KENNESAW STATE UNIVERSITY ORAL HISTORY PROJECT

INTERVIEW WITH NANCY E. ZUMOFF

CONDUCTED BY DEDE YOW and THOMAS A. SCOTT

EDITED AND INDEXED BY JAN HEIDRICH-RICE for

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DY: Nancy, why don't you start by telling us a little bit about your background—where you were born, where you grew up?

NZ: I was born in Omaha, Nebraska, and I grew up there. I went to the public schools in Omaha and went to college in New York City. I went to New York University [NYU]. Dede, I planned when I went to college to be an English major.

DY: How interesting! I want to hear about this conversion!

NZ: When I was a child, I said what I wanted to do when I grew up was to get off of the prairie and go to the big city [of] New York. I think I was more geographically motivated than anything in terms of my decisions.

DY: Did you enjoy NYU?

NZ: I did; I enjoyed it very much. I found it just an exciting time to be in New York, and I still love the city. I love New York. I have no regrets about being there. I had done very well in mathematics in school, but it wasn't something that I was terribly interested in. I did have a very inspirational high school teacher who encouraged me to go on. I'll tell you, as a girl in that era, being a mathematician wasn't something that even really crossed my mind. It was something I was very used to in high school, being the only girl in the accelerated classes.

DY: Was your mentor, this high school mentor, a math teacher?

NZ: Yes, a high school math teacher.

DY: What's her name?

NZ: His name is Mr. Perry, and he died a long time ago. He made math just very, very exciting and very interesting. This is getting a little afield, but I guess we have time for that. At that time everything was very gender divided. We even had the boys' stairs and the girls' stairs in my high school, and there was the boys' counselor and the girls' counselor for registration. When I got to my senior year math registration, the girls' counselor said my name wasn't on the list for people to go to the Advanced Placement [class]. Not being terribly confident then, well, I decided that I wasn't as good as I thought that I was. When my senior year started and I was in the regular math class, I saw Mr. Perry, and he said, "Why didn't you take the Advanced Placement class?" I said, "I wasn't on the list." And he said, "But I gave all of the names to Mr. So-and-So"—the boys'

counselor. I think it took me ten years before I even realized the kind of impact something like that had, but I was really happy doing my Advanced Placement English and my Advanced Placement history.

TS: Did they move you to the Advanced Placement math?

NZ: I stayed where I was. I don't know if it was a failure of nerve or what. My parents were very academically supportive, but they didn't see that there was anything outrageous about that at the time.

DY: Tell us a little bit about their background.

NZ: My father was a newspaperman; he was a Nebraska Bureau Chief for the Associated Press.

TS: What was his name?

NZ: His name was Ed Makiesky. Zumoff sort of stayed long past the marriage that ended a long time ago! [laughter] He was a newspaper man out of St. Paul, Minnesota. He arrived in Nebraska in the '30s and never really planned to stay. He died there in the late '80s, so he spent the rest of his life there. My mother was a social worker, and she came from Hot Springs, South Dakota.

TS: And what was her name?

NZ: Her name was Helen Makiesky—Helen Eastman. She came up that pioneer stock. Her father was the sheriff of Fall River County up in the Black Hills when it was the Dakota territory.

TS: And he lived to tell about it?

NZ: And lived to tell about it, yes.

DY: And you've got a sister?

NZ: I've got two sisters. I've got two older sisters.

DY: Where are they, Nancy?

NZ: One is in the Washington area, and the other is in New York City and is an anthropologist—a cultural anthropologist. She's also an academic like me.

DY: This is the one that you're going out . . .

NZ: This is the one I'm taking the trip with, yes.

TS: We ought to probably put this in the context of the decade that we're talking about.

NZ: Well, I was born in the ’40s and educated in Nebraska in the ’50s and early ’60s.

TS: What year did you graduate from high school?

NZ: In 1964. So I came to New York City in 1964. I remember the day. I’d never been east of Chicago until I went to New York, and both of my sisters were already there. They both went to NYU. At that time, NYU was really wanting to diversify their student body geographically. So my middle sister and I—I’m the youngest—both got very, very generous scholarships to go there. NYU was a private school, and it’s expensive and would not have been . . .

DY: It still is.

NZ: It still is. But we had the kind of scholarship [that included] tuition, room, board, spending money and everything.

TS: Dr. [Horace W.] Sturgis got his doctorate at NYU.

NZ: He did. When I came to interview, Dr. Sturgis interviewed me. NYU until very recently always had hand-written transcripts, and that was what he was very focused on. I don’t know if we still have to supply transcripts, but I had all of my transcripts, and he was just delighted to see that they were still writing all of the entries by hand.

DY: How interesting.

TS: He had been a registrar at Georgia [Institute of] Tech[nology] so I guess he was really interested in that.

NZ: Yes, he was very into that. NYU at that time had two campuses, and they had a more collegy-atmosphere campus in what’s now the South Bronx or the East Bronx. The neighborhood has changed very much, but that’s where I did my undergraduate work.

DY: Is this University Heights?

NZ: Yes. Yes.

DY: And that’s not the Greenwich Village campus.

NZ: No, that’s not the Greenwich Village campus, but there’s a subway line that got you right down there. I remember my sister, my eldest sister, was living in Greenwich Village then. I remember the night that I arrived in New York City staying at her apartment. Her husband was in law school, and the law dorms overlooked Washington Square. I remember being given the couch in the living room to sleep on, and I remember looking at these tall casement windows. It was Saturday night in Greenwich Village in 1964, and I thought I was going to stay up until everybody went to bed. Morning came, and I was still just leaning on the

windowsill, looking out and thinking this was the most exciting place in the world to be. And I think it was a wonderful, wonderful, wonderful time to be in New York when I was there. I went through my undergraduate [studies], and then I stayed there for graduate school.

DY: Now you got your bachelor's degree in 1968.

NZ: I got my bachelor's degree in 1968.

DY: And that degree is in . . .?

NZ: I had a major in math and a minor in English. I had enough courses, although I didn't declare it, to have another minor in history. I really still love history, and I love literature.

TS: So how did you make the change to math?

NZ: I started with calculus, which was the starting course as a freshman, and I really did very, very well. And I liked it. I still wasn't really hooked by it, but in my sophomore year I wanted to take two math courses at the same time, and they said you can't take two courses as a lower level student unless it's your declared major. I said, "Fine, I'll declare that as my major." And so I did. I enjoyed that more and more; I really loved the math that I was taking. My real breakthrough, I think, was as a junior when I took a course in number theory, which is very, very beautiful. It's very simple, but it's a very abstract way of looking at very simple concepts. It's also one of the courses where a lot of students who did very well with math—thinking that math is solving equations and coming up with answers—just threw up their hands and ran in horror saying, "What are these proofs?" It's a whole different way of doing mathematics. Well, I loved it. I just thought that was something. It was a game. It was just so much fun and so interesting to me, and I had some very supportive professors who really encouraged me to keep going.

DY: What about gender here? Were these professors male?

NZ: They were male; that's what I had. The two most influential professors in math that I had as an undergraduate were both male. I believe they're both still alive, although older. Ricky [Richard] Pollack taught me number theory and abstract algebra and topology, which are where my real mathematical interests [lie]. Hilly [Hilbert] Levitz . . . Joshua Du [Professor of Mathematics at KSU] recently crossed paths with him in a meeting, and he said to me, "Well, you know, he's very, very old." And I laughed because he was such a young man when I had him.

TS: What was that first name? Hilly?

NZ: Hilbert.

DY: His last name was . . . ?

NZ: Levitz. He taught me real analysis. It's a quote "hard" course, and I loved it.

TS: Real analysis.

NZ: Looking at the real number system as opposed to the complex number system. I always had fun because I loved words; all of the mathematical words that have such technical meaning also seem to have such everyday meaning, like real analysis. What it means mathematically is very different than what the term means . . .

DY: What the term real means, say, in literature—realism.

NZ: Right, exactly.

DY: Almost the opposite, isn't it?

NZ: Yes.

DY: Interesting. You mentioned someone else. You mentioned Hilbert Levitz and then someone else.

NZ: Ricky Pollack. He was the one who really encouraged me to go to graduate school. And I did have one woman professor for a logic course. She was the only woman math professor that I had.

DY: Interesting, though, she was not really serving a mentoring role?

NZ: No, she didn't. She was kind of transient through the department. She probably wasn't tenured. As an undergraduate you're not as aware of the status of who's tenured, who's prominent, and who's not so.

TS: When I was in college as an undergraduate, I took the two calculus courses, and that's as far as I went. A woman taught the second course, but I'm sure she must have been a graduate student because I don't think there were any professors that were teaching those classes.

NZ: When I was an undergraduate—and I remembered this; this is, I think, when the light started to go on—I was taking differential equations, which is after calculus. The University Heights campus was primarily liberal arts, but there was also the engineering school, so some of the math courses were combination math students, physics students, and engineering students. This differential equations class was real mixed because that's a somewhat more applied course. I remember very, very clearly that I was the only female student in the class. In that era, students were more, you know, Mr. So-and-so or Miss So-and-so, and the professor would just call me "miss," and he would refer to me as "the girl." This was about '65 or '66. I do remember his name, but I don't think I'll give it to you. After the first

class, he came in carrying these test papers; he was shaking, and he was angry with the class. He said, "You should all be ashamed of yourselves. The girl got the highest grade!"

DY: Yea for the girl!

NZ: It was unbelievable, but what I mainly felt then was embarrassed.

DY: Well, of course you did.

NZ: Now I feel angry, but what I felt then was just pure embarrassment. That was part of my undergraduate experience. I did have women professors in other areas, and some of them were very, very influential and very supportive of me going on and staying in graduate school.

TS: Well, being in school in the '60s—'64 to '68—there's a lot of radicalism on campus. Feminism is really getting going with Betty Friedan. *The Feminine Mystique* was published in '63. So were you being influenced by the larger culture?

NZ: I was absolutely being influenced by the larger culture. I've always felt like I have something of an ambivalent relationship with mathematics, and part of the ambivalence that I felt more as a graduate student in 1968—and we all know what kind of year 1968 was—was how could I be focusing so much of my life and my energy on something that is so removed from the real world when there are all of these battles to be fought and to be won? Around '68 or '69, I thought that maybe what I should do is drop out of graduate school and become a full-time activist. But a woman anthropology professor said, "Doing what you're doing is a feminist act in a way." She was very much a radical political activist and still is. She's like eighty-something years old and a wonderful, remarkable woman.

DY: Anthropologists are good at that.

NZ: They really are good at that.

DY: Oh, your sister's one.

NZ: My sister's one. This is really my sister's mentor, but I've kept up contact with her.

TS: What's her name?

NZ: Her name is Connie Sutton.

TS: I don't believe we got your sister's name, did we?

NZ: Susan Barrow. So I was so impacted by that. By '67, what I remember very clearly as an undergraduate was the teach-ins. I remember I didn't go to my

college graduation. Actually, I had gone home to Nebraska to get married, but that's another story. But the graduation speaker was [Secretary of Defense] Robert [S.] McNamara.

TS: Oh, no. That's a good one to boycott.

NZ: Exactly. I wish I had been there to walk out because people did walk out. And I was very impacted, and I am to this day, by the student activism, by the anti-war activism. Certainly, as the feminist movement emerged, I would not be who I am, where I am, doing what I am without all of the awareness that I gained through there.

DY: Yes, the external social environment affected all of us.

TS: Now you say you went back to Nebraska to get married. Did your husband come from Nebraska?

NZ: No.

TS: So you just go back where your family was.

NZ: Yes, to do that.

TS: Right.

DY: Had he been to Nebraska before?

NZ: Yes, he'd been out for a visit.

DY: Is he a New Yorker?

NZ: He was from Philadelphia, but he lived in New York when I was there.

TS: So did you go straight to graduate school?

NZ: I went straight to graduate school then. I started graduate school in September of '68.

TS: And that was still at New York University?

NZ: I went to Courant Institute [of Mathematical Sciences], which is part of NYU. Richard Courant was a very renowned applied mathematician in Germany who brought over a number of German mathematicians before World War II. He established Courant Institute, which became a very prestigious, well-known mathematics research institute that also has a graduate school. It's part of NYU.

TS: And applied mathematics means that you apply them to the real world or what?

NZ: Well, not really. Applied mathematics is more like applying to physics. There were a lot of applications to the real world.

TS: I guess what I was thinking is in terms of our research definitions, where you use applied research as opposed to basic research.

NZ: It's all basic research. I guess as opposed to theoretical mathematics, you're really looking at mathematical structures and mathematical systems by themselves, more internal systems. When you start applying them to other sciences, theoretical physics and applied mathematics are almost indistinguishable. So it's not applied in the sense that you would think of biology or chemistry being applied; it's more applied to other sciences. Courant also had a very vibrant theoretical mathematics component, and that's very much still where my interests are. My mentor from undergraduate school, Ricky Pollack, had really encouraged me to apply there. I did and got a good fellowship with good support.

TS: Were you teaching?

NZ: I didn't start teaching the first three years that I was there. Again, this is the good old days—or the bad, I don't know. [Courant] supplemented the NSF [National Science Foundation] Fellowships, so we really didn't have to teach or do anything. I just got paid to go to school. That was for the first three years. After that I started working for my support, and I started teaching. I remember my first class. It was 1971. I had finished most of my course work, and I think I was studying for my final set of exams.

DY: In your master's?

NZ: No.

DY: You got your master's in '70?

NZ: I got my master's in '70. In a lot of mathematics graduate schools at the time, if you were in a Ph.D. program and you passed your qualifying exam for the Ph.D., you got your master's just on the way. So that was like no big deal; that was just something that came along in the middle of that. So this was my final oral exams, while I was studying for those; that's when I started teaching. And I loved it. I had no notion; I had no preparation. I hadn't really thought what I wanted to do with my degree. I really didn't have a notion yet. I thought, "I like what I'm doing now."

TS: But you didn't want to go to work for Dow Chemical?

NZ: I didn't want to go to work for Dow Chemical. [laughter] Oh, we could really go on on that one! [laughter] I have these vivid memories in graduate school—and we were kind of the minority—of being the activist students there. We were out demonstrating. I was in New York, and I remember taking the train down for the

marches on Washington. Courant was very apolitical, and there were [only] a handful of us who were the politically engaged students. But you're right; I didn't want to do that. The area that I was studying in group theory, which is a part of abstract algebra, has a lot of applications in code breaking and cryptography and things like that. So people were going to work not for Dow Chemical but for the CIA and for places like that. I knew that I didn't want to do that. I certainly knew that I didn't want to do that in that era.

TS: Nor did the CIA want you, I bet. [laughter]

NZ: Oh, that was the part I didn't think about. But when I walked in that classroom—I wasn't a graduate assistant—they hired me as a temporary part-time instructor. So I had my own class, and it was one of these big old classrooms right on Washington Square. I can't remember the building, but I remember it had big, big windows. I had like fifty students in there, and the oldest student was seventy-five years old. I can remember that. I was about twenty-something, and I looked to be about ten. I've made up for it, but I looked really young when I was young. I walked into this pre-calculus class, which was semi-remedial at that time. My first shock was when I started talking and everybody started writing down what I said. I just wanted to say, "Wait a minute; don't write it down. What if there's something wrong?" [laughter] But, I don't know, after about thirty seconds—it seemed like almost no time, something shifted and I thought, "I love this. I absolutely love teaching." I have never gotten over that. I don't mean that I haven't had bad classes or boring classes; over the years you get all of those. But that just gave me such clarity about what I wanted, how I wanted to make a living when I finished.

DY: That's a wonderful story. Does your sister teach?

NZ: No. She taught very briefly. She's a researcher. She works as the only anthropologist with epidemiologists, but it's a joint appointment with Columbia University and the State of New York. She's been doing research for decades, really looking at the epidemiology of homelessness.

DY: Is she a medical anthropologist?

NZ: No, she's not, but she clearly works with medical anthropologists.

DY: I have a very good friend who is a medical anthropologist.

NZ: She's a political anthropologist.

DY: I bet they know each other because they have a wonderful network.

NZ: Probably so.

DY: I wonder if it's time to jump to how you got to KSU?

NZ: Okay. Sort of a long, meandering road.

DY: Give us some of the big paths.

TS: You come from the Midwest to the East Coast, and then you end up in the South.

NZ: When I finished, I got my degree; it was a January degree. I finished in ’72, like the end of the year in ’72, and it was a very bad job market.

TS: December of ’72?

NZ: Yes. I think it was a January degree of ’73, but I say ’72 because I finished everything then. I kind of bounced around for a period of years until I got to Kennesaw. I went to Oberlin College. The rest of the world still has sabbaticals, and I was a replacement for various people who were in and out on their sabbaticals. I was there for about two and a half years. It was an interesting experience, and I don’t regret it; but I don’t know what I would think now because I’m older and more mellow. It didn’t suit me in a lot of different ways.

TS: Why not?

NZ: Well, I didn’t like the small town. And I didn’t know if I wanted to be a mathematician.

DY: Oh, still that struggle?

NZ: I still had that struggle in that it was a very good institution, but it was also very elitist. Oberlin is very well-regarded, and rightfully so, on being progressive on women’s issues. When I was in the math department, they said, “Well, we had a woman in the math department in World War II.”

DY: Where’s your progressivism there?

NZ: When I was at Oberlin, there was a very active coalition of faculty, students, and administration [working] on women’s issues and on really implementing a lot of feminist vision. I was very, very influenced and impacted; I feel very grateful for being there during that period.

DY: It was one of those formative experiences.

NZ: Yes, it really was one of those formative experiences.

TS: But you’re saying there was a woman in the math department in World War II but hadn’t been since then?

NZ: Since then, yes!

DY: No doubt you were replacing a male on sabbatical?

NZ: Yes. And so there was that combination. There were a lot of good things, but I really didn't know what I wanted to do.

DY: I think many of us didn't at that time. I know I was just finishing up my master's at that time, and one of the things that made me go on and decide I'd get a Ph.D. was, well, what? I'm not going to go out and get a job?

NZ: Is that right?

DY: Yes. I had also started graduate teaching, and, like you, I walked in and said, "Oh, this is fun!"

NZ: I know.

DY: This is wonderful!

NZ: I really still love to teach.

DY: I'm curious about geographically, where did you go after Oberlin? Did you head on back to the East Coast?

NZ: No, then I came down to Georgia. It was a relationship still ongoing. Thirty years later [I'm still here]. I came down here without a job.

DY: To Atlanta?

NZ: To Atlanta.

DY: This was Atlanta in 1975?

NZ: About '75. I really think I always struggled with that whole notion of elitism. One of the things that I have always enjoyed in my teaching is to try to reach the people who are viewed as unreachable. So I went down to the University of Georgia in 1976, and what I did there was to set up the mathematics part of what was then being developed as a special studies program.

DY: Right, Nancy!

NZ: With Jan Kemp.

TS: Oh, my!

NZ: Oh, my. That's right!

TS: Jan Kemp, of course, is the one that took on the football program and caused Georgia not to win an SEC Championship for several years, they say. [chuckle]

NZ: They say. We could talk about that! [laughter]

TS: Right.

NZ: Who actually caused that?! [laughter]

DY: Gosh, Nancy, I had forgotten that. Because I came to special studies, and then they changed the name to developmental studies because special studies had . . .

NZ: A bad name.

DY: It had the connotation of the "special children." Special as in what? Not intellectually elite children. So, '75, there you were.

NZ: It was the fall of '76, and that was really exciting. That was an interesting time.

DY: Those were good programs coming out of there; they were excellent.

NZ: And part of what I loved was that I was in charge of developing what the math program would be. About half of the students were football players, and the other half were a mix of children of alumni who couldn't quite make the regular admissions. And there were local students out of Athens.

DY: I remember the demographics well. They didn't change in five years.

TS: I guess that's true. They could be so selective at UGA. The only ones that would be in the special studies would be those that didn't meet the entrance requirements for one reason or another.

NZ: Right; there was some other reason for letting them in. So that was an experience for me. Among the group of us, the interdisciplinary collaboration was absolutely wonderful. I felt that I was given a lot of freedom to experiment with ways of teaching mathematics to students who are poorly prepared or not ready for mathematics. The three components [of special studies] were English, reading, and math. One of the things that we did—and this was back in 1975—is we looked at working together with all of those three areas, and [we got] the idea that maybe writing could help clarify mathematical thinking.

DY: Good and cutting edge, too.

NZ: It was. I think that the people who were there were really passionate about what they were doing. I think that all of us really believed that there weren't throwaway students. I also got a very different view of these football players. I had seen them as these very privileged students that came in and were given all of these special dispensations. But then I [became] aware of the fact that if the coach said that you do this rather than studying for that, you do what the coach says. I grew aware of how very few of the [the football players] graduated and how exploited they were.

DY: That was Jan's point.

NZ: That was Jan's point.

TS: Sure.

DY: And I testified for her.

NZ: I know you did. I felt very supported and influenced by the person who headed the writing program.

DY: Who was that at that time?

NZ: Angelia Moore. Do you know her?

DY: I do not know her.

NZ: She's down at Georgia Southwestern [State University]. I really feel she was somebody who impacted me. She was very passionate about this. Jan worked for her. Angelia and I saw some of what was going on, and we decided, "Well, things are not right." We tried to do a little bit of pointing it out; things are not right. Of course, they knew; and both of us kind of quickly left the same year. I didn't feel that I could stay and keep my integrity.

DY: I stayed one year.

NZ: I stayed two years.

DY: And it was the very same reason. It was fixing to blow when I left.

NZ: Well, I left in '78. Angelia left and I left; Jan stayed. Of those of us who were there, Jan was the one who stayed.

DY: Who was head of the developmental studies at that time?

NZ: Well, Leroy had left. Leroy hired me; he had been at Oberlin.

TS: Who is Leroy?

DY: How do you begin to describe Leroy?

TS: What's his last name?

NZ: Ervin. He was the head of the special studies. He had been at Oberlin, and it was through connections at Oberlin that I went to UGA. I have mixed feeling about Leroy because partly I think he had a real passion to do something. But I think he got so co-opted by the system, and then he moved upward. And then they brought in Ron McFadden. Was he there when you were there?

DY: Ron was working for Leroy, I think.

NZ: So I left in ’78. And at that time, there was an opening at Kennesaw. I really wanted to be in Atlanta—out of Athens and back in Atlanta. I was becoming, I think, more at peace with being an academic. I don’t know how else to say it.

DY: With being an activist mathematician.

TS: Well, we had a huge developmental program at that time in math, didn’t we?

NZ: But I felt too burned by that.

DY: You weren’t even interviewed for the developmental position.

NZ: No. That was actually part of the math department then; it wasn’t separate

TS: Well, it was probably an asset that you had had that experience.

NZ: Oh, I think that it definitely was.

DY: It was for me, too, when I was hired.

NZ: So I interviewed here in 1978, and I was offered a job.

DY: So you interviewed with . . .?

NZ: Herb [Herbert L.] Davis. As you remember, we didn’t have a math department. It was the Division of Natural Sciences and Mathematics and included nursing.

TS: Yes, he was the chair.

NZ: He was the division chair. We had no separate math department. I interviewed with Herb, I received the job offer, and I accepted in 1978. My mathematical training was very much classic, pure mathematics. I had already had a lot of experience, a lot of different kinds of teaching experience. I was eager to come here; I liked the fact that the emphasis at the time was very much a teaching institution. I was still just really wanting to explore this whole issue of, I don’t know, mathematics for everyone. The experiences at UGA had not soured me on that as some kind of passion that I have.

DY: Don’t you think that’s because the students were so wonderful?

NZ: Well, they were wonderful.

DY: I loved my students there.

NZ: I loved my students; I really did. I learned so much from them.

DY: I did, too, Nancy. It’s an incredible teaching incubator.

NZ: It was a wonderful time, and I have no regrets that I was there. I also have no regrets that I left.

TS: Were they hiring for specialties yet in the math department?

NZ: No, they were not. They were not hiring for specialties.

TS: I mean, there wasn't even a math department then.

NX: We were a math concentration, we had a math concentration. Part of what we started to do then was to build up a little bit of something [with] computers. There was no computer science department, and I had not done anything with computers since the '60s as an undergraduate.

TS: Well, that's right about when personal computers are being invented, isn't it?

NZ: Yes, but they weren't there yet.

TS: I know. They weren't at Kennesaw.

NZ: That's right. They sure weren't, and we were still teaching the five-day-a-week, fifty-minute classes. What I loved initially when I came to Kennesaw were the nontraditional students. It was my first experience teaching primarily adults.

DY: It was for me, too.

NZ: I loved it. I still do. I still think that there's something that Kennesaw has had and that I hope that we never lose that comes from having that group of students. I liked the fact that the program was new. I really enjoyed the opportunity at UGA to build something, and I was very interested in how we built our program at Kennesaw. At that time, you were lucky to teach one or two calculus classes. I did teach some of the special studies classes that we had; they were taught across the department. I very much did not want to be identified with that, but I also thought that that was fun to be teaching those students. And then we have the Math 101.

DY: So when you came into Kennesaw, you saw—

NZ: Horace Sturgis was president.

DY: Horace Sturgis was president, and you saw potential there for developing programs.

NZ: I saw potential for developing programs, and I saw a place that . . .

DY: That honored teaching.

NZ: That honored teaching. It just seemed like a good environment for teaching.

TS: I remember in those days in history, we always loved the nontraditional students. They were often our best students. But I would talk to people in math, and they would seem to have a very negative view toward the nontraditional students because a lot of them were women who felt threatened by math.

NZ: And I think that's where I always found that in many ways I was a little out of step with a lot of the math department. Because that was very true; I think there was a lot of just negativity—an attitude that there was something wrong with these students or that there was even something wrong with us for being there. What you're saying is very much my memory of things. But I think that attitude has changed. I think that what I described was definitely true back in the late '70s, early '80s, but it is not the prevailing attitude.

TS: Of the math department.

NZ: Of the department now. I think it's a very different culture than what it was back then.

TS: In what ways? More student-oriented?

NZ: Yes. I think that there's a lot wider range with that. It's just not that same negativity that I found very difficult. My first few years here I found rather difficult.

TS: Because of your colleagues?

NZ: It was a very different environment. I was surprised in ways to find myself here. I don't live in Cobb County. The whole suburban environment is not the place I expected to find myself. I also think there were just wonderful things and wonderful people here in the early years.

TS: But in the late '70s, Cobb County was 96 percent white, and the student body was at least 96 percent white.

NZ: Although I remember the first large group of international students was from Iran, and I remember when the Shah was overthrown. There were people saying, "Well, you've got to watch those students," and saying terrible things about them. There was a lot of bigotry about the students.

TS: That they weren't honest?

NZ: That they weren't honest, and there was not a lot of appreciation of the differences. That's another thing that I've loved seeing over the years—the different groups of international students who move through here. I think they've really enriched this school wonderfully.

DY: And now that's one of our central foci of this institution; I mean, we now have an Institute for Global Initiatives.

NZ: Yes, and I think it's wonderful.

DY: As opposed to just a center. I think it's one of the strong points.

TS: We have students from over a hundred countries.

DY: Yes, represented here. I wonder, too, if at that time when you came in the late '70s—I sort of sensed this when I came in '82—that Kennesaw was still wanting to establish itself as a player, as an institution of intellectual integrity and what maybe even could be defined as elitism. I saw some of that in the English department. I came very open-armed to special studies and developmental studies and . . .

NZ: Oh, yes; yes. I think that was very true also in math.

TS: So they were embarrassed by the fact that we had the students that weren't Harvard bound.

NZ: And I think that there was even pride that we had very, very high failure rates in our freshman classes. I saw that as a sign of something that we as a faculty needed to be concerned about. I think that some people viewed that as a real sign of our intellectual and academic strength and integrity.

TS: We had high standards.

NZ: Yes, we had high standards. I think that's some of what outraged me as a young faculty member in a mathematical culture: I'm thinking that this is terrible that these people here are saying this. It's part of the undercurrent that we as mathematicians are kind of the standard holders of the gates of academia.

DY: And if you aren't, the writing people are.

NZ: That's right. We share that. English and math really share that.

DY: I'm glad we've been forced to get over that.

NZ: Well, I am, too.

TS: Is it time to start talking about your transition toward earth algebra and how that all came about? We're really leading to that, aren't we?

DY: Well, the question that may get us there is why did you stay at KSU?

NZ: I almost didn't. I went through a period of questioning again. My question wasn't so much did I want to stay at KSU, but did I want to stay in academia? Partly the teaching—I just loved coming to my classes—that kept me. That was one of the things that kept me. But I kept that ambivalence, and I'd say that my first five, six, or seven years, maybe, I questioned it. I really questioned whether

or not I'd stay. I also think that I hadn't really yet found a place and a focus for myself. I did different things, and I felt eventually more at home in my department, but it took me a long time. For the young people coming up now, I'm one of the old people in the department, but I never felt like that; I always felt a little bit like the real outsider there. I kept thinking that I needed to do something a little differently, but I didn't quite know what it was. [For] two years I went through this computer science institute that the university system ran, on top of my full-time teaching. It was something different, but it wasn't for me. It wasn't what I wanted to do, but it did get me to become more serious about finding a place for myself.

DY: Yes, you were looking for a niche.

NZ: Once Dr. [Betty L.] Siegel came and departments were formed, I think that for awhile we were the math and computer science department. I think that as a department we had a real split identity. At that time the computer science people were really retooled mathematicians, and it wasn't until later that we kind of found our focus. I think that the best thing that happened to the math department was when the two departments split, and they split under difficult circumstances.

DY: Do you remember when that was?

NZ: It would be about '86 or '87. [It was] one of those things that happened in the middle of the semester.

TS: So Tina [H. Straley] became the head of the department?

NZ: Tina became the head of the math department, and I think that was one of the wonderful things that happened to the math department. We got a focus. And if you have ideas, Tina knows how to support people with ideas. She doesn't have a lot of tolerance and patience for a lot of things, but she knows how to give people support. I think this would have been around 1988; Chris [Christopher] Schaufele and I started doing very pure mathematics research together.

TS: Did he come after you?

NZ: Chris was here and then he left and then he came back. He wasn't here the first year that I was at Kennesaw. He was on his hiatus, and Tina was on leave. Those, I think, were the two people that I connected with the most, and so neither one of them was here. Chris came back after a couple of years, and he was the first chair of the math department.

TS: Math?

NZ: Math and computer science when the departments were formed. He can give you his own take on why he resigned, but we went through a period of different acting chairs.

TS: But you all were kindred souls as far as your interests?

NZ: We were. He's a topologist, and his topology was two really closely related pure mathematics areas: algebraic topology and combinatorial group theory, which is what my training is. My interests were combinatorial group theory with a lot of topology, and his were topology with a lot of combinatorial group theory. We started doing some research together; no one in the department was doing any pure research then. For years people were trying to get department seminars going, and they kind of faded out, never really took off.

DY: You mean senior seminars for students?

NZ: No, seminars for faculty. I think in some way we all, as a department, were looking for what our niche was. As you know, it was still very much a teaching institution then, but where do you go with that? So Chris and I started doing this pure research, and Tina was very helpful in getting us a little release time and a little bit of support for that. We really did some beautiful work. Chris even went out and got a master's leave out at the Mathematical Sciences Research Institute at Berkeley. I got a travel grant from the Association for Women in Mathematics to go out there when they were doing a big combinatorial group theory low-dimensional topology workshop. We got some very good results and were kind of moving forward with that. This was right after the math department had split, and we were really looking for a way to get more time to concentrate on our very esoteric, pure research. The math department had a meeting one day; I remember this really clearly. Tina was chairing it, and Chris said that forever, college algebra classes had just been a nightmare. The students were failing. The students hated it, and the faculty hated it. It was just a miserable experience, and no one was learning anything.

DY: What is this? The elephant in the living room?

NZ: It's the elephant in the living room, yes. So Chris said that he was wasting his time and the students' time by teaching that course. I said that I absolutely agreed with everything he was saying. Tina, being the excellent administrator that she is, said, "Okay, you two are in charge of doing something about it." And Chris thought we were being really clever because we had taken on this minor project and we would carve out the room for us to continue this very beautiful theoretical research. This was 1990. At that time in mathematics people were really starting to look more at all of these elephants; there was a herd of elephants in the living room! The first elephant had been the calculus classes, and there had been some real moves forward. There's been a backlash since then, but that's a separate issue. In really looking at reforming the mathematics education, there had been a lot of changes in how people were thinking about teaching calculus, and there had also been a lot of changes at the secondary level in how math had been taught. In between those areas, nothing had been touched with these students. These were primarily students who were never going to go on to take calculus. This was their terminal course, and it *was* terminal. I mean, it was deadly for them; it really was.

So Chris and I both had really enjoyed teaching; we both thought we were good teachers. And we decided to do something about that [in-between area in math]. Tina sent us to an MAA meeting in North Carolina—Mathematics Association of America.

TS: Which is what she's the head of.

NZ: Which is what she's now the head of. The third component that was coming in was all of this new technology. So [at the MAA meeting] this person had done this wonderful new cutting-edge thing by looking at finance, annuities, retirement, and all these things that are exciting to eighteen-year-olds! [laughter]

TS: Well, for the nontraditional student it is.

NZ: Yes. So we were up there and started looking at the idea that rather than just thinking, "Aren't these students awful," [we should think], "Whether they are or not, here they are. What are we going to do for them?" So we were driving back, and some place between North Carolina and Atlanta, we started talking. And we just had this idea: What would happen if we tried to design a course using environmental issues as the focus?

DY: How did you make the leap to environmental?

NZ: Well, I'm trying to remember.

TS: As you were going down the Blue Ridge Parkway! [laughter]

NZ: Well, yes. There were a lot of things going on. It was like the twenty-year anniversary of Earth Day, and we were both real environmentalists. It was 1990, and it was an issue that just seemed natural, but neither of us can really remember exactly how the idea came out. By the time we got to Atlanta, we sort of had the notion that this was a wild idea, but maybe we'd try it.

TS: It must have been the Great Spirit as you were going through Cherokee Country! [laughter]

NZ: I guess so!

DY: I think it was the Great Spirit of Ronald Reagan destroying all the environmental protection.

NZ: Actually, it was the Great Spirit of Ronald Reagan and Senior Bush.

TS: Yes, Senior Bush would have been president.

NZ: But we'll continue on! We got back to Atlanta, and we went in to talk to Tina. Actually, we wrote a letter to her saying what we wanted to do. I found a copy of it when I was cleaning out my files.

TS: I hope you saved it.

NZ: I did. I think it's in my garage where my files are.

TS: Send us a copy.

NZ: If I find it. If not, I think that Chris said he had it, too.

TS: It should be in the archives.

NZ: We wrote the idea about here's what we've come up with, and we went in to see Tina. Tina got that look, and then she got this big smile and she said, "This is it. This is really, really good." And she immediately took us down to talk to Herb Davis. Herb said, "This is really what I've been wanting people to do." We had been doing so much fiddling: You know, you fiddle with things a little bit; you change things. You do this; you do that. And it didn't make any difference. Well, Herb was very, very supportive of this. Tina, Herb, and Ed [Edwin A.] Rugg pulled together some support so that we could have some time over the summer to see what we might be able to come up with.

TS: And Ed Rugg was vice president at that time.

NZ: Ed was vice president at that time.

DY: Oh, that would be right up Ed's alley.

NZ: By then one of the miraculous changes we had made is we had changed College Algebra from 101 to 105. And it didn't help! Chris was teaching a class that summer, and we just came up with some really, really rough notes. We decided that what we wanted to do was to focus on not lots of little applications but more looking at larger issues in an extended way. What we were looking at would be ideas of fossil fuel consumption and change in global temperatures. So we went and researched. The Web was not available so we'd go down to the Emory library because it was close to me. We got data and we started coming up with just some very rough notes. I came in with Chris to teach his class for the second half of the summer, and they came alive. They absolutely came alive with this. The students found it very interesting and exciting and very informative.

DY: It was also summer time.

NZ: It was summer time with those long classes over in the Social Science building that never had decent air conditioning.

TS: It still doesn't!

NZ: Still doesn't! And the other thing that we'd come up with and we were influenced by was the notion that if we were going to provide different kinds of material to come up with the ideas, then we probably also needed different methods of

presenting the ideas rather than the lecture method. So all of those pieces came together. We decided that we wanted the students to work together collaboratively. I have these theories that one day, Dede, you and I could have a talk about: women and learning and mathematics with collaboration versus a whole competitive nature of mathematics.

DY: I would love to, Nancy.

NZ: We're looking at collaborative activities where the real data and real information motivated the mathematics; we were also looking at choosing something that was of interest to the students. We had been meeting in the spring; before we came up with this, we had a little task force together, and Marlene [R.] Sims said, "Well, maybe this is a naïve idea, but if we want the students to be interested, maybe we should teach something of interest." [laughter] We remembered that. They just absolutely came alive, and we got very, very excited about this. Then Tina at that stage said we needed to get some support for it. I used to say we needed to enter Tina in Grant Writers Anonymous. At that stage there wasn't any grant activity, really, at the school—or hardly any. Tina said we needed to go and apply for a National Science Foundation grant, and Herb paid for Tina and Chris to go up to Washington to meet with someone there. They came back with some good ideas, and we wrote a proposal for, I think, a one-year project; we thought, "In one year, we'll be done with this." We wrote an NSF proposal and got some other people in the department [involved]. Marlene worked with us from the beginning, and Tina, of course, was really wonderful and supportive.

TS: Was Jackie [Jacqueline L.] Givens here?

NZ: Well, Jackie was here, and we just kind of went ahead and did this on our own. We sent it off to the NSF. Tina had told Jackie that we had this really great idea, and then Jackie called us up and said, "I think you should apply for a FIPSE grant." Chris and I said we didn't want to, and Jackie said, "What if I take your proposal, and I rework it into just a preliminary proposal." We said, "If you want to waste your time and do that, you go ahead." So Jackie took our proposal; she put out this three-page preliminary proposal for FIPSE, and she sent it off.

TS: Explain what FIPSE is.

NZ: FIPSE is the Fund for the Improvement of Postsecondary Education, which is part of the U.S. Department of Education. So at that stage we had an NSF proposal, and we had a FIPSE proposal. I think by then it was fall; we were both teaching experimental sections. I won't say [we were] using our material because we were writing our material on little pieces of paper that we were putting into our back pockets and we were teaching. We had one of those big classrooms on the second floor of Social Science with the curtain between them; Chris was on one side, and I was on the other side . . .

TS: They've got a solid wall there now.

NZ: Well, they had that curtain then. I was always slow; I'd chatter on. And sometimes I'd be going, and he'd open the curtain and say, "Okay, don't try this. This doesn't work; try something else." [laughter] And in some ways, the course was never better. We were teaching out of our back pockets so nobody knew what was going to happen. Part of our idea was that this mathematics can be exploratory. And it really was then. There wasn't a book; there weren't answers in the back of the book. We found at that time the students didn't have any technology that they were using. So we found that things were going wonderfully because part of our idea was that you use real data. Mathematics was developed to answer questions, and students at this level had lost track of that. Nobody just said one day, "I'm going to teach you how to factor." Students don't understand. You can say, "Evaluate this function at such and such a number," and they can do that. If you have a function that describes something and you ask them to use a function to interpret, they don't have a clue about what it means. So part of what we wanted to do was to use real data, but the arithmetic facility the students had was lacking. If you're really trying to solve something—that instead of $x^2 + x - 7 = 0$, if you got .037x; if you got something complicated—the students would really bog down when it came to the computational parts. So as the technology advanced and we as a department were already really committed to using this new technology, we found that we could really go to town in a way that if we had had this idea five years earlier, we probably would have come right up against a wall at the time. So we were really bringing all these different components in; we were working through trying to develop some notes; we got various kinds of support. And then we got word—I can't remember exactly the timing—but we got word that the National Science Foundation funded us pretty much for everything that we asked for, and we also got asked to submit a full proposal to FIPSE. Their main criticism was that instead of asking for one year of funding, we should ask for three years of funding. Well, we said, "No, two years is enough!" So we asked for two years, and both of the proposals were funded fully.

DY: And what's the date of this?

NZ: I'd say '91.

TS: But you all weren't sure you wanted to do this forever?

NZ: We weren't sure we wanted to do this forever. I think it would have stayed very small and very local without Tina. She was excited about it, and she told people about it. She went to the math meetings and stood up in a session and talked about what we were doing. Then we had publishers come to us. We met somebody who we really liked as an editor, and we were so dumb; the other publishers we wouldn't talk to. We decided, "No, we don't want to know what you're offering us. We like so-and-so." And we had a publisher and an editor, but then her senior editor said that he was tired of publishing the same book over and over again, and he really wanted to do something different.

DY: You might not have been so dumb.

NZ: Yes, I know. We weren't so dumb; I know.

TS: But maybe you could have made a lot of money is what you're saying.

NZ: Yes, possibly. But we weren't so dumb because what we did is we really got a lot of different people supporting us. I have such respect now for what that whole editing/publishing process is. I think how much they really helped us produce something that's so much better than we possibly could have done. One of the things is, of course, the whole review process. We learned so much. We had external reviewers that we're still in contact with fifteen years later. There was a lot of excitement then, and there were a lot of people out there that were really looking at different ways to change how mathematics was taught.

TS: Your external reviewers were other academics?

NZ: Other academics. And some of the reviews were so helpful that we called Ann, our editor, and said, "Look, we need to talk to this person. Clearly this person knows things that we need to know." And she arranged it.

DY: Did you ever do an article, *Teaching Out of Our Back Pockets*?

NZ: No.

DY: That is so wonderful.

NZ: Because we were. I mean, that would be a great title.

DY: Of course it would be!

NZ: There was also a lot of resistance and continues to be and will continue to be—resistance to what we're doing.

DY: On what levels and for what reasons?

NZ: Well, okay, here's something legitimate: Are we watering things down?

TS: And what's your answer?

NZ: No, because there was nothing there. I felt that before, the students either knew it or they never learned it. I don't think people were losing with that, but there's something to be learned, primarily with that [in-between] level of student. We would say, "Well, you'll need to know this when you take calculus." And they didn't take calculus.

DY: So you couldn't hold another course over their heads.

TS: So this is not really what you would want to do if you're going to be a math major?

NZ: I don't know because I think there's something to be said for that. And there were political battles within the department and the whole issue of collaboration in mathematical learning. You know, I think there are people who genuinely believe that the way that you learn mathematics is to watch me and to imitate me as the expert and at some state it becomes natural. We were coming at this from an entirely different view.

TS: Right.

DY: And isn't the mythos of the mathematician as the solitary genius there with his brain brimming with brilliance?

NZ: Yes.

DY: And whether it's communicated or not is not important.

NZ: Not only communicating, but in some sense, *not communicating* is a sign of how brilliant you are. There was some criticism that the material was too political, and it is. It is.

DY: How are you going to find material that's not political?

NZ: Well, I believe life's political! [laughter]

DY: I do, too. I mean, that's the reason for my question.

NZ: Then again, there's the myth of here is science and mathematics, and here's the world. In math you know that one plus one is two, and that's not a progressive. I think those are all myths, but those are very, very powerful myths.

DY: Yes, and very culturally entrenched.

NZ: Very, very culturally entrenched. So we always had strong reactions to what we were doing. What I know is that I believe teachers teach the best when they teach in a way that's most congenial, that comes from them. This comes from me. It works for me, and it works for a lot of other people. I think there are other people who are brilliant lecturers and this is their style. I don't believe there's one way to learn; I really, really don't believe that there's one way to learn.

DY: Right; we know that there's not.

NZ: And the other thing that struck me the first time I gave a test, and I feel terrible about this . . . I know I always tell my pre-service teaching students that I can train my cat to do this: If you ask a question the right way, you can get back the answer that you want. I think some of us have become very, very expert—and I had—at eliciting back the response that I wanted. I can put out a problem and I can train—and I say train because I think it's not teaching; it's training—most any student to give me back the answer that I want. Once you take it out of that

framework and you put it into this context, you start probing: What does this answer really mean? At first it's really shocking to see what students think it really means. When you get them to talk to you about how they're really thinking about this, it's not pretty. It really is not pretty, the misconceptions, the little tricks that work, how much of that is really in their mind when you start stripping that away. I think it's uncomfortable; I think it makes people uncomfortable.

DY: Hmm.

NZ: Part of what we always said is, when you answer something, bring it back to what does this mean? What is it telling you? If somebody walks in off the street, how do you explain what it is that you're doing? So part of what we built into this was an attempt to tie communication with the mathematics, and some students who are very, very good at cranking out the answers don't like that. We also looked at one of the theoretical underpinnings—and this is true; any good mathematician knows this: Your answer is only as good as what your assumptions are. Rather than saying that what we're telling you is the truth about the environment, the truth about global warming, the truth about fuel consumption, [we say,] under these assumptions, this is what you can say—which I think is valuable.

DY: It's intellectually honest, isn't it?

NZ: It's intellectually honest. I think where the danger comes is when you start just getting so caught up in the process that you leave out those steps, and you just say, "Well, according to this equation we're all going to be dead in twenty years." No, it doesn't tell you that. For a few summers we did workshops with gifted high school students. One of the things that we did that was fun, because we wanted them to learn this, was to say, "Okay, take all of your data and make some kind of outrageous prediction. Show you can do something silly with the data." And these students, some of them, they took population data that we have, and they went backwards to determine when there were two people in the world. I thought that was delightful that they really got on to what was fun about that.

TS: You mentioned technology improvements making it possible. Are you talking about those calculators that students would buy?

NZ: Yes. Again, there was a broader disagreement about what role those hand-held calculators should have. I think that all of us as mathematicians think that if we just teach black box mathematics—punch in a number and out comes an answer—they're not learning. They're missing things that are important to learn. On the other hand, at what stage do you stop cranking things out by hand and take advantage of what's there, what they're going to, what is useful for them to learn how to use. Of course, the technology has skyrocketed since we started. What was really hot stuff in 1990 is now archaic.

DY: But your ideas no doubt were adaptable.

NZ: Our ideas were adaptable. One of the things that was really wonderful about it is I really valued the kind of federal grant support that we got. Of course, I think it made it possible for us to continue developing the ideas that we have. The other thing that we got was a connection with a whole broader network of other people who were doing their own outrageous, outlandish, interesting, interesting projects. There was a lot of real ferment going on at that time. I think the pendulum has swung way back the other way now, but I think that we were very fortunate and influential in coming along at that time. A lot of what we did *did* have wide impact. I meet people that say, "I know what you're doing, and I've seen what that is." And these are people who have no connection with higher education or the mathematics field.

DY: Oh, how gratifying.

TS: How many grants did you all get eventually?

NZ: We got a lot. Both the NSF and FIPSE supported us through all of our work, which is remarkable; I'm just astonished at that. There were some people there that really took a lot of risks and continue to take risks with us. So we did four projects, and for each one of those we got funding from both [the NSF and FIPSE]. We learned quickly that two years was not enough. And some of our projects were more successful than others. I mean, we hit a real brick wall. We wanted to bring some of the same ideas into the beginning courses for the math and science majors. That's where there were a lot of sacred cows, and I feel that we really never did what we set out to do. It got very, very difficult. We backed away from there, and I think that was probably the right decision to make. Then we did some work with some applied calculus problems. The last project, which we just wrapped up about six months ago . . . One of the things that's changed from when we started is the consolidation of publishers.

DY: Yes, the industry has changed dramatically.

NZ: Rather than taking a risk on, say, publishing something that is very clearly what it is and not trying to be all things to all people, everything was moving more and more to the center. There's more homogenization. We would find that we'd go to meetings and people would say, "I love your book, and I [copied] the chapters, but my department—we're thirty people in a department, and no one would ever adopt something that radical." So we decided that rather than trying to fight that, because that was much larger than anything we were doing, there was also this wonderful technology of the Web. So for our last project, by now we had a lot of people we were collaborating with nationwide. We took a lot of what we've done and made it free and self-contained with some wonderful technology, and it's all available on the Web.

DY: I looked at some of that yesterday, and it's just fabulous.

NZ: Well, thank you.

DY: It's wonderful.

NZ: Like Philippe [B.] Laval, who's in the math department—he wrote these applications to do all of the mathematics that the calculators did so that somebody can literally just go online and do the whole thing online.

DY: Well, it's visually done very well; it's very accessible. It's very impressive.

NZ: Thank you.

TS: You must have brought in at least a million dollars in grant money.

NZ: Yes, that's about what it is. It was about $250,000 for each project.

DY: Well, Nancy, this is just so wonderful, all the work you've done. Maybe this is the time for this question: What do you consider your most significant professional accomplishment?

NZ: I think that earth algebra is. I feel that real clearly. I think that when I get discouraged, which I do a lot now, I feel that Chris and I shifted a little bit some of how people look at presenting mathematics to a larger audience. What I think is ironic is that I didn't know it back then, but the conflict I always felt between being a mathematician up there and being in the world out here, that let me . . . Now I think, "Well, of course, this is natural that this is how I put it together, how Chris and I put it together" because this is so collaborative. I'm real aware of how each of us has our own strengths of what we've brought to this and certainly our own weaknesses.

DY: Yes, knowing your own story, or at least parts of your story, and the great chapter on the earth algebra success, when you first began talking I thought, "This is wonderful because it is going to come together for you."

NZ: And it did.

DY: You had that conflict but . . .

NZ: Yes, and it delights me. I feel pleased about this; I really feel pleased that I was able to do that.

DY: It's a lovely narrative for a career, Nancy.

NZ: Well, thank you. I've loved my career here. I don't think we could have done what we did at a lot of public institutions. I think that what kind of school Kennesaw was in 1990 had a lot to do with what we were able to do.

DY: That leads to another question that we've been asking our distinguished faculty award winners, and that is: What notable changes in the intellectual climate at

KSU have you seen? Maybe you could begin by describing the climate that you just spoke of, KSU in the ’90s that permitted this.

NZ: I think that people were looking to move out in the world, but in a very nontraditional way.

TS: To develop a national reputation?

NZ: Yes. My dean [Dr. Laurence I. Peterson] is always talking about national reputation. What I felt then was that it wasn’t so much a push to develop a national reputation. I mean, I think that’s like saying, “I want to be famous.” You don’t want to be famous; you want to do something. You don’t set out to be a writer. You say, “I want to write; there are things I want to say.” Maybe, I think that’s the difference then that things were kind of wide open right then or they felt that way to me. I felt we were highly, strongly supported by the administration in our attempt to get money. Of course, you say, “How could you not be?” But a lot of places weren’t, and a lot of people weren’t.

DY: Well, I will throw this in, Nancy. I want to ask you about this because I was just editing Sarah Robbins’ oral history, and she said that the two of you talked literally over the period of a year about the difficulty of administering a grant once you get a grant.

NZ: Yes. I hated that. It was so difficult. Sarah and I really worked to try to make that better. The difficulties were just awful, particularly for us. We’re not trained in that, and you know, I still operate out of my back pocket. I feel that Sarah’s just done wonders with that, but we really did have difficulties with that. I also think this is a reality: Chris and I basically had an independent budget that we operated on. We had a lot of money, and we worked so hard. But I think that some people viewed that as, “Here they are, flying off around the country doing this and that, and I’m stuck with my 8 o’clock calculus class. It’s not fair.” I never claimed a penny of department travel money since 1990. I never claimed a penny of department equipment money since 1990, and I gave money to the department. But I know that not everybody saw this as a blessing at all. I think Sarah and I talked a lot about some of the difficulties of . . .

DY: Of how you’re perceived?

NZ: Yes, and how difficult that is. I think that Tina was very unambivalent about it, but I think that when she left, it was a whole different ball game.

DY: So administrative support and the administrative structure were crucial to your getting started.

NZ: Yes.

DY: And once you had the momentum, you could sustain it.

NZ: Once we had the momentum, we could sustain it. We could go and get grants on our own because we had a reputation that we had established.

DY: And did you find near the end, say the last two or three years, that that had changed? That you were—well, I don't want to put words in your mouth . . .

NZ: Go ahead. [chuckle]

DY: What *did* you find your last few years here at Kennesaw?

NZ: Well, I could get into trouble for my little jokes, but I used to say that the department's longest standing committee was our search committee for the chair. We went years with interims and temporaries.

DY: Did they come from inside? You'll have to refresh my memory about that.

NZ: Well, we went through various stages, and I think that the department never had the clarity of vision brought back that it did during those years.

DY: Those years being . . . ?

NZ: The early '90s, the late '80s.

TS: Tina was here until the late '90s, wasn't she?

NZ: Yes. She went up to the NSF, and when she came back she wasn't chair, but she came back. What I see now pleases me. I think now the math department is a very, very different department than it was when I came, and it's a very different department than it was fifteen years ago when we started this. There are some wonderful things that are going on there now that are very, very different and going in a very different direction than what Chris and I did, but I think they are really, really strong and healthy. We have a vibrant program of seminars and lectures and student organizations. We have a huge number of students; we finally reached the critical mass, and I think the students have a community. Some people have worked very, very hard for that to happen; I think that what the department struggles with is not whether or not people are going to be doing research—because I think that question has been answered; yes, they are—but number one, what kind of research are they going to be doing? And number two, how are you going to support people doing that research? I think that there's an unfortunate move right now that says that every single person should go out and bring in a grant. That's like saying everyone should be famous; that's not how it happens. That's not how this happens. I think you've really got to look at the fact that if you're going to require or desire traditional mathematics research, you have to give people large chunks of unstructured time, and you've got to support it. I think we're in the unfortunate situation now of wanting to have all of that and not wanting to pay for it. So if I walked in today with a project like this, I don't think I'd get anywhere with it. That may not be accurate; I think that's how the culture has changed.

DY: Interesting. You know, Betty [L. Siegel] did those cohort groups of people who had been at Kennesaw twenty-five plus years and then—what was the next break-down? Fifteen plus years, and the most recent was seven years. I read all this because I was on the strategic planning committee for the university. It's very interesting, the commitment and the interest that the long marchers had as opposed to the faculty who are newly arrived. I wondered if that's playing into what you're saying in terms of climate.

NZ: I don't know. I think it may be, and I think what I'm interested in would be the differences between the new ones and the middle group. I feel optimistic about the new people; I really do. They're coming in, and sometimes they propose things and part of why I thought it was time to leave is I didn't want to be standing up and saying, "Look we've tried that and I know that doesn't work." I know they have to go through the process that we went through, and I see things happening now that I want to say, "Don't you know that we did this twenty-five years ago, and it's not going to work?" But what I'm pleased about is that they're wanting to do something.

DY: So you see some energy here.

NZ: I see some energy there; I see some really good energy there. Other good energy that we have in our department is that we have stayed a math department and a math education department in one body; I think that each group challenges the other group in really healthy ways. I like that. In the last few years, the work that I primarily did was with the pre-service teachers with these kinds of materials to really try to get this down into the schools.

DY: The secondary, yes.

NZ: And the math ed component of the department is out there doing wonderful things and being wonderfully supportive. I think the mathematics people are taking an interest in that and a delight in that. I'm very much of that [first] group and not the math ed people, but keeping a really solid mathematical foundation to everything that's being done is really important.

DY: Tom, have you got anything else?

TS: No, I guess not. No more major questions at this point.

DY: Nancy, this has been so fascinating.

NZ: This has been fun. It's fun to reflect.

DY: It is fun to reflect, it is. It's gratifying to reflect.

TS: How many books have you written?

NZ: Well, we've written three. One of them is sort of buried in a preview edition and never came to full fruition.

TS: So you did . . .

NZ: Earth Algebra and then the middle project was the Pre-Calculus. I don't know, we could probably write a whole thing about how mathematicians can get caught in the cultural wars of mathematics. We wrote a book with that that's never gotten out of the preview edition. And then we wrote an Earth Studies with a colleague at Portland State University. They've done a lot of collaboration with us on applied calculus studies in issues of sustainability.

DY: You've got a real environmentally conscious area out there, too.

NZ: Yes, well, I still care about that a lot. Chris and I are currently working with a geologist out at Arizona State University writing materials primarily in quantitative literacy—earth sciences—but really using the earth algebra model. Primarily, he's been working with Navaho students and now he's down at Arizona State.

DY: That's wonderful. Well, anything you'd like to say in closing?

NZ: No, I appreciate your doing this project; I think it's wonderful.

DY: Thank you for your time and for coming back. We will close at this point.

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