JOSHUA LEDERBERG 7/11/83 at Rockefeller University

JL Im interested in mylife as a student at Columbia

EG I'm interested in the journey - in how you started andhow you got where you are . what role Columbia played. How it faild you . how it helped you.

JL Well, I did send you a piece that I wrote about Francis Ryan.

EG Can we start where you were born - in 1925 in Montclair

JL Montclair, New Jersey on Glenridge Avenue, not exactly the wrongside of the railroad tracks, because it was practically on the railroad tracks.

EG Were your parents born here?

JL NO, they came from Israel . They came to this country a year before I was born.

EG How did they get to Israel?

JL They and their ancestors for quite a few generations had lived in Israel.

EG They were Sabras.

JL They didn't even know the word at that time. However, the economy of Palestine was in absolute shambles after World war I and there was really nothing to do, so my father decided to come to AMerica , as so many other people had.

EG ~~What was his field in America~~ What was his field ?

JL He was a rabbi.

EG Do you have brothers and sisters?

JL I was the oldest. And I have two ~~sisters~~ brothers who were both born in this country. MY brother Seymour is a professor of biology at Brown. My brother Dov, who is 16 years younger than I am, was educated at Haverford then he's the one who picked up the religious persuasion from our father and he joined the Rabbi Schneerson's Hassidic Movement and for the last ten years he's been living in Jerusalem. He's been working in film. I just had a visit this mornign from one of his associates, and someone who you might haveknown, professor Alexinberg, Aleksenberg who used to be in the art dept at Columbia, who's now heading a college in the Negev, and he told me that my brother is teaching down there in visual arts program at the college . It's a small world.

EG He's still committed to Hassidism?

JL oh yes, that's his ~~belief~~ religious life and there's no contradiction between that and his

secular one. So that's the family.

EG The reason I asked was the interest in science. in your family.

JL It's not at first order, apparently in my family background. I would have ached to know someone who was a scientist when I was a youngster. But I think there was a certain element of inspiration in figures like Albert Einstein, and Chaim Weizmann, who were certainly culture heroes in our family, but it was up to me actually acquire and develop that interest and.

EG How'd you do it?

JL MOstly from the public library. I just sent a note to Ed Koch congratulating him that maybe that's hit bottom and that city support for the branch libraries might be coming up again. You've heard that story over and over again.

EG We're all educated that way. When did you come to New York?

JL Oh when I was 6 months old. (laughter) MOntclair is a formally correct statement.

EG Where did you live in New YOrk?

JL In Washington Heights. SO I was well aware of Columbia as a fountain of knowledge. Where we lived was between the Morningside Heights campus and the medical school. Surely by the time I was 10 years old probably before that, the notion of being able to go there was a very remote possibility. We were not terribly well off. I noticed in my ——— I went to Stuyvesant High School. That's important.

EG Was Townsend Harris extant at that time?

JL It was, but Stuyvesant was the science school. TH was for the literature majors , at any rate I noticed in my Stuyvesant yearbook that even at the time the yearbook was I said I was going to CCNY. Just at the very last minute I did get a scholarship from Columbia College and that covered tuition and that made it possible. still with some sacrifice.

eg How about being Jewish. Was that a problem in getting into Columbia at that time?

JL YOu know, I have put into a rather funny way. I tried to investigate that.

EG You mean subsequently.

JL Yes, it was not obvious to me at the time. BU t I was living in an ivory tower. And there's plenty of concrete factual on that. point. HOwever,

EG You mean it's somethingwhich didn't occur to you, is that what you're saying?

JL Since I succeeded, I didn't have anything to attribute to that. While there were still some undercurrents of it, it was not a big issue in my visible personal experience. I would hear of a lot of other incidents, involving others and I could never be sure to what extent they were making excuses or how real it was in each case. As I had investigated the matter I can't deny that it was rampant. But I was fortunate enough and presented solid enought credentials to - let me say I succeded in spite of being Jewish - that might be the best way to put it. But it was not a visible matter to me.

EG When did you get interested in science?

jl From my earliest consciousness, as far as I can recall. And by the time I was 7 or 8 years old, I was reading everything in sight in science. I was looking at college books when Iwas in junior high school and did very little else. By myself studying every science I couldlay my hands on.

EG I imagine at that age, it was fairly general interest in science.

JL Well, I had nobody to guide me. So it was a random browsing throught whatever I could grab on to that I could also understand. I had really no one who was able to be particularly helpful, either in orienting me or in answering questions, or whatever.

EG Was Ryan, the first person,then?

JL He was the first person I was able to have intimate contact with in the scientific world but that was already after Iwas a sophomore at Columbia. Well, the minute I entered Columbia, I was knocking on the professors' doors eager to learn what I could . I had met Burr Steinbach who taught the Zoo 1 course; I had met Barbara McClintock within a month or two of the timethat I arrived at COlumbia, I'd had a brief experience in a rather peculiar laboratory called the American Institute of Science Laboratorywhich was a program which was subsquently displaced by theWestinghouse Science Talent Search . But in 1941 the same supporters sponsored an actual research laboratory that had some level of equipment far better than at Stuyvesant high school and I could actually do some puttering in that lab.

EG You were a high school student at that time.

JW I graduated from Stuyvesant in January 41 and I had the spring semester and the summer before entering college and so I did spend that time at that lab. And did have a couple of projects .

EG Was it a biological lab?

JL It dabbled in everything and I worked in chemical cytology. That's how I came to look to Dr. Mc Clintock because I was curious aboutwhy the nucleolus stained as it did, and I was trying to find ways of exploring the chemical identification of the nucleolus by staining methods. And she had worked on the genetics of the nucleolus and I'd encountered her name in my reading on the matter . And she was quite a sympathetic , friendly person. I ended up doing a term paper on the subject in my first semester in Zoo' I. What COlumbia did though - it was a place where there was a vast collection of scientific talent. They also gave me a lot of freedom and some of it is - they even gave me the freedom to be a little bit unwise - they sort of just didn't get in the way when I pushed hard enough and I arranged to take quite a lot of graduate courses almost at the very beginning. I think by the time I was a sophomore I had mostly graduate courses in my program. I'd get an occasional squawk that I really oughtto finish my CC and my humanities and my other requirements. In a funny way I really wasn't mature enough for those - it was easier for me to do the scientific specialties at that very advanced graduate level and it was just as well that I deferred the more liberal subjects until I sort of caught up with that part of my development. So that was fairly happy, my relationships there. But a lot of it was orchestrated with Francis. He covered for me in many , many things. I'm sure it wasn't as easy as I'm putting it out. (Laughter)
Well, while I was an undergraduate there I worked in Francis' lab, I had an experience of what research was like. I think he did two very important things for me - one was taking me seriously, but also being then the more able to put down a fairly strong line of discipline - nobody else had been able to do that

before . As a very precocious youngster I had learned that I could outsmart or outwit many others who might be around and you know that kind of raw callowness could have gotten me into very very deep trouble. It was age-appropriate, but not appropriate to the level of working and thinking that I was doing - I'm talking about when I was 16 and 17 - And I just profited enormously by the kind of discipline that he also imposed.

EG Were there any other kids like that ? Most of the students were older?

JL Not at Columbia. There were three or four certainly equally precocious youngsters at the AISL. It was quite a hatching ground. I've met many of them again, Well, Professor Yanofsky in the Stanford biology department - a really gifted scientist , was one of my lab mates there. BarryBlumberg , you may have heard of in another context, also was. Bob Jastrow - he was one of my lab mates there. I don't know if you remember him -

EG That was a very fancy group.

JL Yes. (Laughter)

EG How did your family take to your interest in science? Did it bother your father?

JL It was a matter of considerable discussion. We had to develop some reconciliation between his sacerdotal interests and what I was headed for. We eventually resolved that we were all looking for the truth in our own way. And while it was not his first preference, he was nevertheless sufficiently proud of what I was trying to do and my commitment to it that he certainly tried - as I get older the more I realize I have to say the kind of encouragement he gave me - I used to say, well, he would grudgingly accept it - but I know better as time goes on . So we worked out a modus vivendi that we just had to acknowledge that I was going to go my own path, that our fundamental purposes and interests weren't really very different. And we had a lot of respect for one another.

EG Did he see your success? Was he alive at the time of you Nobel PRize?

JL Yes. I was quite young.

EG You were.

(Laughter)

JL It wasn't many years after what we're talking about

EG Thirty-three. Were you the youngest?

JL Well, I think the youngest in biology . There may have been some physicists earlier. The fact is, the work for which that was awarded, was started while I was still at Columbia.

EG THat goes back to Ryan?

JL So it was almost the first experiment that I did inthe laboratorywhich was the root of that.

EG I made a note here that it seemed a fortuitous kind of connection — your drive and interest and the right person and the right field - it was a fantastic coming together of things.

JL I was very fortunate. just in many many ways. that many things came together. and innumerable people have been extraordinarily supportive of me. I mentioned Francis Ryan - the one individual I was mostly deeply indebted to- he was avery important part of mylife at a very crucial kind of turningpoint. But I've had enormous encouragement from many many people .

EG Who else?

JL Oh I'm just thinking of my teachers at school- professors at the university . When I had to look around to get some money to support myself at Yale the Jane Coffin Childs ~~Charles~~ FUnd came out and Ed Tatum was the one who provided cover for that. He was a close friend of Francis' which is how I got to know him. You know, I could go on . so I really had extraordinarily few obstacles. ANd when you ask about anti-semitism, I had good reason to learn that - it was an issue that was always inthe background , but with what I was able to present of myself - and the things that I was able to do, that was set aside. I do not believe that it ever influenced the outcome of any decision that I had to encounter, but I'm sure it was at various times in the minds of various people . I'm certain that it was - because I have the documentationfor it- in some of my early academic appointments -

EG You're sure it was or it was not?

JL Oh, it was. It was an issue. But it was an issue that was overridden. But it

was a major turning point and I have to say - when it comes to a question of for example of admission to medical school, because I did start at Pand S after Columbia, would have been so easy fiveyears earlier, again I have documentary evidence to the contrary. When Paul Markx was Dean up there, - he was a classmate of mine - he got out the files for me. (laughter) So, as I say, somethings worked out well. in spite of that issue and at the time I had very little perception of it. I was not really being obstructed. Things were going well.

I'm trying to give you more of a picture of COlumbia. I managed to get myself a place to work in the Zoology department almost from the very beginning. and I guess. it must have been ~~Bert Steinback~~ Burr Steinbach who was the first mediator for that . Then when I started taking some of the graduate courses like the onein cytology with Schrader ~~Von~~ ; embryology with Barth and so on I had a working desk in Schermerhorn. I could do some of the scratching in research.

EG You were living at home?

JL Yes, I'll come to that in a minute. At that time I was commuting. But I then had aplace in Francis' lab. I washed his dishes, I boiled his agar. I reclaimed the agar which was getting very very scarce . I 'd gladly sweep the floors for him and so on. and learned an enormous amount how to do research in the process. Another advantage , if you want to look at the social history of this - there are a lot of other threads, -we don't have the time to go through them all - that was the war. I was quite young for the student cohort, so I wasn't immediately taken up into the selective service as some of them. But on my 17th birthday I enrolled in the Navy and they had the V12 training program and on the first of July 1943 (I guess that's just 40 years ago,) that was formally established on the Columbia campus and after a few other bureaucratic vagaries, eventually my orders read "Columbia", as the place to continue training in uniform . And so from that point I was resident on campus. The Navy brooked no form of discrimination. They had an objective appraisal -you had to have very high academic standing to do anything. I'm sure it opened a lot of doors as well -

it certainly did for women., as far as the medical school was concerned. ANd so I think that it as much as anything to make that entire matter moot. I was very fortunate about the timing, in that way. And five years earlier, it might have made a difference.

EG So you were in the Navy all the time you went to the Medical school

JL That's correct. From July '43 on, I was in the V12 program. I spent ayear of that time in the hospital at St. Albans, at that turnout to have also a very fortunate experience . First of all, I really wanted to make some contribution - actually doing something during the time, But my assignment was tobe in charge of parasitology work in the clinical laboratory and that meant looking at enormous numbers of stool and blood specimens - looking for parasites - and the biology of the parasites fascinated me - and there was the material. It would be very hard to find if you were looking for it today. There were amoebe. There was malaria . I had a chance to see that stuff at first hand in great volume in a way that not many are privileged to do, right now. And I rather think that looking at and thinking about the life cycles of these microbial parasites in that lab had a lot to do with my thinking about bacteria and so on.

JL Were you able to do any research there.?

JL Very limited. It was mostly observational, in the course of doing the clinical micrsoscopy, bUt just alittle bit. I did play around with improving the staining methods for these things. So you get immersed in what these beasts are like. that makes a big difference. I've retained a conviction about the importance of the biology of parasites since that time and also - I knew that they were not beng studied in a scientific depth that was true of other fields in microbiology . I've been able to put that convictionto use only in the last few years. It's been an item very high on my agenda, here in theRockefeller . And we were very glad to get George Cross here as professor in that program.

EG These things go way back.

JL They do, indeed. (laughter.)

EG Do you do any research of your own now?

JL No, I don't keep my own lab now. I'm just trying to interconnect what's going on here .

EG Allright, You went to Yale after that.

JL Well, I really want to stress Columbia still more. As an undergraduate I was doing graduate work. I had the right kind of discipline because I had Francis looking over my shoulder and guiding me in what to do. On the other hand I was not registered as a graduate student. I wasn't trying to fulfill a major in any particular subject. So I had a lot of lattitude. I don't think many zoology majors would have been taking the courses in chemistry and courses in theoretical physics and logic and mathematics and quite a few other things, which I was able to do, because of that peculiar circumstance.

EG They might not be interested.

JL Well, even if they were, they wouldn't even have raised the question. That's important too, because the research I got into was a very large gamble - you know the notion of goin^g in and seeing whether a bacteria could be crossed and using the genetic methodology . The typical graduate student would have great difficulty in investing in that speculation, because it might take a year or to to see whether it would work out . and if you're in the middle of a program, working toward a degree, it's hard to afford that.I was first an undergrduate, then a medical student doing research avocationally. I could afford to take risks that others students didn't. I was not aware of that at the time. This was all retrospective reflection. But there again COlumbia was very important for that. It was also very ~~specific~~ special around one very specific issue. Once again as I mentioned in my essay about Francis, he - the scientific event that triggered my - really scientific commitment, was Avery's paper identifying DNA as the agent of genetic transformation in bacteria. But how did we get to know about that? We got to know about that because Al Mirsky who was a professor here at the Rockefeller, was collaborating

with Arthur Pollister at Columbia and was a weekly visitor . There were frequent seminars. He would sit and chat with the students from time to time. We had a direct channel at Columbia in everything that was going on here at the ROckefeller. We heard about DNA three times a week. And the reason I stress that - I've been so puzzled at the contrary perception that Gunther Stent has published about the reception of Avery's work. Where Gunther Stent sat, ~~in was~~ in the Delbruck phage group, he was totally unaware of it. He published a paper in Scientific American a few years ago in which he described Avery's as a premature discovery - and he would say such things as nobody understood what Avery was trying to say and it was ignored for a few years. And that's at such total odds with the picture ~~which~~ that I'm giving. It ignited the department. But we had, I came to realize. We had a very special channels of communication between COlumbia and the Rockefeller.

EG These meetings were at Columbia? People used to come down there?

JL Yes, I don'tthink there was much traffic inthe opposite direction. Mirsky was working very closly with Polister. It was on DNA related questions. So we were heavily infiltrated withthnking about DNA as a result. I wrote a little piece, which I think I also sent you about scientific communication in New York, reflecting back to the issues which I raise there, about the ways that science is organized in this town comes directly out of that experience.

EG The implication to me, who is not involved in science, is that today, this kind of thing may not be discussable any more. I don't know. Isn't there more secrecy?

JL NO, I don't think so There are people who will always want to be a little careful until they've got their work ready for publication ANd so on But I wouldn't say there's a noticeable difference in that respect. There may be less need for this facilitation of communication - there are so many more people working in biological research. It's a much denser community. The infection spread a lot faster when you have a lot of people. There are ten people who might potentially be telling you about something instead of only one. So there's more of a chance of missing something if things are thinner.

EG: I was thinking -from the point of view of having the work taken from you. - you you know, competition.

JL Well, there's probably more of that now, again because the field is denser, but I think the net is, there's much more to commu nicate about and meetings are organized much more intensely today, there are more of them. The typical professor - I have no statistics on this, but I think you'll find, goes to many more meetings in a year today than would have been the case 30 or 40 years ago. But things like the Harvey Society lectures, there important inthe 40s :(I heard Beadle, Chambers)— and they're important today, especially for students.

Anyway, I've told the immediate story aboutthe recombinant research. Those experiments were started in Francis' lab . They used different strains of ecoli than were used lateron. Francis learned that Ed Tatum was moving from Stanford to go to Yale - Stanford didn't appreciate him at the time - blatant - And Francis thought it might be a broadening experience for me to workin another laboratory and Ed had some other strains of the bug that might be unusually useful . If I had stuck with only Ecoli C, the experiment would not have worked. I don't believe Iwould have stayed just with that - if Iwould have seen that that was unsuccessful. for whatever time was available and that's something I can't retroflect about but Iwould have looked at some others. But it was a very lucky break to have shifted into K12. So Ed brought back to Yale with him and he had a few units with him and I made a bunch more.and when I got there. It's sort of a technology around. Ed didn't have better lab facilities and did get a fellowship for me to get set up and work so the happy convergemce of things. I got there in March and by the middle of June I had the experiment working. And so that's what happened. But I think Columbia doesn't get enough credit for it. That's really not right — pass on.

EG That goes back to what you wrote about Ryan and the Nobel Prize. I think you said he was " a presence" there.

JL He was a presence I wish it could have been more visible. I think if he had been

alive I would have moved heaven and earth to be sure that he would have been there in person.

EG You said somwthing about you thought the choices are arbitrary.

JL Yeah, how can they do it any better tha n they do?

EG I think it's been challenged recently - saying there are too many people , particularly in physics where they have these huge conglomerations of people doing research and they can hardly single out...

JL Well, it's hard to decide about anybody. Whether there should be an award is one question. If there is an award I don't think it can be done any better than they're doing it now. ANd it's got to be arbitrary at some point. I think the best you can say is that they don't put too many incompetents in that position. Inevitably one can always think in any particular case where there are three or four others whose accomplishments are competitive and it would be a toss of the dice, just which one would be chosen.

EG What was your reaction when you got the Nobel Prize?

JL Oh, well, that was quite a few years later. I did not - I hadn't given a moment's thought about that, At that young age I thought Nobel PRiz might be sbmething to think about when I was in my 50s or 60s but surely I'd never given it (end side A) 662 I was livingin WIsconsin at that time. A reporter called me up very early in the morning from a Swedish newspaper and passed on the story and what reactions did I have? and so on. I said, "you're playing a practical joke and I wish you'd cut it out ! which is what I was sure it was. And since he couldn't offer firm evidence on the matter I thought it would be better to lay low until the question was really clear, because it would be very awkward to get congratulations from people and have the whole thing be a bust, which I thought there was a perfecty reasonable chance for it to be.the case (Laughter)

JL OK. Yale, I explained how I got there. I was there not as a student at Yale University but as a student of COlumbia Medical School - sort of on the side, I'd ' gotten to the middle of my third year at P&S.

EG Sequentially? Or did you go back and forth?

JL We had an accelerated program. We were working 60 hours a week and things were truncated but I actually did get through . I got my BA from COlumbia COllege and went on to register in ~~October~~ July 44 - is when I started at Columbia Medical School . And by March 46 we had completed two medical school years - it was just a non-stop program. OK? So I was at Yale on an elective quarter from P&S, registered as medical student and with a fellowship from the ~~Charles~~ Childs Fund. After these experiments worked ~~out~~ - my original plan had been to stay there for the elective quarter and then everybody was so relieved the summer of 46 - that it was going to be their first vacation for the past five years or so but I was going to spend that at Yale and come back in the fall and comp lete my studies at P&S but these experiments worked out and I'd got them under way. So I took another year's leave to round them out. At that point I had to face a decision whether to complete my medical studies to take an academic position where I could continue my research more nearly full time and I was really in some agony about which of those alternatives . Ed Tatum helped clear the way - so that I would at least have a clear option - and arranged with Yale University that they would reexamine my academic credentials and s ome small sleight-of-hand , on examination of the facts rather than the formalities - I had attended a lot of seminars with a lot of my peers and I could pass the exams and so I was somewhat tardily registered as a graduate student at Yale - namely a day or two before I was awarded the PhD. (Laughter) I"d been there and done the work, and so they acknowledged it . Anyhow, with the degree essentially in hand, I then had an option. I could take a teaching position, or I decided actually to go to Madison - so I was there for twelve years in the genetics department. And it was a very happy place

in which to continue my research in microbiology.

EG In that piece you wrote about Ryan, you wrote that it was a very happy time, but that wasn't the place to go into that story. Did you tell it any place?

JL No, I'm collecting... I'd like to make an authentic autobiography - if that's not a contrdiction in terms so I'm at least trying to collect the documentation.

EG Well, it sounds as if you have nice memories stored up about it.

JL I wish I had more detail. I can't really capture the image of the particular conversation I had with Francis when I brought up-could we cross bacteria - I just don't have it in mind. I do have some scraps of paper that sort of surround the matter so within a week or two I can date these things. but I can't really give the precise documentation that I prefer. But more of it comes in all the time. I do get bits and peices from different sources. Unfortunately Ryan's own papers were not preserved when he died. That's a great loss from this and other perspectives. Of course, also Avery did not keep his papers.When he retired from the university, he just discarded them. So those are two important collections it would have been very good to have. I'm so much of a squirrel that - from September 47 I think I have 99% of everypiece of paper I've ever written. But that's when I first had an office. That's my job at Wisconsin. Everything before then is quite fragmentary.

EG Have you ever had any regret, not having completed the medical degree?

JL I'd have more if I hadn't been able to get into medical research. I had some qualms about WIsconsin because I was in the college of agriculture, but it looked like the best opportunity actually to do the laboratory research that I was immediately interested in. It took a few years before medical microbiologists woke up to what was happening in the genetics of microorganisms and what significance it would have in their field - so the first jobs were scattered in various ways. But within a few years at Wisconsin I connected to the medical school.

EG You're saying that you wanted to have that connection.

JL To medicine? Oh yes, very much. And did. And eventually started up a department

in medical genetics at Wisconsin parallel to the one in agriculturally oriented genetics.

EG I saw that, but I didn't understand what the implications were...

JL Well, the College of Agriculture at WIsconsin had to be taken very seriously as a place where a great deal of fundamental biological and especially biochemical research was done - even though situated in the COllege of Agriculture. It was quite unusual among Ag schools from the perspective as a research site. Wisconsin was quite notable for that. Nevertheless, there was a medical school and that was a different organizational unit. Naturally issues that had to do with human disease and so on were not part of the College's agenda.

EG So your department was where?

JL I started out in the Ag school . Some years later I succeeded - when John Bowers came in as Dean in '53 , one of the first things that came up, was just this question - I'd met him a few years earlier - and he approved the establishment of a new department of medical genetics in the medical school and so from that point, I had a split appointment. Developing the program at the medical school and still keeping a foot in at the ag school . And that was then the forrunner to just what happened when I moved to Stanford - it was to take up establishing a department of genetics in the medical school. So the regrets I would have had, have been mitigated by the fact that I've been, in fact, deeply involved in medical affairs since that time.

EG Do you want to tell me anything about that time.. at Wisconsin

JL I think I've given you the main story. It was the place to round out the work I'd started at Yale and again it was a very nurturing and happy setting and I was always keeping an eye out fro practical applications. I took agriculture very seriously as something that one should make some effort to contribute to . I think I did mostly on the educational side, rather than what my own research did . But I was always keeping an eye out for what useful things might come out of that .

I think there came a time when opportunities for biochemical work-to understand what was happening in bacterial heredity-began to outstrip what was my immediate environment at Wisconsin. And the irony is that it took my leaving, for WIsconsin to do the things that would have filled exactly that need. That's when ~~Gilbert~~ Govind Khorana the Enzyme Institute and so on. So after I left it became a great center of DNA research So I think the best thing I did was leave. (Laughter) But Arthur Kornberg was coming to Stanford in the Biochemistry department - a great magnet - sort of a convergence - as indeed there was in what he brought in in the enzymology and biochemistry of DNA and my interest in the genetics and biology of these phenomena. So I was at Stanford for twenty years . I found myself more and more a mixture of my own lab science and administrative affairs , which is the typical evolution of an academic . And while I was there, besides the department that I established which I'm very proud of, - many notable figures have been developed and have been and stayed there - I also became quite deeply involved in medical school and university affairs in a lot of different programs .

EG You were also professor of COmputer Science and Artificial Intelligence.

JL Yes,

EG As related to medicine, I suppose

JL Sort of, (Laughter)

EG Sort of? There are lots of stories behind all this, I can see. (Laughter)

JL That would take a little while to go into all the details.

EG I see that.

JL I was very much interested in trying to reconnect a lot of disciplines. I felt that the reason bacterial genetics had taken so long to get started was that these were disciplines - bacteriology on one hand, genetics on the other - they never talked to one another and it took somebody who was interested in both to try to connect them .

So I was quite consciously looking for ways and places of doing that. I'd been somewhat intrigued about computers for a long time - One of my lab mates at AISL had in fact, did something amusing with and IBM card punch machine which was quite useful to the company as a matter of fact, That's was my first actual, hands-on experience of a calculating machine. And so I was keeping my eyes open for what computers could do. I took a course in plugboard programming while I was at Wisconsin. And then again when I came to Stanford, it was the first , sort of general dissemination of big machines . Oh they had a huge machine, it was called the IBM 7090. It's about what you could get today as a personal computer . It was the university computer, shared by everybody. You put programs in with card decks in the evening and comeback the next morning to get your results and so on.. But anyhow by that time it had reached the lab. But there was Fortran, there were languages and so on I thought well, computers are grown up enough . They're going to be of some use in actually doing science . And I connected - first with John Macarty and then with Ed Feigenbaum - we just cooked up a few things that might be called artificial intelligence. That's the genesis of that. And shortly thereafter - I played here strictly an administrative role - but I was very impatient with the people in the medical school should be up to the cutting edge - and I organzied the first general computing system for the medical school. Just got a program together, got some money from NIH to put up a prototype system for time sharing purpses - medical investigative uses. So that's how I earned my computer science title. We had some fun ~~NAI~~ with an AI research program called ~~Dendrol~~ Dendral It's getting quite a play these days. It's been ignored for five or ten years.

EG What has?

JL The ~~Dendrol~~ Dendral project. It's teaching computers how to thnk about chemistry . It's a prototype of expert systems that are being touted all around these days. It is

It is the prototype of expert systems. You don't pretend that you're teaching a computer to be a whizz at thinking. But you just collect a lot of facts, data, know-how aboutdong things, you should build a computer program a little bit of intelligent engineering , rather than scientific discovery about making that useful to somebody who gets tired of a lot of housekeeping details in trying to solve problems . So we demonstrated it for some problem in chemistry, it's getting a fair play now.

EG So you're still involved with it.

JL I'm still collaborating with Ed Feigenbaum - in the sense of talking to him every few months. I'm going to spend AUgust back at Stanford and catch up in what's going on in expert systems.

EG This is not the same as bio-engineering. ? this is completely different.

JL No, not at all. This is just a way of organizing software. They're now done in fairly general way - and it's...I'll give you an application that I think will be very important. Suppose you're running an investment company and you've got hundreds of these so-called account executives and they're supposed to be advising their customers in how to invest their money and relate them to the different sources. Well, 99% of that is just a lot of factual information about what the opportunities are and you've got a research group like the big companies do, they can be plugging in interesting detail. And it would do a far better job than the individual account executive now.

EG It's a little ways from genetics, but it's all right.

JL Yeah, it's easier than genetics though. The range of knowledge that you have to call upon and the immediacy with which you use that information - There's a lot less judgment involved in - let's put it this way. - The judgment's are less complicated . You've got your research groups deciding what are the expectations about a given stock - well, that's going to stand. That's not going to change every

time you look at it. The account executive is not going to improve on it, let's put it that way, so you have an expert to call on. Calling on an expert in genetics especially on the research side, is kind of hard to do. Everyone who works in the field is his own expert. So that's why some of these more mundane applications are ? We did try to develop systems that would help people design experiments in the lab . That program is continuing. In fact, I just heard ~~xxxxxxx~~ to my delight - Charlie Yanofsky has gotten hooked and become interested in this and he's going to be the principal consultant to the molecular biology-cum-computer program that I started about 6 years ago. Since he's done a lot of thinking about how you design experiments in this field. Well, how you get his expertese into a program so it can provide advice on how you deal with analogous situations as they arise in the lab from day to day.

EG Were you able to help any students the way you were helped?

JK Well, I sure hope so. It's a little hard. Maybe not. Maybe I'm too impatient to do what Francis did. I don't know that I had a student that could have been as difficult in many ways as I was . But he had a degree of patience in dealing with me that I doubt I could have with anybody. So I'm just not sure. But I've been very conscious of - I inherited a debt as well. I would certainly wish to

EG Is there anything else that you want to say about it.?

JL Well, the transition from Stanford here was not a abrupt as many people think. They have the vision that somehow I was working with my own hands 12 hours a day in the lab one day, and then walked into an office the next. ANd it was really was more gradual. My last few years at Stanford I was less visibly involved but in a broader range of university affairs as I am right now.

EG That is clear from the material the University published.

JL Is't perhaps not so clear to others. When my appointment was announced, there was a little squib in Science magazine that was - Oh I was delighted when it came out

that way . It said, "there are some observers who are a little puzzled that they chosen someone who had no administrative experience to be President of ROckefeller University" I really chortled about that. You know, for one thing, what a bonus to come into a place and have that reputation. (Laughter_)

EG I guess having the NobelPrize makes you a desirable person for a University. Is it a burden when you have the Nobel Prize when you're 33?

JL Well, it's not a question of burden. It certainly accentuated my distractions to do things other than work in my own laboratory. On theother hand, it gave a kind of you know, face legitimacy to do why I would be doing that. I would say it's not appropriate for people quite so young. It would be just as well if there were a rule that you can afford to wait till 45 or 50 before you hand those out.

EG You mean it disrupted your life, you're saying, in some respect.

JL Disrupted is not quite the rightstatement. I think I might have spent a few more years and very appropriately in a more focussed way in the laboratory and it would been a better time to have things progress inthat way. But who's to say? It's 25 years ago since that came out. Well, there are a lot of as ifs one can think about.

Eg What are your concerns today?

JL Well, maintaining the vitality and the creativity of the people we have here . I'd like the institution tomake sense which is one condition for doing that, so I have a structural concept of what kind of place this is. And I try to see that it is sustained.

EG Do you want to tell me what your concept is?

JL Well, it's the one it was founded on. It's a bio medical research institute that has a blend of very fundamental basic science and someconnection with a range of related applications . We're not going in for being a big hospital ...

EG There are mathematicians and physicists on your staff ?

JL There are in a very limited degree. They can do a lot to enrich the overall intellectual breath of what we have here. They're not the mainstream of the institution. We have very, very, good people and I have to look out for those people too. I'm trying to find all the ways I can so that they can sort of reflect to the center of what we have here. We're a non-departmenatlized institution. That's a very important point. We don't have cadres, clusters of people focussed on specific disciplines and talking to one another but nobody else. The lab here is a sort of free-standing entity and there's great encouragement for intercommunication among them. That's an important responsibility I have to try to maintain that role. My understanding of the work that goes on in the range of labs is a very important element. That makes it a very exciting and interesting and challenging job.

EG Are you in direct contact with the research that's going on?

JL I hope so. I tried to convey that. I'm not in the bench. I'm not out there talking about this afternoon's results but I get frequent reports from my colleagues . You know, they'll often see me mainly on administrative matters, but I try not to let them leave without also catching up to what's going on scientifically. And I have many other occasion when I also inquire about that. I'm an avid reprint collector and I just collect them from my own colleagues above all. I get a weekly report from the ISI - that's the source of all the books on that shelf . But they also provide - that's a computer based information retrieval system - but I get the ASCA report and one of the versions I have is just keyed to any contributions from the ROckfeller University. So I get a weekly print out about what my colleagues have been up to . I use that as a way to keep abreast of what they're publishing. WHen there's an area I haven't heard very much about, I'll get a reprint on it.

EF I read someplace that you wrote a column for the Washington Post for a while.

JL I did. Between '66 and '71 on science and man, scientific issues and public policy.

It just covered a large potpourri of subjects. The first one in '66 was about the artificial heart. ALl the issues that you can think of today - about the dilemnas that it generates.

EG Are you still interested in public policy matters?

JL I am, but I'm not writing in any way. There's no possibility of that now. It also created a difficulty. I ended up writing about 250 columns altogether. Each one was a little bit of research and in order to produce it, my own scholarly temperment is, having done it, I can't just leave it alone , and I've got five miles of file cabinets downstairs which is the continued follow-up on these subjects.

EG (Laughter) Oh really?

JL Well, I'm exaggerating, a little, . You know,having once started to think about those things, they're still very live sort of issues . I gave a lecture up at Harvard on the artificial heart and a lot of people asked me, what my credentials were to be speaking on that subject. I had in fact been studying it for fifteen years.

EG Is there anything else that we haven't covered or that you want to tell me about?

Jl I would like to go back to Columbia COllege and how to encourage youngsters who are interested in science. I'm so delighted to hear that Bob Pollack is Dean of the College. He certainly shares the interests that I just expressed. I was hoping some more effort might be made to provide still better linkages between the high school and college experience. And I know there have been some in the past. Thinks like summer programs for high school students to work in college laboratories where students can talk to and see and touch an actual working scientist, are very important to do in a motivational way. I just hope COlumbia can have a role in that.

EG Do you know the science honors program that they have?

JL Yes.

EG They do have that for bright kids. juniors and seniors I think.

JL You see, taking courses, - I'm not sure so that that's so appropriate. FIrst

of all it doesn't guarantee - it's not terribly likely, that they're really going to have the kind of personal discourse with laboratory scientists. It isn't quite what I had in mind.

EG What did you have in mind?

JL I have in mind a way in which professors could be encouraged - if the machnery were set up, so that each one can adopt a few students. I'm saying, let them meet Francis Ryans even at a younger age. I could have stumbled very badly. It was lucky that I didn't. You know, before I got into college. I didn't really have anybody like that, in my childhood.

EG You think it would be the college's responsibility to.....?

JL Yes, the school teachers are very conscientious. I know many of them who have given their lives to the nurturing of kids that they've been teaching. But they, themselves are not working scientists.

EG You mean high school teachers.

JL At the high school level, yes. I think you do need that extra ingredient . It wouldn't hurt the school teachers themselves to have better level of contact with what the labs are really like.

EG You're saying to encourage, not only the studnets but also the teachers to come into laboratories. I think I read that something like that was tried at one time.

JL I just agreed - I'm very reluctant to add tdother complications ofthis kind. but I just had lunch with them today - I'm talking aobut the Dreyfus Foundation. - I've just joined their board. And the reason I said yes to them, is that they have focussed on just this kind of intermediation for secondary school and college education in science. They're funding a program in Princeton. The WOodrow WIlson Foundation has a summer institute for chemistry teachers. It's going on right now. They did it last summer and the summer before. From everything I hear, it's been a tremendous

success . That's dealing with he teaching level. I don't know why there isn't more of that, as between the colleges and science school teachers intown, right now. And there's probably more than I'm personally aware of, reaching to the students as well.

EG I should think it would have to be carefully arranged otherwise you'll get kids tripping over someone's work.

JL Yah, I don't know that it has to be a lot of work in the lab, although summer is a good place for that. Again, I'm projecting from my own reflections. If there were somebody I could have had half an hour with every thhee months, you know, just my accumulated questions on what I'd been tryingto learn for myself, some guidance, you know, about what reallyis the best book I should be reading on such and such a subject. You know, a few things like that, it would have been - those few minutes would have been very precious to me. Now, you could say, college students need that guidance too and they have trouble getting it. So, I don't want to leave that out.

EG Well, one of the things that you hearabout COlumbia, is that because so many of the students, especially graduate students , liveoff campus, there's verylittle interchange between students and faculty and sometimes among students themselves.

JL I think maybe it's a little more difficult. I used tohear that same complaint, even at Stanford, from students who were living on the campus . Maybe there are different levels of those barriers . It's very much a matter of the students taking some time and initiative themselves. I don't say that that's theentire story, but students need some encouragement actually to come through. The brashest of them are also the shyest of them when it comes to doing things likethat.If there's not a more organized program of counseling, it's notgoing to work. One of the things I was into at Stanford was a human biology curriculum. This was to try to provide something like general education inthe sciences with some emphasis on the biological

sciences. But general education, as opposed to the specialist programs. If you'd get a biology major you'd come out superbly trained to be a graduate student in biology. A lot of people ought tolearn more biology without necessarily going on to PhDs in that subject. So that's it in a nutshell.

EG It sounds like biology for poets, like physics for poets.

JL Well, it's biology and poetry for general education, OK? But one of the important things that was developed there , and I have to say that people like Don Kennedy had more to do than I did with actually emphasizing that part of it, but he and I and Dave Hamberg and Norm Kretchmer founded that curriculum. End Tape 663 The juniors and seniors in the human biology majors took on a largepart of the counseling work for the freshmen and the sophomores. Oh, they loved it, and they did it beautifully. It was well organized and orchestrated, and there was a director for that in the program and I can't remember anything having gone wrong. The counselors knew the bounds of what they were supposed to do and the lines of communication were open.When there were problems they couldn't handle , they knew where to go. And those students knew more about course content and who was really teaching what, than any other professor could. How could professor A really know what was going on in Course B? It worked out very well. and It's working, very , very well. It's just about the most popular curriculum on the campus. Now, the only reason it could work is that there were a bunch of department chairmen willing to commit themselves to it as a voluntary thing. It was organized among ourselves. We felt something was amiss. We've got to pull these disciplines together and set it up. There are a lot of structural obstacles to doing things like that. There are a lot of things we did't succeed in doing. Without that kind of push behind it, it would never go. You see, you can't plant it. It's not the Dean can say, "let's do it", and it happens.

EG So you did give back what Francis Ryan gave you, in a different way.

JL Maybe so, maybe so.

EG You ended that piece though, by saying that COlumbia was not in such good shape and

you hoped it could regain its prememinence in research and teaching.

JL At the time I wrote that piece

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JL things were at a very low point in the sciences.

EG Would you say its' come back, then?

JL A little, a little. It's still not what it was . But , you know it's ahead of where it was when I wrote that, by a long shot. I'm not saying anything different then my colleagues there would say.

EG I know. Are you still interested in communication in science, or was just in the one particular piece that you sent me? How scientists communicate with one another?

JL Well, I'm obviously vastly interested in it,and it has a lot to do with my job here at the ROckefeller, but I'm not writing on it, in a formal way.

EG What are you writing on?

JL Not a great deal. Just some things that come up now and then. I wrote a piece on - I'm sort of interested in the structure of research in molecular biology now, now that a lot of it has become so mechanized - and the concept of reducing the DNA code to a string of symbols is a very exciting one. You get to the point now, where a publication consists of 20,000 characters - you have an alphabet of A, G, C and T (laughter) and that's the entire paper. That is the structure of somethng terribly important. We've arrived at the reduction of biology to chemistry. Now what? and it's very, very complicated. You've got 3 billion characters to try to cope with. It's all reduced, so I have a few reflections about that.

EG Is there anything I haven't asked you about....

JL Oh, an enormous amount, (laughter)

EG I'm sure, I'm sure.. (laughter) but something that you want to say now.

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JL Well, I'd like to just go back to some of themes in that article about sciences in New York. SInce you're writing in a Columbia production. I think there'sstill a lot that could be done to make life in New York even more interesting as an academic center and that would involve still more communication between the campuses.

EG That article that you sent me, it was a statement. There were no suggestions in it. I was going to ask you if you had an recommendations.

JL Again, these are things that can't be imposed on the top. But I hop[e] there might be some agreeability to it. There are problems of very high degree of competitiveness (Off the record if the question came up - some cooperative agreement between Columbia and NYU, how far do youthink that would get? In the sense that-either one party is not worthy to be a member of it, or each is comepting for related resources - who wants to agree to the kind of coordination that says , 'well, if we're going to concentrate on 13th century art history in this area, maybe somebody else will take the post-medieval period.) So I'm not sure it's likely to happen in a number of fields. You mentioned mathematics a little while ago. I wish it were possible to find a way to get some more viability and the possibility of some collaborative arrangements. A school like this doesn't really have a way to develop a comprehensive department of mathematics . If we could have mathematicians and if they could feel comfortable about relating both to us as a sort of source department on one hand and a community of biologists on the other , I think there's still more cross fertilization that would be possible .

EG I'm not quite understanding. You're talking about mathematicians, here at Rockefeller.

JL If we could identify the appropriate people, they might find a department, a comprehensive department in mathematics as a reference group at Columbia, and spend enough of their time here, that they'd also be useful to us and bring the flavor mathematical thinking. It would have to be an actual division of time, between two

places. We started in a rather vague way to look at something like that and it's not the institution's fault, but there was not really- there was not enormous enthusiasm for it on either side, I have to say. And we need a few successful examples before we can go on.

EG Are you still thinking of your own experience, - of what we spoke about at the beginning - having the people from ROckefeller, come down with all their results to your department of zoology.?

JL I think that's right.. as a matter of fact, just to illustrate how fruitful that can be, to have that sort of interchange. Now departmental structures make it very hard to do that. Since we don'thave departmental structures maybe, even more so. However, as long as there are reasonable aspirations , as long as a place like Columbia feels that it can itself be an adequate mountain for everybody and every thing it's not going to be terribly motivated to tryto share anything with anybody else and I don't want to deter it from being everything to everybody. I don't know how much of this makes sense translated into print . I'd like to look at it very carefully. It can have meanign to others that I didn't intend.

EG I understand.

JL But what I talked about - tryingto find some deeper levels of interaction in that piece, I meant it very seriously. However, a placelike COlumbia has to ask if it doesn't need that business at home first. Its internal integration is as good as and no better than that of any other major university and that's not saying much.

EG There have been some attempts to improve it,...

JL Well, if it 's not a community a scholars within it's own framework, with all the additional difficulties of getting a cross balance and so on..It might be asking for something that's not feasible.

EG You said 'crosstown was harder." (Laughter)

JL It is (laughter) Everybody knows that.

JL I would say, even without going back, I think there's no great urging. Within a given specialty there's a fair amount of discourse and people do know one another and I'd certainly like to continue and encourage that, and find any other way that might be helpful. I'm glad that Ron Breslow is on my board of trustees. We have a scientific committee on the board and he's on it. He's a professor of chemistry at Columbia, as you know. And I think this institution has such a specialized function that it certainly not in direct competition with Columbia University, as a whole and I think we don't have to worry about satisfying each other's quality standards and so I think there's a possibility of things we might try to connect.. Anyhow , the spirit's there.

EG Yes , I see. OK. Let's see if there are other questions which I didn't ask.....

pause..

JL By the way, some of the ideas of curricular development (it might not be too dissonant with some of the things that I was talking aabout. The issue of majors and so on - things have improved enormously since I was a student - I'm quite sure that with the right counseling - I keep coming back to that - any students who has the interest and the will can find unexampled riches around the range of thing that's available at Columbia. Without knowing first hand I'm skeptical of the counseling that's there. I guess I did discuss this with Ellen Futter ~~Putter~~, across the street and she had to agree that it was difficult issue over there too. And it's not something that can be done spontaneously. A good counselor has to know a lot about what's being taught in a range of areas around the school and that's very difficult to know.

EG Also, I suppose the accessibility to the students and...

JL It has to be managed carefully. A few students can swallow up an enormous amount of time andyou have to find some way in which a reasonable amount of time can in fact

accomplish a great deal. I still think it's an important ofour investment. It hardly ever appears on somebody's CV when they're up for tenure or something of thast sort , so there's very little reinforcement to expending much effort in that direction. Pure counseling has perils as well...

EG You're talking about counseling in terms of curriculum

JL Yes, inevitably there's more personal counseling on top of that, which not every professor is going to do well. You can't expect that uniformly.

EG Is there anything else that youwould like to say?

JL I don't think so.

EG OK That's about it. I think we covereda lot of territory.