BARRY LIST: Hi, I'm Barry List of INFORMS. I'm sitting with Sidney W. Hess, who's had an illustrious career in operations research and with our organization. I've got a whole bunch of questions for you. I thought we would start off with some of the highlights of your career and then go on to some of your background.

SIDNEY HESS: Call me Sid, please.

BARRY LIST: OK, Sid. Sid, I want to look at some of the things that were important in terms of the work that you have done. Since I follow politics, I was immediately drawn to your work in legislative redistricting, which is always in the news. Can you tell us a little bit about what your work was there?

SIDNEY HESS: After Baker v. Carr in the early 60s, a good government group in Wilmington, Delaware was trying to figure out what they could do to help with the redistricting process in the state. And my boss was a member of that organization. And he started running numbers and looking at maps. And finally, he threw up his hands and said, this must be a job for a computer.

And this was probably '64, '65. And I was manager of operations research there at the time at Atlas Chemical Industries. And I thought about the question he asked for a while and came up with a general idea of using a transportation algorithm repetitively, where the origins would be the centers of the legislative districts and the individual population units would be the destinations, a warehouse destination thing, under a constraint of equality.

And then, what we did was to use a distance measure between the centers and the individual population units. So, we developed a very simple algorithm. But it took a lot of computer time because there's a lot of data. And Atlas had no computer big enough to do this at the time. But, DuPont did.

So, I went to my counterpart at DuPont, told him about our problem and he got interested in it. That was Jack Whelan. And he brought a couple of his buddies in from their OR group. And this became eventually an organization called CROND, Computer Research on Nonpartisan Districting.

We were all volunteers. The computer time was stolen from DuPont.

BARRY LIST: Stolen, so to speak.

SIDNEY HESS: So to speak. But they finally said, we can't do this anymore. So, we went to the National Municipal League, who were going for a Ford Foundation grant. And they wrote us in for about $100,000, which would pay for computer time and would buy us individual times at $2 an hour. So we could volunteer, but get somebody else to cut the grass.

That's the way it got started. And we did the first councilmanic districts for the county. It was the first thing they'd ever done, any districting. And that was implemented. And we eventually helped the state legislature, which was Republican in one house and Democratic in the other. It was very hard for them to come together. And we did the districting for them as well.

Other states that we were voluntarily helping included Pennsylvania, New York, Nevada. Long after I was no longer involved in that, a company who was doing the work commercially did Minnesota, Michigan, a couple of others. Now, it doesn't always mean that these were implemented. Some were and some weren't.

BARRY LIST: But it formed a basis of redistricting in several major large population states.

SIDNEY HESS: Exactly, exactly.

BARRY LIST: So you must be proud of that.

I was kind of. I was kind of. I've sort of kept my finger in the redistricting pie ever since. Currently, I live in Pennsylvania. And I'm on a Common Cause Pennsylvania redistricting committee, study committee. And we're now in the process of helping Senator Boscola, one of our local senators, state senators, who just introduced a bill to eliminate the system in Pennsylvania and try and emulate the California system, where you have an independent legislative districting commission.

And there are guys like Fred Murphy, who is also an INFORMS member and is on the committee.

BARRY LIST: You're in good company.

SIDNEY HESS: We're in good company and unfortunately, it's not a computational issue right now. It's the political issue of getting the enabling done.

BARRY LIST: Right, and even though Baker/Carr was such an important decision, there's still major political things going on.

SIDNEY HESS: Oh, yeah, absolutely. There's a lot of Gerrymandering. We're trying to eliminate that.

BARRY LIST: Let me ask you about some of your other work and also what you've done with the society. You mentioned Atlas Chemical. Was that where you spent many years of your career?

SIDNEY HESS: Yes, or their subsequent, acquirers. I went to Atlas right out of Case Institute of Technology, at that time, graduate school there. And the activities-- I guess, my primary interest was to try and apply some of this OR stuff we had been studying.

And it was pretty good, pretty well to do. I did some marketing pricing problems.

BARRY LIST: So it wasn't just mixing chemicals.

SIDNEY HESS: Oh no, this was a staff organization trying to help the operating systems. We did some with the production, inventory control, eventually a linear programming solution to one of their blending problems.

BARRY LIST: Blending is big in the oil industry and chemicals, other chemicals, as well?

SIDNEY HESS: Yeah, this was a situation where you're trying to make products from sugar feed stocks. And we found that it worked pretty well, and that they're still using the system, but the model and the computer programs have been expanded. So, it's really unrecognizable to me.

The one thing I thought was kind of interesting that we did was trying to look at decisions about sizing plants. In fact, the same plant, they were built to do this sugar work. And I introduced them to a Monte Carlo analysis.

And of course, we didn't have computers in the early '60s, and what we did was to do it by hand.

BARRY LIST: Wow. That's a tremendous amount of computation.

SIDNEY HESS: Well, the model was fairly simple. But we did 100 repetitions and could actually see from the distribution that that was a good enough sample size for what we wanted to do to size the plant.

BARRY LIST: And I'm sure there's a lot of money involved when you're creating a plant.

SIDNEY HESS: Yeah, we're talking about $10 million or so. And the size was pretty important. You could throw

a million or a million and a half extra in there.

We gave that paper afterwards at a AICHE meeting in Texas. And a year or so later, when Dave Hertz published his landmark paper in the Harvard Business Review, in there was a little paragraph that acknowledged the fact that we had done this.

That paper was so popular, that it was reprinted. And in the reprint, they took our paragraph out. So, that was my short fame there.

BARRY LIST: Do you have good memories of working in the chemical industry? You spent how many years there?

SIDNEY HESS: I was there about six, seven years and then I left to go to Wharton to teach operations research. By that time, Russ Ackoff and his crew had come from Case to Wharton. And he recruited me and a couple of other of the old graduates to come in and help.

BARRY LIST: So you were at a very fundamental level in terms of Wharton and the relationship with management science and operations research.

SIDNEY HESS: Yeah. In fact, eventually I was Research Director of the Management and. Behavioral Center there. But, I was due for a sabbatical. And I was going to go to DuPont to run their Marketing Research Department. And they called Atlas for references.

By this time, Atlas Chemical had been bought by the big British company, ICI. And when the guy in employee relations got this request-- I mean, he knew me. We'd both gone to work the same day, essentially, at Atlas.

And he called his boss and the next thing I got a call to come in and talk to them. So, long story short, I went back to Atlas on a sabbatical. It was now ICI Americas, as Director of Development in the pharmaceutical business.

So that got me out of the OR line into a sort of a managerial role. But all the time, I'm looking for OR applications. And over the years there, at one time I was Vice President of R&D, I was able to take stuff from my PhD dissertation and apply it in the area of projects selection.

BARRY LIST: Oh, what was your PhD dissertation?

SIDNEY HESS: On R&D project selection.

BARRY LIST: Oh, OK.

SIDNEY HESS: Yeah. So, that was kind of neat. And I retired from ICI in '84, '85. At that time, I was Vice President and General Manager of the aerospace division there.

And there, I did a back of the envelope model for deciding, again, research and development project selection. And, of course, by this time, I realized that all the stuff I had done at Case (a dynamic programming model, one of the very early ones). And it just required too much data. You didn't have estimates of what would happen, what kind of a return you would get from a particular project if you did it this year or next year.

So we viewed it as a poker game, where you're going to bet for the next card and know that you get a chance to do it or not do it afterward. Sort of a dynamic programming approach.

And with a few very simplifying assumptions, we were able to get it down to a thing that you could put into a simple decision tree and actually look at the sales potential, versus the development expense, versus development expense in the next year, not the future, but in the next year, versus the chances of it failing.

BARRY LIST: These are very important planning components of business.

SIDNEY HESS: Yeah, but it was applications of OR in an area that made it very simple, almost back of the envelope sort of stuff. But very important for picking our development projects in the aerospace division. So it was a chance of being a general manager and at the same time doing a little OR on the side.

BARRY LIST: It's nice, even as you make shifts in your career, to come back to your roots.

SIDNEY HESS: That's right, that's right.

BARRY LIST: Let me switch a little bit and talk about your work in this organization. You were involved for many years with TIMS. Tell us how you learned about TIMS. Tell us about your different roles there.

SIDNEY HESS: Well, when I and a couple other guys were recruited to Case as graduate students in OR.

BARRY LIST: Is this the same as Case Western Reserve?

SIDNEY HESS: It was Case Institute of Technology before they merged with Western Reserve.

BARRY LIST: I see.

SIDNEY HESS: And I have to go back a step-- well, we'll come back to that, how I got into that. But I did meet Len Arnoff. He was recruiting. And we met him at the ORSA meeting. So that was my introduction to the professional societies.

And of course, as graduate students there, we joined both societies. And I remember some of the early meetings. The big things going on was in the cocktail lounge after the sessions. Because you could go down there and sit among people you had read about, some of the early guys, World War II guys. Very impressive. Meeting attendance was probably 125 people. BARRY LIST: OK. SIDNEY HESS: So you got to know--

BARRY LIST: It was intimate.

SIDNEY HESS: Very, very intimate. Made a great meeting. And eventually, after I had graduated, Len nominated me for secretary of TIMS. And so I was TIMS secretary for about eight years. And then, was elected president.

And the things that I remember most about that was, again, the feeling that these small meetings were so intimate - Bill Abendroth, who worked for Russ at Wharton, and I, took a trip up to New England to look for places where we could hold small meetings.

Earlier I had run two meetings for the Gordon Research Conference on Operations Research , an organization that publishes their programs in Science. I'll have to--

BARRY LIST: It's a publications organization.

SIDNEY HESS: Well, it's an organization that is put together to bring scientists to come to an informal week in New England to talk about their mutual subjects, everything off the record. And I went to one several years on Statistics.

BARRY LIST: And you did some site selection so to speak for them, before you moved on to TIMS.

SIDNEY HESS: And we ran a couple for them. And then we found a site for the college, what became the College on Practice. And that was at Casenovia College. Gene Woolsey invited us to have subsequent meetings at Golden.

And this group met every summer for a week for a number of years. And the College of Management Science came out of that. That was probably my major accomplishment for

TIMS.

BARRY LIST: Were you involved with the founding of what became the Edelman Prize?

SIDNEY HESS: Yes, yes. I was. I knew Franz. I remember him having at one of these meetings, saying if we don't get on our toes, the computer guys are going to take us over. We have a chance of being their superiors, but nobody listened to Franz.

Anyway, after he died, I was one of the people who established the Edelman.

BARRY LIST: Now, before his death, what was the birth of this prize? How did you decide to honor great projects?

SIDNEY HESS: Before his death, I can't tell you how that was done.

BARRY LIST: OK, but you were involved with the renaming. It was Newt Garber who was really the instigator of all this. And I was one of the follow ons. But he had worked for Franz, and so it was important that he wanted Edelman to be honored. And he convinced the CPMS people to do that.

BARRY LIST: You mention both TIMS and ORSA. These were two organizations, very similar, with slight differences. And the idea of merging them came about how?

SIDNEY HESS: There were a number of us who felt that this competition was not good. Some people felt that TIMS was for industry practice and ORSA was for theory. Some people felt it was the reverse. And of course, neither was correct.

They were very similar. TIMS, anybody could join. ORSA, you had to-- to become a voting member, you'd have to have some qualification. So we started having joint meetings, which I guess was an attribution of the meetings committee of the two organizations.

And we started doing things together. I was secretary of TIMS, and Seth Bonder was secretary of ORSA. And he and I would get together. And we drafted bylaws for this cooperating arrangement.

One of the things was how do we have joint meetings and how do we decide where ORSA's in charge, and which is TIMS in charge. How do we split the money, all these kinds of issues.

And so, we started having joint meetings. And then we had joint council meetings, where

ORSA and TIMS councils would sit in one room and make joint decisions. Eventually, this became such a pain that guys like John Little led the battle to actually merge the two.

Originally, I wasn't interested in a merger. I was interested in just the cooperation. But when the merger finally started to get off the ground, I was chairman of the name committee. And we had a competition for that. Finally, the winners were a couple of guys in California. And they had the name INFORMS, for the Institute of Operations Research and the Management Sciences.

BARRY LIST: Now, the merger took place in '95, and you and I met a couple years afterward. And I remember that you were very involved with making the field better known.

SIDNEY HESS: Yeah, exactly, exactly. And Newt , the same way. Burnell Brown, who was a secretary of TIMS after me. I had been president one of those years before the merger. We all lived in and around Philadelphia. And so it was convenient for us to get together and try and persuade the council to take a more active role in publicizing the activities.

And they agreed. And we participated in the recruiting of somebody to handle publicity for INFORMS. And you were the selection of that committee.

BARRY LIST: So I noticed.

SIDNEY HESS: Yeah. And I'm delighted that we made that choice. Obviously, it was a good one.

BARRY LIST: And you've been very kind to me over the years.

SIDNEY HESS: And you're still with us, which is great.

BARRY LIST: Let me take you back now to go into your background, where you're from, where you went to school as a young man. Then, onto your study at Case.

SIDNEY HESS: I was an army brat.

BARRY LIST: Oh.

SIDNEY HESS: My father was moving around a lot. We ended up in Kansas City after he retired. And I was interested in engineering. I picked three or four different schools I wanted to apply to. And one was MIT. One was Missouri School of Mines, which is now the Missouri Technical Institute, I think. Kansas University, Northwestern, Carnegie, a few like that.

And I finally was offered a spot at MIT. And I remember talking to the counselor in Kansas City. And my dad said you know, why don't you go to a local school which is cheaper and then go to MIT for graduate school. And the counselor said that's like putting a good frosting on a bad cake.

So I went to MIT as an undergraduate. And I studied chemical engineering. And I was in the chemical corps ROTC unit there when the Vietnamese war winding down. Not Vietnamese -- the Korean War was winding down.

BARRY LIST: Oh, OK.

SIDNEY HESS: Yeah, I got a Fulbright to go over and study in the Netherlands. Got a one year deferment from activating my commission. And when I came back from that at Delft Technical Institute, came back to the US, got married and went into the army, through officers basic training, and they said, well anybody who's been to graduate school, I had the one year, goes to the chemical corps operations research group.

BARRY LIST: I was about to ask you.

SIDNEY HESS: And I said what is that. And they said well, really it's classified. But there's a book in the library by Morse and Kimball.

BARRY LIST: Two venerated names.

SIDNEY HESS: Yes, and you can take a look at the book. So that's how I got into operations research. We were doing this for the chemical corps. Essentially, trying to answer questions-- what can we do with chemical weapons? Where do they have a benefit over nuclear? Or high explosive weapons?

If one decided that that was a moral thing to do, and of course, eventually the decision was it wasn't moral and we got out of that business completely.

BARRY LIST: But it was your responsibility to develop options.

SIDNEY HESS: Right, right. And to look at where there was an advantage. And the advantages were fairly small because you couldn't use these things for big areas. And they're very helpful in small areas. But it wasn't a real great thing to do.

In any case, we did these studies. We did models of chemical cloud behavior. So you didn't

have to test for every kind of--

SIDNEY HESS: Meteorological conditions, winds and humidity all having playing an effect. So that was an interesting experience. I loved that playing with the math and the s better than working in the chem lab or in a chemical plant.

And we'd heard, I think it was an article in Fortune Magazine about operations research, and Case Institute of Technology was the first school to actually award a degree in that field.

BARRY LIST: I hadn't realized that.

SIDNEY HESS: Yeah, MIT had a program, but it was a program that was interdisciplinary. And the graduates got their degrees in electrical, or math, or whatever their major was. So two other lieutenants and I went to the ORSA meeting and met Len Arnoff. And that's how I got into the field.

I used to tell my kids that, well, they say, well, you're a doctor. And I say, well, I'm a doctor of sick companies.

BARRY LIST: That's a very clever way of phrasing it.

SIDNEY HESS: So that's how I got in. And to cycle back, just to complete the picture, after I retired from ICI, I went back to it to teach, this time at Drexel University. And this time, instead of teaching operations research, I was teaching management and management strategy. And trying to add a few models into the curriculum. But for the most part, it was more business than math and statistics.

BARRY LIST: So there's been an arc from your career and your focus from chemicals to chemicals and operations research, to business applications. So you got a PhD from Case.

SIDNEY HESS: Right.

BARRY LIST: And you were mentioning earlier that your dissertation was in picking projects.

SIDNEY HESS: R&D project selection.

BARRY LIST: In other words, to determine how to grow a business by doing research that's most promising.

SIDNEY HESS: Well, more fundamental than that. If you have a portfolio of projects that you could select from, which one should you work on? And there are a lot of ways to do this. But, none of them took

advantage of the fact that you have another chance next year when you budget again or decide whether you want to continue the project.

So dynamic programming seemed to be a perfect application. And Bellman's book had just come out. So I gave it a try.

BARRY LIST: Now we've touched on this spot, who were some of your early influencers in OR. You've mentioned names like Russ Ackoff and--

SIDNEY HESS: Len Arnoff. Wes Churchman, he taught my course in statistical sampling, which was kind of strange because he was a philosopher rather than an actuary. Probably the guy who influenced me the most there was John Little, who came as--

BARRY LIST: When you were at MIT?

SIDNEY HESS: No, at Case.

BARRY LIST: I see. I didn't realize he was at Case.

SIDNEY HESS: Yeah. When he got out of the army, he came to Case to teach. And he was an Assistant Professor, young guy, but he was teaching a course on marketing models, OR and marketing. And there wasn't much going on. But, what was going on was interesting because it was a pretty untapped field.

And that's what really influenced a lot of my professional life.

BARRY LIST: So John Little was definitely an influence. And of course, he's been very much an influence in the profession.

SIDNEY HESS: Yeah, and he went to MIT after I guess a couple years at Case.

BARRY LIST: And Little's Law is often quoted as a fundamental in the field.

SIDNEY HESS: He had proven Little's Law for one or two cases. And this was in the marketing class. And I said well, why can't you generalize to all things. And so, he sat down, and in a couple of weeks, he had proved Little's Law.

BARRY LIST: Wow. So you had a role.

SIDNEY HESS: I get a little footnote. Yeah. It's like the David Hertz thing. But, I guess I pioneered some of

these applications, but didn't necessarily do the theoretical research that's so important to permit them to be done.

BARRY LIST: Let's take a look a little bit at the OR problems that you worked on that fascinated you. Are there any-- we talked about a couple of them already. Are there others that we should mention that stand out in your mind?

SIDNEY HESS: The redistricting issues, the project selection. Pricing is one that I think that that's terribly important.

BARRY LIST: What kind of products were you pricing?

SIDNEY HESS: Well, pharmaceuticals mostly.

BARRY LIST: Oh, OK. Tell us a little bit about that.

SIDNEY HESS: Well, it there was a question-- there was a replacement product that was coming in for a drug in-- it was Stuart Pharmaceuticals, which at that time was part of ICI, Atlas Chemical. And they had a product, a vitamin for children. And they wanted to reformulate it.

And they had a name. One was Mulvidrin And the other one was Mulvidrin Junior. They were going to replace one by the other. But, the original had a higher price than the second one. And it was a big controversy as to what was the right way to do this. I made a fairly simple model to show under what circumstance you'd want to make the switch. You should make the switch at one extreme or the other, but not in between. You should either do it, or not do it at all. And that was implemented. They did what the model suggested.

BARRY LIST: And we know how important pricing has become.

SIDNEY HESS: Yeah, and course, now we have all the kinds of pricing that Tom Cook and his people have developed at American Airlines, and now have spread over to the hotels, and virtually everything. Where you can make decisions now or later. Again, an application of dynamic programming.

BARRY LIST: I thought we would take a look at the arc of the OR profession, since it's been so important to you. What has been your-- during your career, during your many years in operations research, how have you seen the profession change, grow, come under challenges?

SIDNEY HESS: Well, when I was young, early on, the key thing was to try and identify the problem and model

it. We were delving into the questions being raised by the client and figuring out how can we describe this thing. So, the modeling was uppermost.

As far as I was concerned, solving the model was a piece of cake. You could always simulate it. There all kinds of techniques that you might use if you had to solve that. But it was characterizing the real issue. Of course, what has transpired in the 50 years or so since I got started-- that was mid '60s-- actually, late '50s, what's transpired is that it's easier to teach mathematics and mathematical techniques than the skills of modeling, of trying to see a problem, see an operation and describe it in terms that you can then play with it offline.

I've always tried to push in the modeling direction. At Wharton, when I was teaching there, I had a course in modeling. And we studied various theories of modeling published by different people. But basically, that the best part of the class was each week we'd take an issue out of the newspaper and decide, OK, how can we model to solve this problem. We're not going to solve it, but the assignment is to prepare a model and describe how you're going to solve that eventually.

BARRY LIST: And considering how theoretical operations research sometimes becomes, that was down to the basics, how we're going to use it.

SIDNEY HESS: Right it's an applied profession. And it's sad for me to see people going off and concentrating on the mathematics. I try to encourage, then and even now, that the people who are interested in teaching operations research spend some time in industry for a while to see how they can apply it, or what kinds of problems are there that they might apply in the future.

BARRY LIST: So you agreed with Gene Woolsey, who had a very similar approach, as I recall.

SIDNEY HESS: Yeah, oh, yeah. He was better at doing it than I. At least publicizing it.

BARRY LIST: Yes, that's for sure. And since we're talking about publicizing, why was it so important to you to make the business world, the broader world, aware of operations research and management science?

SIDNEY HESS: Why was it so important. I guess it was selfish of me. I enjoyed doing it. And I saw benefits, and I wanted to have other people share these benefits. And we'd spent three years at Case learning these various techniques, and how to apply them, and how to do the modeling. And there were very few implementations in the early '60s. So the big challenge was to get out there, and implement some of these things, and publicize the results, so other people would

come along.

BARRY LIST: And are there examples of the application of operations research that you see that make you satisfied about your work?

BARRY LIST: Many, many, many. I'm pleased with the movement to analytics. As long as it doesn't overcome the fact that you have to have the basic theory and the basic understanding of how you have the application, how you can apply that to ill structured problems. And not just a matter of collecting a lot of numbers and putting it into a spreadsheet or doing an LP on these things.

There are a lot of problems that are unsolved that maybe OR could do something about. The British have put a lot of effort into the soft sciences, trying to get their professional group to spend more time on the soft sciences, the behavioral sciences. And it's very difficult to quantify.

BARRY LIST: And originally, operations research did a lot with those soft sciences.

SIDNEY HESS: That's right. That's right.

BARRY LIST: It wasn't just heavy math influence.

SIDNEY HESS: I mean, that the notion of something like how to draw the districts, OK. I want to draw this legislative district to favor me and my counterpart-- and it was all seat of the pants. Now, of course, it's very computationally and you can Gerrymander the hell out of a state with without spending much time computing at all.

Another example that comes to mind is the yield pricing, which is the thing that I mentioned about from Tom Cook. I have a lot of friends who hate that because it is annoying to get on a plane and sit next to somebody who bought the ticket at a different time and paid half of what you paid. Or the theater pricing, where the tickets prices vary from date to date. Some people find it annoying.

But from the benefit of the corporation, it's a pretty good deal. It's important for them if their job is to maximize profit, that's important to do. And OR should help them if they are our client. If they're not our client, if we're a client of the consumer group, then we have to do things that help them and hopefully our models will do that.

BARRY LIST: Now, in terms of the pedagogy of operations research, I'm wondering if you have any observations or insights on how OR ought to be taught. You've hinted at it in your emphasis on modeling to real problems. Is that something--

SIDNEY HESS: I think Case was super in that. We did a lot of projects for industrial clients. I remember doing an inventory control thing for Sharon Titanium, Mallory-Sharon Titanium. I was on a project for Pure Oil Company where we showed them that you could model the bidding for oil leases. And we made so much money on this that they kicked us out and kept doing it themselves.

We had prepared a set of bids, put them in a sealed envelope, and given it to them. And we beat Pure Oil by several million dollars. That was useful. And the fact that graduate students were on the team doing this, I think the faculty members were Fred Hanssmann and Pat Rivette. And then there were myself and a couple other graduate students.

And that gave a balance, gave a motivation for the mathematical techniques and the al techniques and why these were important and how they could be improved, what were the shortcomings of these techniques that practical problem pointed out.

I've had other examples. I saw George-- pardon? Nemhauser, yes, I wanted to say somebody else. Nemhauser, I saw him--

BARRY LIST: You saw George Nemhauser.

SIDNEY HESS: A few hours ago. And we were talking about the old days when I asked him if my redistricting problem could have been improved, if we had a good way of doing the manipulation, rather than going through the transportation algorithm, which was really a heuristic. And it got George interested in integer programming applications. And as George said, reminded me, a few minutes ago, it started him on a new career. For the rest of his life. He'd been concentrating on problems and programming and various kinds of branch and bound technologies. Several students did their dissertations on that. But, you had to have some connection between the real world to motivate this kind of research.

And there are lots of other examples I can think of. The OR center at MIT. The students work on real projects. And that's a major motivator. When Russ came to Wharton, the OR students there also worked on projects at the Management and Behavioral Science Center.

And it's this mix that enriches both, makes the applications more likely to be successful. And motivates the theory to solve these future problems.

BARRY LIST: As we come towards the end of our interview, we wanted to look at retrospect and prospect, so to speak. Let me ask you very simply how would you like to be remembered in this field.

SIDNEY HESS: Oh, boy. Well, one thing comes to mind is he was too theoretical to work in industry and too practical to work in academia. But that's not the way I'd like to be remembered. I think I'd like to be remembered in terms of starting these small summer conferences, which provided a backdrop different from what you would get in a big meeting with 5,000 people.

The small groups where you could sit around and share experiences. I think that was important. And I see it continuing as there are more and more different sections developing and various different interest groups. I think the local sections, the local organizations, have a great opportunity to provide this because they bring people from different companies together to share experiences with participants from the local universities. And you get this inner mix. And I've always wanted to encourage that.

I think the general idea is that I've brought OR into the business world and brought business problems to the theory world.

BARRY LIST: Very succinctly put. Let me ask you just a couple more questions before we have to part. What do you think about how your area of OR has developed over the years, the research areas that you've just been describing? Including with the advent of computers to help with some of the problems you had to do by hand.

SIDNEY HESS: There are great algorithms now for doing the districting. The basic problem is getting the politicians and the legislatures and the Congress to use them. The fact that there are political motivations which you can or can't put into these programs makes them a double edged sword. It can help be fairer. It can also help be more unfair depending on how you use them.

A lot of new algorithms and new approaches, I guess, starting with John Little's branch and bound, and going on all the way to things that I can't even understand when I read them anymore.

I think the yield pricing, I've mentioned before. I think there are a lot of opportunities for pricing and marketing. We still hear the old adage that half of our advertising budget is wasted, but I don't know which half. There are all kinds of transportation issues and issues of supply chain. And all of that has blossomed out of the old simple inventory control models. That's been a

pleasure.

And I'm continually impressed by the submissions to the Edelman competition and how some of these fairly simple things back 50 years ago have now blossomed into very complicated, but manageable things, as a result of the OR input.

BARRY LIST: And if I had to ask you what was the one greatest accomplishment of OR to date, what would you say?

SIDNEY HESS: The single most accomplishment of OR.

BARRY LIST: The greatest.

SIDNEY HESS: Would you include people who have done things?

BARRY LIST: Sure.

SIDNEY HESS: OK. I guess the linear programming probably is the major. So guys like Gif Symonds and others who were in that early on. Gif of course is a guy who was in Exxon or Esso at the time and published a book on linear programming in the oil industry. I think it was published in '54, maybe. All the other well-known names in the earlier mathematical programming eras. I think that single discipline, technique, has probably been the linchpin for everything else that's developed.

BARRY LIST: Because?

SIDNEY HESS: Because it had such wide impact and opportunity for use. Not just oil companies, not just blending operations, but allocation of people, crews to aircraft, moving supplies, the transportation algorithm, and all the things that came out of that, which was a special interest of-- special example of the linear programming model.

All that started to boil over with inventory. So you got the supply chain issues. What do you ship from to where to where, and how do you handle the inventory at the various locations along the way. And then you became not just deterministic, but became stochastic, and sometimes you added in a little bit of queuing theory. I think I'll stick with the linear programming as the single.

BARRY LIST: And where do you see OR going in the future?

SIDNEY HESS: I don't have a strong opinion on that, Barry. I'm really interested in the increase with analytics because that's a buzz word. And when we encompass that into the operations research domain. I'm not sure everybody, certainly not all we analytics people, recognize that.

But it could become that OR is the academic part of analytics. They develop the techniques, and teach them, and the analytics people are the implementers.

BARRY LIST: So you're optimistic about the future in the field?

SIDNEY HESS: I'm not sure I like it going that way, because I don't think somebody who is an analytic necessarily has the skills to be a modeler. And I worry about whether that modeling capability is still in our curriculum.

BARRY LIST: Coming back to the crucial way of understanding exactly what the problem is.

SIDNEY HESS: That's right, and how you describe it in mathematical terms so you can actually do something with it.

BARRY LIST: What would you consider that to be the most valid criticism of OR?

SIDNEY HESS: I suspect it's the fact that there's an over concentration on techniques and the education of techniques. It's easier to teach somebody how to do an integer programming solution with a computer program than it is to make the link between the problem out there and how that could be used by-- integer programming can be used to solve that problem.

BARRY LIST: How would you respond, how would you deal with it?

SIDNEY HESS: Well, I think it's training, getting these graduates to spend some time as interns or a couple of summers or some way that you get their feet and their hands in the dirt of the real world.

BARRY LIST: Just one final question, along these lines, what areas would you tell a student have the greatest promise? Where would you encourage a young person who was like you when you first went to MIT or Case?

SIDNEY HESS: You're talking about a student who is selecting a field of study or one who studied OR? And now is looking for a position?

BARRY LIST: Let's say somebody who's in operations research and they came to you for advice based on your work and your career. What should they study? What should they do?

SIDNEY HESS: I would urge them to get a job in a practical operation for a while, whether they want to stay there or not, whether they actually prefer to teach. They want to become a teacher or a researcher, but to get out of the university for a couple of years. And sometimes you can do this on a sabbatical if you go to the university first. But that may be too late. You really want to get this experience early on.

And I've seen some situations where we've had guys who are teaching at Wharton, for example, who would spend one day or two days a week working for Sun Oil. And this was considered within his academic contract, that this was important to his academic career and to his ability to link theory with practice.

And it made him a better theoretician. And I think it helped Sun Oil a little bit too.

BARRY LIST: Let me ask you one final thing. Is there anything that I haven't asked you that you very much wanted to talk about today?

SIDNEY HESS: Yeah, talk about public relations for INFORMS. I think it was important when you first came to work for INFORMS. And it's important now. The public, who include future and current clients, must always be exposed to what we're doing. They must realize that operations research is here to stay. And it's an important area for future investment, in terms of hiring OR people, and in terms of enriching the analytics.

Analytics is the big thing now. But we don't want the potential clients, which are the justifiers for all the academic studies of operations research, to have them say that we're over the hill. As they did in the '70s and '80s. BARRY LIST: They seem to have the last word.

SIDNEY HESS: Yeah.

BARRY LIST: And the last word is I'm Barry List of INFORMS. We've been talking with Sidney W. Hess. Thank you so much for your time. We really appreciate putting your words on the record.

SIDNEY HESS: My pleasure, Barry. Take care.