INTERVIEWER: So this is the 150th Anniversary interview with professor Tyler Jacks. And you're a local person, so why don't you tell me a little bit about growing up in this area.

JACKS: Well, I guess I'm local on two levels. One, I did grow up in Massachusetts and spent my entire adolescence through college, actually, in the area. Knew about MIT in general terms, but more specifically my father was on the faculty here. So in that in that sense I'm very local. I used to get my healthcare from the MIT medical services as a boy and would come in with my father on those occasions. And sometimes attend classes as a high school student or even younger just to get a sense of what MIT was really like from that perspective. So I've been I've been around the Institute actually since my early childhood.

INTERVIEWER: So what was it like being in classes as a kid?

JACKS: A bit intimidating. I remember several examples, actually, of professors recognizing me part way through the lecture and stopping and staring at me and at least on a few occasions saying, what the heck it you doing here? And of course I didn't know very much. I was there just to kind of take in the atmosphere, not so much take in the information.

But I was obviously extremely impressed by the scale and scope and wonder of MIT in the eyes of a small child.

INTERVIEWER: What department with your father in?

TYLER JACKS: He was on the faculty of the Sloan School. So he taught labor relations in the Sloan School and was very involved in the Sloan executive program. So that was my perspective at the time, was more through Sloan. But actually when I would visit campus I would sample classes in different disciplines. And my brother, actually, was a undergraduate student here, as well. So when I was entering high school and going through high school he was in college here.

INTERVIEWER: Now, you're a science person. So were you always interested in science?

JACKS: My interest in science grew over time. I certainly was interested beginning in high school, but I was interested in many things in high school and didn't really know what career path I would take. The fact is that when I went to college, and I didn't go to MIT, I went up the road.

INTERVIEWER: You can say the name.

TYLER JACKS: Yeah, I went to Harvard. There's actually an interesting story about the decision to go to Harvard versus at least consider coming to MIT. And it relates to your question, actually.

The fact is that had I known then-- that is as a high school student thinking about where to go to college --that I was going to become a scientist and ultimately become a cancer researcher, I might well have chosen to come to MIT. But at the time I didn't know. And in fact, if I'd had to choose a career as a high school senior it probably would have been as a lawyer or as a politician. I was very interested in that sort of thing. My father was a lawyer. My brother was in law school at the time.

So for me the decision came a little bit later. It actually was influenced very strongly by a course that I took as an undergraduate during my sophomore year in molecular biology by a wonderful lecturer by the name of David Dressler, who was able to both convey the necessary information about the budding new discipline of molecular biology, but also the excitement and the power of that discipline. So based on that experience-- very much, largely based on that experience and then at the end of that year joining his laboratory --I became more and more committed. So starting at around the end of my sophomore year I was quite certain that I would go into biological sciences.

INTERVIEWER: What was it that was so enthralling about it-- for someone who is so interested in different things --what clicked about that?

JACKS: Well, for me, the interest in science and the interest in biology in particular, relates to a larger interest I have in and had at the time, even --in understanding how things work; understanding how the component parts of a more complex system fit together and function to allow that more complex machine to carry out it's work. As a younger individual in high school I used to take cars apart and put them back together to make to non-functional cars functional. And I think it was that interest which really carried through, ultimately, to understand then how cells work and how they become defective in the development of disease.

And particularly, that course that I took it as a sophomore and learning about the recombinant DNA revolution-- this was in the early 1980s --when cloning-- not organismal cloning but DNA genetic engineering, let's call it --was just becoming feasible and DNA sequencing was being developed, actually right down the hall from where I was doing my research. We were beginning to be able to manipulate the genetic material of cells and in that way investigate much more thoroughly how they contribute to normal cell behavior, normal development, and ultimately disease. And I got to participate in that even as an undergraduate researcher. So that was just captivating to me and it really was quite quickly that I decided this is what I wanted to do for a living.

INTERVIEWER: You spent a sort of important year living in Cambridge--

JACKS: How do you know that?

INTERVIEWER: I did my homework. --and I wonder if you would talk about how that was an influence on you.

JACKS: Well it's true that I lived in Cambridge, Mass. one year growing up when I was in fourth grade. As I mentioned, my father was on the MIT Faculty so he was always commuting to work from Southborough, which is where I had grown up, and my mother actually inherited a house in Cambridge not far from the Harvard Divinity School. And we decided to move there.

So we moved in 1970, I believe. And it was a tremendous year for me on many levels. It was 1970 Cambridge, so this was the end of the 60s. The Vietnam War was still ongoing; there were a lot of protests with the sort of free love, drug generation. I was only 10, but nevertheless I watched it happen. My brother's seven years older so he was participating. And so it was just a lot of fun, actually.

But more importantly, perhaps, I attended what was then called the Agassi School in Cambridge and had a fantastic teacher there; a woman named Susie Carpel-- who was a bit of a free spirit herself --and was very much committed to expanding the minds of her young students and taught us lots of different things and allowed us to teach each other. It was a very non-traditional classroom and really got me excited about the whole learning process in a way that I hadn't experienced before and probably haven't experienced since. So she had a big affect on my interest in education and learning, and the different ways that education and learning can be exciting.

INTERVIEWER: And after a year your parents decided, no more Cambridge.

JACKS: Yeah, it wasn't quite-- they didn't decide against Cambridge. It's somewhat of a mundane explanation, unfortunately; couldn't sell their house in Southborough. So as a consequence we sold the house in Cambridge and regretted it, actually, ever since. But that was a necessity.

INTERVIEWER: Was it difficult to go back to Southborough?

JACKS: It wasn't terribly difficult to go back. I had lots of friends there, obviously, and it was a very different lifestyle. Inner-city Cambridge versus much more rural Southborough. And they were lots of things that I liked about Southborough, as well, so it really wasn't difficult transition. But given the effect that the fourth grade had on me, it would have been interesting to play the tape forward had I stayed in Cambridge and what might have happened as a consequence.

INTERVIEWER: So tell me how you wound up picking Harvard.

JACKS: Well, the decision to go to Harvard was influenced by a number of things. As I said, I'm from this area so I know these institutions quite well. And I think I knew pretty well the differences between Harvard and MIT, for example, at the time. With MIT being wonderful for science and math and engineering, and Harvard being also very good in those areas, but also very good in a broader range of areas. And so for me, Harvard made more sense at the time because I didn't know at that time exactly what I was going to do.

My father had gone to Harvard, so that was also part of my upbringing and it was a goal for me from some point during my education. As I said, my father was on the faculty here and then, and even now, there's the incentive to have your children attend this university because of the contribution to tuition. Which at the time --and I think it's still true. I should know this but I don't --the tuition for your children is waived. So it's free, at least on a tuition basis. So my father had great incentive to have me come to MIT and actually offered me a sports car if I would come to MIT.

INTERVIEWER: And that didn't do it?

JACKS: It didn't do it. Actually, I didn't even apply in the end. I got accepted early to Harvard. So I accepted that invitation and that was that.

INTERVIEWER: And you don't regret it?

JACKS: No, I had a wonderful time at Harvard, actually. I learned a lot. I had a wonderful experience educationally. I got very involved in research as an undergraduate, which was extremely important to my ultimate career development. Met a lot of wonderful people, many of whom are friends to this day. So I had a great time there, actually, and if I'm asked by undergraduate students, should I go to Harvard or to MIT or to some other institution, I always have good things to say about the Harvard experience. It's very dependent on the kid, obviously, and what they're looking for and really what their approach is. But both are wonderful institutions.

INTERVIEWER: So this research you got involved in sophomore year was about leukemia, correct?

TYLER JACKS: That's correct.

INTERVIEWER: Can you talk a little bit about what you were involved in and your contribution and what was going?

JACKS: Yeah, I was working on a leukemia induced by a virus, called the Friend Erythroleukemia Virus-- identified years earlier by woman named Charlotte Friend -- and this virus causes leukemia in animals, not in humans. And we had access to leukemic cells derived from those animals. We were really trying to understand what it was in those cells, what the virus had done to those cells, that had blocked their normal function and normal development and in a sense locked them into this leukemic state. Our approach at the time was to try to understand the regulation of the genes of those cells and how they differed from normal blood cells. There was then, and there still is, a great interest in the details of how genes are turned on and turned off. All cells have the same DNA compliment-- now we know it's about 20,000 genes --but different cells differ in which of that collection is turned on and therefore turned off. And the different cell types in our body differ in that respect.

These leukemic cells had failed to turn on certain genes that should have been on, given the type of cell that they were. So we want to understand that process and use these leukemic cells to dig into the details of this gene expression regulation.

INTERVIEWER: Was this work so influential to you? Did you decide become the cancer researcher based on this experience?

JACKS: It was based on that experience and other things happening more or less at the same time. The research that I did as an undergraduate related to cancer, but it also related to the regulation of gene expression, which is much broader than cancer. And I could easily have gone into-- based on that experience --I could have easily gone into some other aspect of biology research. But it did introduce me to some of the problems of cancer and it got me interested in the problems of cancer.

In addition, I was taking classes including classes about cancer. And cancer was at a very interesting point just then because we were beginning to understand the genes that are altered-- specifically mutated --in the development of cancers, not just in experimental animals, but also in humans. And there was a very influential moment that occurred right around that time. I think it was probably in the spring of 1983-- I might be off by a year, probably the spring of '83. Probably the spring of '82, actually, because I know when the paper was published --during this course in cancer biology, which was a seminar style course, and the professors would invite in experts in different areas of cancer research, and they invited an expert from down the road here at MIT, a guy named Bob Weinberg.

And Weinberg described in his lecture to us some ongoing research in his lab which had identified a human cancer gene for the first time through what is now a classic experiment. And that was just amazing to me. I got extremely excited about the potential for understanding cancer at the genetic level and the implications of that; what it would mean if we understood cancer at the genetic level ultimately to try to control the disease. So that exposure to that type of work from Weinberg.

We also learned about work from researchers out in California. Mike Bishop and Harold Varmus, who ultimately won the Nobel Prize for their discoveries of cancer genes. And as you may know after college, I went to the University of California San Francisco and worked for Varmus, so it was kind of locked in at that early point.

INTERVIEWER: So what is it you were looking for when you thought about graduate school? And how did you wind up in California?

JACKS: My choice for graduate school was a combination of regional interests and scientific interests. I'd grown up in Massachusetts. I'd spent really my entire life in Massachusetts through college, and was anxious to experience a different part the country. So I applied mostly to schools in California, actually. And there are many terrific institutions there, all of which I probably would have been happy at. At the end of the day I was deciding between Stanford and UCSF and Berkeley.

UCSF was most attractive to me partly because of the fact that Bishop and Varmus were there. But it wasn't only that. I liked the fact that it was a medical campus and there were opportunities to experience both biological research and things medical. In fact shortly after I arrived at UCSF, literally within a couple of weeks, I was approached by somebody in the MD/PhD program, which is the joint degree program where you get both the medical degree and a PhD-- I'd gone to UCSF as a PhD student --but I was approached by this individual asking me whether I was interested in joining the joint degree program. Which I hadn't really seriously considered in college and in fact hadn't taken the MCAT exam, so I was I was not eligible to go to medical school. But I was asked whether I was interested just based on my general interest in biomedical research and ultimately did join that program. So UCSF being at this interface between biology, biomedical research, and medicine was particularly appealing.

INTERVIEWER: Not having taken those exams was not a problem?

TYLER JACKS: It was a big problem, actually. They couldn't accept me. The person who had raised this as a possibility thought we could make a work around, but it turned out that was not doable. So I was not accepted into the program straight away. Had I been, everything would have been different in my career, I expect. Because had I been accepted right then, I would have gone to medical school. That's the typical course for an MD/PhD student; you spent two years at medical school, then you take a break, do your PhD, and then you come back to medical school. And had I been accepted right away I would have gone to medical school classes, and who knows what would've happened.

Because I hadn't taken MCAT, I couldn't do that. So I instead I did my first year courses of graduate school, took the MCAT exam in the spring, got accepted into the program at the end of that first year, and then an interesting thing happened: I had decided to join the Varmus lab, and actually had started my research project, and I was sent two letters of acceptance from the MD/PhD program, one of which said, congratulations, we want you to start medical school next fall. And the second letter said, congratulations, you can finish your PhD studies, and then when you're done with your PhD studies you can go to medical school. So I answered the second letter and decided to finish my PhD. And by the time I finish my PhD I was so excited about research and very intent on a research career, that I couldn't fathom going to medical school and doing the medical training, which takes a long time. So I decided not to go to medical school, and I think I'm the only example of MD/PhD student at UCSF who's bagged in that fashion. I don't think they take students like me anymore.

INTERVIEWER: Well, they certainly wouldn't take somebody and let them do the PhD first.

JACKS: That's what I mean. They have many examples of people who decide to leave the program for one reason or another, but I don't think they'd let them do it in the sequence that they let me.

INTERVIEWER: So what was it like working in the Varmus lab?

JACKS: It was a very exciting time in the Varmus lab. When I joined, actually, it was the Bishop-Varmus lab; they ran a joint lab on the same floor at UCSF. So it was a very large lab full of terrific people working on, mostly, aspects of cancer genetics but also aspects of retrovirology. There was a subset of the group, both groups, I guess, who were interested in how retroviruses reproduce themselves. That's relevant to cancer because we learned about cancer genes in part through the study of retroviruses, which can cause cancer in experimental animals. But it's also interesting from a purely virological point of view.

And ironically, even though I came to UCSF to work on cancer and I joined the Varmus lab to work on cancer, I actually studied retrovirology there. My project was very much about basic questions in the retroviral life cycle. That was also extremely exciting though, because the HIV virus-- the virus that causes AIDS --was discovered right then, and I got to participate, actually, in understanding some of the basic, fundamental mechanisms by which HIV reproduces itself and published a couple of papers on that, too.

INTERVIEWER: Your timing has been excellent.

JACKS: Yeah. No, it's been good, yeah. Luck plays a big role here.

INTERVIEWER: Were there any other besides your molecular biology person, any other mentors or really influential professors who impacted your decisions along the way?

JACKS: Well, I've had terrific teachers throughout, actually. I won't list of them by name, but even we talked about a fourth grade teacher and I actually had terrific teachers throughout school, through high school. I went to public high schools, actually and really committed individuals from a lot of different disciplines. And likewise in college: terrific teachers. But I think for me the most influential ones have been the ones who sort of shaped to my decision to go into science. And that continues. We haven't talked about my post-doctoral phase, we might in a moment, but Weinberg, whom we've mentioned already, was obviously extremely important in the last phase of my training.

INTERVIEWER: So how did you wind up finishing your PhD and then working with Robert Weinberg?

JACKS: The decision to join Bob Weinberg's lab was also very much influenced by developments in the field taking place at that time. So now we're talking about the mid- 1980s, '86, '87 time frame. I had worked on retrovirology, and a very, very specific aspect of retrovirology: ribosomal frameshifting, which is pretty obscure stuff. And pretty far removed from cancer, actually. And throughout the time that I was doing my PhD studies, I knew that I would return to cancer. I was doing that because it was exciting at the time. It was new. I learned a lot in doing it. But I knew that it was just a chapter and it wasn't going to be continued thereafter.

I was looking for an opportunity to return to cancer and in that period of time, we were learning about a new class of cancer genes. The first class of cancer genes, the first era of cancer genes, involve what we call oncogenes. And the work that I described earlier involving Weinberg's discovery and Bishop and Varmus' discoveries related to the discovery of oncogenes. These genes promote cancer development when mutated by in a sense locking the cell into a phase in which they proliferate continuously.

In the '80s, a new class of cancer genes was being appreciated. We call them tumor suppressor genes now, and they act in the opposite fashion. They act as the brakes on the cell division cycle. And they are involved in cancer when mutated or lost.

So we were just learning about this new class and this class caught my attention not only because it was clear that these genes that were important in cancer, but also there were people who had inherited mutant copies of these genes and by virtue of that mutation, were cancer prone. So we were beginning to see the nature of familial predisposition to cancer, specifically involving the loss of function of these tumor suppressor genes, and that I found very, very interesting. So that was one set of influences.

The best studied of that class of genes was something called the retinoblastoma tumor suppressor gene: Rb. And Bob Weinberg's lab had cloned it. So that was on my radar screen, for sure. Separately, unrelated work was developing the ability to make mice with mutations in any gene of interest. It was very nascent at that time. In fact, only the proof of principal experiments had been done. Nobody had mutated an interesting gene by the mid 1980s, but the technology was being developed to allow that to be done. So I decided, in probably like 1987, that I would apply this new technology, gene targeting technology or knockout technology, to create mice that had a mutation in the retinoblastoma tumor suppressor gene in order to make a mouse model of the familial cancer syndrome associated with mutation of the very same gene.

So that was the idea which I then pitched to Weinberg. He probably thought I was crazy at the time. I think he would even admit that, but I decided I would give it a go and that's what I did as a postdoc.

INTERVIEWER: Did you at any point think about heading off in the HIV direction for your career?

TYLER JACKS: I did briefly. I was a graduate student between '83 and '88, and HIV was described in '83. I mean it was really very much a major topic of scientific investigation, and I was working in San Francisco, which was a hot spot of the infection. So I certainly thought about it, but frankly I was committed to a career in cancer research. That's what I really wanted to do. So although I thought about it-- and I certainly could have done that given the training that I had --I was much more interested in going in the direction of cancer.

INTERVIEWER: Is there a where to articulate why you think that was? What was it about cancer that generated that sort of commitment?

JACKS: It's a good question and I've thought about that. I have not been closely, personally affected by the disease. It wasn't like I came from a family in which we had a lot of cancers and I knew as a small child that I needed to solve this scourge. On the other hand, I think I probably did appreciate even than what a big problem it was. And I think the thing that attracted me was the notion that by understanding the disease better, we could actually develop better therapies. That there was an opportunity to use science to inform us about the disease-- so from a very basic science kind of perspective --but that that information can be used ultimately to come up with better therapies. Because everybody knew-- I certainly knew --but I think everybody understands that cancer treatments are barbaric. It's almost embarrassing how crude most cancer therapies-- certainly at the time, and largely still true today --are. And so there was a tremendous opportunity to do good. It was interesting, but also there was an opportunity to change the paradigm in terms of how cancers were treated. I think that's probably what drove me even from that early stage.

INTERVIEWER: You had lots of experiences at MIT, but do you remember sort of what you thought when you actually came here?

JACKS: Yes, I remember it very well. My arrival in the spring of 1988 was very exciting. I was joining the Whitehead Institute, which had opened probably three or four years before and was considered widely as a Mecca of biomedical research. David Baltimore was the director at the time. Bob Weinberg was there, Rudy Jaenisch, Harvey Lodish, a tremendous group of talented investigators. Being funded in a slightly different way with this large philanthropic gift, it was a very exciting place to work. And it was part of the larger MIT community which I did know, but from a very different perspective, and began to appreciate actually more fully upon my arrival.

MIT had had and was developing among the best, if not the best, Department of Biology in the country. And so the Whitehead was part of that larger community. The Center for Cancer Research, which I ultimately became part of, was also part of that community. So there was just a tremendous collection of people doing really interesting work in the area that I had chosen. So it was a great, great time to be a postdoctoral fellow.

INTERVIEWER: You said that you became even more impressed when you started working here. What was it that impressed you? What was different in your perspective?

JACKS: Well, MIT is different in its approach to research, in its approach to scholarship, in its approach to education, in my experience. I was impressed and remain impressed by the commitment of our faculty to the educational process as a whole, the degree to which our very established faculty colleagues get involved in all aspects of the educational process, from undergraduate to graduate training, post doctoral training, and their own research in their laboratories.

It didn't have to be that way. These folks who are so well accomplished could have developed big egos and led them to lock themselves away in their ivory towers, never to be seen again. But it's not that way at all. It's a highly collegial, very interactive, collaborative environment. Lots of interactions between labs. And these guys participate in the educational process.

So that surprised me. And it made the whole experience, even as a postdoc, but certainly since then as a faculty member, much more pleasurable. I felt a part of a community that I think doesn't exist in every similar outstanding research university.

INTERVIEWER: Did it have a different feel than your experience at Harvard and UCSF?

JACKS: Yes, it did. And I don't mean to demean any other institution, but I think that the overall approach at Harvard is slightly different, if not more substantially different. At least at the time; I shouldn't say that it is today because I don't really know. But I think the degree of interaction amongst the faculty, the engagement of the faculty in the educational process, is different. Harvard is also a different type of university; it's much broader in its scope. MIT is more focused on science and technology, which I think adds to its ability to be interactive across those disciplines.

UCSF was different because it doesn't have undergraduates. It's a different type of campus altogether. And I think the undergraduates and the fact that we're a university contributes to the atmosphere here. So it actually did feel quite different. And I've obviously experienced many other universities through my travels, and I think it still stands alone in the kind of unique character of this place.

INTERVIEWER: Are there any other things that you would point to as being unique about MIT?

JACKS: I think our undergraduates are unique. I think the kinds of kids who come here are very talented, very committed, very motivated. They're very smart. They know a lot about-- typically --they know a lot about science and math and aspects of technology when they come. I think that probably only Caltech would compare with respect to an undergraduate population. So that, I think, is unusual about this place, and the undergraduates add a lot to our work and to the atmosphere.

The other thing that's unusual about MIT is, and it relates to my comment earlier about interaction and sort of lack of ego, people here are interested in interacting with colleagues around the university. It happens in different ways and probably to different extents, depending on the specific circumstances, but there are lots of examples of such interactions. But that doesn't have to be true, and it isn't true it at other universities. I think it's helped by the fact that we are a university of science and technology. That's what this place is about. And the leadership of our university, between our deans and our provosts and our president, understand that. They grew up in that culture and they can help foster and facilitate those kinds of interactions and that kind of culture. So that's unusual about MIT.

INTERVIEWER: I've been very struck in doing these interviews with the extent to which collaboration is a natural, daily part of how things are done here, and that seems very unique to me.

TYLER JACKS: Yeah. I think it's becoming more common, collaboration, but it's something that's been happening at MIT for a long time; it's part of the culture here. Collaboration within a given discipline amongst faculty in particular department, for example, but also across disciplines. And that aspect is growing considerably. And I've been very involved in that through the establishment of Koch Institute, which is all about cross disciplinary interaction and collaboration. But I think it's part of the fabric of MIT. I think it's part of the M.O. of this institution, is to promote those kinds of interactions. And to bring people together who've see things from different perspectives, hopefully with the goal of solving the problems. That's another part of the fabric of MIT; it's very much about solving problems, which is not always the same for a research university. You could describe that more as just defining the problems, but MIT has a very practical aspect to it. And that can be benefited, I think, by bringing people together who represent different points of view and different disciplines.

INTERVIEWER: And another thing that we've actually talked about here, and listening to a number of these interviews, is it seems to be pretty easy here to do something new, to try something.

JACKS: Yes.

INTERVIEWER: Have you had any personal experiences or, you know, like that?

TYLER JACKS: Well I've had many experiences where I've been encouraged to try something new, from within my own laboratory to a much larger scale. I think all good or great universities encourage their faculty to go beyond, to develop new ideas and new approaches. In that sense the MIT approach is consistent with many such universities' approaches. But I would say my experience in terms of trying something new which was particularly noteworthy with respect to the MIT experience, was the Koch Institute project, where the decision to develop a new cancer research institute that involves cancer scientists and engineers was very new, risky, expensive, you could argue a bit of a gamble, but I was given tremendous support, as were all the others who've been involved in this project from all the levels of our administration. Because it seemed like it had the potential to do something very different and very powerful. It resonated well with what MIT is about. And so I agree: that sort of attitude that we don't have to stay locked into our common approaches let's try something different, is more common here.

INTERVIEWER: This is probably as good a time as any to walk through that sort of history of the Center for Cancer Research and then how it sort of evolved. Can you tell me that story?

TYLER JACKS: Yeah, so the story of the Center for Cancer Research and it's transition to the Koch Institute is a long one, and actually goes back to the early 1970s. MIT had already established itself is a major center of biological research based on investments that had occurred 20 years before. And one of the people who had led that was Salvador Luria, who was a geneticist, very instrumental in understanding the fundamental nature of DNA and the genetic code. He came to MIT and continued on researching the fundamental nature of cells and genes and DNA and won a Nobel Prize for that work, by the way.

And in the late 1960s, early 1970s, there was a discussion in Washington to create new centers for cancer research as a product of the National Cancer Act that Richard Nixon signed into law in December of 1971. And MIT was poised to apply for funding through that mechanism. Jim Watson, actually, was very instrumental in that bill and argued strongly that the money shouldn't just go to clinical centers, but also to basic research centers. And MIT responded to that opportunity by putting in an application for a new center for cancer research that Luria would head. That application was successful, the center was established, and with money from the Federal government as well as from MIT, an old candy factory was purchased-- the Brigham's Candy Factory -- and outfitted for prep laboratories. So there were 13 laboratories established at the time.

And Luria was masterful in assembling a tremendous team of young investigators. David Baltimore, Nancy Hopkins, Phil Sharp, Richard Hynes, ultimately Susumu Tonegawa, many others, several of whom are still on our faculty today. And they then invested themselves into understanding the fundamental nature of cancer. The argument being, we didn't know anything. And that was true.

We literally knew almost nothing about how cancer cells differed from normal cells at the molecular level. And because the tools of genetic engineering and molecular biology were just becoming operative, the approach was to try to understand cancer at the molecular level, at the genetic level. And that group contributed significantly to our current understanding of how cancer cells differ from normal cells. Many important discoveries, not just about how cancers develop, but also about the fundamental nature of mammalian cells, human cells. Phil Sharp's discovery of splicing, for example, was done in the context of a virus that can cause cancer in animals, but actually led to an appreciation about how genes are organized in our cells much more broadly.

Anyway, they together, from that early point and I would say on through until the current era, have made significant contributions to how cancer develops.

INTERVIEWER: Can you name a few of those?

JACKS: Well, I've mentioned splicing, as an example; Phil Sharp's discovery. Bob Weinberg's work in discovery of the first human oncogene took place in the Center for Cancer Research laboratories. David Baltimore's work in understanding the fundamental nature of multiple cancer genes, including one called abl kinase, which was then appreciated to be involved in certain human leukemias. And that discovery ultimately led to the development of a small molecule drug called Gleevec, which is now used successfully in the treatment of that disease.

Richard Hynes' lab discovered components of the extracellular matrix and the receptors that bind to the extracellular matrix, which is very important in how cancer cells form their structures and move around and metastasize. There are innumerable examples of fundamental discoveries. And again, on to this day Jackie Lees' work, for example, understanding the retinoblastoma protein and how it controls the cell cycle through its interactions with transcription factors called E2Fs. Angelica Ammon's discoveries of the fundamental nature of the cell cycle, which again becomes deranged in the development of cancer. So these contributions started early and continue on to the current era.

Now in terms of the telling of the story, back in probably the mid 90s, Richard Hynes, the director at the time, began to lobby the administration that it was time to think about a new building. The old candy factory had sort of served its time and was beginning to show it's age. We really did need to replace it, but there are other priorities and we ultimately were not successful in getting that approved. I then took over in 2001 and took up the challenge of lobbying for a new building for the Center for Cancer Research. And in fact got approval at one level, at least, from our previous president Chuck Vest, and our previous provost Bob Brown that yes, that was right. We needed to do that.

We even got the site approved on Main Street across from the Whitehead Institute. But we hadn't done much detailed planning at the time and Chuck was on his way out as president, and he didn't want to make any further commitments that might burden the new incoming president.

So Susan Hockfield arrived and she and I begin to talk about the future of cancer research at MIT. And she began to ask me what was happening in cancer research. And I talked about some of these fundamental discoveries that I've just mentioned to you and how wonderful our cancer scientists were, but I also started to talk to her about some new developments involving not just cancer scientists, biologists, but also engineers, with whom we had begun to interact productively.

And this was relatively new. The long history of the Center for Cancer Search had rather few examples of interactions with engineering colleagues, but in the previous couple of years we began to reach out more extensively to our engineering colleagues. From biological engineering to do, for example, computational and mathematical modeling of complex problems in cancer biology, to our nanotechnology colleagues to think about new delivery vehicles for cancer drugs or new imaging agents for cancer. These had led ultimately to large grants from the National Cancer Institute to support this interdisciplinary approach for cancer search. And when I started to mention these things, her face lit up and she said, that sounds particularly interesting, and we should work on enhancing that kind of cancer research. Which I was very pleased to hear, and frankly surprised she took it one step further.

As we begin to talk about a new building for the Center for Cancer Research and a new building that would house the cancer scientists from the Center for Cancer Search, she actually said something like, you're thinking too small. The new building should be bigger than that. It should include the cancer scientists, but it should also include those engineers. And we should create a new type of cancer center here at MIT that would be very interdisciplinary. I was surprised to hear it just because it had been such a fight to get approval of a 1x sized building. I never could've imagined that we would build a 2x sized building. But that's exactly what we were talking about, and from that point forward we actually set out to do exactly that, which has ultimately lead to the development of what we now call the Koch Institute for Integrative Cancer Research.

The Koch Institute part reflects the fact that David Koch, MIT alumnus, cancer survivor, very dedicated supporter of this institution, made ultimately a $100 million dollars plus contribution to help us build that new building and outfit it. We also had to organize the faculty who would work in the new interdisciplinary cancer institute. We identified engineers from across the MIT campus working in many different engineering departments. Our original list had 10 engineers, many of whom we had begun our interactions with by then, some of whom we hoped to interact with in the future. We made 10 offers, and all 10 offers were accepted to join us in this new building.

And so for the last, oh boy, three, three and a half years, we've been designing that building and now building that building. And in a few months time we'll move into that new building.

INTERVIEWER: I can imagine that not only would there be a lot of excitement in the MIT community about this sort of a joint venture, but that in the field in general, was there a big reaction to this new vision?

JACKS: Yeah. I think there was, and remains, and continues to be a lot of excitement and appreciation for this new approach. And part of that is the inherent power of bringing people from different disciplines together to think about cancer in new ways, approach the problem in new ways, but also it resonates so well. It seems so right for MIT to be doing this for the cancer problem because we have such talent in science, in cancer biology, and in engineering sciences and technologies. It is the perfect place to take this approach.

And we have had clear validation from our colleagues about this idea. Our cancer center is part of the National Cancer Program, part of the National Cancer Institute's designated Cancer Centers Program, and every five years we get reviewed to see whether we're worthy of that designation and our core grant is approved for further funding based on that review. And we defended that grant most recently in the fall of last year, so six months ago. And that was the first time we were describing the new vision, the new Institute. We talked glowingly about our history in the Center for Cancer Research and all that we had done, but we really focused on what we were going to do. The power of bringing scientists and engineers together. Examples of how we could do a better job at understanding cancer on the one hand, but also developing new solutions for the disease.

We talked about the very translational aspects of what we were doing, the ability to turn our discoveries, whether basic science discoveries or new technologies, into ways to diagnose the disease in patients more rapidly or to treat patients in the near term. And the reviewers were extremely excited. And we got our reviews back and they were filled with comments like, paradigm shifting nature of this process, and how this was really a high point in cancer research for the country, not just for MIT. The review actually could not have been more positive even if I had scripted it myself. So we're clearly on the right track here, and now the burden is on us to deliver.

We haven't moved into that building yet. We've begun some of this interdisciplinary work and we have many good examples of how it can be powerful, but when we move in our opportunities will be that much greater because we will be sharing the same building. We will have those chance encounters in the hallway and in the lunchroom that we've talked about as being so powerful in precipitating the next great idea. That's to come. So we'll see what the future looks like.

INTERVIEWER: Do you have any speculation about that? Are there specific things that could point to to say, you know, here's what we're thinking we might see or discover in the next 10 years?

TYLER JACKS: Yeah, I think there are specific examples of things that I think we will do and I'm confident we will do. I'm excited about those, and I'll tell you about those in a moment. I'll pick a few examples. But there are other things which I can't anticipate, and I'm more excited about those. Because you know, those are going to be the products of these chance encounters. Those are going to be the products of investigators from different disciplines coming together at this interface and thinking of something new that I haven't thought about yet. And those could easily be much more powerful than the ones I can imagine.

But regarding the ones I can imagine, I'll just give you three brief examples to illustrate the point.

We now have in hand a technology that could be transformative in cancer treatment. It's a technology that derives from a natural cellular process. We call it RNA interference. It was only discovered a decade ago; it's already lead to a Nobel Prize for the two individuals who discovered it. One of whom was a former graduate student of Phil Sharp, again, a guy named Andy Fire. The other discoverer is Craig Mellow from UMass Worcester. And RNAi has the potential to allow you to silence, shut off, inactivate, any gene of interest.

Because cancer is in its essence a genetic disease-- it's a disease in which genes don't function properly --if one could silence a critical cancer gene, it could turn that cancer cell into a more normal cell. Or it could cause that cancer cell to stop dividing or to die, which would be extremely powerful. And there many such genes that we've identified, several of which encode proteins that are difficult to drug in a classical sense to, find a small molecule inhibitor to interfere with, or an antibody to interfere with. But with RNAi , it doesn't matter what the gene encodes. It's indiscriminate. It can shut off any gene. So that's tremendously powerful, and Phil Sharp actually started a company with this in mind, called Alnylam.

The challenge is to get these RNA molecules, which do the silencing, into the cells of interest. This is a delivery problem. And our colleagues in engineering, Bob Langer and others-- Sangeeta Bhatia, others --are developing new materials for improved delivery of RNAi molecules, which will be in the clinic, I suspect, within the year. And if successful, could really change the nature of cancer treatment. So that's one. And depends on cancer science, biology, and engineering.

The second example comes in that area of cancer immunology. In theory, your immune system should recognize these abnormalities that occur in your cells that lead ultimately to cancer and eliminate those abnormal cells. Ideally that would be true, but because humans develop cancer, we know it ultimately fails. The question is why? And we're beginning to learn, through our understanding of immunology and cancer biology, some of the mechanisms by which cancers control the immune system. Which they do, actively.

We need to be able to overcome those types of inhibition to allow the immune system to fight cancer more effectively. And some of our engineering colleagues like Darrell Irvine, chemical engineer, material scientist, is developing new approaches using, again, nanotechnology, to soup-up, over-stimulate the cells of the immune system, to counteract the negative effects that the tumor has to allow those cells to do a better job. And again, in preclinical models of cancer, they're working extremely well and I believe will be tested, again, in the near term. And I'm quite hopeful about them.

Final example, also in the area of technology and science coming together, is in cancer monitoring. So we know that cancers develop over time. Cancers when treated can go into remission, but ultimately can relapse. And for all these things we would like to be able to monitor the state of the disease more actively then we currently do. We're not very good about knowing the specific nature of an individual's disease over time. We do screening tests, but we do them periodically. And the disease could be changing substantially in between the times that we look at it.

So Michael Cima and Bob Langer and others are developing new technologies to implant sensors into the body, for example at the time of biopsy, that would allow one to track the state of the disease over time continuously and, if a change occurs, to send a signal back out of the body to the individual, or more practically, their oncologist to begin to treat the disease at that time.

This technology is moving rapidly along, and I think Michael will deploy a device of this sort in patients within the next couple of years. So these are things that are very much on the horizon. I can see how they will take shape. They're, in my view, wonderful examples of the power of bringing cancer scientists and engineers and clinicians together around a problem. But as I said earlier, the even more powerful ideas I haven't even thought of yet.

INTERVIEWER: You are sitting, as director, in a seat that's very exciting at a very exciting time. Can you talk a little bit about the administrative responsibilities that you have and the appeal of that and also how you balance that with your own personal research?

JACKS: Sure. I agree that it's an exciting time; no question about it. I've been fortunate, really, to be given the opportunity to help lead this effort to create a new type of cancer research institute here at MIT, and I've done so with enthusiasm. It's been a bit of work, to be sure.

Beyond just the design and execution of a building project, we're also developing a new culture which is exciting and has its own challenges. We're bringing together individuals from different disciplines who approach problems in different ways. Don't necessarily know each other. Don't know each other's languages terribly well. And so that has added, I would say, to the challenge and also to the fun, I think. Because it's interesting to watch this process of educating one's colleagues unfold.

So I've enjoyed my role as director very much, and I've been extremely well supported in that role. I have two associate directors-- Jackie Lees is on the science side, Dane Wittrup on the engineering side --who help me think through the plan and execute the plan.

I've been extremely supported by the MIT administration really since day one. This is a complicated project. It involves the School of Engineering as well as the School of Science, therefore the Dean of Engineering as well as the Dean of Science. It involves multiple departments at MIT, I think seven different departments at MIT. So the different department heads of those departments are also involved. We now report to the Vice President for Research at MIT, Claude Canizares, because we're a cross-school initiative. And I've interacted a lot with the provost, Rafael Reif, and with the president, Susan Hockfield.

Quite a lot with the president, actually. She's been heavily engaged in this process. I mentioned since day one, she really was a major impetus for bringing the notion of science and engineering together for cancer research at MIT. And she's been very involved in helping us fundraise for the project, build enthusiasm within MIT and outside of MIT, build interactions particularly with local hospitals and clinical centers, which is very important to our mission. So the job of director has been complex and has allowed me to engage with the MIT community very, very broadly, which has been quite interesting and exciting for me.

But it has made more challenging my day job, which is as a cancer researcher. I've been running a cancer research lab, first in the Center for Cancer Research, now in the Koch Institute since 1992. My lab has only gotten bigger over time. It didn't get smaller when I became director. So I now have 17 graduate students and postdocs and eight technicians and about 10 undergraduate students working in my research lab. And my ability to direct their research on a daily basis has been influenced by administrative responsibilities.

INTERVIEWER: Very tactfully put.

JACKS: But fortunately, I've attracted a terrific group of people. And I select them, in part, based on their ability to function independently. So the research in the lab has actually gone on well. I think we're doing our best work we've ever done despite the fact, maybe because of the fact, that I'm around less often.

INTERVIEWER: Well, the sign of a good manager is to find good people and let them do what they do.

TYLER JACKS: Yeah, it's true. Delegation is key to this business and I have terrific people who are working with me both in the Institute and in my own laboratory. My associate director for administration, Cindy Quense, takes care of a lot of the day to day aspects of running the Institute. And that's a big job, too, because we're creating this new Institute, which is 2x in every way what the old Institute was. And so there are a lot of details to be worked through in that regard. And likewise in my laboratory. I have a wonderful lab manager who deals with a lot of the daily questions and issues on the lab front.

INTERVIEWER: What's the appeal to you personally? What have you found by being an administrator, the accomplishments you can make in that role that you aren't able to make in another role?

JACKS: Well, I think they it's an excellent question. What is the motivation for taking on a job like director of, or head of, department head, for example? On one level I think you do it out of obligation. Others have done it before you, and so when it's your turn there's an expectation that you will say yes, or you'll at least think about it seriously. And I felt that at the time. Richard Hynes, who was the director before me, asked me whether I'd be willing to do so. I did think about it. I was 40 years old at the time, and you know, still quite committed to my research career, didn't know what impact it might have on my research career at that time. But I felt an obligation.

He had done the job for 10 years. Phil Sharp had done the job before him. Salvadore Luria had done the job before him. And so I readily accepted.

But I think what's even more important is what you can do in these administrative positions. You can develop a new direction for the institute, for MIT, for cancer research, that you couldn't do in the context of your individual laboratory. I couldn't have imagined at the time that we were going to build the Koch Institute. But by virtue of the fact that I am the director, I've had a major role in figuring out what the future of cancer research at MIT is going to be. And I'm quite pleased, quite gratified, quite proud of the fact that I've had that responsibility, and excited about what we're going to be able to there.

INTERVIEWER: You like the policy making?

JACKS: You know, the policy, it's-- I do like it. I do. I think it's challenging, it's risky, you have to sort of stick your neck out and make bold decisions. Let's go this way now.

INTERVIEWER: And you're very visible.

JACKS: I am? [LAUGHS]

INTERVIEWER: Well, [INTERPOSING VOICES] when you stick your neck out, it's very public.

TYLER JACKS: Yeah. Yes, you are. You are taking a position and defending that position, and I think it's important to do so. You have to politic a bit and do some convincing, get people on board, and not everybody will be. And so there's a certain risk there. But if you believe strongly, firmly, in your convictions, you don't feel compromised in doing so.

INTERVIEWER: So what's going at the Jacks Laboratory now?

JACKS: Well, the Jacks Laboratory, since its inception, has been about using more and more powerful tools in genetic engineering to develop and study mouse models of cancer. And we have succeeded, along with others in the field, to create very accurate models of major human cancer types, like non-small cell lung cancer and pancreatic cancer. Certain brain tumors. Colon cancer. These are still big problems in terms of treatment and survival times and so forth in humans.

And our commitment has been to develop better, more accurate models of those human diseases in part to understand the disease. And we can do experiments in the context of experimental models that aren't possible, practical, or ethical in humans, and in that way to learn about the details of the disease more deeply. And we can use those models to test better ways to diagnose, track, and treat cancer. And so we're doing all of the above. And our technologies have gotten more and more sophisticated, and our understanding of the diseases become more and more complete. And we're starting to be able to see the fruits of that in terms of better treatments.

INTERVIEWER: Can you talk a little bit more; you mentioned Gleevec before. You haven't mentioned Herceptin.

JACKS: Yes. So Gleevec and Herceptin are two now quite familiar examples of molecularly targeted anti-cancer agents. And these derive from the field's basic understanding of how cancers arise from normal cells through acquisition of mutations to cellular genes. Those two drugs, Gleevec and Herceptin, are targeted against two different genetic alterations in two different types of cancer. Chronic Myologenous Leukemia in the case of Gleevec, breast cancer in the case of Herceptin.

These are poster children of the investments, the value of the investment, in molecular oncology. They are proof of the value proposition that by investing in basic cancer research, it will do something useful for patients. These drugs work by inhibiting a specific alteration in the cancer and largely, not completely, but largely have no side effects. And in that way they're better because they're treating a specific alteration in the cancer, and they're better tolerated, as well. And they represent the beginning of what will be the future of cancer treatment, where drugs will be targeted to specific alterations in an individual's tumor, not just blasted with a nondiscriminant DNA damaging drug or radiation.

And we're just beginning to see that future unfold. These are two examples. They were approved by the FDA within the last decade, and there are more coming. So our work is related to that in the sense that a, we make some of those discoveries that teach us about the fundamental nature of cancer which could lead to new targets and new treatments, and we have the model systems, in terms of these mouse models of cancer, to test the efficacy of these drugs or combinations of drugs which would be most effective in a particular cancer of a particular type.

INTERVIEWER: So in addition to being better tolerated, these drugs are also more effective?

JACKS: These drugs are extremely effective for the particular cancers that have those specific alterations. Gleevec, for example, is used in the treatment of chronic myelogenous leukemia. In the past 100 percent of patients, as I understand it, 100 percent of patients-- probably not really 100 percent --but the vast majority of patients who had that disease which had progressed to a point which we call blast crisis, where the disease sort of exploding and accelerating, 100 percent of those patients would have died. Now with the treatment of Gleevec, the patients survive for a very long time. Some are cured. And for those who aren't cured, whose disease does eventually come back, we now have a second generation of drugs which work in the resistance class. So this is an example of a curative cancer treatment, which are few and far between, which is based entirely on our understanding of the molecular nature of the disease. That's what we're shooting for.

INTERVIEWER: What kind of time frame do you see for this? At what point will radiation and chemotherapy actually be kind of relics of the past, and there will be a medicine cabinet full of targeted drugs for different kinds of cancer?

JACKS: Interviewers often ask the, when should we expect the better treatments, question. And it's a dangerous question to try to answer because I don't have a specific answer for you. What I say is that overtime-- and I'm thinking in the sort of 10 to 20 year time frame --we will begin to see examples of treatments analogous to Gleevec and Herceptin for other major cancer types like pancreas cancer, like advanced lung cancer, like ovarian cancers, that are based on specific molecular alterations in those patients. Some of those drugs are coming. We already have in hand very good inhibitors of some of these molecular targets. Some of them are working very well in the cancers in which they're being tested. It's not far enough along to say for sure that they will be curative or that they will necessarily even lead to longer survival times, but we can see already that they're having good activity against the tumors that are being treated.

So this gives us confidence that the examples of Gleevec and Herceptin are not one-off, that they really represent what the future will look like. So again, my prediction is that in the 10 to 20 your time frame we'll begin to see it complete shift away from the non-specific class to the very specific classes, which will be rooted in molecular diagnostic tests. In other words, lung cancer will not be treated as a unitary disease, but lung cancers will be molecularly diagnosed based on their specific alterations. And the particular alterations will then inform the particular therapy or combination of therapies that are needed for that patient.

INTERVIEWER: So it sounds like it's going to be sort of almost a one disease, one kind of cancer at a time.

JACKS: Yes. And so I agree with that. In the extreme, you could say that every individual's tumor is different. Now the challenge with that is that we have 1.4 million people diagnosed in this country every year, and we can't really afford to completely sequence the genomes of every one of those patients. Sequencing technology is better now and more inexpensive and so we're not far from being able to do that, but I don't think we'll be able to do that literally for every patient.

Now the good news is that there are patterns. It's not really true that every tumor is completely different. There are patterns of mutations that we've observed. And probably there are therefore subtypes of lung cancers. And the subtypes will be all responsive to a particular drug or drug treatment regimen. So that's most likely what things look like, not necessarily individual to individual, but subtype to subtype.

INTERVIEWER: So I'd like to spent some time talking about MIT because clearly the environment has a lot to do with your work. Perhaps more so with your work than a lot of other people. You've talked about some of these; are there other ways in which being at MIT helps or hinders your research?

JACKS: I can't think of a way that it hinders my research. Well, actually, that's not entirely true. I think there's one aspect of the nature of this university that we need to overcome to be fully successful in my line of work and in the Koch Institute, for that matter. Because MIT does not have a medical school or take care of cancer patients, our access to patients or cancer material is more limited than it would be if we were somewhere else. And so to overcome that problem, we actually do need to establish connections to clinical centers. And we've begun to do that, actually, through interactions with the Mass General Hospital, with the Dana Farber Cancer Institute, with the Lahey Clinic, and I think we'll do a lot more of that in the future. But we need to do so.

We're also starting to hire, into the Koch Institute, oncologists who take care of cancer patients by day and do research in our laboratories by night, which is another way to deal with this limitation. That's probably the only limitation I can think of.

INTERVIEWER: Do you foresee a day where there's a medical school here?

TYLER JACKS: No, I don't. I think that we do what we do well, and I don't know that we need to develop yet another capability. We have the Health Science and Technology program, HST, which interacts a lot with the medical school and helps train medical students. We have medical students on our campus. But we don't have a medical school per se, we don't take care of patients, and I don't expect that we will.

We happen to be in one of the greatest concentrations of biomedical research in the world, so we should be able to interact productively, and we are. That, I think, is the more sensible way of developing.

In terms of the advantages, we have touched on the fact that the university is about science and technology, and I think that really is the key advantage. This university has a broad scope, but it is not an infinitely broad scope. It's interested in addressing the world's problems, but addressing them through science and technology. And I think that focus is helpful to all of us because it increases the local concentration of experts in relevant areas, because our administrators grew up in those fields and understand the nature of the work that we do; they can be particularly supportive and understanding and thoughtful about our future plans and strategies. So I think those help us as well. And our workforce. Our undergraduates are fantastic and contribute significantly.

The reputation of MIT as being the center of science and technology in the United States means that we can attract fantastic colleagues as graduate students, as postdoctoral fellows from the United States, but really from all over the world. So that's another tremendous advantage that we have. And I think for us in the Koch Institute, that group of people -- undergraduates, graduate students, and postdoctoral fellows -- are extremely important because those young, agile, less calcified minds are much more willing to branch out and take new approaches, especially these interdisciplinary approaches. They're less locked in to their specific training and backgrounds, they're more willing to be exposed to things they don't understand so well. They're more ambitious in that way. And so they will help us form the kind of collaborations that will be central to the work in the Koch Institute.

INTERVIEWER: I can imagine that in this culture the faculty would be more open to the interdisciplinary approach than faculties at many other institutions.

JACKS: It's true that we have a history of interaction and interdisciplinary work here at MIT, and there are many examples of it. Even so, there is still activation energy. Familiarity still has a place in determining the kinds of interactions that you have. So it's true that we do have many examples, and the Koch Institute is a prime example of interdisciplinary research. And it's true that MIT has a history of fostering interdisciplinary research. People say that you know, the walls between our departments are less tall then they are at other institutions, and that's absolutely true.

And I think it relates, in part, to what I said before, that we have the concentration of 1,000 faculty members at MIT. The concentration of people who are in science and technology is just that much higher than it would be at other places, and therefore there's less territoriality. We sort of, in a sense, feel all part of one big department, in a way. But even with that, there's still work to be done in creating those bridges and creating those opportunities for bringing people together.

INTERVIEWER: I like that image of the graduate students and the postdocs sort of leading the faculty to be more open to new ideas.

TYLER JACKS: Yeah, they are very important in the process. And we have lots of examples of students who are being trained by a biologist on the one, and a chemical engineer on the other. And they begin to learn the two languages. It's like children who are less locked into their primary language and can learn multiple languages much more easily than an adult would. So yeah, they are very much the conduits of this kind of interdisciplinary research.

INTERVIEWER: Is your vision that the Koch Center, is MIT going to become kind of the foremost cancer research center in the world?

JACKS: I think the Koch Institute will be a beacon of outstanding cancer research focused on advanced science and technology. I would never claim that it will be the foremost. I think there will be multiple foremost cancer institutes in this country and around the world. But in terms of the approach that we are taking at this interface at science and technology, I think we're already the best. And we haven't even moved in. And by the time we do move in and establish that very exciting culture that I'm anticipating, then I think there will be nobody close to us in this area.

INTERVIEWER: Is there anything that you would want the Koch Institute to do that it's not going to be, that's not part of the plans?

JACKS: You know, I think the one thing that's been on my mind of late-- and I think it's going to evolve, and we'll see how it evolves --academic institutions run by hiring faculty and allowing those faculty to do what they find interesting. The Koch Institute has different types of faculty. We have scientists and engineers. They approach problems fundamentally differently. Scientists approach problems to understand them. And the problem never stops; you understand the problem at one level, you dig down to the next level, and on, and on you go. Engineers approach problems in a very different way. They're basically out to fix the problem. They need only as much information as they need to fix the problem. The bringing together of those two cultures is quite interesting, and that's really the power of the Koch Institute.

Now, my goal is to make the Koch Institute very translational. That is to say, the products of our work make an impact in cancer patients. Soon. It's not just about publishing papers. It's not just about making discoveries. It's about doing things that impact patient's lives. That's a very practical goal.

Our engineering colleagues are more wired to do that sort of thing; they help in this regard. But even they are mostly driven by their inherent intellectual interests, which may or may not be aligned with delivering on the goal of providing the new discovery or technology to the patient. And that is going to require either a very significant shift in our priorities as faculty and/or our ability to create capabilities beyond our faculty laboratories. And that could be within the walls of the Koch Institute, a group of individuals whose job it is to do that in collaboration with our faculty and our students and our postdocs, or something outside of the Koch Institute which has that as its mission. Some adjunct entity which is about the development of those concepts and technologies for their use in people. Those could be spin out companies on one level, and we will do that, or there could be something that's sort of quasi affiliated with the Koch Institute that has that as its mission.

INTERVIEWER: Completely unchartered territory.

JACKS: Not completely unchartered, but challenging to make happen in an academic institution. This is not typically done. It's not unprecedented, and certainly the spin out company concept is by no means unprecedented. But the very directed, sort of product-oriented nature of the research is less familiar to an academic enterprise.

INTERVIEWER: Yeah, it's much more of an industry type of goal.

TYLER JACKS: Exactly. It's bringing university-based research and industry R&D closer together. And there are lots of ways of doing it: spin out companies, interactions with existing companies, or building a workforce within or without that has that as its primary focus.

INTERVIEWER: Yeah, explained that way, I can understand why there'd be more resistance, perhaps, in an academic environment which at some moments is sort of you know, holding up a cross to industry. JACKS: Yeah, that's true. There's the concern that you don't want to cross over too much to the sort of, for-profit nature of things, that we have to do our pure unadulterated research for research's sake. But for me it's time to begin translating all of that much more aggressively, for me personally. And I would like to see develop to an even greater degree, because it's already true, at one level it's already true amongst my faculty colleagues, I'd like to see that attitude permeate through all of our laboratories and very possibly lead to the generation of a new capability that allows us to do that even better.

INTERVIEWER: In your own work you've had some experiences working with outside companies and consulting and advising them. Do you feel that adds to your work as a researcher? How do you bring back that experience and how does it benefit MIT?

JACKS: Well, I think it can benefit MIT in many different ways to have interactions with industry. One, financially; if we license our discoveries to companies, MIT benefits directly. If we were to start a company and there were some sort of royalty payment to MIT based on that, or some ongoing even equity position, that can benefit MIT directly. But I think also the interactions benefit MIT.

We do, and will do more, have interactions with companies where, for example, drugs that are being developed in companies can be tested in the systems that we have in our laboratories that the companies don't have. And those might be cell-based systems or whole animal systems. And by having the relationships with the companies you know really what's happening at the cutting edge, what's the hottest thing in the pipeline, and thereby have a greater possibility of gaining access to that very precious material. Not easy to do, by the way. But it does enhance one's ability.

And MIT is very good, I would say uniquely good, at promoting industrial relations. You mentioned earlier holding the cross up. That cross exists, but there's a much bigger cross at most institutions. MIT is very comfortable interacting with companies. There's a long history of such interactions in many different forms. And I think that's actually very important, because there are only so many things that we can do in our labs. There's only so many things that we can do with government funding. Interactions with companies can allow us to do many more things, and especially many more things that are directly applicable to patients.

INTERVIEWER: Do you have anything to talk about in terms of the strengths you see to your school or your department, in particular?

JACKS: I think that-- you know, I'm part of the Department of Biology, and part of the School of Science --and I would say there are great strengths in both respects. MIT as a academic institution, as a research university, is universally excellent. We have the best colleagues in a broad range of disciplines. So in the School of Science, for example, we interact extensively with members of the Department of Chemistry, who are world class. With members of the Department of Physics, who are world class. This has directly benefited our research through collaborative projects.

So being here has allowed me to access, first hand, some of the world's best people, in a range of topics, in the School of Science. And likewise, the Department of Biology. We have among the best-- you can look at the rankings; it's one, two, or three, depending on which ones you read --programs in biology. Which means we have an outstanding group of faculty, and we get the best students in the country.

And MIT has invested significantly in the biological sciences over the last 20, 30 years. There are multiple units now in the Department of Biology. The main building, which is also a Koch building, by the way, has 25 to 30 outstanding investigators who look at many different aspects of the biological problem, many of whom we interact with. Many of whom are members, actually, of the Koch Institute as extramural members. The Whitehead Institute: outstanding. The Broad Institute: genomics and post genomic research. The McGovern Institute, the Picower Institute. These are all extremely high powered research institutes that have terrific faculty, terrific students. And with that atmosphere of interaction and opportunities for collaboration, it enriches all of us. So in my field there's nothing like this, and if we think about that building that we're building, it's going to sit right in the middle of all of it. So we are at the epicenter of this great investment in biomedical research here.

INTERVIEWER: You know, one thought I just had as you were saying that is, since there's so many excellent centers of research, does that foster in any way a kind of competitive spirit?

JACKS: Yeah.

INTERVIEWER: You know what I mean.

TYLER JACKS: Yeah, I think one can never get away from competition. I think there's always a goal to strive to be better and better recognized. I think there probably is that at some level. You know, we invest a lot in what we're building and we want to see it succeed. I don't think we want to see it succeed to the detriment of anybody else, but we do want to see it succeed. And we want to grab some of the attention. And there's a lot of attention around here; there's a lot of things that demand attention around here.

So I think there is something to that, but I don't think it in any way inhibits the motivation or opportunity for interaction. So there are people in all those places that I've just mentioned with whom we collaborate and interact-- and when I say we I don't mean just my laboratory --and those are always encouraged and always supported. So in our institution there is no doubt that the whole is greater than the sum of its parts. And that's not true with every institution.

INTERVIEWER: Yeah, when I was thinking about the competitive spirit, I was thinking that it would be an enhancement.

JACKS: Yeah, I mean you can take that statement two ways. I think competition is always good. I actually make this point about research-- this is a bit off the topic, but I'll just mention it --sometimes people complain. Cancer philanthropists or donors sometimes worry that we're competitive, that two investigators working on a common problem aren't sharing their ideas more, that they're competing with each other, that they're keeping information to themselves. And it's easy to understand why someone might be concerned about that, but the fact of the matter is that competition is a good thing. Competition gets you there faster. It motivates you to work harder. And so I think that in that sense, competition is always positive, or most of the time is positive.

In terms of the competition amongst the different institutions, I think we're all pushing to be very, very good and excellent. But also you could say that we have a collective goal, which is to be together like no other place. And I think we're succeeding in that.

INTERVIEWER: We've covered most of the things that I have here. Are there other things that you'd like to stay? Cancer research or about MIT or about the students or faculty?

JACKS: Yeah, I mean I think we've touched on most of the important points. I think MIT is a rare place for what it's done and what it can do, and I think it's the product of all the things that we've talked about: from the students to the president of the university, to the 1,000 faculty in the different institutes that are component parts of this institution. The atmosphere around here is very much about doing new things, developing new directions, and turning our ideas into ways or things that benefit the world. And I think that's an exciting place to be. So I've been connected to this university since I was a kid, I am extremely proud to be a member of this community, I have tremendous hope for what the Koch Institute is going to do for MIT and for cancer research, so I'm thrilled to be here.

INTERVIEWER: You're kind of a lifer in a different way.

JACKS: Yeah, I might be a lifer in the other way. Who knows?

INTERVIEWER: Anything else?

JACKS: No, I think we've covered it.

INTERVIEWER: OK.