was tedium, and it was not a labor of love. I did it originally because it was Dr. Krugman's textbook, and he invited me to join as co-editor. I so admired him that I could never say no to him.

END OF TAPE 3, SIDE A

DR. KATZ: Then when he died, some of the other people who had been involved with the book, urged me to continue. So I have done this, with the help of Dr. [Anne] Gershon, who is one of Dr. Krugman's students and the head of infectious diseases in pediatrics at Colombia. More recently, we added Peter Hotez, who was at Yale, and brings a totally different facet. He is a parasitologist in pediatric infectious diseases, and we've really not had a great deal of strength in the United States in parasitology, particularly pediatric parasitology. So that's been a very nice addition. They do the heavy work. I am really not totally honorific, but I don't do as much as they do any more. I will be the first to tell you that.

One of the things that both Cathy and I have enjoyed is travel. Again, infectious disease is a worldwide issue, and if you go to any of the developing nations it's nutrition and infectious diseases that are the two upper most

aspects. We have been to so many places, most of the time together, that we've really formed many, many professional friendships that have become personal friendships in countries in Asia, Africa, Europe, Australia, and New Zealand. You name it and we've probably been there and have had wonderful, wonderful experiences. That's been one of the things that so impressed me about pediatrics. I've gone fairly regularly, every three years, to something called the International Pediatric Association, which runs a meeting. It's not one of the great meetings scientifically, but it is one of the great meetings from the point of view of interaction of people — people from Egypt, people from Malaysia, people from Vietnam, pediatricians from Israel. They can all get together and sit there with common goals which are the betterment of the lives of children. The politics of what goes on between their governments is totally out of the picture, and it's so good to see. I think that is in part because of the issues of child health, but I think it's in part because of the type of people who are attracted to child health.

I think we are different. I try to say that without false pride, but I think there is a difference about people who choose to make their careers in working with infants and children, and this shows in that there can be ecumenism, a little collegiality, a loss of barriers. I realize it has no pragmatic application, but I always felt that if the pediatricians could take over the governments in Israel, and Palestine, and the Sudan, and Northern Ireland, all of the friction places of the world, maybe we'd get rid of some of the friction. Probably you'd have economies that would fail, but I think there might be more friendships and fewer conflicts, and less strife.

DR. BAKER: It's good to hear though, because you really have so many international roles.

DR. KATZ: I enjoy working with the World Health Organization, because again it brings me into that same arena where the concerns are much more broad. It's terribly important to be on the front line of genomics and proteomics. I don't belittle that at all, but I think that's going to thrive anyway. I think it's much more difficult to try to cope with what are the problems in the former Zaire, the Democratic Republic of Congo, where they're losing thousands of children every year. What are the problems where you see children starving in Afghanistan, or where polio is still occurring when we think we've almost eradicated polio? These are issues that I think we have to pay attention to. I don't pretend that, as an individual, I'm going to solve those problems. But I'm happy to be part of whatever team is going to be involved. I know that several of our deans at

the medical school have identified me as someone to whom they send students who want to go abroad to places of this sort. I am sort of the reference, the travel bureau [laughs] for many Duke medical students, because I do know people in many of these areas, and can help them make the right contacts. I enjoy that. And when they come back, and we talk about what they've done, I feel it's a good thing, because they are then exposed to what are the major problems outside of the United States. A number of them have chosen careers subsequently in public health or in world health or in another way working in areas that have more than just local applicability.

DR. BAKER: This might be a good time to return to vaccines, and your emerging role as an advocate and consultant in that whole arena. We left off in the late 1960s. I'm not quite clear how involved you were with vaccine issues in the 1970s, in particular. I know by the 1980s, you were very involved.

DR. KATZ: Well, I think I began to in the mid 1970s, because I was chair of the Committee on Infectious Diseases, the so-called Red Book Committee of the American Academy of Pediatrics. I can't tell you without looking exactly when that was, but that brought me into, again, an arena which was more national in its focus. They brought me in touch with some of the forces involved in communication, in public relations, in public acceptance, and government support, and many of the other issues which had nothing to do with how you manipulated a virus in the lab. It's a little bit trite, but you make a wonderful vaccine, and if it sits on the shelf it doesn't do any good for anyone. How do you get programs going to support immunization programs, abroad and within our own country? We've talked more about the global ones. Also, I chaired the ACIP [Advisory Committee on Immunization Practices] of the CDC for 8 years and have been a member almost continuously.

DR. BAKER: Right.

DR. KATZ: With some of the problems that have been encountered in vaccine liability, with anxieties about safety of vaccines, our very successes have in many ways been our worst enemy. That the young families, as well as young health professionals today have never seen polio, have never seen measles, have never seen congenital rubella. Our residents today never see H flu B [haemophilus influenzae type B] meningitis or pneumonia with empyema. So many of the things that I saw as a resident, that my grandmother and parents and your grandparents knew about, are just not visible. At the same time, as people increasingly look for solutions and causes

of terrible conditions that medicine has yet to solve, it's very easy to point a finger and say, "That's probably due to a vaccine."

With the internet, with the web, with all of the information that well meaning families find available to them; it is very hard for them to sort out what's wheat and what's chaff. So I found myself increasingly involved in that aspect of vaccine policy; in trying to provide relevant and reliable information for legislators. In this country, 50 different states legislate what will be required for a youngster to go to daycare or to go to school, and many of the anti-vaccine groups are trying to do away with those. At the same time, the media is frequently misinformed or sensationalist in their approach to vaccines or alleged causation of autism, of multiple sclerosis, all of it down the line. There is not the incentive for the media to do a program on, "Isn't it wonderful we don't see H flu B meningitis any more? We used to see 20,000 cases a year. There were less than 200 last year, of which only a small number were due to H flu B," etc., etc.

So we tried to form groups uniting advocacy programs. The American Academy of Pediatrics, the Infectious Disease Society of America, The American Academy of Family Physicians [AAFP], American College of OB/GYN [Obstetricians and Gynecologists - ACOG], the national [American] Nurses Association all merged to develop programs to provide information that will be helpful to health providers, families, the media, policy makers and legislators. So I have found an increasingly portion of my time devoted to that, but that's been a gradual evolution.

I was elected to the Institute of Medicine [of the National Academies] in the early 1980s, and they began to develop increasing interest in immunization. With the scientific advances, how do you establish priorities? You have only so many things you can work on at any one time. How do you establish priorities? Which is the next vaccine we should be working on?

DR. BAKER: That was a committee in 1985?

DR. KATZ: Yes, that's right, and we worked on both priorities for the United States, as well as for the developing world. Obviously leishmania and malaria are not things we put on the top line for the United States, but they certainly are for India and other areas.

DR. BAKER: As you look back at the vaccines that came on that list, that were high up on the list, and look back at it 15 years later, how do you feel you've done?

DR. KATZ: I think we've done very well really. The only flop we've had to date is respiratory syncytial virus, where we would still like to have a vaccine. It has not been amenable. Today, obviously, we add HIV, and malaria and tuberculosis, but HIV is probably the only one of those three that excites most people in this country. Whereas, adding TB and malaria certainly addresses the global aspects.

I had a wonderful experience a couple of years ago. The State Department [US Department of State] and the [US] Department of Health and Human Services asked me to co-chair something called the Indo-US Vaccine Action Program [VAP], which is exactly what we've been talking about. What they need in India is quite different from what we need in the United States, and yet we have a lot of technology and a lot of ability to do things that would be very helpful to them, even though in a capitalist system they wouldn't be profitable to the companies that make vaccines in this country.

DR. BAKER: Right.

DR. KATZ: Part of it is looking at technology transfer, part of it is looking at ways of developing products that may not make much on the open market. But groups like GAVI [Global Alliance for Vaccines and Immunization], which is the one that the [Bill & Melinda] Gates Foundation has given close to a billion dollars to, could be greatly augmented by the availability of many of the vaccines we have that they don't have in many of these countries, like hepatitis B, like haemophilus influenzae B, like pneumococcal vaccines. These are very costly, but are also very costly in life and limb in many of these countries.

DR. BAKER: A lot more than hepatitis?

DR. KATZ: Right, exactly. Yes, it can be frustrating. But at the same time, it can be very rewarding when you do make a few steps forward and overcome the one step you took backwards. I mean, the rotavirus is a sad, good example. Again, the World Health Organization uses figures like 600-800,000 children a year die of rotavirus gastroenteritis. I know from my India program, they feel that they loose 100,000 children a year from rotavirus. We had a vaccine which had problems we didn't anticipate with

intussusception, and we withdrew the vaccine. They won't use the vaccine in the developing world if we say it's not good enough for the United States. There are other rotavirus vaccines under development, but each day that goes by more children are still dying from rotavirus gastroenteritis, and the question becomes one which I don't know how to answer to. Are you willing to say that we'll use the vaccine in India, that one of 10,000 children may get intussesception, but 100,000 children may not die of gastroenteritis? These are ethicist questions, not clinical scientist questions.

DR. BAKER: Yes. There's been a lot of talk about what obstacles impede vaccine development to the pharmaceuticals. These companies don't feel they have an incentive to provide a vaccine for the developing world, because they make their money in this country.

DR. KATZ: Right.

DR. BAKER: And some other things come up with the Vaccines for Children Program [VFC] and that whole issue. I wondered if you could comment on that, and the consequences?

DR. KATZ: Well, I think you know in this country we have a piecemeal system, if you will. I guess that's one of the things that was very enlightening about the exchange program and working in England, where you never made a decision based on, "Well can this family afford this, or do they have insurance to cover this?" or what have you. If it was part of a national health program, that was it; it was done. In England they have exactly the opposite system we have regarding vaccines, because every child is part of some physician's panel. So instead of saying, "You can't go to daycare if you haven't had this vaccine," they do the opposite. They say, "Dr. Baker, if you have 75 percent of your children properly immunized by age two, you get a bonus of 500 pounds. If you have 90 percent of your children immunized, you get a bonus of 750 pounds." Those figures are hypothetical, maybe off. I don't know the exact numbers these days. We, of course, have taken the opposite approach. There are lots of children who don't have a primary physician or a health home if you will, so we hold our hand up and say there's a barrier. "You can't come to daycare, or you can't come to school unless you've had vaccines A through G."

In this country we've made a lot of headway I think. To me, the Vaccines for Children Program was one of the best things that came out of the Clinton administration, and has been implemented in a number of states in a

wonderful way. I'm very proud of North Carolina. We're one of the 15 universal states where you don't have to worry about what the father's income is, or which insurance is provided by his employer. Every child is entitled to vaccine. I think we've done very well. As I'm sure you're aware, last year we were number one in the nation as far as the percentage of children who by age two had received the recommended vaccines. That still isn't perfect. We're talking about 80 percent, not 100 percent, so we've got a way to go, but many of the issues are not as simple as whether the vaccine is affordable, it's the access for many of these youngsters. But I think we've moved in a number of good directions in this country. What we're facing today in March 2002, which is my big issue, is shortage of the vaccines, because many of these products have a single company that produces them.

DR. BAKER: Right. Fewer companies making the vaccines.

DR. KATZ: Like pneumococcal conjugate vaccine, measles, mumps and rubella [MMR], varicella-zoster, meningococcal vaccines, all made by single companies. The tetanus containing vaccines, only two companies. There used to be four and two have dropped out. So we're having shortages of DTaP [diphtheria, tetanus and pertussis], shortages of tetanus toxoid, shortages of tetanus diphtheria. Tetanus is the limiting factor. I've learned it takes 11 months from beginning to end to produce tetanus toxoid. So I don't know what the answer is.

There has been a significant move to say we should have a national vaccine authority. What that national vaccine authority would do is the real question. I could conceive of a government plant that would produce vaccine. Whenever I think of that, I think of the astronauts and $200 toilet seats to go in the spacecraft.

[Laughter]

DR. KATZ: But I think there could be a national vaccine authority that provided incentives to the private firms to help them over difficult spots or to encourage them to produce vaccines that are perhaps less likely to be big money earners. I've encountered this in a totally different arena that I never thought about until a couple of years ago, and that is the military. The military has terrible trouble getting vaccines, because they are sending troops to places where there's tick-borne encephalitis, Rift Valley fever [RVF], Dengue [fever]. Things that no one's concerned about in the continental United States. The issue is not only the health, but the military

availability of a group when you send them to countries where these exist. The morbidity and the time loss from active duty due to these are major, yet there's no real solution at the moment to providing the military with this. Again, I've sat on the Institute of Medicine committee recently, which is why this is fresh in my mind. It isn't anything I ever thought about until a few years ago. I'm a child advocate, not a militarist, but if we're going to have a military, and we feel it's important that they be in Afghanistan, or Somalia, or the Philippines, then they're facing very different infectious disease threats than they face at Fort Bragg in North Carolina, or a San Francisco base, so that there is still need for better organization even in this country where we do so very well.

DR. BAKER: Coordination and incentives in some cases can solve some of those problems we've talked about.

DR. KATZ: Right, exactly.

DR. BAKER: The FDA [US Food and Drug Administration] is pretty stringent, I understand.

DR. KATZ: Yes, the FDA is. They are charged with the responsibility that what they license is both safe and effective, and they take that very seriously.

DR. BAKER: I think as we're drawing toward the end —

DR. KATZ: I think we're running out of gas at this point. If there's more maybe we should do it on a second time or something.

DR. BAKER: Okay, I think that's fine. Unless you have any other just general comments for right now. You were supposedly retired from the chairmanship, but not your time. [Laughs]

DR. KATZ: You qualified it correctly. I retired from the chairmanship, but not from active duty.

DR. BAKER: Right.

DR. KATZ: I've enjoyed very much continuing to do the things that I do. Duke has been very kind to me in providing me office space, and part of a secretary, parking space at half price once you become emeritus. And being identified as part of Duke is still very important for your credibility as you

circulate in many of these places. Duke is highly respected, not just nationally, but internationally, and to say he's Chairman Emeritus of the Department of Pediatrics at Duke is still a good card entree to many such places as I tend to go. So it isn't all just because it's Samuel Katz, it's Samuel Katz from Duke University. And increasingly I think one of the nice things is the administration at Duke, not just the medical school, but the entire university is working hard to have more of an international presence and influence. I think that medicine is one place where we can do that.

DR. BAKER: Since we are at a very exciting time in regard to measles, maybe we could just include some thoughts on that.

DR. KATZ: Sure. Well, in the minds of the World Health Organization and other groups, measles has sort of come along third — smallpox first, then polio, and when we finished with polio, measles. Measles, I think, is far more difficult than polio for many reasons, virologically and epidemiologically, but I am delighted that people are moving in that direction. There's something called the International Task Force for Disease Eradication, which I was invited to address a few weeks ago in Atlanta. As the name implies, it is an international group representing many parts of the world, and there's no doubt they're committed to measles. People tend to use different words; when you start out you say measles control. Well, control is what we have in this country now. We have no endemic measles. There's no US strain of measles. Of 100 or so cases that occur each year now, of those where the virus can be studied, they're all importations from elsewhere.

The entire western hemisphere is doing very well with measles. Just as the western hemisphere did well first with polio, they're doing very well with measles. There were only about 2,000 cases of measles in the entire western hemisphere in 2001. The big problem areas are the same ones that are problems with polio, problems with HIV, and problems with other disorders of that sort, Sub-Saharan Africa. But even there at this International Task Force that I mentioned, they had a program through the World Health Organization in seven southern African countries, Botswana, Namibia, Union of South Africa, those areas, and showed that they were able to get 80 percent of the children immunized with a push program in the last year or so. They see these as prototypes of what they can do elsewhere. That's control. Elimination is a bigger step, and eradication is the final goal. I don't think I'll live long enough to see eradication. I'd love to see it controlled throughout the world, and maybe elimination from many regions.

The World Health Organization divides us up into different regions, the Western Hemisphere [called Region of the Americas], the Eastern Mediterranean, European, the Western Pacific, African, and South-East Asian. I think they've done very well with polio, except in Africa and some parts of Asia. I think they can do well with measles, too. But it's a tough one.

DR. BAKER: Yes

DR. KATZ: But the Pan American Health Organization has shown very effectively, under the leadership of a wonderful man named Ciro [A.] de Quadros, that it's possible. And if he could get it done in Bolivia, and Columbia, and Venezuela, and Argentina, and Peru, then I think there is the possibility. He's an optimist and believes that we can do this elsewhere. So I will certainly be a strong backer of that program for the next years.

DR. BAKER: It will be exciting to see what happens. I think if you have any other thoughts, we could easily get together at a future time. I would really like to thank you for taking all this time out on behalf of the Academy.

DR. KATZ: Well, thank you for listening. [Laughs] It must drive you crazy after listening to all this. I'm sure there are many other things we could talk about, but I think you have more than enough, and I'd be happy to talk with you again.

DR. BAKER: I'm going to stop the tape here before we have any further unnecessary modesty.

END OF TAPE 3, SIDE B

PART TWO OF INTERVIEW CONDUCTED ON JUNE 13, 2002

DR. BAKER: This is Jeff Baker. I am interviewing Dr. Samuel Katz on June 13th. This is part two of the interview, and this is actually tape for side A. We are reconvening the group together to discuss Dr. Katz's role, especially with advocacy, and his own family. I wanted to start though with coming back to the earlier period with your role in the measles vaccine development. You had such an important, and obviously the central role in clinical trials involving the measles vaccine, as well as the basic science development of it. Could you just talk about

how you chose the first people to take the vaccine and where you went from there?

DR. KATZ: Well, once we had completed our studies of the vaccine in tissue cultures, then in susceptible monkeys, it became apparent that this was, at least for the monkey, an attenuated agent that we developed. The question came up: how do you make the next step, which is to test it on humans? Well, we did what probably is not considered legitimate anymore, and we gave it to one another in the laboratory. Obviously, we were all immune, having had measles, but it was more a test of any toxicity or any ill-effects of the vaccine that might be from its components, not from immune responsiveness. It was perfectly benign.

So we sat and talked, Dr. Enders and I, about where to go next. There was a school on the periphery of Boston called the Fernald School, which housed hundreds of youngsters who were at that point institutionalized because of both physical and intellectual challenges. They were what we then called severely disabled youngsters. They lived in close quarters in dormitories, and we knew, from pediatricians who worked there, that they had severe outbreaks of measles almost every year, in which there was a significant morbidity and indeed mortality among these youngsters. So we went to talk to the officials who ran the school and proposed to them that we thought we had a product that would protect their children, and asked if they would be interested in housing such a study.

They agreed, and we then set up a program with them to meet with the parents of children who had not been there at the time of the previous measles epidemic, so we would presume that they were susceptible. We explained to the parents what we were about, why we felt it was important, why we felt it was safe, but explaining honestly that these would be the first children to whom this product would have been administered. We told them that we would see them twice a day and observe them very carefully; that we didn't anticipate any problems, but we certainly couldn't guarantee them that nothing ill could happen. Quite gratifyingly, all the parents to whom we spoke were very interested in having their children participate, and they agreed.

One of the problems was that there were children in the institution for whom there were no parents available. Some of them had guardians, and some of them just had parents who had never shown up for years. We did not include them. We only included children for whom we could actually meet

with their parents and obtain personal permission. Now this was before the days of institutional review boards [IRB] or informed consent. But nevertheless, we had informed consent.

We went ahead, and Ann Holloway — who was Dr. Enders' technician, not mine — and I arranged to administer this vaccine to the children, and then we arranged, as they had nurses there at the institution, to have their temperatures taken four times a day. We visited them each morning and each afternoon. I examined them. We obtained blood specimens from them, and throat swabs from them, and followed them over a period of 30 days. Now, we didn't bleed them everyday for 30 days. We bled them for the first week; we then bled them after two weeks, on the third week, and on the fourth week. And we did these nose and throat swabs daily for the first two weeks.

Many of them were children who did not communicate with you very well, but they did not seem upset by this, which surprised me. They had less objection to having a blood specimen taken than many of the children we dealt with in our clinics back at the hospital.

After about five or six days, many of them developed fevers, and yet the striking thing was that they did not seem to be ill. It was much like what we interpreted in those days as roseola, where you got a high fever and kids were fine. After the fever dissipated in two or three days, some of them developed a rash. Again, not the profound rash of measles, but nevertheless a rash you could see. As I remember it, these were all Caucasian youngsters. I don't think we had any pigmented youngsters, so that rash was easy to see. Again, this didn't seem to bother them at all, and it lasted only for a day or two.

As we took the specimens back to the lab and studied them, we found results which were very reassuring, similar to what we had found with the monkeys. That is that we could not detect the virus in their blood or in their nose and throat swabs, and yet after the end of two weeks, they had developed antibodies to measles virus. So we felt very comfortable that this was a successful experiment. At the same time, we had injected other children with tissue culture fluid in which the vaccine had been prepared, but without the virus, so they were so called controls. The control children had no problems, and had yet developed no antibodies. And because they lived in intimate contact with one another, that was again reassuring to us, that even though we couldn't detect virus in the nose or throats specimens, there wasn't any

transmission from the inoculated children to the placebo recipient children. When we analyzed these results and looked at the antibody responses, we were really very encouraged. At that point, we decided that it was time to bring in some recognized national clinical investigators who would be interested and willing to collaborate with us.

I presented our first results at a meeting of the Society for Pediatric Research, and they were very enthusiastically received. Not only did we begin to talk to other investigators, we had volunteers who showed up and said they wanted to participate. We were fortunate in selecting a number of the national leaders at that point, Dr. Saul Krugman in New York City, Dr. Henry Kempe in Denver, Dr. Fred [R.] McCrumb [Jr.] in Baltimore, Maryland, and Dr. Fred Robbins and Marty [Martha L.] Lepow at Case Western Reserve, Dr. Frank Black at Yale, Dr. Robert Haggerty, who was there at Children's Hospital in Boston. Each of them, with the material we had prepared, went ahead and did studies very similar to what we had done, except theirs were in home-dwelling children or school attending children.

Again, as we collated the results, they were all very much the same. Children did develop fevers. As many as 50 percent of them developed fevers after four or five days, lasting for three or four days. But the striking observation was that they didn't feel or act ill. Again a good number of them developed mild evanescent rashes, but these were all very exciting results to these investigators, and we felt very, very pleased.

Dr. Enders had a good friend, Dr. Joseph Garland, who was at that time the editor of the *New England Journal of Medicine*. Dr. Enders approached him, and Dr. Garland was very excited having been well aware of the severity of natural measles. I think, he may have been a pediatrician in his earlier days. He decided that he would devote an issue of the *New England Journal* to publishing the results, not just of our studies at the Fernald School, but all of the different investigators; so that we had our own little issue, if you will, of the initial studies of measles vaccine. I think it was 1960, in the *New England Journal of Medicine*.

DR. BAKER: Yes, it was the majority of it. A lot of the issue I think was devoted to this.

DR. KATZ: I think they gave us the whole issue.

DR. BAKER: It was a special edition of the *New England Journal*.

DR. KATZ: Right. A collector's item.

[Laughter]

DR. BAKER: Well, thank you very much for coming back to that. I think a lot of the other story we've outlined before in the previous interview.

DR. KATZ: That's fine.

DR. BAKER: It's fleshed out a little bit more for the record.

DR. KATZ: Sure. Well, that's probably much more then you want.

It's interesting you know, off the record, and I don't mean you have turned off the tape, but my personal pediatrician who took care of my children, had a daughter who was there at the Fernald School. She had measles so she didn't participate in the studies, but I got to know her through this contact of going out there every day, and it was a lesson to me. This was the era when kids were dumped into the institutions, I think very much in contrast to today when more families will deal with their challenged children at home. But the thing I admired about our pediatrician was that I discovered that, yes, their daughter lived there during the week, but every Friday they came and took her home. She spent the weekend at home with her "normal" siblings who were home and out of school for the weekend. So, it wasn't quite the same as many of those kids who were left there, rarely saw their families at all, and rarely had the stimulation of siblings or parents. I came to admire him greatly.

DR. BAKER: What a lot of people just don't appreciate is really just how severe and deadly an illness measles could be in that setting.

DR. KATZ: Right. Especially that setting. Of course, that again is in some ways analogous to Dr. Krugman's studies of hepatitis at Willowbrook [State School], where hepatitis in young children by and large was not a severe infection. It might lead to chronic illness, but as far as the acute infection went, adults have severe hepatitis, while children often have occult infection or fairly benign infection. And yet in that setting at the Willowbrook School where kids were in close contact, a lot of exchange of fecal and oral excreta, oozing skin wounds, etc., they had a lot of hepatitis, and more of it was overt. The other aspect was that they transmitted it to their caretakers.

Again, those sorts of settings don't exist as much today as they did then. When I first came here, there was a place at Butner like that. I can't remember the name of it [Whitaker School], but Jim Renuart, who was sort of a pediatric neurologist and had a part time appointment with us, took care of the youngsters there. As was often the case, he had a youngster who was a resident there. But that was a national thing, it wasn't something unique to Durham, North Carolina and Boston. It's just like the old days when there were fever hospitals. There was Sydenham [Hospital] at [Johns] Hopkins [Hospital], there was [Charles Value] Chapin [Hospital] at Brown [University], there was Willard Parker [Hospital] in New York. This was part of medicine in those days.

DR. BAKER: Yes, part of medicine, and there was really a certain logic to testing the vaccine in an institution like that where there was obviously a tremendous benefit for those children.

DR. KATZ: Right. I think we felt good about that, that it worked. Of course, the other thing I didn't mention is that we followed them over subsequent years. Until the vaccine was licensed there were still susceptible children. Everyone didn't get vaccine after that. It was at least three or four years, or more than that, I'll have to check to see, but at least a four year lapse between when those studies were completed and when vaccine became licensed. So there were still outbreaks of measles in that school, and yet these kids remained solidly immune.

DR. BAKER: The vaccinated children did show clinical evidence of protection.

DR. KATZ: Yes. They had enduring immunity, which was again reassuring. But this again was fallout in a lot of the studies by these other clinical investigators, particularly Saul Krugman. I think he had a 16-year follow-up of the first children he immunized at Willowbrook, and then subsequently in one of the paid health plans in New York. So we had both institutionalized and home-dwelling children.

DR. BAKER: With measles. He followed both groups that long?

DR. KATZ: Yes. Right.

DR. BAKER: I hadn't realized that.

Well, let's move on from that period to in the 1970s and 1980s. You've been involved in so many committees and groups in the national and international level. It's really a great challenge, I think, to pick out what to focus on, but let's look at the American Academy of Pediatrics and the ACIP, the Advisory Committee on Immunization Practices at the CDC. Now which of those were you involved with first?

DR. KATZ: The American Academy of Pediatrics. At that time they had the same committee as today, nicknamed the Red Book Committee, because of its publication, what is formally the Committee on Infectious Diseases.

I was very fortunate. I tell this to people, and it's not meant as false modesty, but because the measles vaccine work came out so favorably, suddenly I was a national figure. I was really quite a young punk, if you will. But because I was an MD, and John Enders was a PhD, I was selected out in many ways to fulfill roles that you needed a physician for. I was very quickly made a member of the Committee on Infectious Diseases, the so called Red Book Committee, and very quickly its chair. Through that I had a lot of contacts with people I might not otherwise have known, who were national figures in pediatrics and particularly infectious diseases, who were the members of that committee. As their chair, I felt quite junior to some of them, who were not just more senior in age, but senior in experience.

It introduced me to a number of other things in which I might otherwise have been only tangentially involved. For example, I got involved very heavily in the Salk-Sabin disputes about inactivated versus oral polio vaccine, because the Academy had to support oral vaccine as being the public health service. Dr. Salk was very disturbed, and we engaged then in a great deal of dialogue and correspondence, in which he presented large amounts of figures. It was to me a very educational aspect of that function, because these were very distinguished, internationally reputed individuals. We were being asked to make decisions to rebut some of the complaints that we received from Dr. Salk. Dr. Sabin was pretty quiet, but he had won the battle on that point. We had accepted oral vaccine. Dr. Salk, on the other hand, never gave up, and you know I respect him. He was a fine person, but I think at that time oral vaccine was the vaccine for the States. Things changed 20 years later, but that's another story.

But because of that role, I became well known to pediatricians around the country. That was for me very enjoyable, because I came to meet a lot of people, was invited to speak at various places, and was being put in the

limelight at a time when otherwise I never would have been, had it not been for the measles vaccine. I mean, I was a good infectious disease person, but there's nothing to distinguish me from 50 other people of equal talent.

DR. BAKER: Are there any other issues arising during that time that you'd like to highlight, or perhaps anything to do with measles immunization and the measles outbreak?

DR. KATZ: Well no. There were never any issues as burning with measles as with polio. The only issue that came up was what was the best age at which to give it to children? We started out very early giving it at nine months of age, because that was when we were beginning to see measles in youngsters as they escaped from maternal transplacental IgG, and the vaccine was very effective. But as we moved along over several years, it became apparent that you got an even higher efficacy of the vaccine giving it later, because there was persistence in some infants of maternal antibody longer than had been previously appreciated. So having taken the major thrust away from measles between 1963 and 1966, we began to refine things, and we moved immunization up to 12 months of age, and then eventually to 15 months of age, when 100 percent of children had no maternal antibody. Even at 12 months, many youngsters still have detectable antibody. It remained at 15 months for a good period of time until just recent years when we made it a little less rigid and said between 12 and 15 months of age.

DR. BAKER: Ours are getting it pretty much on the dot of 12 months, I think.

DR. KATZ: Yes.

DR. BAKER: I had almost forgotten that. We started off at a time that's closer to what is recommended in developing countries.

DR. KATZ: Exactly. The other thing that happened of course is that because of the fever and rash that occasionally accompanied the vaccine as we had originally produced it, and as it was eventually produced by the suitable firms and licensed, some people got the very clever idea, why don't you give a tiny dose of immune globulin along with the vaccine at a separate site. They showed, indeed quite correctly, that by doing that you could even further abort any of this fever and rash, which to some people was distressing, even though it wasn't to the youngsters. It was sometimes difficult to say, well maybe the child was getting some other illness. Who knows if this fever is due to the vaccine or what. And that was done for

several years. I think it was Dr. Joseph Stokes at Philadelphia who came up with that idea originally.

Then Dr. Anton Schwarz, who worked at what was then American Home Products [Corporation], I believe, or Dow Chemical, came up with taking our virus and passing it further in tissue culture and at a lower temperature, which was really the critical thing he did. That was quite imaginative. Tissue cultures were ordinarily kept at body temperature, 35 degrees [C] or so. He grew the same virus, but passaged it at 32 degrees [C], and one way or another, and I still don't think we know the molecular biology of it, that selected out an even more attenuated variant. So that so-called Schwarz strain, or further attenuated Edmonston became the vaccine of choice, and Edmonston B, which was the originally licensed vaccine, became less and less used. This did away with the need for globulin also, and that became the prototype of what's still used today in most places in the world. Merck has changed the name. They called theirs Moraten, which is obviously more attenuated Enders, but it's the same as the Schwarz.

DR. BAKER: Okay. It's still basically the same thing.

DR. KATZ: Yes. Edmonston-Zagreb, which was made originally in Yugoslavia. Almost all the vaccine used throughout the world is genetically identical. There is a Japanese strain which is somewhat different.

DR. BAKER: Yes. I had never realized what Moraten stood for though.

DR. KATZ: Oh, really.

DR. BAKER: I suppose few do.

DR. KATZ: As with so many others pharmaceuticals, I think they pay someone on Madison Avenue to come up with these names.

DR. BAKER: I was about to ask who Dr. Moraten was?

[Laughter]

DR. KATZ: It's supposed to be "more attenuated" Enders.

DR. BAKER: Right. That's good, and of course that was combined with the measles, mumps, and rubella vaccine.

DR. KATZ: 1971, of course, was the big jump when Dr. Hilleman had developed mumps vaccine. No one was interested in mumps vaccine. It was very interesting and very clever marketing, in that the mumps never had the anxieties. There was rare mumps encephalitis. There was certainty orchitis in post-pubertal males, but it did not raise the anxiety levels among parents. So there was only one state in the — well I don't know there were 50 at that point, there were 48 maybe — that used mumps vaccine extensively and that was Massachusetts, because the health commissioner Dr. Nicholas [J.] Fiumara had had severe mumps in his family and he pushed it. But this was very helpful for Hilleman and Merck, because they showed that they could really markedly lower mumps in Massachusetts. It still didn't really catch fire, but then when the epidemic of rubella, or the pandemic in 1965, and the subsequent development of rubella vaccine, Hilleman very cleverly not only combined measles and rubella, but stuck mumps in, which we always called a fellow traveler. And people accepted this and said, "Well you know, one injection and it is measles, mumps, and rubella. That sounds okay." And that's really how mumps came along.

DR. BAKER: Right, and the MMR was accepted very widely soon after its inception.

DR. KATZ: 1971, and on. Right absolutely.

DR. BAKER: And used widely with very low controversy, if any.

DR. KATZ: Absolutely.

DR. BAKER: As I have said, the main concern of the measles vaccine was not so much the vaccine itself, but just trying to develop a good strategy to reduce and openly eradicate measles during those years.

DR. KATZ: Right. This meeting I was just at in Würtzburg, Germany reminded me of another thing: measles live attenuated virus vaccine, the Edmonston, was licensed in 1963. It was not until 1967, that it was discovered that subacute sclerosing panencephalitis [SSPE] was a slow measles virus infection. I think had that been known in 1962 or 1963, we might have been very loathe to license a live replicating measles virus. Sure, we put it into the brains of monkeys, but how many monkeys, if you're talking about a complication that occurs one in 100,000 or something? How many monkeys are you going to do, if they even got SSPE? By the time this

became known four years had passed, and there had been no cases of SSPE. Well, admittedly the incubation of SSPE may be five to ten years after an episode of measles, but there was no hue and cry to do away with live vaccine at that point, and fortunately, over subsequent years SSPE disappeared from the countries where measles vaccine was widely used. So the proof of pudding was obviously there, but I think if the time sequences had been reversed, we might have been very, very less enthusiastic about a live measles virus vaccine.

DR. BAKER: Yes.

DR. KATZ: Now, there was an inactivated measles virus vaccine. As you know, that lasted for about four years. We were very much against that, Enders and Katz, but we had very little influence on the pharmaceutical firms who developed it, marketed it and sold it. Hundreds of thousands of youngsters in this country got it, and within four years, unfortunately they discovered this atypical measles syndrome. Children who had it and were subsequently exposed to natural measles, as their immunity waned, they got this aberrant disease, which was called atypical measles. So that was the end of it in 1967.

DR. BAKER: Was the rationality to introduce the inactivated measles vaccine to avoid the fevers seen with the live vaccine?

DR. KATZ: You know, I don't think it was that so much as just at that time the only widely used live virus vaccine was oral polio. I think there was still this sort of the way you did things. You use inactivated antigens. Also, I think it was probably for some companies easier to satisfy FDA requirements by having a formalin-inactivated material. Merck had done a very clever thing in that the virus for vaccine was grown in chick cell cultures. Chickens have a lot of avian leukosis viruses, and there were only a few flocks of chickens in the country that were leukosis-free. Merck bought them up very quickly so that they had control. We had done our work with leukosis-free chicken cells, but Merck very quickly took over the monopoly. I've never seen it stated, but that to me might have been another reason, because formalin-inactivation also inactivated the avian leukosis viruses. So again, I think they could satisfy FDA that this was a safe preparation.

DR. BAKER: Why were you and Dr. Enders concerned about the inactivated measles vaccine? Because this is before atypical measles was reported.

DR. KATZ: Sure. Well, I think for one reason, of course, that you had to give three injections rather then a single one. Secondly, that we were not convinced from the experience at that time with inactivated virus vaccines that you got enduring immunity. Polio at that time was the only widely used inactivated, and with the original inactivated polio we had had experience in Massachusetts with an outbreak of type 3 polio paralytic disease, which included many individuals who had had three, four or five doses of the inactivated polio vaccine. So we were big proponents of live vaccines as being more analogues to natural disease and more likely to produce enduring immunity.

DR. BAKER: Okay, that was a good aside. Those are rather important doubts that we had, I think, earlier on. Those are very interesting stories.

DR. KATZ: [Laughs] Good, good. Okay.

DR. BAKER: Fascinating how vaccine manufacturers had to get into the chicken poultry business. [Laughs]

DR. KATZ: Right. You know, it's interesting, because there were a lot of companies, I can't even remember how many, who got into the measles vaccine business. But as things developed over the subsequent years, Merck remained the only one. The others, [American Cyanamid Company] Lederle [Pharmaceuticals] used to make it, Pfizer [Inc.] used to make it, American Home Products, which is Dow Chemical — I keep saying American, but I think one bought the other or something — but Schwarz's company which was Dow Chemical, and over the years they all dropped out.

DR. BAKER: Do you have any thought on why that was? That wasn't because of litigation concerns.

DR. KATZ: No.

DR. BAKER: What would it have been?

DR. KATZ: I don't know. That's a good question. One is, of course, that several of them use cells different than chick cells, and again this is probably because they couldn't get leukosis–free. One of the companies made their vaccine in dog kidney cells. Well, there was no question when that was compared and contrasted to the chick cells it was more reactogenic, more fevers, more and higher fevers. I think that was one reason one group

dropped out. But I don't know. I can't really say. That's an interesting question, and I'm not really comfortable in answering it.

DR. BAKER: Okay, okay. Interesting asides there. Unless there's anything else you want to mentions in connection with the Red Book Committee, you might move to the other most prominent national committee you were involved with which is the ACIP.

DR. KATZ: Right.

DR. BAKER: And that was I think in 1980.

DR. KATZ: That did begin in the 1980s. I was a member, and then I became the chair. I think that was from 1982 to 1993. That's the committee that I always called the Duke endowed committee.

DR. BAKER: Why was that?

DR. KATZ: Well, preceding me as the chair was Catherine Wilfert.

DR. BAKER: Okay.

DR. KATZ: Succeeding me as the chair, was Jeff [Jeffrey P.] Davis, who had been a Duke resident and Duke infectious disease fellow. Succeeding him as the chair is John Modlin, who was a Duke medical student and pediatric resident. They've had four successive chairs all of whom were in one way or another Duke products. So I've told them on occasions that we have endowed this chair intellectually, but not financially.

DR. BAKER: [Laughs] That's interesting. That is interesting.

END OF TAPE 4, SIDE A

DR. BAKER: We are just going to the ACIP.

DR. KATZ: The AAP Red Book Committee, I was a member from 1966 to 1976, and the chairman from 1969 to 1976. I became chair at just about the time I moved to Duke, but I was a member even before then.

DR. BAKER: There we go, thank you. And with the ACIP then, because I think I was citing when you were chairman. [Laughs] That's what I did.

DR. KATZ: Now let's see where we go with that one? Advisory Committee on Immunization Practices, I was a member from 1982 to 1993, and chair from 1985 to 1993.

DR. BAKER: Okay.

DR. KATZ: This was supposed to be a three-year term, and I had eight years. I think part of it was because the Washington administrations were changing, and no one bothered to worry about this person having more terms.

[Laughter]

DR. BAKER: Okay. You were in the ACIP during an interesting period.

DR. KATZ: Yes.

DR. BAKER: Have anything you'd like to highlight from that time?

DR. KATZ: Well again, I think that a number of the things that came up brought me to face a number of issues that I hadn't previously. Part of the time was the vociferous anti-vaccine movement beginning and coming into more prominence. For the first time I began to became acquainted with and face-to-face with a number of the very vocal opponents to immunization. These are public meetings. They are announced in the Federal Register. They are open to the public. It was interesting that when we first started very few people came. We met in the small room and everything was very cozy. Within a few years, we had to pick larger and larger rooms, because first of all many of these folks began to come, secondly, many of the representatives of the pharmaceutical industry began to come, and third, members of the media began to come. So we graduated from a nice comfortable conference room to a large auditorium hall.

DR. BAKER: Really?

DR. KATZ: Yes.

DR. BAKER: Roughly how many people are we talking?

DR. KATZ: Well, a meeting is ten people.

DR. BAKER: Okay, right.

DR. KATZ: And then there were always many folks who worked at CDC who came as providing information and presentations, and very helpful information. But from having maybe 20 people sitting around listening, we went to hundreds of people sitting around. And requirements are that those who registered to give public comment be able to give public comment.

DR. BAKER: Meetings changed their flavor?

DR. KATZ: Yes. [Laughs]

DR. BAKER: Significantly. [Laughs]

DR. KATZ: Absolutely. The other thing that happened was that as the Committee on Immunization became much more prominent in public heath, as well as in pediatrics and family medicine, there was an increased desire by many other groups to have liaison with the Advisory Committee, so that from ten committee members, we suddenly had 25 or so liaison people who came. Representatives of government groups, Food and Drug Administration, National Institute of Allergy & Infectious Diseases, Department of Defense, in addition to representatives from groups such as the American Academy of Family Physicians, the American Academy of Pediatrics, the American College of Obstetricians & Gynecologists, the Society for Healthcare Epidemiology [of America – SHEA], on, and on, and on.

DR. BAKER: And you are directly involved with the Institute of Medicine committee for vaccine development [IOM Council on Vaccine Development].

DR. KATZ: Yes. Right.

DR. BAKER: Can you tell us about that effort, and how you are trying to identify the best prospect for vaccine development, and how that looks to you in retrospect?

DR. KATZ: Well, if you think that you can prognosticate what's going to happen, we did pretty well. It involved people with much more sophistication than I in statistics, for example, in trying to weigh the value of potential vaccine. W**e were entering the period when molecular biology was**

moving along rapidly, and the potential to develop new products was expanding greatly. Both the funds, whether they be from NIH or from industry, as well as the talented individuals devoted to these had a finite limit, and one had to say, "Well, what are the vaccines we most need?" How do you judge that? On statistics of morbidity and mortality, the days of life, valuable life lost, the economic cost. These were all formulae. I remember we had a statistician from the Harvard School of Public Health, Milton [C.] Weinstein. He loved that. That was his forte in life, and he worked out all sorts of formulae to study these. I must confess that I never fully grasped them. [Laughs] But I was able to utilize them in helping to make our decisions.

I think we did fairly well in looking at what we thought were the priorities for research and development. As we looked, you know ten years later we've done fairly well in predicting what could be developed and what should be. I think we were less successful in our attempt to look at vaccines for the developing world. Not less successful in identifying those of high priority, but in identifying those where there would be investment of public and private funds to develop those vaccines. Of course you can look today and say we still don't have a vaccine for malaria.

DR. BAKER: Yes.

DR. KATZ: We don't have a new vaccine for tuberculosis. We don't have vaccines for some of the enteric infections and the respiratory infections that are major causes of mortality and morbidity in developing nations. So that's changing, obviously, with the Gates Foundation, and GAVI and other efforts. But what we wanted to have happen in the mid and late 1980s had a much longer incubation period.

DR. BAKER: Yes, but would you say that within this country, in the US, that the companies did step forward? And meet the challenge?

DR. KATZ: Very much so. Absolutely. And I think that this gave them some encouragement in the sense that here was the Institute of Medicine which does its studies at the request of governmental institutions, be it NIH, CDC, Department of Defense, whatever, so that there is the inherent belief when you read a study from there that you know someone is behind this. It isn't just a group of scholars spending a little time having fun, but that there is a reason that this study has been funded and initiated. This was helpful in many ways to the pharmaceutical firms who eventually developed vaccines.

DR. BAKER: It gave them reason to believe their investment would be rewarded by demand.

DR. KATZ: Right. Exactly. It's very interesting, we're talking 1985. When we talked with the pharmaceutical industry at that point and we talked about the cost of development of a new vaccine, they would say, "Oh, $15 or 20 million." If you talk to them today they say, "$100 or $200 million."

DR. BAKER: Why is that? Why has it changed so much?

DR. KATZ: I think that one is just that the 1985 dollar is different than the 2002 dollar. Secondly, regulatory aspects are much more stringent and more exacting than they were then. The cost of doing clinical trials is probably the most costly aspect. And last of all, and this is part of the regulatory aspects, for most new vaccines, FDA will require that you build a new plant, I mean a production facility, so you can't just add this on to your existing facility. So again, you are talking about the cost of contracting and building, let alone hiring scientists or technologists. I can't be anymore precise on that because I haven't been a part of industry, but I think all of those things weigh heavily.

DR. BAKER: Do you have any idea why the FDA required that? That you build a plant for a new vaccine?

DR. KATZ: I think they were very concerned about contamination, particularly as we got more and more into the live vaccine products.

DR. BAKER: Yes.

DR. KATZ: But even with the inactivated vaccine products, the concern that what went on with influenza virus vaccine production might not be good for what went on with yellow fever vaccine production, or one or another. You may know haemophilus influenza B conjugate is produced in Sanford, North Carolina. Why? Because they bought an old aspirin plant that had gone out of business because of Reye's Syndrome, and they were able to convert that to a new facility.

DR. BAKER: I didn't know that story. Those are timely issues right now.

DR. KATZ: Right.

DR. BAKER: As we're looking at the diminution really of the pharmaceutical industry with the precipitation of vaccines at the moment, it might be a good lead in to talk a little bit more about your interest in vaccination on the international stage.

DR. KATZ: I think that early on with measles vaccine I began to receive phone calls from a pediatrician named David Morley, who was an English physician working in Nigeria. He was dealing with a population that had a mortality rate of ten percent or higher with measles. Children who died of measles. Measles pneumonia, then it turned out as we studied, more often times from gastroenteritis. People often don't remember that kids with measles got diarrhea and vomiting often. The virus multiplies in the GI tract. Many of these were breastfed children. The thing that we call Koplik's spots is pretty benign in normal well-nourished children. Children who are protein depleted or otherwise have malnutrition get very sore mouths with measles, so that these children stopped their intake, and at the same time are having increased output with diarrhea and vomiting. So dehydration and acidosis were common complications of measles, so that these children died of the complications, either of pneumonia or of gastroenteritis.

Dr. Enders and I talked about this at great length, and we agreed we would not go give measles vaccine in Nigeria before it was approved in the United States, which is what David wanted us to do because he heard our early papers. We felt we'd be accused of using the poor Nigerian children as "guinea pigs." Once the vaccine was approved, then we went to Nigeria. I went, and then I was followed by Saul Krugman. We worked together. Actually, I did the initial things, and he did the follow-up. We collaborated with Dr. Morley in a little village, a little market village outside Ibadan, that was the location of the big university. It was the only university, and this was about 75 miles from Ibadan where he had a Wesley Guild Hospital. It was a Methodist mission hospital. There were three English physicians, of which he was one. He had a wonderful nurse, Sister Margaret Woodland, and they had this wonderful little clinic there a few miles from Ilesha, which was the name of their town. It was called Imesi, and they had regular clinics, and the parents, the mothers were attending regularly. They brought their kids regularly, and we went ahead and did sort of the reprise of the same thing we'd done at the Fernald School a number of years earlier, talked with the parents about it, obviously. I did not speak Yoruba, but they had people who

did. They trained their own nurses from local young women. We went ahead and vaccinated a number of the children and had a number of controls, again had very similar results, very similar. We were concerned because these children had so much trouble with natural measles, might they have a much more exaggerated response to vaccine, and fortunately they didn't.

DR. BAKER: They didn't.

DR. KATZ: They tolerated it very well. The thing was, that close to 100 percent of these youngsters had malaria. And again, we were uncertain what to expect. A very unexpected result was that these children got higher antibody titers from the vaccine than any of the children we'd seen in the States. I think in subsequent years it has been postulated that the malaria so revs up the immune system that it is just that many more B cells and T cells running around in somewhere or another responding to neoantigens. Measles was a new antigen, but the system is upregulated is what the immunologists say today.

DR. BAKER: It was already primed.

DR. KATZ: But they got very high titers in antibody.

DR. BAKER: Interesting. That was really the first study of measles in a developing country, beginning there.

DR. KATZ: Absolutely.

DR. BAKER: Very important story.

DR. KATZ: And it was interesting because we ran into some national competition which we hadn't anticipated. Nigeria had been a British colony, and there were still British professors at the University in Ibadan. They were a little put off —

[Laughter]

DR. KATZ: — that these brash young colonial Americans were coming to do the studies. We had given measles virus and vaccine to the people of the Wellcome Laboratories in Beckenham in Kent, as we had to any legitimate people who came to study and work with it. They were producing vaccine at

that point. Well as soon as they heard that we were there, their English buddies in Nigeria called on them said, "Come down here." [Laughs] And they subsequently did a study about a year after ours, but ours was the first.

DR. BAKER: Okay. David Morley was British?

DR. KATZ: Yes. David Morley was from the [UCL] Institute of Child Health [ICH[in London.

DR. BAKER: Yes. He was a key ally.

DR. KATZ: He didn't have any concerns about whether it was American or English vaccine.

DR. BAKER: Right. Very, very interesting. More recently would you like to talk about any of your work again having to do with measles eradication and those efforts?

DR. KATZ: One of the things, again, of course, that happened because I was identified with measles, was that I was asked to work with the World Health Organization in a number of their committees that plan both research and plan field programs. Again, I found that very gratifying in that they very quickly adopt — At the time measles vaccine was licensed, their estimate, and these are guesstimates, because many of the places for which they provide data they don't have the public health infrastructure to gather numbers with the precision that you and I think we should have, but they estimated there were eight million deaths a year from measles around the world, and the majority, of course, occurring in developing nations. I would say with some degree of pride, gratification is a better word, with a great deal of gratification that as of 2001, their estimate is a little less than 800,000 deaths. That's still 800,000 too many, but it's a 90 percent reduction.

The problems are, of course, in getting vaccine programs going in the areas where there is a civil conflict, where there are refugee groups, where measles still persist in the very places you would expect. A number of the Sub-Saharan countries, particularly Sudan, Angola, Congo, places where there continues to be civil war, or war-war without just being civil. India and Afghanistan, those are the places still with a lot of measles. But through WHO, I became very well acquainted with the people who ran their program called the EPI, the Expanded Program on Immunization. A very fine physician named John Clemens heads that up. Without any push at all their

program was BCG [bacille Calmette-Guérin vaccine for tuberculosis disease], oral polio vaccine, and DTaP, and they were very happy to very quickly to add measles vaccine to that program. That was one of the wonderful things about getting a better grasp of the international picture, because it soon became apparent that though —

[Recording Interruption]

DR. KATZ: With the issue of economics I began to become aware of the fact that American companies would not sell, and it wasn't just measles, any of their vaccines on the foreign market at reduced prices. I used to discuss this with the people I knew, and I didn't know the people with green eye shades, but I knew Maurice Hilleman at Merck, and his counterparts at Lederle [Laboratories], and other companies. They were always concerned, and they said, "Well, Congress and the American public would not permit a two-tier pricing system. If we had to pay $10 for a vaccine in the States, they wouldn't tolerate the fact that you sold it to Nigeria for $2." Well, that never made sense to me, because the big European manufacturers did that — Aventis Pasteur [Sanofi-Pasteur is the vaccine division of Sanofi-Aventis], bioMérieux, GlaxoSmithKline. Well, in this country we really had two-tiered pricing, but it was public/private. What they sold to CDC was at significantly less, it still is, than what they sell to you or me as a private individual.

I never knew whether this was an excuse or whether this was real. Talking with some people in government, particularly a fellow named Tim [Timothy] Westmoreland — I don't know if you know his name. He is a wonderful individual. He was [Representative] Henry [A.] Waxman's medical legislative assistant for many years under the Clinton administration. He was one of the head people at HCFA [Health Care Financing Administration]. He is now back. He is a lawyer. He is a Duke graduate. I didn't know him at Duke, but when we first met one another that became a bond. But Tim was Henry Waxman's advisor. Henry, for many years when the Democrats were the majority in Congress, ran the committee responsible for health, and for the budget of NIH, and for lots of things of that sort. So Tim had a lot of major influence, and he said they could do that. They could get away with two-tier financing, but somehow or other it never flew. Eventually of course, the thing that happened was that countries with very different economies, but some good scientists, began to make vaccines themselves. India, for example. Today one Indian company makes more

measles vaccines than any other country in the world, and theirs is the one that the WHO buys for about 35 cents a dose.

DR. BAKER: Interesting. It has happened with AIDS meds too, hasn't it?

DR. KATZ: Well that's going on.

DR. BAKER: But anyway, I didn't know that about India and measles.

DR. KATZ: Oh, yes. I forget the name of the company [Serum Institute of India], but the WHO gets measles vaccine for 35 cents a dose.

DR. BAKER: Wow. [Laughs]

DR. KATZ: The major expenditures really are for personnel, and for needles and syringes, in that they've moved more and more towards the autodestruct syringes, because they have a problem in many of these developing nations. A needle and syringe were costly, and they weren't going to throw them away after they gave a child an injection of measles vaccine, so they reused over and over again and passed hepatitis B, hepatitis C, and HIV. So that's been a real problem. The programs WHO has developed, they had special apparatus for, not burning, but for melting down needles and syringes. You were supposed to throw them all in, but how well that was utilized or how widely was a matter of the particular area and people. So there were a lot of things I became familiar with through WHO in that way, and have continued to enjoy working with them.

One of things that we have continued to support at WHO is whether you could get away from an injectable vaccine, and have a vaccine that was administered by the respiratory route. Now when we did our original studies back in the early 1960s, we were not able reliably to infect by putting measles into the nasopharynx. You'd say, well, that's the natural route of infection of the wild virus, but obviously one of the assets, or liabilities depending on which side you are looking at, of the attenuated virus was it didn't infect successfully when you put it in the nasopharynx. What people have done now is they aerosolize it, so it's blown down into the lower respiratory tract, and indeed it does seem to infect successfully, so there are continuing studies going on now in South Africa and in Mexico looking at administering measles vaccine by aerosolization.

That has a number of implicit advantages. Getting away from needles and syringes being the most visible, and also you don't need an MD and three years of residency or what have you to supervise aerosolized vaccines, as you may for injectable. There are lots of aspects about it. The other, which we really haven't had to rely on, but which seems at least something you would enjoy, is that maybe it gives better mucosal immunity. Now the natural route of infection is the respiratory tract. Injectable vaccine seems to protect very well, but maybe you get even better protection if you have mucosal immunity from introducing the virus to the respiratory mucosa, instead of subcutaneously.

DR. BAKER: Wow. So measles vaccine continues to evolve. The story is not over, is it?

DR. KATZ: Exactly.

DR. BAKER: There are so many things that we could talk about with your involvement. You've been involved in just about every aspect of vaccine development in some way, shape or form. [Laughs] I do want to conclude it by giving you some time to talk about your own family.

DR. KATZ: Thank you. I've enjoyed them. I'm very proud of them. I wrote them a letter.

DR. BAKER: I can tell you are.

DR. KATZ: I wrote them a letter. I had my 75th birthday on May 29. I don't write my children any form letters. We have eight between Cathy and me. In our blended family there are eight offspring. I was tempted at one point. Cathy and I used to write a Christmas letter or something, but felt that was very impersonal.

DR. BAKER: [Laughs]

DR. KATZ: But for my 75th birthday, I sort of wrote them a reflection and told them how proud I was of each of them. And I am, because each in his or her own way has chosen a serving profession. As I said to them, they haven't chosen their roles in life because of personal aggrandizement, greed or monetary gain. Just running down the list, my elder son, who died as you know of leukemia, was studying to be a cultural anthropologist. John who is now the oldest is an attorney, but refused to take any jobs with firms, and

went to work for the government where he supervises water rights for the Federal Energy Regulatory Commission. David, who was the first MD actually, he went to Duke Medical School, did his residency, went into the National Health Service Corps and worked in northeastern North Carolina. He decided that one physician wasn't going to make that much difference in the health of these folks, and that really it was health policy that he should be doing. So he then went to law school. He has an MD/JD. He works with a health policy firm in Washington. And then Deborah is a clinical psychologist with a doctorate in neuropsychology. I don't think any of our kids has less than three degrees.

[Laughter]

DR. KATZ: There are a few with four. Deborah got her master's, and then her doctorate in clinical psychology, and teaches part time at UCLA [University of California, Los Angeles] and has a private practice. She works mostly with adolescents and with kids.

Bill is the only one whose work is a little less conventional. He is the television documentarian, but the things he has done are really remarkable. I'm amazed, and I think what a competitive field it must be, and yet he has been very successful. He works for the public channel in Los Angeles. They sent him to Hopkins to do one on children with hemicraniectomy for intractable seizures. They sent him to Russia to do one on AIDS in Russia. They sent him to Alaska to do one on the culture of the Inuit people. They sent him to Germany to do one on propaganda under [Joseph] Goebbels during World War II. He is not an expert in any of these fields, but he goes to library and he reads, and he does his research. The most recent one I saw, he did one on Jezebel. The woman in the Bible

DR. BAKER: Old Testament Queen, yes.

DR. KATZ: Yes, the Old Testament Queen. There's apparently a movement to make her into a better person instead of a villainess, and lo and behold, who's one of the experts on Jezebel? Carol [L.] Meyers here at Duke.

DR. BAKER: Oh, yes.

DR. KATZ: So he came and filmed Carol Meyers.

[Laughter]

DR. KATZ: And I just saw it. She got the tape and she lent it to me, and I saw it the other night. It was really very well done. It was Jezebel versus the Prophet Elijah, and Elijah vilified her. Now the question is, was she really not so bad, and he just couldn't handle her?

[Laughter]

DR. KATZ: But this is the sort of thing he's done, and I've enjoyed it. He did one on the problems of senior citizens and the indigent population in Chicago. I could go on and on, but he has done a lot of them.

DR. BAKER: Interesting work, yes.

DR. KATZ: Yes. Then after Bill comes Susan, who teaches math and French in high school in Connecticut, with a master's in math. Next is Penelope, who has probably more degrees than any of them. [Laughs]. Penelope went to Hampshire College. Do you know Hampshire at all?

DR. BAKER: I haven't been there. I've heard of it.

DR. KATZ: It's a progressive school that was started by faculty at Smith [College], Amherst [College], [Mount Holyoke] and the University Of Massachusetts [Amherst], who felt they needed a different form of education. It's wonderful for motivated students. She finished in three years. You go at your own pace. On the other hand, she has classmates who, seven years later, [Laughs] were still there. But she finished in three years.

DR. BAKER: [Laughs] You could get through a PhD.

DR. KATZ: She went out to California because her sister Deborah was there, the clinical psychologist, and started to teach school, because with nothing but a bachelor's degree that was one of the things you can do in a private school. She decided that she should get a master's in education, which she did while she was teaching. She continued to teach, then decided that her students needed a social worker more than they needed a teacher, [Laughs] and went and got her master's in social work at UCLA. Then she continued to work, then went to work in a program for distressed or disturbed teenagers and worked with them, then got a doctorate at Berkeley at the UC [University of California]. [Laughs] I said, "I didn't know there

was a doctorate in social work." She said, "Oh, yes." I said, "Why did you get a doctorate?" She said, "You get grants better if you have a doctorate."

DR. BAKER: Okay. [Laughs]

DR. KATZ: She is now in charge of counseling for the same school that she began with when she first went out. The school has opened a middle school and a high school. It was just an elementary school when she was there. So she is now in charge of counseling for the three schools. She counsels the faculty, as well as the students there. So as I say, she has what? A bachelor's, a master's in education, and master's in social work and a PhD. [Laughs] So she is the leader, she has four degrees. The rest of them all have only three. [Laughs]

DR. BAKER: Wow. I haven't done the multiplication, but it's more than a dozen.

DR. KATZ: Rachel. Do you know Rachel, or did you?

DR. BAKER: I don't know her, but I know who she is.

DR. KATZ: Rachel was in art school at Amherst, worked for five years at the Kimbell [Art] Museum in Fort Worth, but found she got more gratification from her night volunteer work with the AIDS service agency. She gave up the museum after five or six years, took a friend and went around the world for a year, came back and took science courses at UNC, which she'd never taken, to apply to medical school. She was admitted to Duke, Vanderbilt, and Wake Forest, but wanted to go to Vanderbilt. She went there, and they said, "Well your parents are both physicians, so you don't qualify for financial aid." She said, "I have been living independently for seven years." "It doesn't make any difference," was their response. She came here, and because she was a North Carolina resident, they had a scholarship for her.

DR. BAKER: Okay.

DR. KATZ: So she's finished at Duke, and she's now finishing her first year residency in medicine. Oh, she got an MPH [Master of Public Health] also. Into her third year, she went over to UNC. So she has her bachelor's, her MPH, and her MD. So she's in the three degrees world. [Laughs]

DR. BAKER: She's catching up.

DR. KATZ: And I don't know what she is going to do. She wants to do something in public health, though I don't think she is quite focused yet on exactly what she wants to do. And then Kate, who is working for the State Department after several years as the only woman in the embassy of the United Arab Emirates with her BA from Stanford and MEd Harvard.

DR. BAKER: On behalf of the Academy, I would like to thank you for generously sharing your time on two occasions for our oral history program. Your interview will be a valuable addition to the collection.

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u/d 5/22/01

SAMUEL LAWRENCE KATZ, M.D.

Born	29 May 1927, Manchester, New Hampshire
1944	Graduated valedictorian from public schools in Manchester, N.H.
1948	Dartmouth College, A.B., magna cum laude
1950	Dartmouth College, B.M.S., magna cum laude
1952	Harvard University, M.D., cum laude
1952 - 1953	Intern, Medical Service (Herrman L. Blumgart, Chief) Beth Israel Hospital, Boston, Mass.
1953 - 1954	Junior Assistant Resident, Medical Service (Charles A. Janeway, Chief) Children's Hospital Medical Center, Boston, Mass.
1954 - 1955	Assistant Resident, Children's Medical Service (Alan M. Butler, Chief) Massachusetts General Hospital, Boston, Mass.
1955 (6 mo.)	Co-Chief Resident, Medical Service, Children's Hospital Medical Center, Boston, Mass.
1956 (6 mo.)	Exchange Registrar (from Children's Hospital Medical Center) to the Paediatric Unit (Reginald Lightwood, Chief), St. Mary's Hospital Medical School, London, England
1956 - 1958	Research Fellow in Pediatrics, Harvard Medical School at the Research Division of Infectious Diseases (John F. Enders, Chief), Children's Hospital Medical Center, Boston, Mass.
1958 - 1968	Research Associate, Research Division of Infectious Diseases, Children's Hospital Medical Center, Boston, Mass.
1958 - 1961	Pediatrician-in-Chief, Beth Israel Hospital, Boston, Mass.
1961 - 1968	Visiting Pediatrician, Beth Israel Hospital, Boston, Mass.

1958 - 1963	Associate Physician, Children's Hospital Medical Center, Boston, Mass.
1963 - 1968	Senior Associate in Medicine, Children's Hospital Medical Center, Boston, Mass.
1961 - 1967	Chief, Newborn Division, Children's Hospital Medical Center, Boston, Mass.
1958 - 1959	Instructor in Pediatrics, Harvard Medical School, Boston, Mass.
1959 - 1963	Associate in Pediatrics, Harvard Medical School, Boston, Mass.
1961 - 1963	Tutor in Medical Sciences, Harvard Medical School, Boston, Mass.
1963 - 1968	Assistant Professor of Pediatrics, Harvard Medical School, Boston, Mass.
1967 - 1968	Co-Director, Combined Beth Israel Hospital-Children's Hospital Medical Center, Infectious Disease Career Training Program, Boston, Mass.
1968 - 1990	Professor and Chairman, Department of Pediatrics, Duke University School of Medicine, Durham, N.C.
1972 - 1997	Wilburt C. Davison Professor of Pediatrics, Duke University School of Medicine, Durham, N.C.
1997 -	Wilburt C. Davison Professor Emeritus

Board Certification & Licensure

National Board of Medical Examiners (1953) Cert. #27450
Massachusetts Board of Medical Examiners (1954) Cert. #23830
American Board of Pediatrics (1958) Cert. #6369
North Carolina Board of Medical Examiners (1968) Cert. #16180

Professional Societies

American Academy of Pediatrics (Fellow)
New England Pediatric Society (Secretary-Treasurer, 1963-68)
New York Academy of Sciences
Society for Pediatric Research
American Association for Advancement of Science
American Society for Microbiology
Infectious Diseases Society of America (Fellow)
American Association of Immunologists
American Public Health Association
American Society for Clinical Investigation
American Association of University Professors
North Carolina Pediatric Society (Honorary Membership)
Southern Society for Pediatric Research
American Pediatric Society
American Epidemiological Society
American Society for Virology
American Federation for Clinical Research
Pediatric Infectious Diseases Society (Fellow)
Australasian Society for Infectious Diseases (Honorary Life Member)
International Society for Antiviral Research
Romanian Society of Infectious Diseases (Honorary Member)

Honors and Awards

Rufus Choate Scholar (1947-48)
Phi Beta Kappa (1948)
Alpha Omega Alpha (1951)
Sigma Xi (1958)
Boylston Medical Society (President, 1963-64)
Grulee Award (American Academy of Pediatrics, 1975)
Recipient of Golden Apple Award for excellence in teaching clinical sciences, from Duke University Medical Students (1969 and 1978)
Institute of Medicine of National Academy of Sciences (1982)
Thomas D. Kinney Teaching Award, 1984 (from the Senior Class of Duke University School of Medicine)
Abraham Jacobi Memorial Award, American Medical Association & American Academy of Pediatrics, 1986
Distinguished Teacher Award, from Duke Medical School Alumni, 1987
Joseph St. Geme, Jr. Future of Pediatrics Award (from the American Pediatric Society, Society for Pediatric Research, American Academy of Pediatrics, American Board of Pediatrics, Ambulatory Pediatric Association, Association of Medical School Pediatric Department Chairmen, Association of Pediatric Program Directors) 1988
Duke University Award of Merit, 1988

Bristol Award, Infectious Diseases Society of America, 1988
Distinguished Physician Award, Pediatric Infectious Diseases Society, 1991
Presidential Medal of Leadership and Achievement, Dartmouth College, 1991
Society Citation, Infectious Diseases Society of America, 1993
University of North Carolina (Wilmington) Razor Walker Award, 1993
D.Sc.(hon) Georgetown University, 1996
Ronald McDonald House Charities Award of Medical Excellence, 1996
Herbert L. Needleman Medal and Award, American Public Health Association, 1997
D. Sc. (hon) Dartmouth College, 1998
North Carolina Institute of Medicine, 1999
Fellow, American Association for the Advancement of Science, 1999
John Howland Award, American Pediatric Society, 2000.
Miami Children's Hospital Hall of Fame Inductee, 2001

Military Service

Active Duty U.S. Navy, 1945 and 1946 (PhM3/c)

Personal History

Married (Betsy Jane Cohan) 1950 - 4 sons, 3 daughters
Married (Catherine Minock Wilfert) 1971 - 2 step-daughters

Fellowship Awards

1956 - 1958	Research Fellow of the National Foundation for Infantile Paralysis
1965 - 1968	Research Career Development Award of the National Institute of Allergy and Infectious Diseases, National Institutes of Health

Committees, Boards, Study Sections, etc.

1966 - 1976	National Committee on Infectious Diseases, American Academy of Pediatrics, Chairman, 1969-1976; Consultant 1976-1978
1967 - 1969	Vaccine Development Committee, National Institute of Allergy and Infectious Diseases, National Institutes of Health
1967 - 1968	Expert Advisory Committee on Standards for Live Mumps Virus Vaccine, Division of Biologics Standards, National Institutes of Health

1967 - 1970	Advisory Committee on Fundamental Research, National Multiple Sclerosis Society
1968 - 1973	Consultant, Infectious Diseases Branch, Collaborative and Field Research, National Institute of Neurological Diseases and Stroke, National Institutes of Health
1968 - 1970	Scientific Advisory Committee on Standards for Live Rubella Virus Vaccines, Division of Biologics Standards, National Institutes of Health
1968 - 1990	National Scientific Advisory Council, National Jewish Center for Immunology and Respiratory Medicine, Denver, Colorado
1969 - 1971	Infectious Disease Committee, National Institute of Allergy and Infectious Diseases, National Institutes of Health
1969 - 1972	Commission on Immunization, Armed Forces Epidemiological Board, Associate Member
1970 - 1973	Councilor, Harvard Medical Alumni Association
1970 - 1974	Advisory Committee on Faculty Fellowships, Josiah Macy, Jr. Foundation
1971 - 1974	General Research Centers Committee, Division of Research Resources, National Institutes of Health
1971 - 1974 1979 - 1981	Executive Committee, Association of Medical School Pediatric Department Chairmen
1971 - 1974	Advisory Committee on Fellowships, National Multiple Sclerosis Society
1972 - 1981	Consultant, Biologics Review Steering Committee, Bureau of Biologics, Food and Drug Administration
1974 - 1976	National Advisory Child Health and Human Development Council, National Institutes of Health

1977 - 1979	President - Association of Medical School Pediatric Department Chairmen
1977 - 1985	Scientific Advisory Board, St. Jude's Children's Research Hospital
1980 - 1990	Board of Directors, National Foundation for Infectious Diseases
1982 - 1986	Immunology and Microbiology Research Study Committee, American Heart Association
1982 - 1985	Chairman, Committee on Issues and Priorities for New Vaccine Development, Institute of Medicine, National Academy of Sciences
1982 - 1991	Advisory Committee, Robert Wood Johnson Foundation Clinical Nurse Scholars Program
1982 - 1986	Awards Committee for Mead Johnson Pediatric Research of the American Academy of Pediatrics (Chairman, 1985-1986)
1982 - 1993	Advisory Committee on Immunization Practices, USPHS, Centers for Disease Control (Chairman, 1985 - 1993)
1984 - 1990	Consultative Board, James N. Gamble Institute of Medical Research
1985 - 1998	Coordinator, Advisory Expert Panel on Infectious Diseases in Infancy and Childhood, International Pediatric Association
1985 - 1986	Vice-President (President-elect), American Pediatric Society
1985 - 1997	Public Policy Committee, Infectious Diseases Society of America (Chairman 1990 - 1992)
1986 - 1987	President, American Pediatric Society
1986 - 1987	Consultant, National Institutes of Health, AIDS Executive Committee
1987 - 1993	Board of Directors, Georgetown University

1988 -	North Carolina Immunization Advisory Council
1988 - 1993	Member, Scientific Advisory Committee, Children's Hospital Research Foundation, Cincinnati
1988 -	Board member, Hasbro Children's Foundation
1988 - 1991	Burroughs Wellcome Fund, Wellcome Research Travel Grants Advisory Committee
1989 - 1993	American Academy of Pediatrics, Subcommittee on Human Rights
1990 - 1996	Member, Handicapped Housing Corporation of Durham (AIDS apartments) Board
1990 - 1993	Board of Trustees, Children's Miracle Network Telethon
1990 -	Medical Advisory Board, Group B Strep Association
1990 - 1993	Secretary, Harvard Medical Alumni Council
1990	Chair, World Health Organization Panel on Diagnosis of Pediatric AIDS
1991 - 1992	Chair, World Health Organization panels on measles vaccines
1991 -	Member, Lenox Baker Children's Hospital Foundation Board
1991 - 1997	Member, Children's Hospital (Boston) Scientific Advisory Committee
1991 - 1999	Burroughs Wellcome Fund, Board of Directors, Chairman (1995-1999)
1992 - 1994	Chairman, Committee on Investment Strategy for Measles Control, Children's Vaccine Initiative
1992 - 1998	Member, Standing Committee, International Pediatric Association
1992 - 1999	National Advisory Committee, Americans for Medical Progress

1993 - 1999	Scientific Advisory Committee, Pediatric AIDS Foundation
1993 - 1996	Pediatric Scientist Development Program, Steering Committee and Evaluation Committee
1994 - 1997	Executive Committee, NIAID Pediatric AIDS Clinical Trials Group
1994 – 1997	Public Health and Preventive Medicine Committee, Infectious Diseases Society of America
1994 -	Policy Board, Albert B. Sabin Vaccine Foundation
1994 - 1995	National Research Council - Institute of Medicine Committee on the Impact of War on Child Health in the Countries of the Former Yugoslavia
1994 - 1995	Institute of Medicine Steering Committee on the Children's Vaccine Initiative
1995 - 1997	Institute of Medicine Committee on Priorities for Vaccine Development
1996 - 2002	Institute of Medicine Forum on Emerging Infections
1996 – 1998	Infectious Disease Advisory Committee, American Museum of Natural History
1997 - 1999	Advisory Commission on Childhood Vaccines, Dept. HHS
1997 -	Scientific Advisory Committee, St. Jude Children's Research Hospital
1997 - 2000	Fogarty International Center Advisory Board, National Institutes of Health
1997 -	Co-chairman, National Network for Immunization Information, (Infectious Diseases Society of America, Pediatric Infectious Diseases Society, American Academy of Pediatrics and National Nurses Association)
1998 – 2001	Public Policy Committee, Pediatric Infectious Disease Society
1998 – 2002	World Health Organization Global Program for Vaccines and Immunization, Steering Committee on Measles, ARV and Poliomyelitis Vaccines
1998--	Advisory Committee on Immunization Practices, CDC, liaison member
1999 – 2000	Institute of Medicine Committee on Immunization Finance Policies and Practices

1999 -	Grant Review Committee, Pediatric AIDS Foundation
1999 – 2000	Co-chair, North Carolina Task Force on Comprehensive Child Health Plan
1999 -	Co-Chair, Indo-US Vaccine Action Program
2000 - 2002	Scientific consultant, USAID Malaria Vaccine Development Program
2000 – 2002	Institute of Medicine Committee on a Strategy for Minimizing the Impact of Infectious Diseases on Future Military Operations: Vaccine Development in the Military
2000 - 2004	Vaccines and Related Biological Products Advisory Committee (VRBPAC), Food and Drug Administration
2001 – 2002	Institute of Medicine Committee on Dissemination of the Immunization Finance Report
2001 - 2002	Program Advisory Committee, The Dyson Initiative
2001 -	Scientific Advisory Board, Emory University Vaccine Center

Editorial Boards (past and present)

Annual Review in Medicine
Postgraduate Medicine
Reviews of Infectious Diseases
Pediatrics Clinical Digest Series
Current Problems in Pediatrics
Ped Sat (TV Education)
Pediatric Annals (Associate Editor)
Report on Pediatric Infectious Diseases (Co-Editor)

Reviewer

Pediatrics
New England Journal of Medicine
Journal of Infectious Diseases
Reviews of Infectious Diseases
Journal of the American Medical Association
American Journal of Public Health
Clinical Pediatrics
Annals of Internal Medicine
Journal of Pediatrics

Pediatric Infectious Disease Journal
Epidemiological Reviews
North Carolina Medical Journal
AMA Journal of Diseases of Children
Clinical Infectious Diseases
Pediatric Research
Yearbook of Pediatrics
Infection and Immunity
Vaccine
Nature Medicine

Selected List of Visiting Professorships and Lectureships

Special Lecturer of Southern Medical Association, University of Texas Medical School, San Antonio, 1970

Physician-in-Chief pro tempore, Rhode Island Hospital, Brown University Medical School, 1971

Harold Jacobziner Lecturer, New York University School of Medicine, 1973

Queen Elizabeth II Lecturer, Canadian Pediatric Society, 1974

A. Ashley Weech Visiting Professor, University of Cincinnati Medical School, 1975

Convocation Lecturer, University of Missouri Medical School, 1975

Samuel Lilienthal Visiting Chief of Pediatrics, Mt. Zion Hospital Medical Center, San Francisco, 1975

Aaron Brown Lecturer, Baylor College of Medicine, 1976

Visiting Professor pro tempore, Cleveland Clinic Educational Foundation, 1977

R. Cannon Eley Memorial Lecturer, Children's Hospital Medical Center, Harvard Medical School, 1977

Visiting Professor, University of Massachusetts Medical School, 1978

Adam Thorpe Memorial Lecturer, University of North Carolina Medical School, 1978

Salerni Collegium Visiting Professor, University of Southern California School of Medicine, 1979

Stacy White Lecturer, Emory University School of Medicine, 1979

M. Hines Roberts Memorial Lecturer, Emory University School of Medicine, 1981

Carl C. Fischer Lecturer, Philadelphia Pediatric Society, 1981

Herman M. Biggs Lecturer, New York Academy of Medicine, 1981

Centennial Lecturer, University of Illinois Abraham Lincoln School of Medicine, 1981

Lori Haker Memorial Lecturer, Milwaukee Children's Hospital, 1982

C. Henry Kempe Visiting Professor, University of Colorado School of Medicine, 1983

Luis Guerrero Memorial Lecturer, University of Santo Tomas Faculty of Medicine and Surgery, 1983

Warren Wheeler Visiting Professor, Ohio State University School of Medicine, Columbus Children's Hospital, 1984

Anne Yeager Memorial Lecture, California Chapter-American Academy of Pediatrics, 1985

Arthur E. McElfresh Lecture, St. Louis University, 1985

Upjohn Visiting Professor, Oxford University & John Radcliffe Hospital, 1986

Saul Blatman Memorial Lecture, Beth Israel Hospital, Mt. Sinai Medical School, 1986

Culpeper Foundation Visiting Professor, Howard University, 1986

Robert L. Moore Lecture, University of Texas Southwestern Medical School, 1986

Lewis F. Cosby Pediatric Lecture, East Tennessee State University Medical School, 1987

Professor John D. Crawford Lecture, Massachusetts General Hospital, 1987

Visiting Professor and Renata Ma. Guerrero Memorial Lecturer, University of Santo Tomas Faculty of Medicine and Surgery, 1987

Edmund R. McCluskey Memorial Lecture, Children's Hospital of Pittsburgh and University of Pittsburgh School of Medicine, 1987

Alpha Omega Alpha Lecture, University of Pittsburgh School of Medicine, 1988

Herman Rosenblum Lecture, Medical Center of Delaware, 1988

Milton Markowitz Visiting Professor, University of Connecticut Medical School, 1988

John I. Perlstein Lecture, University of Louisville School of Medicine, 1988

Stubenbord Visiting Professor, New York Hospital-Cornell Medical Center, 1988

Warren Wheeler Lecture, University of Kentucky Medical School, 1989

Alpha Omega Alpha Visiting Professor, Ohio State University School of Medicine, 1989

Sir McFarlane Burnet Lecturer, Australasian Society for Infectious Diseases, Auckland, New Zealand, 1989

Marshall Kreidberg Lecture, Tufts University Medical School, 1989

Jeffrey O'Brien Lecture, Toronto Hospital for Sick Children, 1989

Phyllis Lewander Memorial Lecture, National Children's Medical Center, 1990

Bilderback Lecture, Oregon Health Sciences University, 1990

Lowell A. Glasgow Visiting Professor, University of Utah Health Sciences Center, 1991

Ben Kagan Lectureship, Cedars-Sinai Medical Center, Los Angeles, 1991

Erwin Neter Memorial Lecture, Buffalo Children's Hospital, 1991

Brennemann Memorial Lectures, Los Angeles Pediatric Society, 1991

Douglas Reye Memorial Lecture, Royal Alexandra Children's Hospital, Sydney Australia, 1991

Maurice Hilleman Lecture, Children's Hospital, University of Pennsylvania, 1991

Matthew R. Nuckols Distinguished Visiting Professor, East Virginia Medical School and King's Daughter's Hospital, 1992

Kenneth D. Blackfan Lecture, Children's Hospital, Boston, 1992

Carolyn and Maxwell Stillerman Lecture, North Shore University Hospital - Cornell Medical School, 1992

House Staff Visiting Professor, University of Florida Medical School, 1993

House Staff Visiting Professor, Boston Floating Hospital, Tufts University Medical School, 1993

Arnold H. Einhorn Lecturer, Children's National Medical Center, Washington, DC 1993

Lewis Wannamaker Lecturer, University of Minnesota Medical School, Minneapolis, 1993

John H. Erskine Lecture in Infectious Diseases, St. Jude's Children's Research Hospital, Memphis, 1994

Alpha Omega Alpha Lecture, University of New Mexico Medical School, 1995

Phi Beta Kappa Lecture, Troy State University, 1995

Donal Dunphy Lecture, Moses H. Cone Memorial Hospital, 1995

Hattie Alexander Memorial Lecture (with Catherine M. Wilfert, M.D.), Columbia University, College of Physicians & Surgeons, 1995

Jimmy L. Simon, M.D. Distinguished Lecture, Bowman Gray School of Medicine, 1995

Harris D. Riley, Jr., M.D. Pediatric Society Lecture, Oklahoma Children's Hospital, 1995

Robert Ward Memorial Lecture, Los Angeles Children's Hospital, 1996

Phi Beta Kappa Lecture, Randolph-Macon College, 1996

Phi Beta Kappa Lecture, Millsaps College, 1997

Bicentennial Lecture, Dartmouth Medical School, 1997

Ihsan Dogramaci Lecture, Haceteppe University, Ankara, Turkey, 1997

Grover F. Powers Lecture, Yale University, 1998

Grant Morrow III Visiting Professor, Columbus Children's Hospital, Ohio State University, 1998

Jeryl Lynn Hilleman/Merck Foundation Lecture, Centers for Disease Control and Prevention, 1998

Hussein Idriss Memorial Lecture, American University Beirut, Lebanon 1998

Joseph Gilmartin Lecture, Mercy Hospital, Pittsburgh, 1999

Ralph Platou Lecture, Tulane University, 1999

Russell Blattner Lecture, Baylor College of Medicine, 1999

Gerold L. Schiebler Lecture, Univ. of Florida Pediatric Alumni Association, 1999

Saul Krugman Lecture, New York University School of Medicine, 1999

Sydney Gellis Lecture, Boston Floating Hospital, 1999

John F. Enders Lecture, Infectious Diseases Society of America, 1999

Goldberg Memorial Lecture, Cornell-NY Hospital Medical Center, 2000

Phi Beta Kappa Lecture, Jacksonville State University, 2001

Dorothy Horstmann Lecture, Yale University, 2001

J. Neal and Lois Middelkamp Lecture, Children's Hospital, Washington University 2001

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