CHEMICAL HERITAGE FOUNDATION

GUSTAVO W. LEONE

The Pew Scholars Program in the Biomedical Sciences

Transcript of Interviews
Conducted by

David J. Caruso

at

Ohio State University Medical Center
Columbus, Ohio

on

23 and 24 October 2008

(With Subsequent Corrections and Additions)

ACKNOWLEDGEMENT

This oral history is part of a series supported by a grant from the Pew Charitable Trusts based on the Pew Scholars Program in the Biomedical Sciences. This collection is an important resource for the history of biomedicine, recording the life and careers of young, distinguished biomedical scientists and of Pew Scholars Program in the Biomedical Sciences Advisory Committee members.

This oral history is made possible through the generosity of

CHEMICAL HERITAGE FOUNDATION
Oral History Program
FINAL RELEASE FORM

This document contains my understanding and agreement with the Chemical Heritage Foundation with respect to my participation in the audio- and/or video-recorded interview conducted by David J. Caruso on 23 and 24 October 2008. I have read the transcript supplied by the Chemical Heritage Foundation.

1. The recordings, transcripts, photographs, research materials, and memorabilia (collectively called the "Work") will be maintained by the Chemical Heritage Foundation and made available in accordance with general policies for research and other scholarly purposes.

2. I hereby grant, assign, and transfer to the Chemical Heritage Foundation all right, title, and interest in the Work, including the literary rights and the copyright, except that I shall retain the right to copy, use, and publish the Work in part or in full until my death.

3. The manuscript may be read and the recording(s) heard/viewed by scholars approved by the Chemical Heritage Foundation subject to the restrictions listed below. Regardless of the restrictions placed on the transcript of the interview, the Chemical Heritage Foundation retains the rights to all materials generated about my oral history interview, including the title page, abstract, table of contents, chronology, index, et cetera (collectively called the "Front Matter and Index"), all of which will be made available on the Chemical Heritage Foundation's website. Should the Chemical Heritage Foundation wish to post to the internet the content of the oral history interview, that is, direct quotations, audio clips, video clips, or other material from the oral history recordings or the transcription of the recordings, the Chemical Heritage Foundation will be bound by the restrictions for use placed on the Work as detailed below.

4. I wish to place the conditions that I have checked below upon the use of this interview. I understand that the Chemical Heritage Foundation will enforce my wishes until the time of my death, when any restrictions will be removed.

Please check one:

a. ✓ **No restrictions for access.**
NOTE: Users citing this interview for purposes of publication are obliged under the terms of the Chemical Heritage Foundation Oral History Program to obtain permission from Chemical Heritage Foundation, Philadelphia, Pennsylvania.

b. _____ **Semi-restricted access.** (May view the Work. My permission required to quote, cite, or reproduce.)

c. _____ **Restricted access.** (My permission required to view the Work, quote, cite, or reproduce.)

This constitutes my entire and complete understanding.

(Signature) Signed release form is on file at the Science History Institute
Gustavo W. Leone

(Date) 05/31/12

PERMISSION TO POST COMPLETED ORAL HISTORY TRANSCRIPT AND/OR INTERVIEW RECORDINGS ON THE INTERNET

The original release agreement that you signed with the Science History Institute, which governs researchers' access to your oral history, either made no mention of posting your entire transcript and/or interview recordings on our website or stipulated that we would seek your permission before posting the full interview. It is our goal to broaden individuals' access to the Science History Institute's oral histories generally, and your oral history specifically, so we are contacting you to request permission to post your entire completed transcript and interview recordings on our website, located at http://www.sciencehistory.org and on the Science History Institute's Digital Collections website, located at https://digital.sciencehistory.org/. To be clear, if you requested that certain sections of your interview be restricted or sealed, they will not be included in the material posted to the Internet and will remain restricted/sealed as outlined in the original release agreement.

Should you choose to grant us permission to post your entire completed transcript and interview recordings, the Science History Institute will not be able to limit anyone's access to or use of your oral history in any way outside the bounds of U.S. Copyright Law under title 17 of the United States Code.

If you have any questions about this form, or if you would like to review your original release agreement, please contact the Director of the Center for Oral History at oralhistory@sciencehistory.org; (215) 925-2222; or Director, Center for Oral History, Science History Institute, 315 Chestnut Street, Philadelphia, PA 19106.

GWL
Initials

I, Gustavo W. Leone, GRANT exclusive permission to the Science History Institute to post my completed oral history transcript and interview recordings conducted on 23 and 24 October 2008 with David J. Caruso at Ohio State University Medical Center on the Science History Institute's website.

_____
Initials

I, Gustavo W. Leone, DO NOT GRANT permission to the Science History Institute to post my completed oral history transcript and interview recordings conducted on 23 and 24 October 2008 with David J. Caruso at Ohio State University Medical Center on the Internet during my lifetime.

Signature: Signed release form is on file at the Science History Institute
Gustavo W. Leone, PhD

November 10, 2021
Date

This oral history is designated **Free Access**.

***Please note*:** Users citing this interview for purposes of publication are obliged under the terms of the Chemical Heritage Foundation (CHF) Oral History Program to credit CHF using the format below:

> Gustavo W. Leone, interview by David J. Caruso at Ohio State University Medical Center, Columbus, Ohio, 23-24 October 2008 (Philadelphia: Chemical Heritage Foundation, Oral History Transcript # 0675).

Chemical Heritage Foundation
Oral History Program
315 Chestnut Street
Philadelphia, Pennsylvania 19106

The Chemical Heritage Foundation (CHF) serves the community of the chemical and molecular sciences, and the wider public, by treasuring the past, educating the present, and inspiring the future. CHF maintains a world-class collection of materials that document the history and heritage of the chemical and molecular sciences, technologies, and industries; encourages research in CHF collections; and carries out a program of outreach and interpretation in order to advance an understanding of the role of the chemical and molecular sciences, technologies, and industries in shaping society.

GUSTAVO LEONE

1962 Born in Montevideo, Uruguay on 12 November

Education

1988 B.Sc., Biochemistry, University of Calgary
1994 Ph.D., Molecular Virology, University of Calgary

Professional Experience

Duke University Medical Center
1994-1998 Postdoctorate, Genetics, Howard Hughes Medical Institute

The Ohio State University Comprehensive Cancer Center
1999-present Assistant Professor

Honors

1989-1994 Alberta Heritage Foundation for Medical Research Studentship
1994-1997 Medical Research Council of Canada Fellowship
1994-1997 Alberta Heritage Foundation for Medical Research Fellowship
1997-1999 Medical Research Council of Canada Centennial Fellowship
1999 The Robert M. and Barbara R. Bell Basic Science of Cancer Award
1999-2001 The V Foundation Scholar Award
2001-2005 Pew Scholar in the Biomedical Sciences
2004-2009 Scholar, Leukemia and Lymphoma Society

ABSTRACT

Gustavo Leone was born in Montevideo, Uruguay, and lived there until he was twelve—he was the second of three children. His parents owned a deli, in which Leone worked too. Not being able to get ahead, the family moved to Montréal, Québec, Canada seeking better opportunities; a few years later, Leone's father died. From there the family moved to Calgary, Alberta. Leone played soccer much of the time, though he was also interested in marbles and street hockey. He got into fights regularly; he eventually began taking karate lessons. His only outstanding memory of school is that he loved high school biology.

Leone entered the University of Calgary, where he did not do well his first year. He left school for a year and a half; he and his girlfriend bought a motorcycle and traveled through Canada, the United States, and Central America, eventually ending up in Uruguay. When they ran out of money they returned to Canada, where Leone began college anew. He worked hard and did well, intending to become a doctor. After his third year he spent the summer working in Patrick Lee's lab. He loved that work so much he knew he was made for research. He married his fellow-traveler girlfriend and remained in Lee's lab for his PhD, where he worked on reovirus and began work on cell cycles. He loved the work, sometimes even sleeping on a cot in the lab. Feeling that he had much to learn, he delayed finishing his PhD for a year, focusing his research on experiments with oligomerization, the results of which ended up conflicting with those of a Harvard University group. During these years he and his wife had two children.

Lee advised Leone to go to Duke University to work with Joseph Nevins. There he studied cell cycle with James DeGregori, who had lived in Uruguay for a year. The two hit it off and published an important paper before DeGregori left Duke. From Nevins Leone says he learned mentoring and lab management as well as a great deal of science.

Leone engaged in protracted negotiations for a faculty position with University of Calgary, but when Ohio State University made him an enthusiastic offer, he and his family packed up and moved to Columbus. Changing technology brought the opportunity to study interrelationships among the E2F family members, which is where Leone sought a cure for some cancers, notably breast cancer. Seeing cancer as a complex disease needing collaboration and communication among people with differing approaches and goals, Leone established Tumor Microenvironment. He is also one of the heads of the OSU Comprehensive Cancer Center. He continues to find the study of chemistry and genetics of cancer tissue important and fascinating.

Leone concludes his interview with discussions of his administrative responsibilities; his publication history and methods; the connections between art and science; and the importance to him of the Pew Scholars Program in the Biomedical Sciences award.

INTERVIEWER

David J. Caruso earned a B.A. in the History of Science, Medicine, and Technology from the Johns Hopkins University in 2001 and a Ph.D. in Science and Technology Studies from Cornell University in 2008. His graduate work focused on the interaction of American military and medical personnel from the Spanish-American War through World War I and the institutional transformations that resulted in the development of American military medicine as

a unique form of knowledge and practice. David is currently the Program Manager for Oral History at the CHF. His current research interest focuses on the discipline formation of biomedical science in 20th-century America and the organizational structures that have contributed to such formation.

TABLE OF CONTENTS

Early Years 1

Born in Montevideo, Uruguay. Family deli. Moved to Montréal when about twelve. Father computer operator; mother seamstress. Family life. Move to suburbs. Early death of father. Move to Calgary, Alberta. Playing soccer, marbles, street hockey; eventually karate. Loved high-school biology.

College Years 12

University of Calgary. Bad beginning. Left school after first year. Motorcycle trip with girlfriend. Traveled through West Coast ultimately to Uruguay. Money gone, goes back to Canada and college. Works hard and does well. Third-year summer lab studying virology with Patrick Lee changes his intention to be doctor. Loves science and resolves to be researcher. Publishes while still an undergraduate. Marries.

Graduate School Years 26

Stays in Lee's lab at University of Calgary. Opens own karate school. Fathers two children. Keeps cot in lab so he can sleep there. Working on reovirus. Lee hands-off as mentor, but still involved. Wife's jobs. Explains his slow writing process. Liked science so much and felt he wanted to learn much more, so stayed a year longer. Harvard University and oligomerization.

Postgraduate Years 38

On Lee's advice takes postdoc with Joseph Nevins at Duke University. Impressions of social and racial life in the South. Attending black Baptist church. Wife stays home with children; eventually goes back to school to study archeology. Takes up volleyball; sports with wife. Works on cell cycle with James DeGregori, who had lived for a year in Uruguay. Discussion of mate. Nevins' mentorship. Learned management as well as science. Summary of postdoc accomplishments.

Faculty Years 50

Protracted discussions with University of Calgary. Enthusiastic offer from Ohio State University. Changing technology changes plans for E2F work. No longer at bench, but always in lab, overseeing. Sees cancer as complex disease needing collaboration. Helped establish Tumor Microenvironment. One of heads of OSU Comprehensive Cancer Center. Discusses travel; teaching inside and outside lab; reviewing and writing papers. Importance of Pew Scholars Program in the Biomedical Sciences grant. Respect for others' goals and approaches necessary. Connections between art and science. Desire to conquer some cancers, notably breast cancer, by studying chemistry and genetics of cancer tissue. Family life.

Index 78

INTERVIEWEE: **Gustavo Leone**

INTERVIEWER: **David J. Caruso**

LOCATION: **Ohio State University Medical Center**
Columbus, Ohio

DATE: **23 October 2008**

CARUSO: Today is 23 October 2008 and this is an interview with Dr. Gustavo Leone, as part of the Pew Biomedical Scholar [Pew Scholars Program in the Biomedical Sciences] Oral History Project. We are at his office at the Ohio State University Medical Center. Thank you very much for giving us some of your time to do this oral history. What I'd like to start with is hearing a little bit about your childhood. You were born in 1962 in Uruguay.

LEONE: Uruguay. Montevideo.

CARUSO: Were you raised there as well, or did your family move soon after you were born?

LEONE: I was raised there until I was almost twelve years old. I went through primary school in Uruguay; I speak Spanish relatively fluently.

CARUSO: Okay. Are you the only child in your family, or do you have siblings?

LEONE: So, at that time the family was complete. […] I have a brother [Sergio Leone] and a sister [Alicia Leone Webster], and with my father and mother, we immigrated to Canada (in fact, Montréal) in 1973, I believe.

CARUSO: […] Are your siblings older than you?

LEONE: Yes. My sister's old. She's the oldest. My brother's the youngest.

CARUSO: So, you're the middle child.

LEONE: Yes.

CARUSO: Can you tell me a little bit about your life growing up as a child? What did you like to do for fun? What was your school like up until…let's just stay with the period of time before moving to Montréal.

LEONE: So, from what I can remember, it was a fun time. We were very, very—especially to North American standards—very modest. We did have a house and I went to school in a nun's school…went there through grade one, or preschool or kindergarten, I guess, through grade five. What I remember was I know I liked school, and I did well in primary school, I did very well. I can't say the same thing afterwards, but I did very well. It was fun. I enjoyed history and math, and I loved recess. So, life was about school, it was about playing soccer out in the street. That's pretty much what we did most every day. We played in the street. It was a gravel street and we just played soccer.

My parents were fine; they were good folks. I remember seeing them at dinnertime and that's about it, because I was either at school or playing soccer. Then, [on] the weekends, my mother [Emma Leone] was, at the time, a seamstress, so she worked long hours and very often, when she'd have customers, she would be working until 1:00 a.m. or 2:00 a.m. in the morning at home. My father [Walter Sergio Leone] was—my mother's still alive, my father is not—he was a computer operator at the time, where they have those huge rooms with wheels spinning the way it used to be way back then.

CARUSO: The mainframe computer…

LEONE: Probably all [the power in] that mainframe is equivalent to this computer I have here, maybe.

CARUSO: Maybe, yeah.

LEONE: But anyway, he was a computer operator. He worked […] downtown, and I visited his office a few times, a couple of times, and it was phenomenal view of the port. It was really nice. But, anyway, he worked that, and at different times, he had a second job to get money for the family. So I really only saw him Sunday afternoons.

CARUSO: Oh, so he was just working…

LEONE: Yes. I remember his voice. He'd come in at night. He used to smoke, so he'd cough before getting to the door. Then I would remember grumblings between my mother and father when they would talk. My mom would wait for dinner until […my father came home]. We [kids] would eat at 9:00 p.m. at night, because that's dinnertime, then we would go to bed [at], I don't know, whatever time, 10:00 p.m., 10:30 p.m. My dad would get home around 11:30 p.m. My mom would have dinner with him. They would talk, and I fell asleep. So, that's what I remember. It was great, a great childhood.

CARUSO: The other jobs that your father was working, were they computer-related, or just whatever jobs…

LEONE: You know, I don't really know for sure. It was…some of it was computer-related; some of it was even data entry. That went on for many years. Then he did better at his one main job, the computer operator. He did mostly that. At some point, [my parents] came to the realization that this is not going anywhere—I mean, they were pretty young, now that I think about it: they were probably thirty or thirty-something…it's not like they were fifty, right, so they seemed old to me at the time. I guess they came to the realization that they're going to be working like this forever and never get anything. We didn't own a car. The house was built by him, his hands, and his colleagues would come on weekends and help build this wall, then the other wall, then the roof. We had a garage that was supposed to be for a car at some point, but we actually had chickens, we [raised] chickens there. I helped my dad build it. It was three tiers of chickens with lamps and light bulbs. It was…and actually, it made money, you know, some extra money. But of course, my mom would have to do most of the work, as he wasn't there, so she had to kill the chickens, and when people would come and say, "Okay, I want six chickens," […] she had to kill them and boil them and whatever they wanted. She didn't gut them, I don't think. Maybe she did. I don't know. I remember plucking, because we had a big 200-liter tank, and we'd do big batches. Then, we would boil the water and dip the chicken, and then for—I can't remember, ten seconds or something—then we would pluck them. It was a mess. That didn't last for more than two years. My mom had enough of that. We always had a few chickens for us, but not more than that, so [it lasted for] two or three years.

My dad was an entrepreneur for sure. He was always trying one thing or another to see how it would go. But in the end he said, "This is enough. This is not going to work." He decided to stop. He left the company, and he opened up a grocery store, which I remember working in. It was a deli, like a European-style deli. My dad is very sharp, very good looking, and [has] good manners with people and clean cut, so it was very appealing. They did very well. My mom is a fantastic cook, so they had this deli: sausages, jams, and all kinds of hams and stuff. […] My mom would cook a lot for it, so they had prepared foods. I guess the store was not downtown, but in a fairly busy part of the city. We lived way out, and we bused in. Well, the store went really well. I remember working there on Sundays, and they started making money to pay a lot of their debts, which they had—I don't know for what, because they didn't own anything, but whatever—and it started going really well. We bought a moped. I used to, with my mom, my father, me, and two bags of stuff that she had cooked, [ride

altogether on the moped] to the store. And [it had] a 50cc Honda: it was screaming, you know, the highest pitch, "eeeeeeeeee" […]. I remember this one hill that we had to go up, I mean, people would walk faster that we would actually be riding. Then downhill, it would be booking it like crazy. No helmets, nothing of the sort. Nobody thought of anything like that. It was probably completely chaos. I don't remember even where I sat. I think I sat between my mom and my dad. I think I was holding the bags, you know, my mom was holding me, or something outrageous like that. I don't remember…know what happened to that moped: we blew it up or something. I don't know. So, that went pretty well. They worked very hard, and then my dad got robbed twice at night at the store, and once at gunpoint, inside the store, customers and everything actually. One time was outside, and one time was inside. They actually caught the fellows; it was a gang that ran one of these…and they were famous for this. I don't know whatever happened to them. My mom said, "That's enough. These guys were fully loaded"—[we knew] because they caught them and they were dealing with…—"and this is really not worth it, because every night [before] you go out, you have to call the pharmacist across the street to make sure there's nobody at the corner." You know, that kind of thing. You know it's darker. My mom said, "Forget it." So at that point, they started scheming of whether they should go to Australia, United States, or Canada. United States wasn't too favorable at the time because of…I guess they were just scared. United States is a scary place for somebody from Uruguay or other countries because of things you hear on the radio about violence and crime and so on. Canada is much more appeasing and very cold. We could imagine the igloos, you know. Montréal and Toronto [Canada], of course, it's not the case, but…

CARUSO: And if they wanted to flee the crime…was that, sort of, a major problem in your city? Was crime…?

LEONE: Not really. That's not what they were fleeing. They were fleeing the bad economics. Even though they were doing better now with this grocery store, it was an impediment of the crime that my mom felt it wasn't worth not having a husband just to get a little bit more. She said, "To hell with it." So, in the absence of that store, what would they do? Go back to what they were doing before? They just weren't prepared to do that. They decided that they would emigrate, and we had an uncle [Ricardo Iza] in Canada, nobody in Australia. "Australia was warmer"…oh, this went on for months, "Which one? What should we do?" It was Canada. So, my dad visited Canada, stayed there for four months or whatever he was allowed, quite a long time. I remember he came back with a beard, and, wow, he looked very different. He had a new jacket. He visited there, checked it out, and talked to people, got contracts with his computer skills, got contracts and promises that he would have a job and letters. He went back to Uruguay, and he did all the paperwork and applied formally. It took, like, a year, and they accepted us. We moved to Montréal. Sold the house for two thousand dollars, two thousand five hundred dollars, that's what I remember. I don't know, [we took] three bags, sold everything…

CARUSO: And moved to Canada. So, just a couple of questions, you mentioned you did go to work with your father when he was a computer operator…

LEONE: I went to visit.

CARUSO: You went to visit, okay. So, did you get to see what he was doing at all, or was it just you stopped by his office?

LEONE: Oh, I spent an afternoon and went to get a haircut. I came [and] I had a doughnut. Things were spinning. I had no idea.

CARUSO: Okay. So, he didn't involve you with technical aspects of things.

LEONE: I was involved with the grocery store. There I worked.

CARUSO: Right. Your older siblings weren't involved with the store, or your sister and your brother?

LEONE: My sister was. My brother was too young, but my sister was. But I would never work with her. I was with my dad, and sometimes my sister would go [with] my mom. My mom also worked there, but they did shifts. You can imagine.

CARUSO: So, your time at home, when you weren't in school, when you weren't playing soccer, when you finally came home for dinner, what did your family do in the evenings? I know you mentioned, you know, sometimes you were plucking chickens, but did your family participate in outside organizations? Were they religious and go to church regularly? Did your mother sit you down and say, "Do your homework." What happened once you finally got home?

LEONE: What was family life [like]? So, we went to school in the morning then came back at lunch. Some years we went to school in the afternoon, because the schedule would change, so we had mornings off. We'd be back for tea. At 5:00 p.m. we have tea, coffee, hot chocolate; actually kids have coffee. I had coffee when I was, like, three or four, you know, with milk. That was a time that I saw my mother, because she would prepare it for me, and, I guess, my siblings…I can't remember them sitting beside me. And then we'd be off playing, doing homework.

We didn't do very much in the family. I was the only one that went to church. I went to the nun school and got involved. I played the guitar; I played the guitar at church. On Sundays I would go there. My sister would come some also…sometimes, not always. But my parents weren't religious. I went there because I kind of liked it. I had friends, and it was a good church. Other than that, like I said, my father slept in on Sundays. You know, sometimes worked on Sunday mornings but sometimes not—he would sleep in. Either way, one way or the other, we wouldn't see him until 2:00 p.m. or 3:00 p.m. […] I remember watching television and having grilled cheese sandwiches; our big night out either Saturday night or Sunday, and so that was one thing that I remember. Then, the rest was, like, we didn't go out to restaurants and stuff.

Once a year we would go have an ice cream. We had to walk, like, fifteen, maybe twenty blocks. We had ice cream stores closer, but we went to this one that had really good ice cream. It was out by the beach. Montevideo has a beautiful street that goes all the way along the coast. It's right on the…it's not the Atlantic [Ocean]. It's Rio de la Plata. It's an estuary, some water. Anyway, this avenue is four lanes one way, four lanes the other, and there's a sidewalk that's probably about twenty feet wide, and you can walk…almost a good part of the city has beautiful water. So, this ice cream store was close by, and my parents were into walking, the whole family would be walking and have an ice cream. That was one thing that we did every year.

We had family. So, Sundays sometimes […] people would come over, you know, grandparents, or we would go to the grandparents' house, or one of the aunts' or uncles', and we barbecued. In the winter I don't remember doing that. I don't remember much about the winter, but this was definitely true in the summer type of days.

CARUSO: Did you have any other type of hobbies as a child? I mean, clearly soccer. Were you…?

LEONE: Marbles.

CARUSO: Marbles.

LEONE: We were expert [at] marbles. It was a seasonal [hobby]. I think the spring was marbles, autumn was tops and cards—you know, flip them over. Soccer, that was year round. In the summer we would do […]. Some of the neighbors had tangerines and plums, and we'd take a lot of that. Get a pile of magazines, some of them not necessarily the best kind of magazines. We would sit and read for a couple of hours, because summer is very hot, and you couldn't really play soccer between 1:00 p.m. and 3:00 p.m. You had to respect—this was obviously on the weekend—you had to respect people's…you can't be yelling and screaming

around that time, because everybody's having a *siesta*. You can get a lot of adults really pissed off [if you play too loudly]. So that was the time that we would do that, we would eat fruit and read magazines and tell dirty jokes, and I don't know what we did.

CARUSO: So, how was it for you? I mean, you were twelve years old moving to a new country? Were you familiar with the language at all?

LEONE: No.

CARUSO: No. So a completely foreign language. I'm guessing your father was…

LEONE: He spoke a little bit of broken English, because he visited here and my mother too. […] In the process of applying for this, they went to English school. They tried to learn English. Their English was broken, but [you] could understand. You know, I had taken English in school, in grade four I think it was. So I knew a few words—yeah, it was beginning English—because you always got people asking, "Where's this?" or "Where's that?" Or who knows what they were saying; "Sorry, not speak any English." But you learn quick.

CARUSO: So, you moved when you were twelve. Did you go straight into school as soon as you arrived? Not really speaking much of the language…

LEONE: Yes. Grade five.

CARUSO: Grade five.

LEONE: Grade five [in] Montréal. I was already in grade five [in Montevideo] and never finished, so I went to grade five. I did well. I passed everything. I was very good at reading English, because I could read [the language much better than I could speak it]. You know, I wasn't dumb. I was pretty smart, I think, and so I could read. I didn't understand a lot of it, but it starts to make sense. Math was easy. The rest was, like, social sciences and things, and I understood enough […]. You learn really quickly when you're a kid. It's amazing because you have no choice…it's not like you had Spanish television; I mean everything is English, and you're going to learn one way or the other. So I learned that. We moved to Montréal. It was a ghetto, pretty much. It was pretty rough. I pretty much got into a fight, if not every day, every second day.

CARUSO: Over just normal kid things?

LEONE: I have no idea. You know, first of all, I didn't speak English, so I was definitely made fun of. I wasn't used to that. I guess I felt I was pretty tough, and I didn't really like that. So, I got into a fight. Then my brother was picked on, so I had to defend him. My sister was picked on, and I had to defend her. I was in a fight literally almost every day, every second day. It was always somebody after school. I remember they're all, "I'll wait for you after school," a line, you know. I'm used to it. But it got pretty bad. At one time that my aunt [Margarita Iza] was so mad, she talked to the principal [and said] "How could this be going on day after day?" She would come if I didn't get home within half an hour after school ([she knew] because she lived in the same apartment block). I told you that my uncle was there. She would come out and look for me. I think she beat at least two or three of the kids that I got into fights with; she was so mad. Because you know what it's like. You get into a fight and [there is a] big circle [that] goes around, and you fight; and then if you're winning, you have no hope of winning, because as soon as you win, it's, like then they pull you apart, and then you got to say, "I was winning! What are you doing?" [laughter] I don't know. Anyway, it was pretty…I don't have bad feelings about that. That's just the way it was.

Actually, my uncle was a karate fellow, martial arts. So my aunt said, "You've got to go to his school. You're going to get trained in karate." At some point I started doing karate, but it was too late for that because I moved. Once we were in Montréal, then we moved; at that point, my father was alive. We moved to…we did pretty well. We bought a car, a station wagon. I remember that. Then we moved to the West Island, [Canada], which was a suburb of Montréal, which was pretty middle class, pretty good. I remember it being good.

CARUSO: Moving into another apartment complex or moving [into] a home?

LEONE: Condominium.

CARUSO: Condominium.

LEONE: Yes, one of the row houses, which was a huge step up for us. It was really nice, we thought. It was, like, "Carpet!" It was, like, "Wow!" It was amazing. So, at that point, I didn't get into fights anymore. I mean, I had gotten into fights about real stuff—you call somebody something; you call it back; and whatever—in playing hockey or whatever we were doing. But that pretty much stopped. We had a pretty normal life after that.

CARUSO: Clearly you were doing fine in school. You were picking up English; did it quickly. You had the social science classes. Math was pretty simple. Were there classes in your mid-

teens that you really enjoyed otherwise or that you really disliked? I know that the English, the language barrier, probably was problematic for a little bit, but as you became more comfortable with the languages, were there certain…?

LEONE: […] Everything you do well, you like. But I really liked English. I loved writing. I loved to read good stuff, you know. I never did very well until grade eight. Partly it was because [of] my grammar; and my teachers were pretty harsh. But my grade eight teacher just got it, or I got him, and he liked what I was writing even though it wasn't perfect. He, sort of, gave me a couple of good grades on some of the essays I was writing, and he thought, "Oh, this was really good." It just kind of pushed me into that. I really enjoyed that afterwards, and I did well in English ever since, relatively well. So, that was good.

Math, I don't even remember any of the math classes. I did okay, I guess, but I don't remember. Physics, I really enjoyed the first year, first two years, and then it got really hard. It got really hard; I didn't show up to all the classes. It was pretty tough, my last year of physics, let me put it that way; [for] exams, I didn't really know the material, and I passed, just barely probably.

Biology, I loved. The teacher was…I had two teachers in grade eleven and twelve. They were just excellent, and I loved it. They loved me because I aced…got 100 [percent] on everything. I just loved the stuff. In fact, in my last year I had marked up the book so bad, because it was just so interesting how the whole body worked, that he gave me the book. He says, "I can't use that anyway," so he signed it and gave it to me as a gift. I have it someplace.

CARUSO: What was it about biology? What were your biology classes covering? And what was it about the subject that you just found really fascinating?

LEONE: It was just all interconnected. It was all mostly anatomy, if I remember correctly, all the hormones, all the sophisticated names. It made sense of how the heart functions, the kidneys, the pH, how the urine is produced, and I just found all of that fascinating. I guess the teacher made it fun. So, I enjoyed that. Other than that, I, kind of, never thought of getting into biology even at that point, because I was at the extent of chemistry. I remember the chemistry teacher, bald and glasses. I have no idea what we did in that class. I don't remember it, maybe I blacked out about it. We probably did some chemistry of some sort. Not that I remember having fun or anything. But then I really got interested in biology only after [high school], really, in college.

CARUSO: […] After moving, did the relationships in your family change? Was your father working less?

LEONE: Dramatically. So, we moved to the West Island. Within a year, he had cancer and died.

CARUSO: Oh, that's horrible.

LEONE: So, that really was… things were really going up…the dream. He was forty-two when he died. He was sick for about a year and a half. My mom was thirty-seven or thirty-eight when he died. You can imagine everything changed, right. So we stayed in Montréal for another year in the same house. My aunt, at that point, was in Calgary, [Canada] and moved to Calgary through all of this time. This was probably maybe five years after we arrive in Canada.

CARUSO: So, around the late 1970s…

LEONE: Nineteen seventy-nine, sometime in 1979. So, six years. At that point, my mom said, "Enough of Montréal." We went to Canada, to Calgary, and [she] raised us. We went to high school, the last few years of high school. My brother was younger, so he finished there. Obviously it was very different. My mother was working, and she decided to go to school, because, basically, during this period of time she learned how to keypunch. Remember the cards they used to feed into the…?

CARUSO: For the computer, yeah.

LEONE: The cards. Well, I used to keypunch, too, because we had one in the house, actually, to make extra money that way. But she would keypunch. She was a keypuncher and working for an oil company. She worked in Montréal doing that, but also, when we moved to Calgary, she did that at an oil company. [She] had a very good boss, an Argentinean boss, a female, and [she is] still friends with her. She said, "You're really smart. Why are you doing this?" My mom was very smart, probably quite a bit smarter than my dad in reality. So she started going to school. She went into programming, and she became a programmer and program analyst. She way moved up, made lots of money. Well, by then, when she was making…you know we were already out of the house. We were older. We moved there when we were, like, sixteen. I was sixteen in Calgary. So, she did well with that and went to school at night, did her schooling at night, and we didn't see her either—my sister must have fed us and stuff…we fed ourselves.

CARUSO: Before you moved out to Calgary, before your father got sick, did the dynamics of the household change at all? Because you mentioned that he wasn't really around because he was working so much. Was he around more, and were you interacting with him more?

LEONE: Yes, yeah. He was definitely [around] a lot more than when I was a much younger kid in Uruguay. So, we would do a lot of things—a very good point. You know, I remember it's a complete different scenario. We would…Christmases…I remember Christmas, it was great. We had some family or friends over. It was like gifts everywhere. It was just amazing. In the summer we'd camp. Weekends were camping. Not every weekend, but at least once, twice a month we camped for sure. I'd say more often. So, we'd do a lot of camping. We had a tent, we had the car parked, the whole thing. That was a lot of fun. Other than that, you know, my parents were great, but it's not like now, where if I don't show up once a week to my kids' soccer [game], it's like something is wrong, you know, like I don't love my kids. My parents showed up to half of the soccer games ever, period, my whole life. I didn't expect them to; I guess they didn't expect also to participate. I did my things, they did their things, and we did some things together. […] I guess they knew if we had won the game or not. I don't even remember. It was very different: kid stuff, adult stuff, and sometimes we did some things together. It was always like that. The fact that we had some time together to do camping, and we would go out to different parts of the city…. We had friends in Toronto, [Canada], so we'd go there maybe once or a couple times a year. Those kinds of things were big things for us.

CARUSO: When you weren't in school during this period of time, and since you had stopped fighting for the most part, what were you doing with your time? Were you back to playing soccer, or were there other hobbies that you picked up?

LEONE: Yep. I was always in the soccer team at school. And hobbies: we got into a lot of trouble.

CARUSO: Okay, what…?

LEONE: They weren't necessarily the healthy hobbies, like, we played hockey. We played street hockey; in Canada you play street hockey. It was fun. Street hockey, you know, with a tennis ball. We played a lot of street hockey. We had girlfriends. There's a lot of cool stuff going on. My parents had no idea. I was a boy. I was completely free to come and go whenever. I feel bad for my sister; it was a very different story. She could tell you a different story, that's for sure, because they knew everything that she was doing, where she was, partly because I was there. I had to chaperone: she went to the movies with a boy, I was in the movies, that kind of thing. So, we got into a lot of trouble, all kinds of trouble. I ended up a couple of times in the police station, just being interrogated about, "Why [were you] stealing light bulbs from here and there." I was thinking, "Ah, we were going to have a party. We need a red light bulb." I don't you know. This is not the healthiest of time. We survived it, and it was fun. It could have gone the other way for sure. Never got into drugs really, so that was kind of good. My friends, at least, a couple of my close friends never got into drugs, so that was kind of good.

CARUSO: So, you moved to Calgary. Your mother starts going to school. You are enjoying your biology classes. This is around, we said 1979…

LEONE: Yes, 1979, 1980, maybe 1981.

CARUSO: Okay. Now, when you were ending the time…or when you were finishing up your schooling, did you know what you wanted to do? Did you know you wanted to go to college? Was that something your mother wanted you to do, to go to college?

LEONE: No. My mom knew that I was pretty smart. I moved out after high school. My father had died, of course, and my mom started dating at that point. I was furious. I wasn't happy at home. I left. Then…

CARUSO: Were you about eighteen at this time?

LEONE: Yes, nineteen, eighteen, or seventeen, yeah, seventeen. I was almost eighteen, maybe, which coincided very well with going to college. College in Canada at the time—now it's quite different, it's still cheaper than here—at the time was fairly affordable. I didn't need any money from my mother to go to college. I worked and went to college and had some student loans and lived in a basement, some room someplace. First year I did live in the dorms, after that it was just a room someplace. And I thought…and the first year was horrendous. I got low…I think my [grade point] average—I was on [academic] probation—was a 1.7, 1.8. I didn't show up to a lot of classes. [laughter] It was a lot of fun, I have to say. But, you know, I just was not motivated, and I was into different things.

At that time, I had already been doing karate and gotten a lot into that, so I spent a lot of time with that, [with] friends of that. So I kind of had to make a decision there: this isn't going very well first year—1.7 is the same [on a] 4.0 scale as [it is] here. I decided to go traveling. I had a girlfriend. We went traveling for a year and a half. It was kind of crazy. That was a pretty life-changing, I'd say, event. To be able to travel with no money is interesting. That was our first goal. We both, [my] girlfriend and I, moved to Victoria, [Canada]. We figured we'd be able to find better jobs there. We moved there and worked. We each had two or three [jobs], I had three jobs…

CARUSO: Doing…?

LEONE: One was dishwashing, which turned into holding signs for the tourists, you know, they would come…and I was pretty good at it. One as a cook, and the other one was busing or waitering, whatever it was. So that's what we did. She had two jobs at restaurants because there was a lot of restaurant business in Victoria, Vancouver Island.

We worked for about seven months and compiled enough money, and then we decided, "Well, let's go traveling. How should we travel?" We decided that motorcycle was a good way because it's cheaper on gas, etc. I didn't know how to ride a motorcycle. I bought a motorcycle and learned how to ride a motorcycle, and we left. Our first excursion was—I remember my aunt waving, and we were leaving Victoria—we were all packed and were going east to say goodbye to my mother in Calgary and say goodbye to her parents in Winnipeg, [Canada, the] Dakotas.

CARUSO: So, her family, had they moved up…?

LEONE: My girlfriend's…

CARUSO: Oh, okay.

LEONE: …my girlfriend's family. They were from the prairies, and she was a year and a half, two years older than me. They didn't think it was a great idea; you can imagine that. They had never met me, first of all, but I warmed up to the parents pretty good. It worked out okay. They were worried like hell. And then from Winnipeg, we went south and we went to the States, Grand Canyon and all the way to Baja, [California]. We went all the way to South America, to Chile and…

CARUSO: On a motorcycle?

LEONE: On a motorcycle. We were in Uruguay and back and back.

CARUSO: Wow. That's a very long trip on a motorcycle.

LEONE: It's a very long…

CARUSO: The motorcycle didn't die at the time?

LEONE: Many times over, many times. I learned how to fix bikes and how to talk to people to help me fix bikes. You know, we must have wiped out fifty, sixty times on the bike. We had one major accident. But we were mostly out in dirt roads, right. We didn't go to the… not a lot of highways. If there were highways, we didn't stick to them; [we went] to small towns, because we were camping all the way. We didn't have that much money. I think we had […] about three thousand dollars, and the problem is she owned a car. She used to have a boyfriend. She owned fifty percent of a car. It was an MGA or something, for which they were trying to sell it. I guess they had sold it, and we were going to get, like, twenty-five hundred dollars for that, and that never came. We were actually on three thousand dollars traveling full-time. We worked our way through some places; in Mexico, I worked a couple of weeks picking coffee. […] That didn't give us money, but at least they would feed us. We stayed in somebody's house and did that. In Brazil, I had an uncle in Sao Paulo, and I worked. We stayed there at his house because we didn't have to pay. I worked with him. He's an air conditioning/electrical guy. I helped him for three months, and I got paid enough to do stuff around there. We got to know Brazil, because we would go for maybe four days one way, and come back and that kind of thing. That was a lot of fun, too. Brazil was a lot of fun. So, we did that. [This interview] would go on, literally, for days if we start talking about the trip.

CARUSO: Well, can you give me some…you mentioned that it was a life-changing experience.

LEONE: Yes, I mean, I was in love with this beautiful blonde. That was great. We had nowhere to go. We had a map that we had, like, highlighted yellow. We were going, but we didn't know where we were going to go next. You meet a lot of other travelers. We would meet with…there was a couple from Toronto that were in a BMW that we met and traveled for a couple of weeks, and we're learning a lot of tricks with them about bikes and so on. At the time I was nineteen. She was twenty-one or something like that, you know, eighteen or, yeah, nineteen and twenty-one. Every day it was an adventure. We would be camping out in the woods and the beach for a week, wherever. We would sleep…when we were in the States, it's easy because there's a lot of open country in the States, and people don't mind. But even when we were south of San Diego, [California], I remember in Newport Beach, [California] we'd just park the bike and slept on the beach. It's kind of crazy now…if my kids were doing that, oh man. But we didn't think much of it. It was an adventure. We took a shower once in a while in the ocean or in the river or, you know, wherever. We probably didn't appear to be…nobody really bothered us too much. We were probably a little suspicious looking. But…so what can I tell you. Going through borders was always an experience because you had to bribe people, especially in Latin American, Central American countries, or South America. So, it was always kind of tense. It was a little dangerous because my girlfriend was blonde and pretty, so I had to, kind of, be careful of people around you.

CARUSO: Were you communicating much with people at home?

LEONE: Yes. I mean, we made a point [to do so], okay, because they begged us. We would write a lot. We would write letters. We were always writing. We had diaries and we would write in diaries. We would be writing letters once…she would be writing once a week, at the very least, and we would call. So, no matter where we were on a particular day, we would call, once a month. I remember one time we just couldn't do it, because, you know, some places, this is back in 1981, 1982. We went through…

CARUSO: Telephone connections…

LEONE: …really that we were in the jungle a lot of the time in Latin America. Things were getting blown up. Bridges were getting…and Guatemala was not the most […it was going through a civil war], and Honduras is not very friendly times, right. So my parents—my mother—and her parents were really worried, but we didn't really see the danger that much. I mean, we got held up and things like that with…. […] It was a lot of fun. It was an adventure. We traveled. We'd meet people on boats, because we were on the motorbike but sometimes motorbike was an impediment, so we would park the motorbike, put it someplace. We befriended somebody and would put it in the garage, and we weren't sure we were going to see that back or we actually paid whatever, three dollars, to have it in a garage that we also didn't know if we would see the bike back, and we would travel by bus for two weeks. It was just easier, or by boat, train or something like that. So, we could go to Machu Picchu, [Peru] and all that. We did that, a lot of it by train or bus. And then the Amazon was a lot of fun too. It was a French couple that we traveled with, went there by boat up the Amazon River. Went to Manaos, [Brazil] and met this French couple. From there we traveled in a very small, little boat, like a fishing boat, something like that, maybe twelve feet. It was the four of us and we went up the Rio Negro for a couple of weeks and we traveled the Amazon. That was fun.

CARUSO: So, what made this trip come to an end? Did you just get tired of it? Did you run out of money?

LEONE: Yes. Run out of the…the money didn't come from this car, so we were going to go to Africa. That was the plan. We were going to hop over to Africa, get a boat. We had lined up boats to go there and wait in Brazil and waiting. That's why we were, kind of, there for three months, waiting for this money, and this money never came. We had to say, "Okay, we go to Africa, and then the money may never come and we can't go back. We're stuck in Africa, what are we going to do?" So, at least here we had enough money, probably had six hundred dollars or five hundred dollars or something, to get back to Canada. […] It doesn't cost much other than gas, right. A bike, it's not very expensive at the time. I was getting tired of it. My girlfriend really liked traveling. She still likes traveling, but she became my wife. I'm

divorced. We're divorced now, but that's fine. But she likes traveling, but I felt like an observer always.

We've gone through all kinds of stuff, I mean, I can't believe now…meet people for weeks, and you get to know them. They're poor and they're starving. It's not like we had a lot of money, but we were leaving. They were stuck there, right, with a lot of kids, six kids. So, we always had [to say], "Okay, we're leaving, we're going," you know. We had something else. We knew where we had a home in Canada. It was very different, and after a while it gets to you. You're not really participating, not really changing anything. You're always absorbing knowledge and never dishing anything out. That became, kind of, bothersome in my psyche. So, at some point we decided to go back for all these reasons.

It's just, after being a year and a half away on the road, and it's very tiring too, so the comforts of home…. We went back, and I went back to school and so did she. At that point, I decided that I thought I'd go into medicine. I went…did my undergrad again and did really well. For my third year, the summer job I went to a lab. I applied for it. I had no idea that research actually existed until my second year of undergraduate college. It's amazing, because now I have droves of undergrads coming in first, second year to do work. They're so well informed. I had no idea until this biology teacher said, "These opportunities are open." I said, "Oh." I talked to him after [class], I said, "Really?" He says, "Yeah, you can talk to professors. You can ask them if they have positions." So I did a whole bunch of them. One of them was interested in me. I thought, "Okay, all I need is one." I went to that lab and I loved it. I mean, by the third week, you know, I was there late, 9:00 p.m., 10:00 p.m. at night looking at restriction enzymes and cutting DNA and subcloning.

I thought this was it. I had an Indian friend who also, like me, was going to go into medicine. He ended up going into medicine. He couldn't believe…at that point I said, "I'm not going to medicine. This is what I want to do." He said, "You got to be kidding. This is crazy. You still should apply." I said, "Forget it." I totally got hooked. Did well as an undergrad in that lab and got published. They wanted me to stay on as a graduate student, and I thought, "Great." So, I did my graduate studies in virology, University of Calgary. That was a great experience. At that point, I was married.

CARUSO: Can I hear a little bit more about when you started back up in college? […] You mentioned that you wanted to go into medicine. Was that just a random, "medicine would be a good thing for me to do" or…?

LEONE: It was a prestigious thing; medicine would be a good thing for me to do. My father died of cancer, so that was, kind of, in the back of my mind. I had an uncle that was a doctor and I thought that was a pretty honorable thing to do. I did like biology, but I hate blood. But I figured I could cope with that. I would learn how to cope with that. I'm not sure I would have, because I still hate blood, especially when it's, you know… it's funny. I had a number of circumstances that I've been at the doctor, and I almost fainted because of the blood and the

smell. That's the way it goes. I'm not sure how successful I would have been, but maybe I would have learned how to deal with it. But I liked biology at that time, so I took a lot of the hardcore calculus and physics, chemistries, you know, the typical stuff.

CARUSO: So, typical science core curriculum. Were you doing any courses outside of those? Because you mentioned when you were in elementary school you liked history.

LEONE: […] You have some electives, and I think I took philosophy. I loved that. It's amazing what college courses do. I mean, it really expands your mind. I hope they still do. Philosophy was phenomenal. [I took] anthropology, you know, I took archeology, and I don't know, they were different, those kinds of social sciences. That was kind of it. The rest was pretty hardcore [science], I think. I don't remember that much other than that. At that point, I was pretty good at karate. I think I had black belt, and I had my own school.

CARUSO: Oh, really.

LEONE: Yes.

CARUSO: You were teaching?

LEONE: I was teaching.

CARUSO: So, I was going to ask you what you were doing when you weren't taking classes.

LEONE: I worked hard, yeah. That started, and I had a really good school and started [teaching at] the YMCA [Young Men's Christian Association]. I taught kids. It was another black belt with me, we were both…there were several black belts in that school that I trained. The two of us, we got along very well. We started our own school. We taught kids and adults—two different classes. […] Yeah, Tuesdays [and] Thursdays were crazy because I had class, kids' class at 6:00 p.m. or 6:30 p.m. or 7:00 p.m., I can't remember, then—it was an hour and fifteen minutes—then I had a break for half an hour, and then I had a two and a half hour adult class that ended up until 9:30 p.m. or so. I had a pretty good group of friends. That was a lot of fun. We did a lot of other things, and we'd go hiking, you know, Calgary…we did a lot of hiking and skiing and stuff like that. It was a lot of fun.

Eventually, the YMCA was just not the kind of place…[it had] too many restrictions, so we opened up our own school. It was a warehouse out in downtown Calgary. We worked on it

with the students and, you know, helped make it, polished the floors. It was wood all…so, we had to sand it, wax it, paint it. […] We had not a big school: it was, like, fifty students, adult students. There was some kids. Now we have kids and adult students [in the same class]. If there were some kids, great, they would be part of the class. We probably let them off a little early because the class would always be too long. We went to tournaments. We had one of the students [who] was pretty old, was, like, fifty-five and pretty rich. So, he funded a lot of our extra stuff. He really liked us a lot and said, "Oh, yeah, this is great." He was a Dutch guy. He worked hard. He'd sweat like crazy. He wasn't very good at karate, but we liked him a lot. He was very supportive of us. He would give us, like, a couple hundred dollars to paint the place, you know.

CARUSO: So, hiking, martial arts, did you have time for anything else while you were in college?

LEONE: I had two kids. [laughter]

CARUSO: Okay. From when you first started college…okay, what year is that?

LEONE: So, I got married on…with that girlfriend that I traveled, Karen, and on my penultimate year of undergraduate we got married, I think it was 1987. I graduated in 1989, 1988.

CARUSO: Nineteen eighty-eight. Or, [I should say], according to my records, 1988.

LEONE: […] And then went to graduate school and our first baby came when I was in graduate school. Marcelo [Leone], who is now in college. He was born in 1990. I started graduate school in 1989, I guess. So that was our first one. Our second one is 1994 [Ana Maria Leone]. I was still a graduate student, teaching karate, doing all this stuff.

CARUSO: Okay. So, while you were an undergraduate, you didn't have children…

LEONE: No. No.

CARUSO: It was only once you became a graduate student. But while an undergrad did you have any other…I mean, clearly you had a girlfriend. You were going to get married. I'm

assuming you didn't have time for taking up piano lessons or anything along those lines. It was mostly just the activities…

LEONE: I played the flute. Yes, actually, I played the flute.

CARUSO: Oh, you did. Was that something you'd done all your life or was it…?

LEONE: I played the guitar when I was in church. I'm not very good at music, but I can read music. I know music because I learned the theory of music—I always wanted to play music—I could teach myself how to play music. I taught myself how to play the flute, because you know the basics. I did that and that was fun, but I was not very good. I don't know, what else did I do?

CARUSO: I was just curious. It doesn't…what were your…?

LEONE: We had friends. I have to say there's one thing that I really like [in] my life now: I don't have a lot of friends. I don't have many friends. In fact, I have very few friends. I don't have the time for them, so it's not an important part of my life. Then, it was very different. I had a lot of friends. So, you know, people would come over. […] We were undergraduates, or even graduate [students]; you know, you didn't make very much money. I was on a graduate student stipend, but we had a lot of fun. Just social things, people coming over, have a big party, people potluck. We always were doing something; or with the karate group, we would be doing outdoor things, hiking.

CARUSO: We, sort of, dropped the…or I didn't ask about once you had moved on to the time you were living in Canada, but did you participate in church anymore? Was that just you went to a…?

LEONE: Right. I did participate in church in Canada. I can't remember what period. I think I was still a teenager.

CARUSO: But once you got on the motorcycle, you weren't stopping every Sunday to find a church…?

LEONE: Oh, no, no, no. God forbid, no.

CARUSO: No. Okay. One other thing you mentioned, that your mother did go onto…going back, getting an education, becoming a computer analyst. What were your sister and brother doing?

LEONE: Good point. My sister went to college in Montréal. She was already in college there. Then Calgary…she also went to college. She was doing basic first two years of college, where you just learn about whether it's English, math…

CARUSO: A broad education.

LEONE: Yes. She wasn't really very good scholastically, so I don't know where she was going to go with that. Then she married very early. In Calgary, she married when she was like nineteen, so that stopped all of that. He was an aspiring engineer. He was, in fact, a draftsman, studying to go…to be an engineer. And [they] had a daughter, Fabbie, so that was the first in the family—she's now an engineer, married, very successful. And my sister divorced—it wasn't a very good marriage—and remarried later. During that process, she remarried somebody in an oil company because she was working in an oil company. She went to technical school for a year to learn about the oil business. A lot of…I don't know what it's called, seismology, you know, when you learn how to read…

CARUSO: The seismographs, some of the…

LEONE: …waves, and it's very technical. I don't know. She liked that and met somebody and remarried and had two other girls with him. They're happily married and great. So that was my sister. My sister's very, kind of, warm and a people-oriented person, so she's always done well in her life because of her personality.

My younger brother, during the time I was traveling, he was getting into serious trouble. He was at home alone with my mother and sister, and he's, like, chaos. When I came back, it's like drugs, real drugs, trouble. So, that, in a way, has continued to some degree for a long time. He never went to school. He went to finish high school. At that time, we were in Calgary. He finished high school, barely. My mom, after my dad had already died, seven years or so, remarried a German fellow. My mom's heritage is German. She had an affinity for German [people]. So, she went to the German club, and so she met a German fellow and married—[Kurt], nice guy. They're married now and both healthy. He is an interior decorator (painting, wallpaper). He helped my brother get into that business. He worked with him as an apprentice for many years, two, three years. It's hard. It's my brother—long hair—and [Kurt's] German, wow. It was some major changes. It was hard for both of them. They really like each other because my brother's a very good worker, but still he's a happy guy, and he wants to have fun.

But he learned his trade and then eventually went on his own and had his own business, always with working [by] himself or one or two or three or four people working for him. He has done reasonably well, married once, divorced, a couple of kids.

CARUSO: So, during your time, before you went to…while you were in high school, did your science classes, were they just lectures or did they have lab components to them?

LEONE: During which…?

CARUSO: During, sort of, your high school years.

LEONE: High school, no. There were no…physics had a lab component, and chemistry had a lab component, but not biology.

CARUSO: Okay. So, when you were going through college when you started again, and you were doing the biology classes, did they have lab components in college?

LEONE: Biology didn't have lab components that I can remember. It was more tutorials. The other organic chemistry and all that, of course, had lab components. I didn't really enjoy it. I didn't remember…I never liked lab [in] organic chemistry. I really loved inorganic chemistry. There were labs on that. I have to say…and then biophysics. I took that course and I loved it. I aced both of them. It was really bad because the other students would get really pissed at me, because I write this really…for the labs you had to do some research on it, kind of like an essay. I would just get totally into it. It would just make everybody else's papers look really bad because it…they had some serious talks with me about, you know, "You better stop doing this shit." They just wanted to pass and do their things, right. I said, "To hell with them, I like this stuff. This is cool." I liked those [labs], but partly because it was very abstract. I really liked that. I never really said something about blowing up things. I never really felt an urge to do any of that typical chemist [stuff].

I was curious. I always participated in my parents' conversations. Out of all…my brother and sister, they were doing a lot of stuff, but when they were, like, late at night, Sundays or Saturdays, or there were family over, and the adults would be there, and the kids would be playing, I'd be playing at some part…when they were talking about some stuff that was interesting, I was there, and they didn't let kids [stay], but they let me stay there […] as long as I didn't open my mouth, because they didn't want to be interrupted by a kid. But I would absorb this stuff, and they would talk about politics and everything. So I really wasn't into blowing up things in labs, but I just liked the intellectual stimulus definitely. I think that's what it was

about: my parents, being with my parents, in my parent's conversations, or biophysics, inorganic chemistry.

It really wasn't until I joined this lab to do summer research, because I needed a job—and I thought I could do that or pump gas—I thought, "Well, maybe less money, but it could be interesting." Until, wow, just stuff like that on the board, [Leone points to figures and diagrams on a board in his office] enzymes, and I thought, "How is this happening?" You know, it's just amazing. It just blew me away: DNA and how it can be manipulated and how it could be translated to protein, eventually, and cells, and working with viruses. It's just fascinating. I'm into building things and detective work. It just really got me involved in that, and I thought, "Wow, if this is work…" Ever since up to this point, I guess I go to work, but it's not really work, you know, it's just, like, "You get paid for this?"

CARUSO: So, this was the summer after your second year or third year that you started?

LEONE: Third year.

CARUSO: Third year. You had mentioned a professor sort of was talking about these opportunities in class. You thought, "Oh, let me give it a shot." Did you mention that you went around to a couple different people?

LEONE: Yes.

CARUSO: Was it that you were just going up to people saying, "Hey, can I work for you?" Or were they more interviews to see whether or not you'd be interested in a science?

LEONE: No, it was the work. I knew that they had running labs in the areas that they were doing research [that] seemed reasonable. I guess I must have gotten advised to talk to certain people. A lot of them didn't have funding. I think I applied for funding for a couple of them and didn't get it, the scholarship things for undergrads. So I had no position with them because they had no funding. I did need to earn some money, and this one fellow, Patrick Lee, worked on viruses and interviewed me and left the interview, and two months later I got a call from him; [he] said, "Remember me?" And [after] a second, no, [I didn't, but I said], "Yes, of course I remember you." I had no idea who he was. And he says, "Well…," and then he started talking about the viruses, and I kind of remembered. And he says, "Well, I think we have a position for you if you want to come." This is like, January, just after Christmas, it was great. I was so happy. He said, "You want to come in the summer?" I said, "Great." That was it.

CARUSO: So, do you know why he waited two months to call you, or was it just not enough …?

LEONE: Maybe he didn't have enough funding, and maybe he wasn't sure. You know, maybe he had other candidates that turned him down, I don't know.

CARUSO: Okay. You show up in the summer to start working in this lab, virology lab. Did you do any research before going into the lab to start work?

LEONE: Nothing.

CARUSO: So, on your first day what sort of…what transpired?

LEONE: You know, I don't remember my first day.

CARUSO: Or generally speaking your time…

LEONE: I remember it was…I worked with graduate student, David [C.W.] Mah, who I'm eternally grateful [to] because he was…scientists can be careful with how much information they give and knowledge they give, impart on their students, and he was totally open and free; he would give me everything possible that he knew, so that I could have my experiment work, which is good for him, because [the experiment] was for him, right. He actually graduated with key work that we probably did together. So, it was great. He was super good.

I remember the first couple of weeks was difficult because I couldn't find anything. There's freezers and things were in places that I had no idea. So, I was asking a million questions. I felt really stupid. I remember that feeling was not good, but I remember working late and three-quarters of the lab leaves at six o'clock, you know the type. Then there's the hardcore stays, and then there's a couple…I remember there was a senior scientist visiting from Korea who'd stay late. We talked science. We'd do experiments and talk science till 10:00 p.m., 11:00, p.m., 12:00 a.m., it didn't matter, to just drop-dead time. I learned a lot. If experiments didn't work in the day, I got them to work; so, I was there late at night, putting things on x-rays, coming back at 10:00 a.m., dragging myself in at 10:00 a.m.; I remember that because coffee was at 10:30 a.m. And it had a ritual, the lab had a ritual, had a little, like, side lab stuff, besides the lab, where we had coffee, and it was, like, coffee was there at 10:30 a.m. You were either there, and if you weren't, it's because you weren't at the lab yet, right. That means you had already had to show that you were coming in at 11:00 a.m. So, I was making

sure I was always there by—sometimes I'd be earlier—but I was making sure I was there for coffee.

We had interesting discussions. It was a really fun part of the day. But before that I would always go develop my x-ray. Pick it up, take it, freeze it, because I just couldn't wait, right. I had to have something to show my boss, and it was just exciting stuff. So that's what I remember. I remember working out conditions with different experiments because the graduate student that was working with me, I with him, just couldn't get these experiments to work. I just thought that, technically, this would never work unless we get these basic transfections working to a certain level. At the time, there was one paper that everybody uses still on calcium phosphate transfection method by, I don't know.[1] I forget the name. It starts with an o-h, Japanese name, maybe. I had read that paper, all the different conditions, and everything they had done. So, I remember presenting [at] a lab meeting data about all the conditions I worked up for transfection. They were laughing at me, how thorough I was, and how silly this really was, but I think they that weren't laughing because it was silly; it wasn't an experiment, it was just transfection efficiency, right. I had an analysis I had developed, I forget what it was. I don't think it was luciferase, it was something, some other reporter. I got it to work from like from .0 something percent to about 4 or 5 percent; that 4 or 5 percent was enough now to do the biological experiments we wanted to do with the graduate student. So, the graduate student clicked on, saying, "Oh, yeah, this is good." And then after that we were pumping data, just doing experiments one day, getting data the next. It was, like, total adrenaline rush for the whole summer. Of course they invited me to come for the next summer. At that point, I got married, went to India, traveled with her again for about two months, three months; went to graduate school after that with my own project.

CARUSO: So, while you were an undergraduate, I guess you only worked during the summers in the lab. It wasn't…

LEONE: Right, just summers.

CARUSO: Okay. So, during the year you just went back to normal…

LEONE: Yes.

CARUSO: …classes. Did you have much interaction with Dr. Lee during those summers or was it mostly just the….?

[1] C.A. Chen and H. Okayama, "Calcium phosphate-mediated gene transfer: a highly efficient transfection system for stably transforming cells with plasmid DNA," *Biotechniques* 6(7) (1988): 632-8.

LEONE: Yes, totally. He was very involved in the lab. He was in his office. He wasn't doing experiments, but I was generating data. And when you're generating data, you get your PI's [principal investigator] attention. They're always asking you, "Okay, what happened? What's this?" I had a lot of interactions with him. In experiments, for me, when I became…and it was clear my contribution to the graduate students' thesis. And it was clear to everybody. He was very thankful to me, Patrick, also. I got a lot of credit. So it was very motivating to me. I had a very good interaction with him. As a graduate student I never really got a project. I kind of thought about stuff, and I thought what the problems were with some of the experiments that had already been done and published, and I took off from there and did well. My experiments worked. It was a really productive interaction. I think I had a solid paper within the first three years, two years I was a graduate student. […] It was always a very healthy interaction with my PI. He's energetic. He's Chinese. He's very, very thin and into science. You could talk to him about science for hours, and he's just great.

CARUSO: I think you mentioned that some of your work or some of the…your work/the work with the graduate student wound up being published while you were an undergraduate.

LEONE: Yes.

CARUSO: Did you have any involvement in writing the papers? Did you just contribute the data and that's why you were published?

LEONE: Yes. I don't remember being involved in the writing, to tell you the truth. I generated a lot of the experiments and generated data. I mean I must have read the paper at some point, but I don't remember editing it very much. I remember the first paper that I really wrote was…I don't know. I think it was the *Cell* paper, even though it wasn't the first one published […]. It took me about eight months or nine months to write that paper. I didn't feel a particular rush I was going to get scooped. So, I would be writing a paragraph or a few lines, as I was doing experiments. Then, it would be adding, and I wanted it to be really good.

So, by that point I had already published, I think, a couple of other papers in *Journal of Virology*, so my writing skills were getting better.[2] I remember the first paper I wrote, and I

[2] D.C.W. Mah, G. Leone, J.M. Jankowski, and P.W.K. Lee, "The N-terminal quarter of Reovirus cell attachment protein sigma1 possesses intrinsic virion-anchoring function," *Virology* 79 (1990): 95-103; R. Duncan, D. Horne, J.E. Strong, G. Leone, R.T. Pon, M.C. Yeung, and P.W.K Lee, "Conformational and functional analysis of the C-terminal globular head of the Reovirus cell attachment protein," *Virology* 182 (1991): 810-9; G. Leone, D.C.W. Mah, and P.W.K. Lee, "The incorporation of Reovirus cell attachment protein sigma1 into virions requires the N-terminal hydrophobic tail and the adjacent heptad repeat region," in *Virology* 182 (1991): 346-50; G. Leone, R. Duncan, D.C.W. Mah, A. Price, L.W. Cashdollar, and P.W.K. Lee, "The N-terminal heptad repeat region of Reovirus cell attachment protein sigma1 is responsible for sigma1 oligomer stability and possesses intrinsic oligomerization function," *Virology* 182 (1991): 336-45; J.E. Strong, G. Leone, R. Duncan, R.K. Sharma, and

gave to Patrick; he totally changed it. Then I learned a lot, because I read what he changed, and I said, "Oh, this is way better than what I wrote." So the second paper I wrote soon afterwards in *Journal of Virology*, he hardly touched it. Obviously I got it right. The *Cell* paper was already at that point polished, so I loved writing, and I still like writing now. It takes me a long time. […] When I get drafts from students now, which I always ask them to do, I don't care how bad their English may be, I need a draft. I always think, "Okay, I should be able to get this paper done in about two weeks." It's never [that way]. I mean, we publish in good journals and we're very careful about everything. It just takes me…we just submitted a paper a few days ago, and I thought it would be done in two weeks, and it took me two months, which means that I have a stack of other papers that I need [to] write [that] I'm behind on. But it does take a long time and you have to think people are going to read it. That's it: that paper is in black and white and you got to say exactly what you mean. You have limited number of words, space issues, and so on. But I do enjoy it.

CARUSO: So, you said that Dr. Lee pretty much came to you and said, "You should go to grad school." Was this during your second summer in his lab, or was this after the second summer?

LEONE: It was the second summer for sure. I don't know if during the first summer anything was said.

CARUSO: Did he tell you, "You should go to graduate school," or, "You should come and work in my lab as a graduate student." Was he just trying to push you into the field, or did he really want you to…?

LEONE: His lab.

CARUSO: In his lab.

LEONE: Yes. I didn't rotate. I got admitted to the graduate school, and I didn't rotate for any of the labs.

CARUSO: Did you consider applying to any other graduate schools at the time?

P.W.K. Lee, "Biochemical and biophysical characterization of the Reovirus cell attachment protein sigma 1: Evidence that it is a homotrimer," *Virology* 184 (1991): 23-32; and G. Leone, R. Duncan, and P.W.K. Lee, "Trimerization of the Reovirus cell attachment protein (sigma 1) induces conformational changes in sigma1 necessary for its cell binding function," *Virology* 184 (1991):758-61.

LEONE: No.

CARUSO: Just, "this was a good place."

LEONE: "This is a good place," yeah. I was definitely not as savvy as…absolutely, no. I mean, in retrospect, it's crazy, right. You never want to do it that way. It's very different scenario back then and maybe even more so for me. I guess I've always…it's, in a way, like my travels. I never really had a plan where I was traveling. Somehow I knew what to do at the time, even when I was…at that point, I was going for graduate student to postdoc even, right. I didn't do what most do, apply to fifteen different places…"Oh, I want to do this." I have my postdocs now or graduate students, they plan their things to the infinitesimal detail of the grants they're going to write and this and that, and I'm thinking, "Wow, that's a lot of 'if.'" Let's get published first, and let's do…they really plan their life a lot, which is surprising because I don't. Maybe it works with some people. But I always managed to make the right decision at the right time. So, looking for a postdoc, I had three people that I was interested in. I talked to two. I went to one.

CARUSO: I'm guessing, then, that going to graduate school…you'd expressed the fact that you decided not to go into medicine. You wanted to go to graduate school. Did you have a plan to become a lifetime biomedical researcher while you were starting, or was it just, "This will be good for now, I'm enjoying it, and then I'll see what happens in the end?"

LEONE: I don't have a great memory. I remember important things, and so I can't remember what I was thinking at the time. But I don't remember thinking too much about what was going to happen really far, far away. I was enjoying it at the time. I knew that this is…I could see Patrick, and I would go to a conference so I could see other PIs, and what they [did was] kind of interesting to me, so I thought that's the way I was going to move towards. How I would I get to it? I only really got seriously involved in the mechanics of how do you get to be a faculty once I became a postdoc. Because then, you know, I had kids already, had a family, moved to the U.S.; I had some financial responsibility to really think about…"I got to get this thing done some way."

CARUSO: Do you have any recollections about how your family felt about your decisions, either your mother, in terms of, "Well, my son's going to be a scientist," or your fiancé/wife, how…?

LEONE: Yes, oh yeah. My mom was happy if I was going to go to medicine. She would be happy if I was going to do whatever. My mom is very positive: "Do whatever you want to do, do it well." She was ecstatic that I liked science and I did well in science. She thought that was

great. My wife's parents thought this was an admirable thing to do, I think. They thought that was, kind of […] very uninvolved Canadians, very kind of British-like. Their opinions, they don't really give. Unlike Latin people, they don't give their opinions freely. So they thought it was fine. This is very good, they thought. They were very proud, I think.

CARUSO: And your wife, she was just happy that you were happy?

LEONE: My wife was happy that I was happy and wanted me to do this because she saw that I loved this. She, I think, was one of the individuals, like, maybe there are many in this world that don't have a passion about something, and I always did. So, for me, everything was easy for the next step because there was no question. Why would I go to medicine when I love this stuff? Why would I marry anybody else when I love this woman, right? It was very simple to move forward as things are known, although I do plan a lot more now. I have all kinds of missions now, that stuff that I want to do in five years, or even two weeks. But my wife didn't have that in that sense, so I had that. She thought, "Well, this was great." She would go with that. But it got to be a bit of a burden for everybody because she worked. She's very, very, I think, smarter than I am, in terms of logic and math and languages; she's very smart.

CARUSO: What was she doing?

LEONE: She was actually working in an oil company as an accountant, and she hated it. I said, "Why are you doing it"? She says, "You're right." So she went to school, went to a technical school, Southern [Alberta] Institute of Technology, SAIT, in Alberta, and learned nutrition, because she loved food […] and so she learned nutrition. She worked at a research enterprise at the hospital. It was a big study going on, and cancer and diet, and she also worked at the hospital, a separate job, of course, technical, where you service the patients and so forth. Then [she] got an opportunity to teach back at the college, so she was invited to do that, and that was a great opportunity. She took that. It was very good, I think, but she's a perfectionist, and she was very stressed. Even in the last year she was very stressed. We already had a kid […] yeah…. We had a kid a couple of years before, and I said, "Wow, this is…you're not happy, okay, don't…work less. You know, just work half-days, half-time." She managed to get an arrangement where she would be working, teaching less classes than she was working, I don't know, two-thirds. She wasn't making a lot of money, and she was making barely twenty, thirty thousand dollars at the time, which was quite a bit at the time. Then we moved to do a postdoc I took in North Carolina, and she stayed at home with both kids and decided that's what she wanted to do. She couldn't really officially, legally work anyway, but we could have applied for it—it would have taken a great deal of paperwork. She could…that was a big problem, I think, for us, in retrospect, because she's very smart and didn't have that of her own, and I think that's the problem for any relationship, but it was for us. And I worked a lot. I worked a lot of hours.

CARUSO: In graduate school you're talking, I mean […] the fact that you mentioned that you had a child…

LEONE: I had a cot as a postdoc.

CARUSO: You had a what?

LEONE: A cot.

CARUSO: Oh.

LEONE: Army cot. People would make fun of me, actually, because we were studying cell cycles, right, for thirty-six hours, forty-eight hours. I had no problem.

CARUSO: So, you just had a cot in the lab?

LEONE: A cot in the lab. It was one of those foldable things.

CARUSO: Starting as a graduate student, did you…I mean, you worked with one as an undergraduate, so you might have had a certain sense of what the graduate student lifestyle was, but were you really prepared for the amount commitment that was…?

LEONE: Totally.

CARUSO: Totally?

LEONE: Yes, totally.

CARUSO: When you started as a graduate student, were you taking classes and in the lab at the same time, or was it more just lab-focused?

LEONE: It was typical. You have three or four classes you need to take in your first year, and I fulfilled those classes in the first year or first two years. It wasn't a major time commitment. I didn't [become a] TA [teaching assistant]. […] I got a scholarship afterwards, so I didn't have to TA. I was totally prepared for it. Yes, this was exactly what I wanted to do. I never saw it as work and being there late. It wasn't like that at all. I wasn't a slave for anybody. I was there because I wanted to be there and I wanted to get the result. I wanted to publish. I wanted to be the first, and it was interesting science, you know. And I love my kids and my wife, and it's kind of hard for them, not so much for me. So, I always felt like I had to, sort of, balance that to some degree for them, not because for me, just because I had to be there, it's my responsibility.

CARUSO: How many other graduate students were in your entering class? Do you remember? Was it just three or four? Was it a large…?

LEONE: In the lab?

CARUSO: No, in…

LEONE: Or in the class?

CARUSO: When you entered graduate school, there were other…

LEONE: Oh, I don't remember. I was…

CARUSO: Was it just a handful, or…? I'm just wondering.

LEONE: It was a pretty big class, I think.

CARUSO: Did you interact much with your…?

LEONE: No, I wasn't…

CARUSO: It was mostly just your lab…?

LEONE: Yes. It was just in my lab. I was into the science. I wasn't into the whole social thing about the whole class. I don't even really know who got into that particular year, but it wasn't a small class. It was a pretty big [class]—it was in the medical school—and it's a pretty big research enterprise. There were a lot of students.

CARUSO: Okay. So, you came into graduate school. You didn't do rotation, you went straight back into Dr. Lee's lab. You had lots of things that you were sort of interested in, but ultimately, from what I understand, you were given a project to work on, one that you were interested in, but it was more of an assigned project: the characterization of the reovirus attachment is that…[3]

LEONE: Yes. So, that's right…

CARUSO: Oh, the attachment protein, sigma 1.

LEONE: The attachment protein then binds to the cell, right.

CARUSO: Right.

LEONE: Yes. So, no, I wasn't. I could do anything, but I had started working on that. In that process, I had developed this *in vitro* translation assay. It was natural for me to continue to work on that. There were some questions about this whole, "It's an oligomer," "It's a trimer." Well, we figured that out, but at the time, this integrity of structure and function, there was some data that just didn't make sense. I didn't understand it. I had this idea that the reason for the function, it required the right structure, the right oligomerization of the cell. And if that was right, this would explain a lot of the…there were about three or four papers that were, sort of, in disagreement. So, I just kind of thought of that and told that to Patrick, and he thought…I remember his shrugging, I don't remember having a debate or any major…he didn't really care. He kind of shrugged his shoulders and said, "Yeah, maybe." He wasn't too excited. I don't know. I didn't care. I was characterizing this protein, and, meanwhile, I was doing this other experiments, and they were all working. Then, I was doing the characterization, I had this oligomerization project. Then I had this crazy idea that we could use these viruses.

He actually has a company [Oncolytics Biotech Inc.] now based on this. They used reovirus to attack cancers. If—because we had learned so much about the structure of this binding protein that binds the receptors themselves—if we could change it, so that everything fits in the virus but somehow attacks cancer cells, in other words, maybe bind to each f-receptor

[3] G. Leone, et al., "The N-terminal heptad repeat region of Reovirus cell attachment protein sigma1."

or something that would be unique…. I didn't know exactly what would be the right target, but I worked on the principle of it. That would be really cool. Then we could actually use that. I had a lot of experiments going on. I don't know, actually, with the graduate student, we published some of that basis, but I never published a lot of the other work. A lot of things never really came to fruition, didn't work. Those are the three things that consumed my time. Two projects that were really moving forward and another that one that, you know, I was playing around. We were pretty free to do stuff.

CARUSO: So, everyone in the lab, sort of, had their freedom.

LEONE: I think so. I think so.

CARUSO: How large was the lab?

LEONE: I think there were, like, eight graduate students.

CARUSO: And a few postdocs.

LEONE: Occasionally we had one. Sometimes we had two. I think at one point we had three. But, then, it was a graduate student-driven lab. I had a couple of postdocs that were very helpful. It was definitely different than [how] I run my lab here. I'm much more goal-oriented: "Let's get cranking." Maybe the other students would tell you a different story now, right. I worked very hard, so there was no…Patrick wouldn't be coming to me, and say "Well, you really got to crank," and I was producing. I was publishing, so what could he say? I had a lot of freedom. Whatever I wanted to do, that was fine. […] If you're getting interesting data, he would definitely get more involved and give suggestions. I, sort of, learned the game a little bit, that I'd show him a day-old data or two-day old data because I knew what his question was going to be, right. I would have to say, "No, I haven't done it yet." So, if I have two-day old data, I then would say, "It's in the freezer." Then he would smile. And since he didn't know the result of that, he couldn't ask me the next question. I was always, like, trying to…

CARUSO: A little step ahead.

LEONE: …a step ahead, right. It was a lot of fun. I had never any problems. He actually…I was going to graduate about a year and a half before, and he said, "You can graduate if you want." And I didn't feel comfortable. I didn't feel like I was on fire. I wanted to finish some of the things I was doing. I didn't feel like I had learned. Things had worked well, and therefore, I

didn't necessarily explore other things like protein purification that I wanted to learn how to do. I wanted to develop. I wanted to be more of a virologist. I didn't really get to do a lot of virology when I was in a virology lab. I thought, "I really need to learn that." So, my last year, I did all kinds of crazy experiments. Some of them got published ten years later, eventually. It was, kind of, fun and interesting in that way. Some of the experiments were published way later.

CARUSO: You mentioned that there was a camaraderie in the lab at the graduate…most people got along and hung out, you talked science.

LEONE: Yes, pretty good. No, there was some major feuds.

CARUSO: Oh, there were?

LEONE: Oh, yeah. There were major feuds. I can tell you stories.

CARUSO: Was it personal, or, I mean, were people competing, in terms of the science…?

LEONE: Yes. There was another guy who had purified…had a really good purification scheme for the sigma 1, and he was a Chinese fellow. Then there was this Middle Eastern postdoc—they were both postdocs…no, one of them was a senior graduate student, Michael, with this purification scheme. He's a very smart guy. There was this postdoc who was Middle Eastern. And it was a big rush to cloning. It was, like, this lab got kind of known because they cloned this particular gene; cloning was a big…they cloned it, man. It's, like, wow. You don't think of anything like that now, but cloning was a big thing. So, it was a rivalry at one point. They got into a fight. They got into a physical fight at one point […]. That's not the only one. There were two fights actually. I don't know. There was some rivalry, but that was maybe the one arm of the lab that had this thing. We all thought nothing of it. We thought, "That's kind of interesting gossip." You know, it's good coffee conversation, but it wasn't an everyday thing. It just happened once, I don't know. I didn't see it. I heard about it.

But overall, it was pretty well-run; it was a lot of comradeship. For example, when I left, they had a huge party, and they had skits. They had gone to my wife at the time, and they had my clothes and stuff. They were dressing and making fun of me completely, because I would wear weird stuff. So, they had skits. One of them played guitar and sang pretty good. They had one after the other, forty-five minutes. I was, like, roaring, laughing. We did that. They did that for me, and we did that for a couple other people in the lab. So, it was […] a little more easygoing then.

CARUSO: Did you ever collaborate with any of the other grad students on the lab on projects, or were you mainly focused on your own?

LEONE: We collaborated. I trained an incoming graduate student. I collaborated with him. I collaborated with somebody else working on…the lab got into p53 for odd reasons, and [I] collaborated with him. I never really…I don't think that ever got published. We were pretty much into our own projects. We did some collaboration but, you know, it was more teaching than anything else.

CARUSO: Did you work with anyone outside of your lab in other departments or outside of the university, based on interactions you might have had at conferences?

LEONE: No. No, I didn't have the time. I didn't really feel the need that I needed that for my projects that I was thinking about. I think part of it was, you know, a little bit just lack of my education, really understanding what the global scope of science really is. I think I'm totally into it now because I collaborate a lot now—inside the university, outside the university, other countries; and all my students know that because once I get into collaboration, it's the student that carries it, or the postdoc. […] If they screw up one collaboration, they burn that bridge, so communications, emails, responses all of that, I'm really onto them making sure that they do this right. But it's something that I just learned here. I didn't appreciate that even as a postdoc, I didn't do that much of that. I had one collaborative study of something with somebody in Texas. That was it, but driven mostly by my PI.

CARUSO: Okay. Did Dr. Lee involve you in or ever talk to you about the broader aspects of being a scientist? Things like departmental politics or the politics of journal articles or grant writing? Did any of that come up as part of your graduate education? Or did he mainly keep that to himself?

LEONE: Grant writing, no; no idea. Journals, we were involved. I was involved in responding to criticisms and things like that in the papers. I don't know that…we never really thought there was politics involved; you just did your science and put it together. I don't even know to that extent that there's a lot of politics now. If you don't get it in, you have lots of reasons why you can blame politics. But I have to say, for the most part, even in grants and papers, the majority of times I say, "Yeah, I understand why it didn't get into *Science*" […]. People always give you the excuse. The students…they say, "Well, we can't do it. We would have to do this, this, and that to show that. It'd take too much work." It doesn't matter. It doesn't matter how hard it is or what it is, if you want to say something and it's important enough that you need to do this, [then] you need to do this. It doesn't matter. Reviewers don't care that you need to make another knock-out or need to…so, where was I going with this?

CARUSO: We were just…

LEONE: Oh, politics about…so, no, I didn't learn that from him too much. I mean we talked about science in general, about papers we would read. We talked about the politics of science, about ethics, and I don't know that he sat me down. These coffee things we talked about, mainly real things, and it wasn't…it was science, politics, religion, and it all got mixed in there pretty well, so I got a pretty good education that way.

CARUSO: Yes. I guess I was raising the question in part because of what you said about you and your parents and liking to be around the table, even if you weren't allowed to speak. Now that you were [an] adult, did you get a chance to speak? Were you interacting with people either based on science in terms of politics and religion and things like that, or more broadly speaking? So, that's where the question was coming from.

One thing that I'm curious about is whether or not your relationship to either Dr. Lee or other people in the lab changed when you had your children? Not many grad students…for one, not many grad students are married. Not many grad students usually have children. Some other Pew Scholars have mentioned that if they did get married during graduate school, in some ways…or if they had children while they were postdocs, things changed for them. People perceived them differently. They were more the nine-to-fivers instead of the all-nighters.

LEONE: Yes. No, I'm very careful. That happens in my lab, and I'm fully conscious about that. The first thing, it's, like, "Great." [Then it's], "Oh, shit. Now this is going to take longer," in my mind, right. I can't say that. Of course, I think that; everybody would think that. But in my experience here with my people, especially if…. I have a graduate student that just graduated and then stayed here for a few more months. She's doing a postdoc at Harvard [University]. She had a typical pregnancy. She was pregnant. I don't know. Yes, she worked less, but [she was] so efficient and […] I have a very different attitude about that. […] I do think about it because, I mean, she just came in yesterday with that. […] I said, "Okay, very happy. I'm sure we'll make it work." I do feel, like, "Yeah, somehow we'll make it work." I'm not sure exactly how. In a way, they bear most of the responsibility. I said, "Well, you should start thinking about this, this, and that. Start planning this, because I know it's, like, seven months away or six months away. Just think about it, because otherwise, it will be we—you—will be unprepared." But when I was a graduate student, yeah, Patrick knew my wife, loved my wife, my kids. I don't know if that… I never got that feeling. I don't know if it ever crossed his mind, probably. But I worked so hard […] I don't think it ever affected me. Maybe it did in some way that I don't remember.

CARUSO: Okay. So, I'm going to start asking about…

LEONE: Patrick's a very special guy. He's a very special guy, I have to say. He's a very smart guy. He's very good at science, but he's very human in that. He's very considerate, and I guess he expects a lot from himself and therefore provides a lot of freedom. Basically, for him, it's the bottom line. I think he had a problem with a couple people in the lab that weren't getting things done, but I don't remember him really sweating over it too much.

CARUSO: So, as long as you're producing, that's all that matters.

LEONE: Yes, yeah.

CARUSO: Okay. So, let me know if this was a decent assessment of what came out of your graduate research. You demonstrated the N-Terminal half of the protein has intrinsic, I'm going to mispronounce this, oligomers…

LEONE: Yes. Oligomerization.

CARUSO: Yes…ability. The protein is a trimer and not a tetramer as claimed by a Harvard group. The conversion from monomer to a trimer is crucial for its biological activity. It's generated by two independent trimerization events. So, that's a good, relatively good assessment?

LEONE: Yes.

CARUSO: How did people respond outside of the lab? How do people respond to your work? I mean, if you're going up to a Harvard group and saying, "You got it wrong…"

LEONE: Yes. You know, so immediately outside the lab in the scientific community of Calgary, they didn't know about this stuff too much. "Okay, great, got published in a good journal, in *Cell*, whatever. Great, sounds great." In terms of the other people in the field like Harvard and other places, I think they respected Patrick's lab in general, because it's been always pretty solid scientists in that area, in reovirus. He's kind of well-connected because he got trained at Duke [University], actually by [Wolfgang K.] Joklik, [who developed] Joklik media, okay. He's kind of the godfather of molecular virology. His biggest nemesis was Bernie

[Bernard N.] Fields who wrote the *Fields' Virology* textbook […] he was a postdoc in Joklik's lab.[4]

I don't know if Patrick and Bernie Fields, who unfortunately died of pancreatic cancer very suddenly, if they interacted, overlapped, so there was competition there. There was competition between Joklik and Fields. So that was our main adversary, I guess you could say. I took it as being an adversary; in retrospect, it's very bad because they really weren't. They probably were a lot more easygoing than I was. So, I remember presenting this work at a conference and Bernie Fields asked me to go outside the conference after I was all done. I was asking questions for something else, I guess, kind of, strong, overly maybe, probably. He says, "Not everything is black and white. This is great stuff. I really like what you're doing. This is very good." That's all I remember, that, "Not everything is black and white. Yes, maybe it's this way. Maybe it's that way. We'll figure it out." I remember that now.

I didn't realize…I mean, I realize now, maybe three years ago, how important that was. How dogmatic one can be is a problem, becomes a problem, I think. Nobody likes to be wrong; they didn't like to be wrong. I think they came to grips with that. They had published a major paper on that. But I thought that was a very nice thing for him to do. I said, "Yeah, I think he's right." He died two years later or something, year and a half later, unfortunately.

CARUSO: So, you had a relatively, or a very good, publication record, right: *Virology*, *Cell*, *JBC* [*Journal of Biological Chemistry*], EMBO [*European Molecular Biology Organization*]. You stayed a little longer than your advisor thought you needed to in order to actually do some virology. Then, it was time for you to graduate and to leave. Did you know where you wanted to go and what you wanted to do? Or did you seek advice from people about what the next step should be?

LEONE: I had a pretty good idea.

CARUSO: Okay.

LEONE: One of the things I was fortunate…because I was publishing I got to go to conferences, every year I went to a conference. So in 1990…was it 1990? Yes. The Berlin Wall had just gone down [9 November 1989]. I went to Berlin, [Germany], to a conference [8th International Congress of Virology] there. This is six months later and I went there with my son, who was, like, three months old and my wife…

[4] Bernard N. Fields, David Mahan Knipe, Peter M. Howley, eds., Fields' Virology (Philadelphia: Lippincott Williams & Wilkins, 1985).

CARUSO: Easiest time to travel…

LEONE: Actually, yes.

CARUSO: My wife and I took my son to London, [England], when he was six or eight weeks old, he slept.

LEONE: Yes. He slept. He's breast-feeding, yeah, four months, six months, I don't know.

CARUSO: Yes, I can't imagine doing that…sorry.

LEONE: No, absolutely right. That's what we figured. We rationalized it, that one, at least. Anyways, at that time it was exciting. I remember Ed Harlow, David [M.] Livingston…David Livingston, and Joe [Joseph R.] Nevins: three talks, one after the other, on the connection between the different viruses, at a virology conference, International Conference of Virology. They talked about E1A, adenovirus oncogene, T antigen, et cetera, connecting to blastoma and E2F transcription factor. It was one after the other, and I thought, "That is so awesome." It just blew me away. There was that, and then there was the whole papilloma virus, where they had the E7 and E6 genes and one connected to pRB, the other one to p53, from Peter [M.] Howley's lab. I was interested in Peter Howley's lab and Joe Nevins' lab, and there was somebody else, but I never contacted the third person. I did contact these two individuals. I got to meet with Peter Howley at a conference subsequent to that conversation, and I thought about going to his lab. What was it? I'm not sure he was at Harvard then. I forget where he was before Harvard, maybe NCI [National Cancer Institute].

[…] So I was thinking about it, and I told Patrick that and he looked at me. He says, "Oh, Joe." He said, "Duke. I'm from Duke. You've got to go to Duke." And he knew Joe to some degree, because they didn't overlap, but Joe did his master's with Joklik. I mean, this is all coincidence. I had no idea about this. He's very well known in the field, Joe, Joe Nevins. So is Howley. So he said, "Oh, I'll give him a call." He gave him a call and said, "I have a student that is thinking about [a postdoc]…would you be interested"? He says, "Ask him to give me a call." Patrick says, "He wants you to give him a call." I gave him a call and I left a message. He called me back, and I was in lab. He says […]—just talked to me five minutes, three minutes—he says, "Well, would you be interested in coming and visiting here?" I said, "Yeah, that sounds like a good idea." So, he flew me over and I interviewed. He offered me the position, and I accepted there. That was it.

CARUSO: And that was it.

LEONE: It was simple. It was great. It was a nice lab […].

CARUSO: This was a Howard Hughes [Institute] lab?

LEONE: Yes, kind of.

CARUSO: So, you had mentioned previously that your wife and children were going to stay in Canada.

LEONE: No.

CARUSO: No.

LEONE: No, they're coming with me.

CARUSO: Oh.

LEONE: I would never have considered that. I mean, I'm sure during this whole process I didn't mention much of my wife, but we discussed this whole [situation]: how we wanted to proceed, what we would do, what the options were, going here versus there. […] Before leaving I had my second child. We actually owned a house at that time, even though we weren't making very much money. We bought this house very cheap and sold it pretty good, because the oil business was booming at that time. So, we made, like, thirty grand on the seventy thousand dollars…we paid like seventy thousand dollars for the house, and we sold it for like a hundred and ten [thousand dollars] or something. We sold it in one day. The market was that hot. We had to leave. We had to move. So, I move to my sister's basement for three months with a brand new baby, typing away my thesis. It was the best time of my life. My sister will probably tell you the same, although it was kind of humid in that basement. But we all moved. We rented a U-Haul [trailer]. I made so much money in the sale of the house [that] I bought a truck that we still have, a Nissan Pathfinder. Hitched a U-Haul to it, and put everything but the piano, because she had a piano that stayed back with some relatives or her parents. Just packed everything into it and drove three thousand miles to Durham, [North Carolina].

CARUSO: Okay. So, you get to Durham. Probably you hadn't been in North Carolina…

LEONE: Shock. Shock. Coming from Canada, where you have eastern Indian people wearing saris, it's very ethnic. People are very international, with the turbans, you know, people are very…retain their ethnicity more so, I think, in Canada than here. And then coming to North Carolina, this whole black/white thing it just blew me away. It was hard. […] First of all, it's an impression. I don't know if it's good or bad, but there's a lot of black people, and it's a physical impression you get, and it's hard. You're not used to it. We have black people in Canada. It's just not as many black people. So, black is different than white, so it stands out, or white stands out from black, however you want to look at it. So, it was very impressive. But that shock, immediate shock, that's fine. But then, the whole social…blacks don't even…I don't know now, but even then, there's differences, right. The black people were working [as] janitors and so on. And there was just a totally different social thing. You would go out, and there was groups of black people and groups of white people, they'd be in the same restaurant. It's not that issue, but it wasn't a lot of cross-mixes, and that was really hard. It was very hard to swallow, having always thought that you were very liberal and wanting to raise your kids in a place that was very integrated. It wasn't, and so that was…. […] You live it. It's kind of hypocritical, but you have to live it.

The lady that was the janitor, not the janitor, she made the media, sorry, for Joe's lab. She was really nice…Nanny, I don't really know her name. Her name was Nanny. She invited…we got to talk a lot, because when she was making media in one of the Fisher [Scientific] culture hoods, I was doing experiments, and we'd talk a lot. She invited us to church. I said, "Oh, let's try it out." It's a Baptist Church. What a riot, what fun. You know, my wife would be, my kids, the only white kids, you know, blonde like you wouldn't believe. The black people…and they're dressed, like, unbelievable, right, hats and colorful. They're singing away. They're turning around and hugging you and cheering, and oh, man, it was great. We kept going there, not religiously, but we'd go whenever we wanted to go, probably went eight, ten times, something throughout a couple of years, just because it was a lot of fun. Then you'd have a barbecue after or whatever, a fry, whatever they would have, you know, chicken. That was a shock.

CARUSO: How did your wife and…I mean, I guess your one child was still a baby, but your son was…your older son was probably about four or five…

LEONE: Five, yeah, four…

CARUSO: …at the time. So, he was starting school.

LEONE: Yes, starting school.

CARUSO: Was the transition difficult on your wife and your son?

LEONE: My son, I don't know. He's a boy. I never asked him. He's an easygoing guy. My son is an amazing kid. My daughter is a pain. [laughter] My son is a very amazing kid. So, everything is fine with him, and he's a very social person. Everybody likes him. He likes everybody, mild. He likes to play soccer. He likes to participate in all those things. He's never particularly excelled in any of those, but he's part of the team, and everybody likes him. It's great. He likes to be involved with stuff. I don't know that he had any problems. I think he was fine. Never at school, because of racial things, I think it's…we never talked about it. I never thought there was any issue. My wife probably felt the same as I, kind of shocked, I think, [about] the distance between the white and black in North Carolina. So that was, kind of, all we could do is just talk about it and go to church once in a while, participate in that and not worry about it too much.

CARUSO: You said that she didn't go for any sort of working visa, or it would have taken…so she was mainly just…

LEONE: Home, yeah.

CARUSO: …raising the kids.

LEONE: Yes, raising the kids.

CARUSO: Did you purchase another home down there, or you were living in…?

LEONE: Renting.

CARUSO: Renting, okay. A house or an apartment or…?

LEONE: We actually…so we arrived with a U-Haul. You got to picture this, right, with nowhere to live. We camped for the first three weeks in [Jordan] Lake which is about twenty-five miles, thirty miles south of…there's a lake that's south of Durham and Chapel Hill, [North Carolina]. I was out looking for a place to rent. We found a place that was somewhat affordable. It was, like, five hundred and fifty dollars a month. But it was in Chapel Hill, south of Chapel Hill, so it was a ways, and we only had one car. I thought I'd be bicycling there; I was a hell of a biker. I did bicycle for about a year and a half, and that was enough. It took me

like an hour, fifty-five minutes, and I was really pushing it, one way. I was in pretty good shape.

But this house, it was…otherwise I would have had to spend another hundred and fifty bucks or something if I wanted to live closer. It needed work, so we got, like, two months free rent. I had to paint it and stuff like that. It had a big yard, so it was great. It used to be three acres, and they split it up, and they had three houses, and it was like one acre each. A lot of it was woods and stuff, but the kids could play and stuff. It was out, and it was great. That worked out for a while, but it really got to be a real pain for me going back and forth. I think we were there for three years, three and a half years. Then the last year we moved to Durham. One of the postdocs had moved from where they were, and we decided to spend an extra couple hundred dollars and move to Durham…but she didn't…no, she stayed at home. She had gone back to school, has a master's in archeology, she's an archeologist now.

CARUSO: Oh, interesting.

LEONE: Doing really well. I'm telling you, she's very smart. She loves it; doesn't make a lot of money. But I thought you should do whatever you want to do and be happy. But that's what she does now, but not then.

CARUSO: So, you started work in Dr. Nevins' lab. This was in the Department of Genetics.

LEONE: Yes.

CARUSO: Did you come in with an idea for a project to work on? Did you just have a general scheme of what you were interested in? How did the science come about in that lab?

LEONE: He had one suggestion. David, I have another suggestion. Can I go check if there's coffee?

CARUSO: Sure.

LEONE: I don't know if you're still not interested in coffee…

CARUSO: I'm fine. We'll take a break.

LEONE: Okay.

[END OF AUDIO, FILE 1.1]

CARUSO: All right, so you come down to Duke. You come into Dr. Nevins' lab. You were telling me a little bit about how the project or projects that you started to work on came about.

LEONE: I arrive at a time when they had just published a *Nature* paper showing—not that it's a big deal, they published, it's a great lab, but it was an important finding—they found that this transcription factor, E2F1, had the ability to take cells, when expressing cells that weren't growing, to make it proliferate; and so that was pretty amazing [for] a single factor to do that.[5] Then there was a flurry of other work from other labs that were substantiating that, and we're cloning E2F2, E2F3, maybe that's all there was at that time. Then, soon after I was there, someone cloned E2F4, E2F5. He wanted me to do this….what are the phosphorylation of […] some phosphorylation targets? E1A somehow affected kinase activity, and [Nevins] wanted to know what were the targets and could I do two-dimensional phosphyl mapping of proteins? So, he hooked me up with somebody at the Veteran's Hospital [Durham VA Medical Center] who was doing this 2D gels, and it never went anywhere. I thought this was, kind of, not a very good idea, to tell you the truth. I never told him that. I said, "[…] Yes, of course. Sure." In that process I'm doing my own experiments and had other ideas about…it wasn't solid.

This connection of E2F to Rb, it sort of implied an involvement of cell cycle, but there was no physical data that said E2F is central to cell cycle. Somehow, proliferation may not effect cell cycle. So, at the time they had recruited a PI. He maybe had been their TGF beta person, who had a clone of p21 before it was published—p21 cyclin-dependent kinase inhibitor, it was a big deal at the time. He had a cDNA of this. I was thinking about collaborating with a postdoc in Joe's lab, David [G.] Johnson, who had just gotten this *Nature* paper. Except he had a position he was moving to as a faculty, right. He said, "You know, Gustavo, we got along, kind of well, but only in the lab for three or four months. You might want to think about this." I thought about it. I said, "Yeah. That looks pretty cool to me." I thought, "Oh, let's do this experiment." I was thinking about it to myself, we could do these sets of experiments. Okay. In my hands, I had this p21 clone. That's event number one that really made a difference. Event number two that made a difference was that Joe was part of introducing me to the lab said, "You know, this is so-and-so." He had, like, eighteen postdocs. It was like a huge army, right, eighteen, nineteen postdocs. He says, "James [V.] DeGregori, he's doing cell cycle stuff. Why don't you guys work together a little bit?" [He] got us hooked up. That's the extent of his specificity of his conversation. It turned out that James spoke Spanish. He's the Texan, loud and tall, loud Texan, still is (I'm going to get in trouble) and spoke Spanish. Not only that, he

[5] David G. Johnson, James K. Schwarz, W. Douglas Cress, and Joseph R. Nevins, "Expression of transcription factor E2F1 induces quiescent cells to enter S phase," *Nature* 365 (23 September 1993): 349-352.

had lived in Uruguay. I mean, come on, Texas to Uruguay. Lived in Uruguay for a whole year. He had done one of these high schools switches. He spent the whole year in Artigas, which is a state in the northern part of Uruguay that I have never even been there. It's way far, I mean, it's only, like, three hundred miles, but we never traveled anywhere. He loved it, and he drank mate. I drink mate. Sometimes I drink coffee for a few months, and then I drink this tea. I don't know, it's…I have this thing here. See that there. It's, kind of, a gourd with a pipe thing [a *bomba*]…

CARUSO: Um-hmm

LEONE: …which looks very suspicious. Well, you fill it with these tea herbs, right, it's actually potent caffeine. You have a thermos of hot water, you pour it, and you sip on it. Very personal because you're sipping from one metal, silver straw. So, if you want some, you're sipping from the same metal straw, right. Usually you do it on your own, or [with] some of your friends. It's a level of trust. It's an intimate effect. In essence, it's somewhat an intimate event. He drank that, and I drank. He saw it, and he went, "Christ, I can't believe it. This is great." He's a very smart guy. We got along great, had lots of great ideas. In my view, I had maybe more of the ideas, and he was an extremely good experimentalist. I learned a lot about new techniques from him, and we worked together. We published like crazy together, and we had a blast. I would get there at 9:00 a.m., 10:00 a.m., 10:30 a.m. in the morning, first hour was tea, then conversations with James. James would be…because he would start early because his wife had a whip on him. He'd leave by 6:00 p.m. We had a certain amount of time that we were overlapping in the lab. He would be already working. I get there. He stops. He talks to me for an hour—whatever…science mostly, ideas, and set up the plan for the experiments for the rest of the day, some of them which we did together. We had these cell cycle massive experiments. We're famous for this in the Nevins' lab. Nobody's ever done experiments like us, where we have two hundred plates synchronizing. We needed, manually, two people at the very least, and sometimes we'd actually incorporate others to come and shake things for us. It was crazy; we'd have so much fun. But on occasion, there were mistakes. But it worked out very well. We had a very good time, and we were very productive. That was the second event, learning about the technical with him.

That set me in motion to do a set of experiments that showed connection between cyclin-dependent kinase you need to have in cell cycle, which we published together with James in *Genes & Development*.[6] That was really very productive. That also taught me a lot about other things to working with somebody, give and take. I remember this study was pretty fifty/fifty, but I definitely led it. Every time we would meet with Joe…Joe's a very easygoing…he's competitive but relaxed. He's not as effervescent, and he doesn't show a lot of emotion, and he's very careful with his words, mannerisms. So, James, I, and him sitting, talking about projects. We would talk probably more so than other postdocs. And [when] he would talk, [he

[6] J. DeGregori, G. Leone, K. Ohtani, A. Miron, and J.R. Nevins, "E2F1 accumulation bypasses a G1 arrest resulting from the inhibition of G1 cyclin-dependent kinase activity," *Genes & Development* 9 (1995): 2873-2887.

would] look at me. So, oh, that was bad for [James] because it signifies that, okay, I'm leading this, right. We're getting close to publishing, thinking we're going to send this to *Cell*. We actually did. We went to *Genes & Development*. He was already a postdoc for like three, four years. He was thinking he needed to get out and feed his family; he hasn't had a big breakthrough; he was just in the process of publishing an *MCB* [*Molecular Cell Biology*] paper, but, you know, it's hard to get a job with an *MCB* paper.[7] That was going on at the same time.

Joe calls me one day to his office. He's standing up. We didn't even have a chance to sit down. It was, like, a three-minute, most important meeting we had. He says, "Well, James came and talked to me." And we were pretty close, James [and I]; it was a little tainted by that, but…[Nevins said,] "Well, he came and talked to me. I wanted to run this by you. I want to know what you think or what you feel about this. He's getting ready to leave. He would really need this paper, and what do you think if he would be first author, and you're second author; say that it's equal contribution, something like that." I thought about it, instantaneously. You know, you can imagine that as we're going through, I was pretty sure I was going to be first author on that, right. I said, "Yes, great. Is there anything else?" He smiled like I never seen him smile. He was relieved. He was probably tense about this whole situation. Now I realize that he was probably tense because I get into those situations myself. […] And as he was walking back to his office, walking back to his desk, he says, "Well, Gustavo, in the end you may not know, that is what I say about you" and/or me and postdocs, I don't know his exact word, "and that lasts a lot longer than you can count papers." Great, I had already made my decision, anyway. It was quick.

We continued to work and publish together after that. I was a little more careful in the sense that I would have liked to have heard that directly from James, not from Joe. But so be it, you know, he had his pressures. People do things differently. That was that. But it was great and [I] never looked back. I just kept going, like, crazy, out loud. I didn't have any responsibilities other than to do science and my family. The resources were endless. It was Howard Hughes, well funded. So, it was a lot of fun. I got along with just about everybody. Even though there was some…it was competitive for sure. Definitely, it was a competitive lab.

CARUSO: Any physical fighting in that lab?

LEONE: No, but I've made a girl cry. I remember her. She's a good friend now and a very good scientist. But it's a big lab. Howard Hughes, eighteen postdocs, it was usually…even in that scenario, there were only two or three that were really putting out good stuff, so everyone wants a piece of it. Sometimes you have to be tough. Sometimes it's just fear and lack of communication and so on. But, no, I don't know that there was any fighting that I'd seen. I wasn't involved in any. But clearly interesting historical events that have occurred that people still remember.

[7] J. DeGregori, T. Kowalik, and J.R. Nevins, "Cellular targets for activation by the E2F1 transcription factor include DNA synthesis- and G1/S-regulatory genes," *Mol Cell Biol*. 15(8) (1995):4215-24.

There was a postdoc right across from me. I really liked her, Diane. She's a professor now at—I haven't talked to her in a long, long time—South Carolina. Very smart, very unorganized, and was really having a hard time getting things done in the lab, and Joe, kind of, had it up to here. She's loud and complains. Joe is not into that, and gives her two seconds today to change it, right. And she and I got along very well. She was pretty feisty and spicy, and we get along pretty well. I was helping her out a lot. I was giving her all these adenoviruses I'd just generated, and so, at one point, she was…I don't know what got her wrong, it was a bad day, I don't know. […] And I said something about…I probably said something that wasn't quite right. She was very sensitive about this, and she started yelling at me about being such an elitist, and, "You have it all good, and you're publishing, and you suck. You're an asshole." […] She was very mouthy, okay, and vulgar. I'm fine. I'd been yelled at before. So, I let her have a piece of my mind, and I decided well, this isn't going to go anywhere. I'm going to go for a walk. So, I said, "Okay, Diane, I'll see ya." I left for two, three hours, went to work out. [I] said, "To hell with this, I'll come back later in the afternoon and work." I came back and my whole bench, it was…you can see through the bottles. Well, she had wallpapered the whole thing, so we couldn't see across each other. She had the paper cloth, the blue ribbon, absorbent, whatever. She had taken everything off, put it all up, taped it, whatever, stapled it.

Up above where we used to have a bench, a desk at the end that we would face each other, except there was a little cork-board, well we could [look around it] and talk to each other. She had it all the way up to the ceiling. I came back. People had realized this was going on, they were waiting to see what I would do when I would come back. I looked at and went, "Uhhh, pretty interesting." I said, "Oh, shit. I wonder what Joe's going to say about this," because it was obvious. Joe walks by the hallway door, going to different parts of his lab. He always looks at this, everything he looks, I don't know if this is natural. I'm not sure if he was checking whether we were working or not, but, you know, he's outside. Maybe he says, "Hi." You can hear his walk because he doesn't wear running [shoes] like I do, he wears these…not like that either, but leather, so, like, clack, clack, clack, clack; you can hear his step walking down the hallway. He looks. Walks back and looks. Goes to his office, there was never anything said to me about it. This technician named Laslo, very good buddy of mine, and he's always laughing about it. He talks to Joe. I was very interested. There were some things, but we got along fine. I took it down after about…I think we cooled down after about three weeks. She realized it wasn't worth it. We got along fine after that. So, there were things and events going on there, that's for sure.

CARUSO: Were you exposed…I mean, being a H.H.—Howard Hughes—Medical Investigator clearly a very prestigious award to have, you had received the Medical Research Council Fellowship from Canada, which was a very competitive fellowship as well. At this point, you had your, I don't want to call it an incident, but you had the discussion over authorship. Were you now seeing a bit more what being a principal investigator was like? Were you being…?

LEONE: Not yet.

CARUSO: Not yet. So, you were still, sort of…

LEONE: Yes, honeymoon.

CARUSO: Honeymoon. Okay. At any point during your postdoc career, did you start to…?

LEONE: Yes, last six months.

CARUSO: Last six months.

LEONE: When the last year and a half, maybe, when James was leaving; then, when I was thinking about leaving and interviewing places, and started writing my own grants. So, I actually wrote my grant, my first R01 [National Institutes of Health Project Grant Program] I wrote in Joe's lab. I don't know how he let me, because, again, it's one of those things that you're productive…I wrote it and I was getting nervous. I was thinking, "Oh, shit. I have to do this." […] I was thinking, "I have to buy stuff. I've got to get bottles to put liquids in, what liquids? Salts, got to start." So, I started paying attention, I started paying attention to how Joe runs his lab meetings. I started paying attention to behaviors of just the whole thing. But, you know, it was a pretty intense lab. I learned a lot in the lab technically and also a lot from Joe personally. I also learned a lot…I mean, it was a very interesting genetics department. There were very smart people. I was always so impressed every time we had a seminar, the questions that were asked. It was intense: "That's a damn good question." It was just so brutal, you know, critical about stuff, it just pinpointed just the right…and I learned a lot from that kind of continuous quality of science. Then there were obviously people […] invited to give talks and seminars. I just wasn't used to that in Calgary. I don't know why. I was too involved in my own work, or maybe it just wasn't there. At that level, I didn't experience it before. That was really, really ingrained in what it takes to be a professor. This is the kind of thinking, and I'd never had it. I never had it as postdoc. You learn a lot when you become a PI. You start thinking, "Wow." You learn the stuff; it's another path, but now it becomes important, and you learn a huge amount of science in the first few years when you're a PI. I learned how to think more critically as a result of being a postdoc. So, I guess now people think I always ask the hard questions.

But, no, it was really a phenomenal time. We did a lot of fun things too, as a postdoc. I worked very hard, but I still worked out. My wife is very physical and likes to do athletic things, and we worked out together. She ran. She still runs. We run together. We played volleyball together. We had a volleyball team in Nevins' lab. We had a volleyball team. We

had a sand court, and so we played some of the other labs. We did that and that was kind of fun. We would travel to Canada every year because […] I was on this TN [Trade NAFTA] Visa, trade, free trade type of visa. I had to get it renewed every year. I had to physically go to Canada every year, so we made it a road trip; the whole family would go, kids, and get in the truck, and we'd just drive from there to the shortest place, usually Niagara Falls or one of the other places. Go across, basically get stamped and come back. That's why we went to Gettysburg, [Pennsylvania], and stop a couple days, maybe a three-day trip or something like that, four days. That was always fun. We'd visit back to Canada maybe twice, flew back to Calgary, I think once, maybe. Family would come over. And I guess my wife thought that things are going well for me and that we would maybe get a position and move back to Canada, which I thought I was—I had a position in Calgary, actually, it was offered—and that things would change. They didn't.

CARUSO: Okay. Well, that might be a good stopping point for today. We can pick up with professorship and other items tomorrow.

LEONE: Wow, I haven't talked about myself for so long. This is very interesting. It's fun. You really get caught up in your life. You don't normally think about it.

CARUSO: A lot of people have very interesting stories, but when you reflect on it just by yourself, it usually is just a fleeting moment. It's when you start talking about it…

LEONE: I bet that it's probably really interesting for you, I mean, not because my story's interesting, but the dynamics of twenty different stories that are different. I don't know how long this…it must take a lot of huge effort because obviously, you're well prepared; and, kind of, interesting how it makes other people tick. It must be fascinating, actually.

CARUSO: Yes. I mean, you mentioned that early on that you can't see, or in some ways, you don't really think of your job as a job, right. It's a fun thing to do. I get to go around talking to people about things that I'm interested in, but they're also interested in. So, it's a little difficult being away from my family, but at least when I am away, I'm not just hammering some nail over and over, but I'm doing something that's interesting to me as well. Let me turn this off.

LEONE: Yep.

[END OF AUDIO, FILE 1.2]

[END OF INTERVIEW]

INTERVIEWEE: **Gustavo Leone**

INTERVIEWER: **David J. Caruso**

LOCATION: **Ohio State University Medical Center**
Columbus, Ohio

DATE: **24 October 2008**

CARUSO: Today is 24 October 2008, and this is the second session of the Pew Biomedical Scholar Oral History Project. We are still at Ohio State. So, I'm just going to start off with a quick review of some of your accomplishments during your postdoctoral career. From what I understand, you are—and of course, some of this work was done with James as well—you utilized a recombinant adenovirus containing E2F1 cDNA in order to express the protein in quiescent cells and then measure the effects on cellular gene expression and cell cyclin progression. E2F accumulation appears to be a critical event of G1 controlling the passage of cells into S phase. You generated a series of recombinant viruses encoding various cell cyclin regulatory genes to investigate the role of G1 regulatory activities in the cell cycle progression. You suggested a complex interaction between regulatory pathways previously shown to be associated with cell proliferation control providing molecular mechanism for the cooperative action of Myc and Ras in oncogenic transformation. Is that a relatively good…

LEONE: Yes.

CARUSO: …assessment of what you accomplished? Plus, a lot of this came out in journal articles that you wrote, that you worked on. You mentioned that you saw that one of your fellow postdocs was making his way out. You started to think about making your way out of Dr. Nevins' lab. You had a family. You had children. You had lots of considerations. What did you start to think about and where did you want to apply to near the end of your postdoc career for a principal investigator position?

LEONE: Right. So, the where first: I guess I had an idea that I wasn't going to go back to Canada and be a Canadian. I am Canadian, not born in Canada, but I'm a Canadian citizen. Already, University of Calgary had been talking to me for about a year previously—year and a half—to see what I was doing, to recruit me back to Alberta and Calgary. Also, as part of that recruitment, I had to write grants that would be startup packages at the provincial level and so on. I was pretty sure I was going to go back to Canada, likely to Calgary, but I also interviewed in other universities in Canada. I had offers from other universities in Canada. One way or another I was going to go back to Canada. Then, as I'm getting…everything is pretty much finalized. It took a long time to get startup packages, at least from University of Calgary. It was

the most attractive. Then Joe Nevins, my mentor asked me, "So what is it that you're doing anyways?" I was thinking, "Well, I think I'm going to go to Calgary." He looked at me and says, "Why? Science is dead in Canada." I was just, like, wow. I mean, Joe is a very not opinionated person. For him to say that, kind of, was a slap in the face and made me think, "Well, am I doing the right thing?" I second-guessed everything I was thinking about. He says, "Why don't you just apply to a few places in the U.S. and see what happens? Then you can make your decision." That made me, "Okay, fine." I applied to a few other places. I think, I don't know, I sent six, seven applications, not the typical forty, fifty, hit everything possible that moves. I had a few interviews…three interviews, four interviews. One of them was here at OSU. It was just incredibly attractive. They were very…I'd fly home back to Duke after the interview, within two days they called me back for a second interview for the family to come. We flew back in three weeks, came back home, and I had an offer actually before I even had left and knew exactly what they were going to give me. It didn't take a year and a half or two years like it did in Calgary, [where] it was really just painfully slow, everything I would need to go and set up a lab. It was just very dragged out. I thought, "Wow, these guys have a lot of confidence. They have a lot of funds, and maybe this would be the right place." And there were faculty that were here that were doing work that was interesting to me. Together with that, they paid me more money here, and it seemed to be more attractive scientifically. Joe also thought that this would be a good place. I decided to come here. So, that's kind of the "where," and it happened pretty quick. I think I interviewed in the summer, made the decision in October. I moved here in January.

CARUSO: How did your family feel about it: your immediate family, your extended family?

LEONE: I think my extended family, folks back in Calgary, in Canada were, "Oh, it's too bad you're not coming back," but they're pretty supportive. They know this is important. Science is important in my life. They thought there are probably more opportunities here anyways, so they thought that was fine. My immediate family, they were excited. They were excited to travel and visit a couple of places and be in a hotel and stuff like that, very short, you know, my kids. So they thought it was great. This is another adventure for them. For Karen it was a good adventure, too, I think, because she was thinking about how life would change, and it would be a little more stable and maybe work less for me. So, that was it.

Scientifically, I kind of had a pretty good idea what I wanted to do […]. I had two projects that I was going to pursue. One of them fell through and never really worked or never had anybody that made it work, including myself. The other one was to really push forward the field in terms of E2F function and physiological settings. I'd say, by and large, 95 or a higher percent of the work that had been done in cell cycle, even today—maybe it's not quite that high—most of it has been using cell culture systems, highly, highly artificial, [that is number] one; two, using over expression, including adenovirus. I thought that it's difficult to really integrate all these phenotypes, all these effects of these E2F family members of cycle regulators in a concerted way of how the cell cycle may be regulated using these artificial systems. So I definitely wanted to get into the mouse and begin to do genetics. It had begun to really take the

approach of knocking out genes in mouse that were related to this Rb and E2F family members and investigate their functions *in vivo*.

Then all of a sudden my life changed completely because it's new technology. The findings were completely inconsistent with everything that had been published before, in terms of cell culture. At the same time, other people working in Cdk's, for instance cyclin-dependent kinases, cyclins begun to start knocking those genes out and it was very inconsistent with what had been done in cell culture today. Right now, the field in the last two years, from other people's work and our work, has, sort of, begun to say these factors are not exclusively regulated cell cycle. In fact, they have little effect on cell cycle. So, what are they really doing? These are the kinds of questions that we're really addressing now. What are the links of these factors, in terms of regulating cell cycle and how that affects…or other functions? How does that affect development? How does that affect cancer? Because the link to cancer is absolutely solid, because although the mechanism is not understood, these genes like Cdk4, cyclin D1, Rb are mutating into cancers. […] That is the most natural experiment. It's been done for us already just by observing human populations. So, the question is, how do these genes contribute to cancer? I don't think we know. That's one of the questions we're trying to figure out. As a result of going…as a student and as a postdoc working cell culture and over expression systems, we made the switch, and as a result created an area of—not a niche, because a lot of people are doing this—a definite departure from what I was doing as a postdoc in a related field; but technologically, a departure.

CARUSO: Did you wind up taking anything from your postdoctoral time?

LEONE: Yes. I could take anything and everything. Joe was really very good. […] All typical things like plasmids, those kinds of biological reagents I could take. All the adenoviruses I made…I could take everything. There wasn't anything I couldn't take. At that time, Joe wasn't really doing knock-outs, so I didn't have any knock-outs to take. I had started in my last few months that I was working there making constructs to make knock-outs that were then made when I got here. But he was fine with that, because he wasn't going to pursue that. He had begun to do knock-outs for other E2F families, E2F4 for example. He did E2F3 and got many more since then. But even [as] of today, he really hasn't got into that.

CARUSO: So, there wasn't any issue. Some of the people I've spoken with have mentioned that they sat down with their postdoctoral advisor, and they talked about, "Okay, I will work on this area. I will not work on this area. I can take this. I won't take that." Did you ever need to have that…?

LEONE: No. It was very simple, and it's something that I do now. His approach is, "Whatever you want to do is fine with me. You know what we're doing, so if you want to do the same thing, that's up to you; if you want to do something different, great. I don't need to

know. If you want to tell me, that's fine. I will probably find out eventually in some way, that's fine. But the less I know the better." Then I am free—me as a new investigator—I'm free to do whatever I want. He's free to do whatever he wants, because lack of knowledge, then it happens that you're doing the same thing, that's what happens, right. To the extent that he knows what I'm going to do, because I gave him general directions of what I was going to do, he was fine and thought that it's not something he's going to pursue. But he also made it very clear that in a year from now or in two years from now or three years from now, if his research direction told him that this is something he needs to do because of new findings and findings of other postdocs, that he would do it. He wants to feel free to do whatever he wants, also. But he's not going to change directions or pursue something because I have an interesting finding. It would have to come from inside his own [lab]. I thought that's perfectly great. That's super. That gives me a lot of freedom. So, we ended up collaborating. We still collaborate now, not very much, but on very specific points. We've published together and we have provided information, some mice to them, and vice versa.[8] But when we get on the phone and we talk science, we talk about that project. But, other stuff, very generally, [too]. And he says, "Oh, that's fine, sounds great. Let's leave it at that."

CARUSO: So, he left it very open-ended for you, and it's worked out as a good, managed relationship.

LEONE: Yes.

CARUSO: Okay. Yesterday, near the end of the session, you mentioned that, I don't want to say this is a direct quote, but you mentioned something along the lines of you learned a lot in the first three years when you were a principal investigator. Was that statement referring completely to the science, or was it to something about the role that you have to adopt as a principal investigator, as the head of a lab?

LEONE: Well, both. Obviously, as a head of a lab and you never had experience in doing that, other than maybe working with an undergraduate or technician. So that's very interesting; how

[8] G. Leone, R. Sears, E. Huang, R. Rempel, F. Nuckolls, C. Park, P. Giangrande, L. Wu, H.I. Saavedra, S.J. Field, M.A. Thompson, H. Yang, Y. Fujiwara, M.E. Greenberg, S. Orkin, C. Smith, and J.R. Nevins, "Myc requires distinct E2F activities to induce S phase and apoptosis," *Molecular Cell* 8 (2001): 105-113; L. Wu, C. Timmers, M. Baidehi, H.I. Saavedra, L. Sang, G.T. Chong, F. Nuckolls, P. Giangrande, F.A. Wright, S.J. Field, M.E. Greenberg, S. Orkin, J.R. Nevins, M.L. Robinson, and G. Leone, "The E2F1-3 transcription factors are essential for cellular proliferation," *Nature* 414 (2001):457-462; S. Ishida, E. Huang, H. Zuzan, R. Spang, G. Leone, M. West, J.R. Nevins, "Role for E2F in control of both DNA replication and mitotic functions as revealed from DNA micro array analysis," *Mol. Cell. Biol.* 21 (2001): 4684-4699; and J.G. Cook, C. Park, T.W. Burke, G. Leone, J. DeGregori, A. Engel, and J.R. Nevins, "Analysis of Cdc6 function in the assembly of mammalian prereplication complexes," *Proc. Natl. Acad. Sci. (USA*) 99(3) (2002): 1347-1352.

you manage your emotions, how you manage your personality with completely new, different personalities that you need to…you're the boss, in essence.

The responsibility that comes with having a graduate student or a postdoc, you need to be thinking about the science, what they produce, what they publish, but at the same time you need to think about their careers: to what extent are you involved in those careers? And you need to make a conscientious effort. Some people are not. I have to say, Joe was an excellent mentor. He gave me a lot of freedom, as I just told you, to do experiments in the lab and also to take away with me whatever I needed or wanted. But he was definitely removed. He was not involved in—other than writing grants and letters of reference—he was not involved in telling me, "Oh, try this. Think about this," or give me a lot of advice. He gave me very little advice. It was good advice. One of them was, "You're probably going to be the best person in the lab. So, stay in the lab for at least a few years. Don't just, all of a sudden, recruit two or three people and let them do the work, because you're going to be way better than they are. So, stay in the lab." The other is, "Don't compare things to do. Everything is different, and there are good things everywhere. Focus on those good things and expand them." He gave me a suggestion about how to recruit postdocs, which he laughs at it, because it was just a mild suggestion of maybe getting together with a couple of other people with shared interest and advertising. I do it to a complete different scale: I magnified it. We got lots of money to do this from the [Ohio State University Comprehensive] Cancer Center because they liked some of these ideas based on his comments. I never told the people here it's based on his comment. Now, in fact, that's why I was on the phone a little late [for this oral history interview]. This has been going on for six years, but now we've done pretty good job, and they want to pump in tons of money. So, the program is going to move from about four positions to about twenty-four positions.

CARUSO: That's a tremendous increase.

LEONE: Tremendous increase, right. This is going to be a major boost to all our colleagues including, obviously, myself. Those are three pieces of advice that probably lasted thirty seconds on each one of his comments, because he won't repeat himself. Anyway, so that's one of the things that you were talking about, a new role as a PI. I had to learn a lot about that, how to manage people, myself, things you say people pay a lot of attention or some people pay a lot of attention to.

The other is science. I've learned a ton of science. I'm not somebody that…I study for my exams. I forgot most of the stuff. You know, you cram and forget most of it, because it wasn't particularly important to me. I knew a lot about E2Fs and so on, but I think people are asking you questions—students, postdocs, other faculty—and you have this sense of pressure. I need to know this stuff. I need to know the Notch pathway because there are colleagues working on Notch pathway and WIG pathways and *hedgehog* pathways. […] I would read a paper on those topics, great. Then I kind of forgot all the components. That's fine. It gets back to me. I'll learn it again. But now I have to understand that because they're related, and I need to be teaching some of this. It kind of created a pressure to pay attention at seminars. I do not

have time that…I'm still learning at times because some things you don't get enough time, it just needs to be pushed in there.

So, I felt like it was just an amazing learning experience. Technically, the lab…because new technologies we were developing in terms of mouse studies, how to do tumor studies, how to do developmental studies, this is completely foreign…and using animals. How do you manage colonies? We have a ton of mice. We have more mice here than anybody at OSU. Obviously it didn't start that way. It started with two. We have a lot of mice now, a lot of different knock-outs we're mating and so on. That was a big learning curve, technically. But also just overall science, just being able to converse with anybody about anything related to science. That was kind of a learning curve. Then things that you've learned as a graduate student, but especially as a postdoc, come into play even though you didn't realize it. I mentioned one of the things I enjoyed too was the intenseness of the questions of other faculty and how critical they were; mostly good-natured, but nonetheless critical. I sort of learned how to really understand different science other than what I was doing. And one approach to understanding is by asking questions, critical questions, et cetera, and so on. You learn more.

CARUSO: So, in the first few years, how was it attracting postdocs and graduate students to your lab? Were just a lot of people jumping onboard with your research? Was it, sort of, a hit or miss time period?

LEONE: Basically, you're a new investigator, [so] you're desperate. You take anything, and you're not very discriminate. You have no idea what's going to happen. The first five people you met, is that the playing field? Are these the best? Are these the worst? How do you know? So, you're just happy that somebody walked into your door, number one. They walked and breathed. As an interviewer, you have a tendency to look at their positives more than their negatives, because you're really eager to recruit them. That's obviously a mistake, but it's one that I made among others. So, initially, I was successful. I had a reasonable, at the time—now it pales to what startups are for new faculty—but it was a pretty good startup. I had money to recruit one or two postdocs. And graduate students: I had rotation students that wanted to come to my lab. I'm pretty energetic in giving talks, so you sometimes present to the oncoming students. […] There was a, sort of, bias because I was new, and graduate students tend to rotate through new faculty for whatever reason. I'm not sure. Postdocs tend to go to more senior, proven PIs. But I had a few rotation students. They worked out well. I think I recruited maybe two students in the first year. And I had two postdocs in my first year, and that was kind of it. I was in the lab; [I had] a technician. I went through many technicians. Pretty much by the first two years, we got a reputation for being hard-nosed.

CARUSO: Hard-nosed in what sense?

LEONE: Worked extremely hard. Our lights were on all the time in the lab. I pushed these guys really hard, and I expected them to work as hard as I did. […] I was definitely not as laid back; well, this is really important. We worked really hard because of all these reasons. "It's up to you now." That's my attitude now. But then: "I don't care. It's not up to you. You're in my lab. You're working hard, if not, you know, this is not the place for you." So, that's one.

Two, you know, I was in committees, and I was in steering committees and seminars, and I was not complacent in asking questions, so on. People thought that was a good thing, but I'm obviously hard-nosed. So that then, kind of, eliminated a lot of people coming to my lab. But the right people still came to my lab. I still had quite a few students and postdocs that wanted to come to my lab. I worked very hard at recruitment of postdocs through generating this postdoctoral program, for example. At the time, the division that I came into was fairly new, had only been around for a year and a half—Human Cancer Genetics. It was pretty sterile. We were recruiting PIs, and every PI had maybe one or two people working with them, very, very low key. There was no critical mass whatsoever. To me that was a big problem. At some point I met with the director—I think it was over dinner—and I said, "This is a great place. It's brand new, equipment, like, shines, and that means it's not getting worked on. It's not getting worked because we don't have very good students. My postdocs are not enough of them. So we need to have a stimulus of this, and I think we should do it in this particular way." I had a suggestion. The director at the time, Clara [D.] Bloomfield, thought, "Oh, you're right. This is really important, and those are pretty good ideas. Why don't you write it up and send it to me on Monday." This is, like, a Friday night dinner. So I did, and they gave us half a million dollars for over four years or five years.

That was the start of the program that we started recruiting internationally, from Canada, from the U.S., two to four postdocs every year. Some of them went to my lab. Some of them went to my colleagues' labs, and that goes on today. Now they want to expand it to twenty, twenty-four postdocs a year. […] That's what it was like to recruit students and postdocs. Postdocs: the people that came to my lab were very good. They weren't stars, because they didn't have publications in *Science* and so on when they came in, but they were technically very good. I have lots of ideas, and it's a good match. We got a lot of things done. You get lucky, [but sometimes not]. It was devastating. It was a year and a half. We had a knock-out mouse for E2F3. We were just isolating cells from these mice and opened up a *Genes & Development*: E2F3 knock-out. Christ.

CARUSO: Did you have any sense that someone else was working on it?

LEONE: I had an idea that probably somebody else was working on it, but…. So we worked feverishly, but we had the mouse in our hands. It's like having a sandwich right in your mouth. You're looking at it, but you haven't bitten into it, and it comes out in *Genes & Development*. So, "Christ, now what?" […] They didn't look at the mouse very much. They looked more at the cells, which is what we were going to do. That would have been the fastest way to get at some of the functions, the cell culture, but still we'd be the first. We had to then think about

what the results were, what the results we were getting—are they the same or not—and what are the critical questions that we would answer with this.

We decided to now look at combinations of E2F, because it's a big family. Taking one out, it's hard to really put an understanding into what this particular E2F3 does. We combined it with E2F1 knock-out, E2F2 knock-out, to look at, sort of, sets activators versus repressors, transcriptional activators, transcriptional repressors. It worked out well. We had very interesting phenotypes and we published in *Nature* a year after.[9] You know, we held on. We cried…I was devastated for a day. That's the extent of my devastation usually. I go home. I may have a drink or two. Think about it. The morning [after], "That's the way it is." The sun rises, and you're in a different spirit and say, "Hey, this is a battle out of a long period. There's going to be many like this. So what is it we need to do? Let's do it." You can imagine for me to do that, but for students and postdocs, I have to motivate them, too. That's difficult. You get the whip out, and you motivate them like that. But that only helps short term, not long term for sure. But it helped at that point in time. They understood that they were in it too. Their careers were on the line. We worked very hard, got this published in *Nature*, and after that things changed.

First of all they no longer think I'm full of shit, because they think, "Oh, there is a light at the end of the tunnel. Working hard actually does produce stuff." It's not just working hard because I wanted to work hard; it's because we accomplish things together. That was a big change in the lab. Second, you start, obviously, getting a lot of people wanting to come to your lab. So you could be more discriminate in individuals I picked to join the lab. It was a continuous influx of people after that. Every year we had one or two extra postdocs, rotation students that I had to pick one out of eight, nine students. Then our program built, our science expanded. […] I think the lab was very good at making key observations. So I capitalized on those observations and continued to publish in *Nature* and *Cancer Cell* and *Genes & Development*. Once you do it once, then you do it twice, then you do it several times, you know, good publications, then there's an expectation within the lab that that's the kind of work we do. Also, there's an expectation from outside of what we're about. Things get a little bit easier. You get invited to all talks. You get invited to all kinds of symposia. It's easier for grants. It did help. You know, luck is our first paper, right. We could have not been published in *Nature*.

The other is, it was kind of good for funding, at that time, not like now. We had just come off that big dip [in funding] in 1992, 1993, 1994. I think it was…1994, 1995, 1996, 1997, it was very bad funding. Then it had started going up, I think in late 1998, 1999, when I became assistant professor, so I was able to write and get funding. That was great. I really focused initially on my research program in the lab, and this postdoctoral program for the first five years. But since then, I've taken other roles.

[9] L. Wu, C. Timmers, M. Baidehi, H.I. Saavedra, L. Sang, G.T. Chong, F. Nuckolls, P. Giangrande, F.A. Wright, S.J. Field, M.E. Greenberg, S. Orkin, J.R. Nevins, M.L. Robinson, and G. Leone, "The E2F1-3 transcription factors are essential for cellular proliferation," *Nature* 414 (2001): 457-462.

CARUSO: That was actually going to be my next question. Given that you have a finite amount of time in a given day, it sounded like when you were a postdoc, you got to be in the lab doing stuff. When you became a principal investigator, you wanted to be in the lab doing experiments, but you also mentioned that you started having committee meetings and talks to attend. How has your role in the lab changed over time and do you have a new balance between the amount of time that you spend in the lab and the amount of time that you spend in your office, for example?

LEONE: Yes. The answer is yes, and there's no balance. I'm not in the lab at all. I don't pipette. […] I haven't pipetted in years. I look at cells. I use the microscope and work with people and show them how to do some things, sometimes, special cell cycle experiments. They still think I'm pretty good at it. But I'm not really in the lab. I'm totally involved in everybody's projects. I understand inside and out, pretty much, what they're doing. So I'm involved in that science and we have lab meetings. And I walk around the lab and talk to people. You know, I talk a lot, basically. I read a lot, and I write a lot. I still have a lot of meetings.

It's changed quite a bit, a continuous change, because I've come to the realization of a couple of things. First of all, we're curious people, generally, as scientists, I think I'm included. We want to understand things mechanistically: how things work, cells, organisms, and so on. We're obviously curious. But there's just no doubt that I want to cure cancer. Okay. If we don't do that, I think I would consider myself a failure. And we haven't succeeded yet. Not that I think that I'm going to cure all cancers, but I would like to focus on a few and make some real, real dents in that. It may take a few years, that's fine. But we want to do that. If we want to do that, which we do—or I do—I came to realization that I'm not going to be able to do it alone. These are complex diseases. We need to know about physiology and technologies that we have no experience in other than just mouse knock-outs, cell biology, signaling, microscopy, chemistry, and so we need to collaborate. We need to collaborate with the right people, and maybe that is difficult because everybody's got different interests.

What's not there you need to create. We've created programs. I'm the director of a program here. It's called Tumor Microenvironment. It's been going on for now, at least in my mind, for a couple of years. But we just got funding to create this program starting last January; actually; we recruited three faculty this year. We actually have slots for nine faculty and space and startup funds, something in the order of about fifty or twenty million dollars to create this program. Now I'm building not my lab, but a program of which benefits my lab because there's expertise, more expertise that is relevant to what my interests are and my colleagues' interests are. But it doesn't really benefit…if I'm still trying to get a paper out in *Cell* or *Nature*, it doesn't help me that we have a program. It's irrelevant, right.

It's definitely a diversion and people feel that, "Wow, I'm maxed out in time here, and my time with my students and postdoc is more limited." We were meeting today at 10:00 a.m. I knew that, and I wanted to talk to all the students. I said eight o'clock. I don't come normally eight o'clock, but now I've been coming at eight o'clock pretty regularly. I start [saying], "Hey,

you want to meet with me? Eight o'clock or after 6:00 p.m." I have meetings till 6:00 p.m., 7:00 p.m., 8:00 p.m., 9:00 p.m., 10:00 p.m. at night. […] On Saturdays I work until about 4:00 p.m., anytime in the morning until 4:00 p.m. […] That's just the way it is, because during the day, it's steering committee meetings, faculty. I'm one of the leaders of the Ohio State University Cancer Center, what do you call it, steering committee for them. There's about twelve of us in the Cancer Center, and I'm one of them. Then, [I'm the] director of this program, my own lab, postdoctoral program. I also direct this really labor intensive, but I think really important…is mainly geared to junior faculty, but also others take advantage of it—we actually review grants. I'm the director of this committee that reviews grants before they go out. […] Also, I get departmental support, because they've seen how this works. They've seen how some of the borderline faculty that were borderline funded, getting funded, now get funding once they've gone through this review. […] I ask three different faculty to participate for each faculty that we're reviewing. We review their grants. We write it up. We have summaries just like NIH-style [National Institutes of Health] critiques a month and a half before the deadline. Then, we provide that to the faculty, and they use it however they want to use it. It's been very successful. As we recruit more faculty into this program, and implementing that not only to the department, but to this program. So, it takes a lot of effort, but it's very satisfying. It's very satisfying because as soon as you review a paper or review a grant, it becomes part of you. You kind of own it a little bit, and you're rooting for it. The next time you see the student present from that particular lab that work, you feel like you participated in that, to […] a small amount, but nonetheless, [you] participated. That creates a feeling of comradeship and family that we're in it together even with different faculty. That really changes how we see each other. So, that's been really a good investment.

Those are things that are within OSU that sort of diverted my efforts outside of just my research, in part selfishly. Like I said, this started because I realized I cannot do it on my own, I need to reach out; and so this is a way of reaching out and getting things done at OSU that we just didn't have: postdocs; just didn't have the right faculty that we needed; the right infrastructure. So, like I said, if it's not there, either you leave, find it someplace else, or you put the effort in and generate it yourself. Then, of course, like everybody that does reasonably well, you start getting into study sections at NIH, and [American] Cancer Society and those kinds of things are obligations that you need to do, because there are definitely faculty that don't. It's, like, everything: you give or take. You've got lots of R01s from NIH, [therefore] I think you should probably review for NIH. You have a lot of students from OSU, [therefore] you probably should be on their committees and other people's committees and help in that regard as well. It's give and take, and that you need to balance. It's hard to say no. Sometimes you have to say no. I just got this week four requests to review manuscripts.

CARUSO: From journals?

LEONE: Yes, journals: [*Journal of*] *Cell Biology*, *Cancer Research*. I mean, I get them from different ones, *Stem Cell*, *Developmental Cell*. I actually said no. I have four of them I just wrote, I copied and pasted what I said to them. I said, "Not until 5 December." It's just crazy.

I just can't do it. I have two grants of my own to do. I'm backlogged in papers that I'm writing. I'm traveling to Vienna, [Austria], in a couple of weeks, because I agreed a couple of years ago to be a consultant for this institute in Vienna. It's Molecular Biology Institute [Research Institute of Molecular Biology]. They get people from outside to review and to guide them. So I'm doing that. I thought it would be fun, [since] you get to go to Vienna. You don't say no. They're going to fly you there every year, and then you can take…this time I'm not taking any time, but last year I took, like, an extra six days, and I traveled through Spain and England and Tripoli, [Greece], right. That was good. Next year, I'll probably do that again, but not this year, because it's not going to work out in terms of scheduling.

So you start having these other things that are fun, but I think that's my next challenge is how to manage that, how to manage all of this. Then there's the question, is this good enough? Is this what I want to do, or do I need more?

CARUSO: Do you, if you had the chance to do so, would you want to get back in the lab and…?

LEONE: I love doing what I'm doing. I love it. I mean, now you can really think about experiments. What is it you really need to do? Not about what you can do. Not about what can I do before eight o'clock. What can I do with my two hands and…. […] No, you just think. I have people…well, I guess not endless resources, not endless number of people here thought…I mean, I don't know what I have, seven, six, seven postdocs, five students; it's not endless, that's for sure. They're tapped out themselves. But we can now comprehensively address a question or two or three questions and start playing with a couple of things that we've been interested in. And I love that.

CARUSO: So, in essence, the students and the postdocs become your hands in the lab.

LEONE: Oh yeah, totally.

CARUSO: And you just get to play with the data.

LEONE: Yes.

CARUSO: It's, sort of, the true science, I guess. The science isn't about the stuff being done at the bench as much it is the results that come out of it, and thinking about it and processing it and coming up with ideas.

LEONE: I don't know about true science. I mean everything…being at the bench is true science, that's for sure; as small as making a PCR [polymerase chain reaction] work and why it didn't, why it did, the temperature, and all of that. It's just I take it on a different scale, you know. I assume [if] you're going to have a problem with PCR, you can solve it. I'll just look him straight in the eyes [and say], "Go back into the lab and solve it. You got ten people you can ask. You got books." I can give you a few hints showing the data. I'll give you what my gut reaction might be, but it may be right and may be wrong. I don't go into that kind of detail.

But it's important. I realize if that doesn't work…sometimes we have stopped the lab. […] We make our Taq, Taq polymerase for PCRs and genotyping and so on, because it costs a fortune. I would be spending ten thousand dollars a month in just polymerase if I was to buy it; or more, actually. So we make it. We purify it. We grow our bacterium. We purify it. It takes us one column. I invested ten thousand dollars in a few columns, and now it's, like, a fraction of the cost. But all of a sudden, nobody's PCR is working. So, we got to go back, and now we troubleshoot. In cases like that I get involved. I go, "Okay. Let's look at all the data from different people. What are the problems?" And then we try to solve it because it just globally impacts the lab, right. Then I need to be more involved. But if it's one PCR reaction by one person, I don't get involved.

CARUSO: How do you handle…I mean, you mentioned that writing came relatively easy for you after you had that first draft of your first paper that was marked up; you learned, and you didn't necessarily need a lot of feedback thereafter.

LEONE: Right.

CARUSO: What about your students and your postdocs, are they coming to you at the same level of writing skills that you had, or do you need to get more involved with their papers? Or do you…?

LEONE: On the large part, they're not even close.

CARUSO: Okay.

LEONE: I don't know if that's my bias. I've had one student that we spent a lot of time. This is what we do. I ask them to write a draft and to set the figures however they want. Then I look at them, and the first thing I do is the figures, to read and organize the figures. And then they give me a written draft. I read it. If it's somewhat close and reasonable, then we start working together. So, number one, the figures always suck. They have absolutely no artistic composure.

You know, it's just details. Lines don't touch; sometimes they use different font sizes or different font types, and then the margins and the Y-axis, X-axis. There's a big hole in this space and there's a lopsided…. […] The bars are too big, they're too fat, they're too skinny. [...] It's horrible. Partly, you know, I like art. I actually, draw, like this stuff [Leone points to some of his work] and…

CARUSO: Oh, that's yours?

LEONE: Yes. I have all this stuff that I draw. I'm not an artist, because I have friends that are artists and I know the difference. But I guess some people think I'm an artist. So, I must have some qualities of art. But some individuals in my lab just have no clue; the colors are totally…and it's like wow, it's like hitting you left and right. As a result, I spend hours and hours just making it […] just the way you normally see it in *Cell*, right. So that gives them a lot of enthusiasm because their data that looked, kind of, not that good, all of a sudden looks beautiful when I give it back to them. That then stimulates them. That's good.

Then, the writing is…now, once we have a draft that I can read, and I think it's at their best potential, [it could still] be very different. Then we work on it together. We sit together, side-by-side, and they endure my pain, because we go through every sentence and every word, endless times. We start at six o'clock at night. We go until one of us no longer wants to work, right. They know this is happening. It's going to happen over the next two weeks. We get a draft that we feel is reasonable in two weeks or three weeks of writing paragraph by paragraph. Then, it goes back. I let it go for a few days, and they think about it. They give it to their colleagues. They give it to other students. Then I get back on it together again, force myself to polish off whatever I felt wasn't quite right. So, the hope is that next round, next paper—unfortunately, postdocs and students sometimes only publish one or two papers and it's, kind of, like, wow, what an investment here for one other shot, sometimes they publish a lot more—is that the second paper will be a lot better. Thinking back when I was a student, my first draft was totally reshuffled by my PI and so on. The second draft was much better, and after that, there was not that many modifications that were made on those papers I wrote. That has not turned out to be the case.

[…] Jing [Li] for example, we just published a paper in *Developmental Cell* earlier this year that we put a lot of time together.[10] The second paper now we just resubmitted to…which we're just submitting it now, and I thought […] I would have to work very little on it, but I spent a month and a half working on it. So, it's just difficult. It got a lot better in ways of prioritizing the science and the logic, but still, the English is a major, major issue. Then, I had another student that we spent a lot of time on one of her papers. She's in *Development*, and […] she learned a lot. By the end of that same paper, she was correcting me, right: "No, this word,

[10] J. Li, C. Ran, E. Li, F. Gordon, G. Comstock, H. Siddiqui, W. Cleghorn, H-Z. Chen, K. Kornacker, G-C. Liu, S. Pandit, M. Khanizadeh, M. Weinstein, G. Leone, and A. de Bruin, "Synergistic function of E2F7and E2F8 is essential for cell survival and embryonic development," *Devel. Cell* 14 (2008): 62-75.

and this, this, and we really mean that." Then we had another paper soon afterwards, she did the figures, everything, and she was, like, anal about everything. I really didn't have to do anything. Now she gave me another draft. She's actually left for Harvard, but she gave me a draft of her last paper. I have to say, one day, a few hours in that day. That's how much time I spent on it, and it's ready to go. We're waiting for another paper, so we can send it back-to-back. Wow, and really well written, you know, I still made some changes and stuff, but it's, wow. That has really benefited me, hopefully them. I heard back from people, postdocs that have left my lab and now are assistant professors in different places. Like Michelle and Allen Utricht], then Harold [I. Saavedra] at Emory [University] and so on, that that painful sitting down and writing was a huge help for them. Because we do two things: one is that they got to know how I thought really, the logic of things; the other was that we talked critically about every part of that science of that experiment. We got into side conversations that dealt with that, why'd you do differently, what would we expect as criticism. So, we have to criticize it ourselves. That was very helpful […].

That investment benefits me to some degree, but I think in the end, it's good for them. I think that's kind of important. I enjoy it. I have to say, I enjoy writing, and it's kind of painful sometimes; if you feel good about it at the end […] you have to like writing. If you don't, you don't. For some people they really don't…it's, kind of, like pulling teeth. They do all this work, and in some ways, if it's not going to get published, it's kind of okay with them because they don't want to write it.

CARUSO: You mentioned some issues with people being sloppy with their figures. You mentioned some problems with logic. You also gave this category of problems with English. Do you mean that they don't know the subject and the verb don't agree? They don't know how to use semicolons, don't know how to maintain tense in sentence and paragraphs? Is that the sort of English problems?

LEONE: Yes. The English problems, they're using the wrong words.

CARUSO: They don't have the meanings.

LEONE: Yes, just sentence structure, like, would be six sentences put into one; "which" and "therefore" and "thus" all in one, you know. So, that's one. The other is a little more artistic, in the sense that in some ways, we want to make a point here, right. You can present the data, but you want to make a point. You can accentuate points depending on how you phrase it. All kinds of things you learn in literature as an undergrad…repetition. Repetition is bad because it's monotonous. But repetition can make a point in a very pronounced way. You start by saying, "There are several reasons why X, Y and Z. Number one, boom. Number two, boom. Number three…." Wow, you hit them […and] you really made a point. It's not particularly exciting doing it that way, but in that particular instance, it serves a particular purpose. So,

sentence structure; when to use a variety of sentence styles; when to use repetition in certain ways. So you compose two parts of a sentence in the same way, in the following sentence, so it's easier to read. One is meaning. One is how to make it easier to read. So, they're not scratching their heads to digest this one sentence, right, going "What does that guy mean?" You think about it. You read it ten times. That's not good. It may be right, and it may be grammatically right, but it's not useful. […] That is hard, and it takes time. It's hard for me. I mean, I really work on it. I take that sentence and rewrite it. If it doesn't feel good, I keep playing around with it. Grammar, I can help with people. I'm not bad, but I'm not particularly good either. I have some Asian students that […] they know the grammar really well. They know this is not right because of this and this reason. I go, "Yeah, you're right. So, let's find another way of doing this," because sometimes the correct grammatical way of writing is also not necessarily the most pleasing to the ear, so we need to compromise.

CARUSO: I guess part of the reason I asked is just from my own experiences as an undergraduate and also teaching undergraduates, writing seems to be one of the most deficient categories in terms of undergraduate skills. When I was an engineer, they required six credits of writing intensive courses, and as long as I completed that, I apparently knew how to write; I could be an engineer. Do you have any interactions with undergraduates, in terms of teaching?

LEONE: Yes.

CARUSO: So, you have a normal course load, or just occasional lecture shifts?

LEONE: Okay, I see what you mean. I don't teach undergraduates in classrooms. I give one lecture or two lectures a year. But it's more research-focused for advanced undergraduates. […] I teach graduate courses, sort of Ph.D. students in classrooms; not a lot, but I teach some. But I have a lot of interaction with undergraduate students because we have approximately fourteen, fifteen undergraduates working in the lab.

CARUSO: Oh, wow, that's a lot.

LEONE: That's a lot.

CARUSO: I mean, roughly the same number of postdocs.

LEONE: Yes. It's, again, the biggest undergraduate program on campus. […] I took what Joe told me. He said, "Every place has a different advantage. Don't think, 'Oh, it's lacking this.'

Well, fine, it may be, but it has this, and take advantage of that." This one thing here—it's amazing—we have a huge undergraduate campus, if not the biggest, one of the biggest in the country, of which there's a spectrum of students. But the honor programs are very large. They're very, very good students. We have biology, microbiology, molecular genetics, honor programs. I recruit from all of them to do research. They start usually in their second year, sometimes if they're really sharp in their first year. Occasionally, I take students in their third year, and they go all the way to the fourth year. They get a thesis, if they want to. Or they're authors in a publication. We put a lot of effort in training them, and we get a lot back. Of course, I'm not teaching the students, so I match up a graduate student with an undergraduate, postdoc with an undergraduate. Some postdocs have two, three undergraduates. Some have none. I can see who's good at teaching, and who's not; also who wants one or not.

It turns out they all want now, because they've realized with mouse genetics, and it's a lot of work. They can't handle two or three projects unless they get some help. This allows them to be more productive in the lab. The other [reason] is it also gives them an opportunity to teach, and I have a lot of fun with undergraduates because, wow […] they think it's great. They don't argue with you on everything. I have different conversations, and it's stimulating to me. You see them young, and they don't know how to hold a pipette. They leave having done Western [blots], Southern [blots], generating constants for knock-outs and doing pathology, anatomy; they know the anatomy way better than I do in these mice, because they do it inside out, every second day, you know. So, it's been satisfying because all our students have gone to medical school, MD/PhD programs, PhD programs, clinical genetic programs. They've done really well. So they keep coming. We have this rotation for training and pushing our students to really good programs afterwards, once they leave the undergraduate and get a bachelor's [degree] from OSU. And it's been fun. Time management: again, I don't meet with undergraduates until after 6:00 p.m. That's it…or on Saturdays. Then, once a month they present. On Sundays, they present; we have two hours at 6:00 p.m., and they come in and two of the undergraduates present every month.

CARUSO: Oh, wow.

LEONE: So, they present their…it's PowerPoint. It's only undergraduates and I, no postdocs…

CARUSO: No postdocs, no grad students.

LEONE: Yes, we have pizza and Coke. They present, and I ask a lot of questions. Other students ask a lot of questions. Some of them are in the first year. Some of them are in their third year, so it's a big spectrum. It's a little bit of pressure. They like it and learn how to present. I have fun. I think it works out pretty well. I'm always recruiting undergraduates, because there's always one or two that are graduating. It's good. I enjoy it.

CARUSO: One question, and this is taking a few things that you said yesterday about your own childhood, and you mentioned your son, who's started college: Did you ever bring your children to work with you to show them what lab life was like? Did they get interested in doing experiments and things like that, or was that something that they just weren't into?

LEONE: No. I don't think they're totally into it. I've made my kids—both of them—work. But they were like sitting in my office, labeling file folders and stuff. They really like to do that, especially when they were like six or seven or eight, right. I've got weekends to do that. My son actually helped me when I moved here, because I had piles of frozen cells that I had brought from Joe's lab. And I had to take them out quickly and put them into liquid nitrogen, et cetera, and write down what they were. So, he, kind of, logged everything. He wrote everything. He was great. He was really good. I just moved things. I said, "TR15, da-da-da," "TR15." It was really very helpful. That's the extent of what they were involved. I don't think my son is really biologically interested in biological science. He's very smart, but he's interested in engineering. He's doing computer engineering at Purdue [University] now.

My daughter is a little younger. She's in grade nine now. She asks about experiments. What are we doing? I tell her, and she asks questions, very, very good questions. So, she had that inclination. I haven't asked her. I said, "One day if you want to go into the lab and work a summer, maybe I can get some funding for you." "That's fine." I don't even know if it's legal. But she's fourteen and a half. Maybe it's legal now. I don't know whether…

CARUSO: She needs, here [in the United States, a] working permit, otherwise it'll be fine.

LEONE: Working permit, all right, thank you. But, you know, I'm not sure that she will do that. I think she has her friends, and she has other interests. She's a girl and her interactions with her dad go up to a certain point.

CARUSO: Okay. I was just curious, because actually most of the other Scholars who have children, some of them were in their father's labs or parent's labs, and they really enjoyed it. It's sort of what got them involved in science. I think I haven't encountered a single Pew Scholar whose child came into his or her lab, enjoyed it, and then wanted to go into science. It's just sort of a side phenomenon that I've been looking at generally.

LEONE: I think the options are so different now than they were ten, twenty years ago. They got so many things kids can do, right. Being in a lab is not necessarily the most attractive role. [laughter]

CARUSO: You mean working twelve and sixteen hour days, that's not necessarily…so, I guess what I'd like to talk a little bit about—well, it might be a little more than a little based on your responses—when you first got here, you had been working on grants for Calgary, so you had experience in grant writing. You come in to the university with your own startup package, but part of being a scientist, especially in the United States, is obtaining outside funding. So, within your first few years, I know that you obtained an R01 from the National Cancer Institute. But you were also probably writing other grants. Before coming to Ohio State, did you know about the Pew Scholars Program in the Biomedical Sciences? Had you heard of anyone who received the award? Had you heard about that award being advertised?

LEONE: No. I didn't know anything about it until I received that [application], and I thought, "Oh, I should probably apply for that." But then again, I wasn't very astute in paying attention to those things before. In retrospect, one of the things that I did in North Carolina was listen to NPR [National Public Radio], which I didn't have in Canada. And I loved it. I thought it was the greatest thing. Of course, every time they talk about, "And funded by the Pew Foundation [The Pew Charitable Trusts], ta-da-da-da," and maybe there was Ellison something [Medical] Foundation and so on. So now I say, "Oh, yeah, I heard that before. So, that's what it is."

Then this came up; it was really interesting; I just kind of never thought I'd really, really get it. I hypothesized and thought about things, directions I wanted to go with doing the Microenvironment, which is what the program is now called, Tumor Microenvironment. So, in some ways, it gave birth to all this science that we're actually doing that the fruit of which is just coming to bear now, many, many years after we got this award. But it gave me a lot of confidence. That idea was funded by them. I got some of it done. That idea then…I planted seeds in a number of colleagues; we met for a year and a half to two to talk about these ideas and the right amount of data. We got a program project funded, like, nine million dollars worth of funding within a group of investigators for this. This was the basis for it, Tumor Microenvironment, on what I had originally hypothesized to the Pew Foundation. We continued to get other funding for it. We have now a program with recruiting faculty and the Ohio State University Cancer Center is giving us a floor, all this kind of stuff.

Now that I think about it, I hadn't thought about it now in that way. […] I don't know what they're funding now, but I think they funded…they gave me sixty thousand dollars a year for four years. It seemed like a lot of money at the time, but now it's not a ton of money. But it's the confidence, you know, and the fact that I could hire a postdoc with that. There was just this amazing confidence that, "We have confidence that you can do it." God, I better do it.

CARUSO: Do you remember much about the application process? Was this something that, like, a chairman handed down to you and said you should apply for it?

LEONE: Nobody at OSU had ever…maybe [someone] applied but never since…even…nobody's gotten a Pew Foundation Award [before or since me]. So, nobody had any experience with this. I looked at it. I read the home page, and I kind of got a feel for the philosophy. I decided to write something I really wanted to do, whether it was feasible or not, or whether I had a lot of preliminary data, which I had none essentially. I didn't care. "I'm going to wing it and go with their philosophy of new things that normally wouldn't get funded anywhere else," which a lot of these enterprises, foundations often say, but often what they fund is still the logical stuff. Since I didn't feel like I was totally dependent on this, and I didn't feel like…I don't know, I was adventurous that day. I don't know. I said, "I'm just going to do this." You know, obviously, I put a lot of thought into it. So, I just did it on my own.

CARUSO: So, again…

LEONE: I had help.

CARUSO: You did. From…?

LEONE: Yes, I'm sure. I'm sure whoever reviewed my…at the time who was on the Board of the Pew, which I didn't know at the time. I mean, I'm not very savvy; you know, people submit grants and they look out at members and study sections. I don't care. I can't be bothered. I just send it. But, in study section, you think is in the right place, I just worry about the science. I have too many things to worry about like that. I never looked who was in the Pew Foundation Board. It turns out there aren't many that are associated with what I do. There are a lot of crystallographers, a lot of neuro people, which is not what I do at all, but at the time there were a couple of people like Chuck [Charles J.] Sherr. I'm sure Chuck Sherr had something to do with it. He's a very good scientist, well reputed. He knew of my work. He probably reviewed some of my work as a postdoc. I don't know for sure, but I suspected that he had something to do with it. You know, you get help.

CARUSO: Okay. So, from my understanding of your application, the broad thing you were interested in is tumor models for breast cancer. You discussed the role of E2F within the microenvironment of mammary tumors. Tumor biogenesis results from a series of complex interactions between the tumor cell and the surrounding cellular microenvironment. The long-term goals that you sort of mentioned briefly in the application were that you wanted to study, at the molecular level, the interactions which impact on the control of the cell cycle, cell death, cell proliferation of tumor cells. You had, I think, two project aims: you proposed to use unique genetic reagents to explore and define the role of E2Fs in Myc- and Tag-driven mammary tumor genesis and determine the role of E2F for controlling stromal cell growth and the impact this genetically-defined stromal compartment has on tumor initiation, maintenance, and metastasis. One hypothesis that you sort of highlighted in the application was that the microenvironment of

the given tissue with interactions between the different cell types contribute strongly to the evolution of neoplasms. […] You mentioned that this was the beginning of your work. Is that a pretty good description?

LEONE: Of what it was.

CARUSO: Of what it was, yeah.

LEONE: So, essentially, because I haven't looked back at that application, what I proposed originally, the main focus out of what we actually did from that is to develop the model to genetically alter genes, any genes, not just E2F in the stroma and ask, "How do they contribute to the neoplasms?" The central idea of what we want to ask is absolutely still it. There's tons of work that needs to be done by us and many others. In fact, there's now programs in NCI that are doing microenvironment genetics and so on, pretty much. So, that's pretty good. We were starting this early, at a good time, probably foresaw that this was coming up.

[…] Most of our work is really focused on p10, another tumor suppressor in the microenvironment, not E2F, but that's just the way the science has taken us. Yes, I think the idea here is that the tumor's complex. It's a tissue, and it's not just a tumor cell. It's a whole tissue that is interacting with each other. You can't have a tumor without blood vessels. You can't have the tumor without macrophages. You can't have a tumor without fibroblast coming along with it, because they provide nutrients, signaling, et cetera, between each other. It's essential. So understanding that complexity is really understanding cancer. We cannot study it, but you're not going to understand cancer. We thought it's kind of complex. Nobody's doing genetics on this. A lot of pathology people have thought about this a lot before, but it's always morphological pathology, very descriptive. We decided it might be difficult, but it needs to be done, so we might as well get started. So that was the approach and we continue to do that.

One of my new goals—I probably foresaw it then—is to understand…any time there's saline between two cells, it has to go outside. That is an opportune time to interfere, a lot easier than targeting specific cells and gene targeting, et cetera, which I don't think is really going to work. So, understanding this would give us opportunities to inhibit or promote certain processes that are extracellular and help or alleviate cancer progression. That's our idea. Identifying those key components and then using different approaches to target them is what we're definitely going to go together as a program, so a lot of chemistry, a lot of genetics.

CARUSO: You mentioned earlier that the financial amount for the Pew Award on a comparative scale really isn't all that much, right. You had your R01 grant. Was there something significant about receiving the Pew Award other than just an acknowledgment that you had some good ideas? Was there some value to being named a Pew Scholar? Was there some value to being a Pew Scholar? The interactions with other Pew Scholars?

LEONE: You know, it's probably different on an individual basis, and I'm sure that there are a number of Pew Scholars that have gotten incredible value interacting with other Pew Scholars, mainly because there's a concentration of science that is neurobiology, crystallography, and even virology. There aren't that many cancer—there's development, but very different kind of developmental than what we do—people in the Pew. So, I didn't get a lot of collaborations between Pew Scholars. A lot of my benefits were confidence, that people are looking at me, and there are expectations, and that I should try to achieve those expectations. There's that. Huge benefit within, not in the world of Pew and nationwide, but outside, right, on the inside here, it's a big deal that I'm a Pew Scholar. I mean, when we received it, I was the only one. It's a big deal. That helped me in many ways here in people getting confidence in me, which I guess, to some degree, students, postdocs, and so on. There is definitely a palpable benefit internally here at OSU. I think nationwide, too, people invite you for seminars, and they say, "Oh, he's a Pew Scholar." They mention it. I think that's important.

It's been socially…and a real nice retreat to go away for a week someplace where you're still doing science and thinking about it, but it's very relaxed. […] We don't take holidays that much, so this is like a breather; still doing some science, but a breather—people around you that make you feel good, incredible resorts. You hear interesting talks. They give you different perspectives, because there's always one or two different focus. They invite people from *Science*, for example, how to get things published. They have different discussions and discussion panels, whether it be about NIH funding, education, undergraduate education, nationwide, across the country, across the world. What are the health issues of the world? They talk about different social issues that are really interesting, really important. So that's always stimulating. It gets you a little bit out of your domain, which is really very good. There are a lot of Pew Scholars, so even if you don't necessarily do collaborations, you visit different places, and there's a Pew Scholar there. There's a certain association, you know them, and fine, go to dinner with them, that kind of thing. That kind of relationship is always healthy.

CARUSO: Would you have interest in going back to the—they're not annual meetings—reunion meetings?

LEONE: Oh, definitely.

CARUSO: Okay.

LEONE: It's always nice to see how your other colleagues have done. What they're up to, how many gray hairs they have. [laughter] You know, so absolutely.

CARUSO: Okay. […] I only have a couple of questions left, but based on some of what you were describing today, it sounds like, with some of the programs that you're developing here, you mentioned that your lab works on one thing, but in order to truly understand the problem, you need to talk to other people in other fields. So, you're trying to bring those people together to talk to each other. Do you find that the scientific lifestyle generally is not amenable to that collaborative process? I know a lot of people have spoken to me about, "Well, I have my lab. I have my work. Well, it might be nice to go and talk to an x-ray crystallographer about this; I don't necessarily have the time," or sort of a reluctance to do so because, "Well, then I might be leaking information that I'm working on. So, maybe I could get scooped because of it."

LEONE: Sure.

CARUSO: Do you see that?

LEONE: Yes, of course you see that. I don't worry about that. You know, come on. If my success has to be dependent on whether I tell you something or not, that's pretty sad, right. That means I have one idea. I might as well just go home. And I've been scooped before. I've said things, and people have seen it. But I've received a lot more. So, usually when I give talks, I'd say 80 percent is non-published. My students get worried, "Oh no, you're talking. We haven't submitted it." I go, "Guys, how many times I come back and tell you, this is the criticism. These are the comments. We should do this, this, and that, and that made that story better, and we published them." Obviously, we're still publishing in good journals, better journals as time goes through, more often.

[…] We benefit more than what we lose. That's my feeling, my overall philosophy. Until proven wrong I will continue with that, because I think it's healthy, it's more fun. If I'm always hiding and secretive, it's not fun. I like to talk about science, so it's just not fun. […] I don't think that's necessarily [true]; it may be true in Harvard. It may be true in other places. That's maybe something unique about what they always do here; maybe there are many campuses like this. I don't know. But I know that certainly there is a feeling about—I'm not sure of the majority, but many scientists—about being scooped and about, "I don't have enough time," and all that, and this is absolutely true. There's not enough time. But I find that I want to learn and I want to get involved in the other things, just talking is interesting, to talk to all the people in different fields. But what I'm really interested in is actually not talking, it's doing. You cannot do it unless you're in close proximity. So, it has to be a real interest and a common goal, which is not…just because we want to collaborate—you and I, David—we're not going to collaborate because you work in something that's related. We need to have a common goal. If we have a common goal, then we need to make a decision. You have a good idea or I have a good idea, we need to put it into action.

It's hard to put into action, unless you do something about it. What does that mean? Well, if I ask one of my students because I'm not at the bench anymore, or one of my postdocs,

"Let's do this experiment," well, that really detracts from their work, that they have their own goals. You can do that a little bit, but it's hard to move something forward. So, I think the way to really collaborate is to get resources, so that now you have shared projects, seed money from shared projects, so you can actually have funds to recruit a new student, a new postdoc that is a co-mentor, for example. There's a real focus in getting things to move forward. That's hard to do at a distance. If two co-mentors are on the same floor or at least the very same building, you can co-mentor a student or postdoc reasonably well. If you're talking about different parts of the campuses or different places, it's just more difficult, especially with the size of this kind of campus. Bringing together [collaborators] physically does help a lot. It doesn't ensure that things will happen, but you got to foster that. You got to foster by having this…there's no point in bringing labs together in the same floor, two floors, and you create this idea that I'm not going to talk about anything that's not published. You just defeated the whole purpose. You have to, sort of, bring in people that think in a way that you do, that are open, and that takes sometimes for them to change, because they have come from areas that…

CARUSO: Right, different mentalities.

LEONE: …and different mentalities. So they have to change. But they have to change because they see the benefits of it. They either see that this is of benefit to them or not. I don't know. I like it as open as possible. I don't think it's necessarily true that scientists are anti-that. It takes extra effort, but it either is a priority in your life or it isn't. So, there are a lot of people…and it's perfectly fine, students, and postdocs, they need to make a situation on what is their priority in life in general, right. Wife, family, kids, vacation, extended family, other activities, and they all have a grading of priorities. I think if you're clear on what those are, then it's easier to act on. Obviously, all of this takes a lot of time.

CARUSO: The only other question I have is: is there anything that I have not covered in the past two days that you would like to talk about? It could be the relationship between art and science. It could be the NIH and its goals to have translational research, anything along…you could also say, "No, there's nothing." But I just like to give people a chance to…

LEONE: It's just so much we could talk about, all of those things that you just mentioned are interesting topics, on the cells, and you could go on about funding and why you should and shouldn't fund things. Well, I've killed that subject many times over, so it's no point. It's not of much interest, and art, same thing. Everybody thinks differently. Knock-outs, gene knock-outs are thought to be a gold standard for cell relevant biology. It's not true at all. Everything has its strengths.

[…] I think there's a real connection between arts and science. It helps me think more abstract. Maybe I'm an artist because of that or I'm a scientist because of that. I don't know which comes first, but it kind of feeds on each other. Seeing things in three-dimension is a huge

asset of how to think about, mechanistically, how proteins come together, how they activate transcription. If you think very flat, it doesn't give you another dimension, literally. I think having those kinds of dimensional thinking is important for science. I don't think that's the key. That's just one way that helps you in science. It has helped me; so, part of this program project, one of the things that we're now actually writing in three weeks for a new project is to have an architectural three—actually four—dimensional structure of the mammary gland, where we know all the cells in orientation with each other, all the genes that are on and off in each cell type relative to the distance between each other and other cell types, genes that are on chromatin modifications, et cetera, et cetera; so that we can begin to say, "Okay, how does one gene in one cell type affect the rest of the environment?" And create now models for that, based on data that we've input into this architectural model of the mammary gland. So, thinking about three dimensions and four dimensions, maybe I've thought about that, pushing that, because art to me…it's true. I would say I would love to have a photographic memory. I hear some people have it. Jesus, that would be a hell of an asset, wouldn't it be?

CARUSO: Definitely.

LEONE: I don't have it. So, one could say that would be great. Logical thinking […], 95 percent of the time, is the way to go. If you're unreasonable and you think a little bit in chaos, you can think of great ideas, too, unorthodox, right. That's helpful, too. If you do that to an extreme, maybe most of the time things won't work. It won't get a common set. […] I don't think art and science is…I think it's important and it's useful. It's not the only way of doing things.

I think we've covered most everything. One thing that we didn't talk about very much, which I don't really want to talk about it is—just to be clear—my wife and I have been separated about six years. We were here together for about three years and we—she, we, I, I don't know, a combination—felt that, wow, this is not working out. I love her a lot, still. Maybe that's reciprocated, I suspect that, but I know that's the case. But it's just not going work. I'm not going change. I made it very clear many, many years ago, that I am driven to do stuff. I focus on it. When I was having the martial arts school, I really focused on it. I was very good. It was a lot of fun, but it happened to be something that she was really interested in too. Art, same thing; this thing [Leone's artwork] took me a long time, and I have to work. I have to get things done. So, I'm doing this, I get into it. I'm two, three, four o'clock in the morning, smoking a cigarette and drawing and stuff like that for a week. I'm totally chaotic for that week until that gets done. I won't do that again for another eight months or something, and I do another one.

Science has been a prolonged focus driving my life for the last fifteen years. That gets old—not for me—it gets old for somebody that's living with you, if they're not a real part of that. So, it's hard. You can say, "I love you," so many times, but showing it every day is more important for some people. For that, you need time. You can have a lot of energy. People say I have a lot of energy, but eight, nine, ten o'clock at night, my energy, it's kind of low. I go

home, and I am not 100 percent as chirpy as I am here with my wife and my kids. I eat, you know, and therefore, it's not that great. But…so anyway, I have a great girlfriend for a few years, and she travels a lot. She's into science in different ways. So, that's worked out really well. She loves my kids. The kids like her. My wife likes her, and we're actually great friends with my wife. I still think…

CARUSO: That's interesting.

LEONE: …she's amazing. She's beautiful. She is very smart. She went back to school, and we had a pretty good relationship. I supported all of that financially, and my kids. Since about a year ago, she has this…she works as an archeologist. She doesn't make a lot of money, but it's very happy, and she's getting on with her life, and I'm with my life. We still have our life together because our kids are there. It's difficult on my kids to some degree. My son, I don't see any effect. My daughter, I think, is angry. It'll take a long time, if ever, for her anger to go away. There's always a reason to be angry when you're a teenager, but I think we'll deal with it. So, nothing is perfect. My girlfriend has a hard time with my life, too. It's very clear. My priority is work. It's science. I want to cure cancer. And my kids…that doesn't bode very well if you were my wife. It doesn't bode very well if you were my girlfriend, but that's what it is. That's, kind of, it. So, you have to sacrifice things, unless you're Einstein or something close, but I don't think Einstein had a very normal life. I think he had problems with his wife, if I read his…

CARUSO: No, he had lots of problems. Yes.

LEONE: …things, right. There's a reason for it. You're driven; this idea of balance. What's balanced? Balance is for monks, okay. So, I don't want to be mediocre. When I'm doing something I really want…I'm totally into this conversation, most of which I've been participating in, which is okay, because that's the way it's designed. But you put your effort, and you get into and do it the best you can. If I want to cure cancer, it's worth it. I'm not saying it's more a lofty goal than yours or hers, or somebody else next door. But it's mine. That's all I have, so I'm going to do it. This is what I really want to do. It's definitely worth not sleeping sometimes, yeah. It's definitely not worth having the kind of relationship that is ideal with a woman, or your mate or whatever, right. Fine.

CARUSO: Do you find this among your colleagues as well?

LEONE: No. I have to be very careful of that when recruiting, because my expectations are in my lab, "Buddy you're in my lab, this should be your priority number one, or at least, put the kind of effort in." You can have all these things, but you start having too many things, it's

going to start interfering, then we're going to have a problem. Then they want me to publish in *Cell*, but I am here to publish in *Cell*. Are you here with me? That means they need to be here at six or seven, eight o'clock at night writing with me. If you want it, then you're here with me. We'll do it together. If not, I'll write another paper with somebody else. So, in a way it kind of forces them. But it's up to them. It's their choice. They pretty much know before they come in, because I'm pretty straightforward from the beginning what this lab is like.

But with other colleagues, they already have their own life. Some of them put more or less effort. I have to be careful. They have their goals on what they want to achieve in their careers. They may be similar to mine, they may not be. I have to let that, kind of, step back, take its course, I think. You just create an environment that fosters and, sort of, pats on the back for those that do. Let everyone else do whatever they want.

CARUSO: […] It seems to be a trend that a fair number of scientists actually marry other scientists, or some of the people who are physician-scientists marry other physicians, people with similar working lifestyles and things like that. I'm only interviewing a select group of people. I don't know if that sort of extends beyond this group of people I'm interviewing. I don't know if other people at other universities are as committed to their science as the Pew Scholars are, if their family dynamics are such that the family is fully involved with the scientific lifestyle that all these Pew Scholars seem to have.

LEONE: It's probably different. They're Pew Scholars for a reason. Okay, so clearly a difference. A couple of points you made. My kids are not involved in my lab and science and so on. But they are involved in my science because I'm breathing the stuff. They hear it at home when I talk to my girlfriend. They know how critical and a pain in the ass I am, and they know what it would be like to be in my lab. We go on holidays. When do we go on holidays? When there's a conference in Keystone [Symposia on Molecular & Cellular Biology], right. "Let's stay an extra five days and go skiing." So, we do that. In a way, we go to Mexico; my girlfriend would come to Puerto Rico for one of these Pew meetings, okay. We would stay an extra three days or go in early or something like that. In a way […] it's infused in different shades and points. It does help that the family's integrated to that goal. It would maybe be that if you're not as driven, then you would have your normal vacation, and you have your conference and that's separate from your family. That's true. It's not the case in my case. I suspect it's not the case in many Pew Scholars as well.

The idea that scientists marry other scientists, I mean that may be something…nurses and doctors and so on, I think it's just because that's not, like, the only person you would actually match. It's just the person you meet and see; you're not out in the bars. You should see people. You meet people out in the bars. If you're a bartender, you probably marry other bartenders or waitresses because that's the people you have contact with. It's just a matter of chance, you know. I always thought…there's a lot of people have—girls, especially, but guys too—"There's one in this world for me," right? I thought about that. I believed that at some point a long time ago. I think not. I think there's one in five. There are five girls. One of them

will match me pretty well or one-in-ten. I don't know what that number is, but it's in that realm, single digit, maybe double digit. So, there isn't that magical thing that it's perfect. You create your own magic. A lot of it's in your mind, I think, and how you think about things. That's why maybe scientists are married to scientists, because one out of the two people they meet is a scientist. Chances are pretty good they'll hook up with a scientist.

CARUSO: Okay. Is there anything else?

LEONE: No. It's been really nice meeting you. You have a lot of good questions. You thought a lot about it, and I hope this is really useful. If it's just sort of interest for some people, but also down the road, other things and what to learn from it; not one person's story, but the threads that go along different Pew Scholars and others, kind of, interesting stuff.

CARUSO: It is.

LEONE: How the psyche works? Why do we do things? Why do I say things sometimes that are right or wrong? What is our motivation? How much of it is driven or stochastic? You know, sometimes you say things, why the hell did I lie? Why the hell did I say that? Why I am turning here? Then, a whole new set of things, scenarios, that have minor effects in your life or major affects in your life, turn out from those mistakes or chance coincidences of meeting people. It's amazing. So, I don't know. It makes you wonder how seriously you should really take things. Things could change.

CARUSO: I mean, one thing that seems to be relatively common is that most of the people I've interviewed, at some point in their lives, they try to come up with a reasoning scheme behind why they love science so much. I think there are a lot of people who go into professions because they kind of enjoy the profession. It's something nice to do. They don't hate it. Most of the Pew Scholars love what they're doing, and most of those people try to, at some point, figure out why they love it. They can't really come up with a good reason for it, and they seem to like to talk to other people who love it and not know why, because there's comfort in that, right. You're not some weird person so committed to your profession; you're one of a group of weird people so committed to your profession.

LEONE: I'm wondering—this is a superstition—I'm wondering whether these people, scientists that love what they do, don't necessarily, even if they know why or don't know why…. It doesn't really matter. If they weren't scientists because their parents weren't scientists or whatever reason, I didn't get that interview with Patrick Lee, and I didn't go there that summer, I would not be a scientist, right? I'd probably love being a carpenter or drawing or an artist or something…

CARUSO: Maybe.

LEONE: I'm just wondering if it's not that we would love…because we're just totally into whatever we would do. People have a tendency to love something they're totally into. They're not just doing it. I make good money in it. It's not why I'm doing this. I mean, it's great. I'm not going to say "no." But if you're just doing it because you need to pay bills and so on, it's because you like to do what you do. Then, maybe we would do something else and still love it.

CARUSO: It's possible. One of the things that I always ask people, and I asked you as well, during high school, during college, did you have other classes that you were interested in? Did you read about the history of the French Renaissance and…

LEONE: I love history.

CARUSO: …fall in love with it? And that's sort of what happened to me. I was an engineer for quite some time; then I encountered the history of science. I was like, "Oh, my God. Why have I been wasting my time on this engineering stuff?"

LEONE: Exactly, wow.

CARUSO: Sure, it was a chance encounter, but the moment that I came into that chance encounter, I realized that's where I wanted to be. So, I always ask other scholars, "Did you have something other than science that just really sparked your interest?" Most of them say, "Well, there were these other nice things, but science was just it for me." It's an interesting phenomenon, something I'm going to keep asking about to see if I can find that one person that was like, "Well, actually I really love to do pottery, but I decided to take a scientific career and excel at it."

LEONE: That's interesting. I really do love science, and I had that opportunity. I took it and I, sort of, thought, "This is it, but I love building stuff. I have a deck, and I love stonework and cement and stuff." I love doing that.

CARUSO: But you're not out there right now.

LEONE: Oh, I love this more.

CARUSO: Exactly.

LEONE: Well, you know, it reinforces the fact that you make money, and you're good at it, right. So, that reinforces the fact that you should continue doing it. You know, stonework probably wouldn't pay very much. I'm not very good. Of course, I could learn it and be better at it, but yeah. No, definitely. Something to do with thinking […] you can be a little bit of both. You can be more of one or the other, hands-on, physical nature. I mean, you have so many opportunities to think and think, and it becomes limitless, and some people like that. That's a huge thing as a scientist. Some other professions have it too. But anyway, long enough, thank you.

CARUSO: Thank you very much for your time.

LEONE: Thank you.

[END OF AUDIO, FILE 2.1]

[END OF INTERVIEW]

INDEX

A

Africa, 15
Alberta, Canada, 28
Amazon River, 15
American Cancer Society, 58
Artigas, Uruguay, 44
Atlantic Ocean, 6
attachment protein, 25, 31
Australia, 4

B

Baja, California, 13
Berlin Wall, 37
Berlin, Germany, 37
Bloomfield, Clara D., 55
bomba/bombilla, 44
Brazil, 14, 15

C

Calgary, Alberta, Canada, 10, 12, 13, 17, 20, 36, 47, 48, 49, 50, 66
Canada, 1, 4, 5, 10, 11, 12, 15, 16, 19, 39, 40, 46, 48, 49, 50, 55, 66
Cdk. *See* cyclin-dependent kinase
cell cycle, 43, 44, 49, 50, 51, 57, 67
Chapel Hill, North Carolina, 41
Chile, 13
Chinese/China, 25, 33
collaborate/collaboration, 34, 52, 57, 70, 71
competition, 44, 45, 46
cyclin-dependent kinase, 43, 44, 51

D

DeGregori, James V., 43, 44, 45, 47, 49, 52
DNA, 16, 22, 24, 45, 52
  cDNA, 43, 49
Duke University, 36, 38, 43, 50
Durham, North Carolina, 39, 41, 42, 43

E

Ellison Medical Foundation, 66
Emory University, 62
England, 38, 59
ethics, 35
ethnicity, 40

F

Fields, Bernard N., 37
Fields' Virology, 37
flute, 19

G

German/Germany, 20
Gettysburg, Pennsylvania, 48
Grand Canyon, 13
grants/funding, 22, 23, 27, 34, 47, 49, 53, 56, 57, 58, 59, 65, 66, 67, 68, 69, 71
Guatemala, 15

H

Harlow, Edward E., 38
Harvard University, 35, 36, 38, 62, 70
hedgehog, 53
hockey, 8, 11
Honduras, 15
Howard Hughes Medical Institute, 39, 45, 46
Howley, Peter M., 38

I

India, 24
International Congress of Virology, 37
Iza, Margarita (aunt), 8
Iza, Ricardo (uncle), 4

J

Johnson, David G., 43
Joklik, Wolfgang K., 36, 37, 38

Jordan Lake, 41
Journal of Virology, 26

K

karate, 8, 12, 17, 18, 19
Keystone Symposia on Molecular & Cellular Biology, 74
Korea, 23

L

Laslo, 46
Lee, Patrick, 22, 24, 25, 26, 27, 31, 32, 34, 35, 37, 75
Leone, Ana Maria (daughter), 18
Leone, Emma (mother), 2
Leone, Karen (ex-wife), 18, 50
Leone, Marcelo (son), 18
Leone, Sergio (brother), 1
Leone, Walter Sergio (father), 2
Li, Jing, 61
Livingston, David M., 38
London, England, 38
luciferase, 24

M

Machu Picchu, Peru, 15
Mah, David C.W., 23, 25
Manaos, Brazil, 15
marbles, 6
Medical Research Council Fellowship, 46
Mexico, 14, 74
Middle Eastern, 33
Montevideo, Uruguay, 1, 6, 7
Montréal, Québec, Canada, 1, 2, 4, 7, 8, 10, 20
Myc, 49, 52, 67

N

NAFTA. *See* North American Free Trade Agreement
National Cancer Institute, 38, 66, 68
National Institutes of Health, 47, 58, 69, 71
NCI. *See* National Cancer Institute
Nevins, Joseph R., 38, 42, 43, 44, 45, 46, 47, 49, 50, 52, 56, 63, 65
Newport Beach, California, 14
Niagara Falls, New York, 48
NIH. *See* National Institutes of Health
North American Free Trade Agreement, 48
North Carolina, 28, 40, 41, 66
Notch, 53

O

Ohio State University, 49, 50, 54, 58, 64, 66, 67, 69
Ohio State University Comprehensive Cancer Center, 53, 58, 66
Ohio State University Medical Center, 1
Okayama, H., 24
oligomerization, 25, 31, 36
Oncolytics Biotech Inc., 31
OSU. *See* Ohio State University

P

p10, 68
p21, 43
p53, 34, 38
PCR. *See* polymerase chain reaction
Pew Charitable Trusts, 66, 67
Pew Scholars Program in the Biomedical Sciences, 1, 35, 49, 65, 66, 68, 74, 75
polymerase chain reaction, 60
publishing/publication, 16, 25, 26, 27, 30, 32, 33, 34, 36, 37, 43, 44, 45, 51, 52, 53, 56, 61, 62, 69, 70, 71, 74
Puerto Rico, 74
Purdue University, 65

R

Ras, 49
Rb, 43, 51
religion, 35
  Baptist, 40
  church, 5, 6, 19, 40, 41
reovirus, 31, 36
Research Institute of Molecular Biology, 59
Rio de la Plata, 6

Rio Negro, 15

S

Saavedra, Harold I., 62
SAIT. *See* Southern Alberta Institute of Technology
San Diego, California, 14
Sao Paulo, Brazil, 14
Sherr, Charles J., 67
sigma 1, 26, 31, 33
soccer, 2, 5, 6, 11, 41
South America, 13, 14
South Carolina, 46
Southern Alberta Institute of Technology, 28
Spain, 59
Spanish, 1, 7, 43
stromal [cells], 67
stromal cells, 67

T

Taq, 60
Texas, 34, 44
Toronto, Ontario, Canada, 4, 11, 14
transcription factor, 38, 43, 45
  E2F, 38, 43, 49, 50, 51, 52, 56, 67, 68
  E2F1, 43, 44, 45, 49, 52, 56
  E2F2, 43, 56
  E2F3, 43, 51, 55, 56
  E2F4, 43, 51
  E2F5, 43
trimer, 31, 36
Tripoli, Libya, 59
Tumor Microenvironment, 57, 66

U

United States of America, 4, 14, 27, 50, 55, 65, 66
University of Calgary, 16
Uruguay, 4, 11, 13, 44
Utricht, Allen, 62
Utricht, Michelle, 62

V

Vancouver, British Columbia, Canada, 13
Veterans Administration Medical Center, 43
Victoria, British Columbia, Canada, 12, 13
Vienna, Austria, 59
virology, 16, 23, 33, 36, 37, 38, 69
volleyball, 47

W

Webster, Alicia Leone (sister), 1
West Island, Canada, 8, 10
WIG, 53
Winnipeg, Manitoba, Canada, 13