SP: Well, Dr. Olsen it’s an honor and a pleasure for me to be able to ask you a few questions.
DO: Well thank you, Steven.

SP: As you know this is a Project Bionics interview. As you know Project Bionics is an American Society for Artificial Internal Organs program, in collaboration with the National Library of Medicine and the Smithsonian Institution. I want to start off by perhaps embarrassing you a little bit. You are an absolute giant in the field of artificial organs. I must say that my view of your accomplishments is more than incredible and hard to put into words. I look at you and your accomplishments as the infrastructure and the glue that held all of the crazy people together, who were innovative and creative folks, but you added common sense and stability to our programs.

DO: Oh, thank you very much.

SP: It's a little different than some of the others, like Bud Frazier, or Mike DeBakey, or Bob Jarvik. And we’ll talk about those folks, because you touched on each one of them and many others, especially during your tenure as the director of The Artificial Organs Institute in Utah. What I’d like to do is just turn the clock back a bit and ask you as to why, as an accomplished veterinarian, you actually got into this field of artificial organs. I know it’s intuitive to know that a veterinarian has to take care of animals, but this is a little stretch from the majority of veterinarians that I’ve known over the years. And I think it’s just a wonderful thing that you’ve done. But perhaps you can just give us some background on where you went to school and how you ended up doing what you’re doing.

DO: Yes. I was raised on a small farm in central Utah. And I wanted to go to college. My father didn’t want me to go to college. He wanted me to help purchase some adjoining land to his farmland where we could share horses and so forth, equipment. In fact, I often said that, and maybe I’m not fair to my father, but I felt that he was more proud of me when I learned how to drive four head of horses on farm equipment than when I got my degree from the university. But I wanted to go to college and I never would have been able to do so without having a scholarship. But I went to school with tunnel vision; I wanted to treat sick dairy cows. And I spent seven years in that practice of veterinary medicine. But one of the most brilliant instructors I ever had in school through all my years told me it was more reliable, more beneficial, more comforting to have a degree in research than it was in treating sick cows. So after treating sick cows for seven years, I decided I think I’ll try that. And I started doing some research. Now Dr. [Willem] Kolff was setting up the artificial heart program at the University of Utah and he was having all kinds of trouble with the calves dying on the surgery table, or immediately postoperative. And his surgeon heard me give a paper one time on the use of sheep as a cardiovascular research model. Within two
days I was talking with Dr. Kolff at the University of Utah and he hired me as a consultant to try to keep his calves and sheep alive on artificial hearts. He tried to hire me full-time, but I had received an NIH post-doctoral fellowship to go to the University of Colorado for four years to work on my PhD degree. And so after that, in June 1972, I went to work full-time with Dr. Kolff at the University of Utah. Now we had an interesting experience, because Dr. Kolff, as you remember him, was a hardheaded Dutchman, and we had some hard discussions. Number one, the first time I challenged him was [when] I felt it was incorrect to let him, have him put the name of somebody that was working on a device, the Jarvik heart, the Kwan-Gett Heart, the Green Heart and so forth. And he said, "Well what should we call the heart?" I said, "Well, it ought to be the Kolff heart or at best the Utah heart." “Oh,” he said, "I do this for motivation," he said, “you can't imagine how motivated they are if their name’s on it.” But I pointed out that we had some people who'd come and work on a device for a year or two and then they would leave, their name would be attached to this device or this procedure. And somebody else [would] come along, make a little change and it'd be much improved, but they didn't get any of the credit. So that was the first time we had an argument. He hired me in 1972, in June. In March of 1973 I said, "Dr. Kolff, I'd like to talk to you about something. Could we go to lunch?" "Oh, well yes, Don." So we had lunch and I said, "You know Dr. Kolff, we are competing with Bill Pierce at Hershey, Pennsylvania, Yuki Nose at the Cleveland Clinic on NIH money. There’s always a shortage of NIH money. But it’s based in large part on success with keeping the calves alive. And our surgeon is so poor he can’t keep them alive." "Oh, Don," he said, "Dr. Jay Volder from Holland is our surgeon and he will remain our surgeon, end of discussion." Well, that was in May of 1973. In September or October of 1973 he called me and said, "Don, let’s go to lunch." And he said, "You had a suggestion that we couldn’t be competitive if we didn’t have a better surgeon keeping calves and sheep alive." I said "Yes." So he said, "I've talked to Dr. Volder and he's leaving next week back to Holland." "Oh, wonderful Dr. Kolff, how do we go about finding a cardiothoracic surgeon to take his place here and do the work?" "Oh" he says, "We don’t need to do that." "Why?" "You're our surgeon," he said. I said "Dr. Kolff, I’m not an MD, I’m not a cardiothoracic surgeon, I’m a veterinarian." "Yes, but" he said, "the only two calves we’ve had that lived in the last few months has been times when Dr. Volder didn’t show up to do the surgery and you did it. And those two calves were the only longer survivors we had." So he said, "You’re our new surgeon." Well, in 1975, I gave an abstract, presented an abstract to The World Congress of Cardiology in Buenos Aries. And I went there and I talked about keeping a calf alive for three months and three weeks. And Dr. Denton Cooley was the moderator of the discussions. And when I sat down he said to this large group, largest audience I ever spoke to, The World Congress of Cardiology. And he said, "If Dr. Kolff and Dr. Olsen can keep a calf alive three months on the artificial heart, we can keep a human alive a year." Well, the next day I had a call from the minister of health, Domingo Liotta, to come to his office. He sent an automobile for me. I went there and there was Dr. Denton Cooley and Dr. Domingo Liotta. And Dr. Liotta spoke and said, "We’ve got a proposition for you, Don," he said "Could you send us five or six of your hearts and two or three of your heart drivers and then you come to Buenos Aires and Dr. Cooley will fly in from Houston and you’ll put the artificial heart in a bunch of patients here in Buenos Aires." Well, here’s a “nobody” being invited to step into lime light and headlines forever. But something told me this wasn’t right. And I say it was inspiration. I said, "This is a no-win situation. If I come down here and put artificial hearts in gauchos, and they all die, then
they'd say, 'Look, Olsen knew that this heart wasn't going to work. And so he goes down and kills those poor gauchos in Argentina.' And I said, "On the other hand if I come down here and Dr. Cooley and I make them live, then they'll say, 'Oh we gave him all this federal grant money to build the artificial heart and they don't put it in Americans, they put it in Argentines.'"

SP: That why I said you added a lot of common sense to our field.

DO: Well, it just didn't look like we had a chance to win in that situation. Although I recognized that here was a chance for me to immediately step into world history right off. So it was interesting, as a veterinarian. Because within 3 years after I took over as head of surgery for Dr. Kolff, every artificial heart program in the United States and in Europe had a veterinarian on their staff, Bill Pierce and Yuki Nosé here in the United States, and the people in Germany, Austria, so forth.

SP: Well, I took that lesson and I did all my work. I transferred it from the medical school to the vet school at Iowa State University.

DO: Yes, I remember that I went there to visit you.

SP: Yes. That was wonderful. You've indicated that you've met some very interesting people and worked with some very interesting people over the years. Of course Dr. Kolff is well known by everyone.

DO: Yes.

SP: And the work he did with dialysis and artificial organs is just amazing, especially under the adverse conditions that he had to face during the Nazi occupation of Holland. I just speculate, and I've always wondered, I've never had the chance to ask him, why he was never a Nobel Laureate.

DO: I wrote three different letters of support of his nomination for the award. And I was so disappointed. He never did get it. He did get the Japanese award one time and that was a very prestigious award. And he was certainly deserving of that.

SP: You talked about naming the hearts. And personally I absolutely agree with you: no one individual invents anything. We all build on the successes of our predecessors and learn from the failures of our predecessors. I know Rob Jarvik, you know Rob Jarvik very well. I know Bill DeVries, you know Bill DeVries, Lyle Joyce. We're all in the same circle. Would you perhaps talk about that a little bit? About Jarvik and the heart, and Bill, and all those issues and accomplishments that they--

DO: Okay, Rob Jarvik and I didn't get along very well. It turns out that Dr. Kolff one time received a phone call from the president of a surgical instrument company back east. This man told Kolff, I have a bright young engineer here, biomedical engineer here who I think could help your program. Now he said he doesn't have a degree, but if you'll hire him, I'll pay his salary for the first five years. Well good, I said. If Kolff could get a guy to work for free for five years he'd jump at the chance. Well, Dr. Jarvik came out and started to work
with Dr. Kolff and lo and behold, this fellow didn't uphold his word, and Kolff had to pick up his salary from day one. And in 1976, January, Dr. Jarvik was supposed to get his MD degree that spring, and he came to see me and ask me if he could come to work for me full-time in the laboratory. And I said "Rob, no, I won't hire you." He said, "Why?" I said, "Well, you're family, your two children and your wife deserve the financial basis of a better income than a technician; you should get your degree and you should get a specialty in your degree so you can make more money." "No," he says, "I'm independently wealthy. Didn't you know I lost $85,000 in the gold futures just two months ago." "No, I didn't have any idea." "Well, I did," he said "So I don't need money." So I said, "Okay, I still won't hire you." He said, "Why not?" I said, "You took a chair in medical school that some student who wanted to spend the rest of his life treating sick patients, making a real contribution, and you deprived him of having that opportunity. So I still won't hire you." Well, he was pretty upset, and I said, "Well, come back next week let's think about this." Well, he went that afternoon to Dr. Kolff, who hired him and put him in my laboratory. Which created let's--

SP: Can't say no.

DO: --more of a problem. He one time came to me and he said, "Don, I want to learn how to put the artificial heart in calves." I said, "Rob, you’re too busy designing a heart, building hearts and so forth." I said, "We've got good surgeons. I've got a group of Japanese surgeons right now that's helping me, doing a great job." So I said, "You'd be wasting your time." "No. I want to learn how to put the artificial heart in calves." So I said, "Okay, Thursday morning we'll do one." So he came in, scrubbed all up, put a cap and gown on and so forth. And then he came and stood beside me. Two Japanese surgeons were across the table from me. And I noticed from the corner of my eye that there was something coming into the vision field there and it got deeper, and deeper, and deeper in the field and finally I caught him with my elbow before he passed out and fell right into the surgery. And I said to the technicians in the room, I said "Catch this guy, set him on the floor." So they did catch him on the floor. And I said, "Put his knees up and get his head down between his knees." And he sat there, and shook his head for a little while, got up and walked out. And he never, ever came back into surgery. That was the end of that.

SP: I might jump around a little bit.

DO: Sure.

SP: Because you have some marvelous stories to tell and I don't want to interrupt your stories. Since we're on the artificial heart--and there are many other devices that you've worked with. Would you just reflect on the human implant and how that came about?

DO: Yes. Dr. Kolff always wanted to put the artificial heart in a patient. Of course that would have been the ultimate goal of course. And so many of the things he did and many of the people he hired was to achieve that success. One of the great difficulties I had was the amount of information, and the amount of interviewing we had to do with the IRB, the local Institutional Review Board. There were so many of those people, and this was on a rotational basis. So we had new people on the committee all the time. And I'll have to tell you one story. At one time I spoke to the transplant people in Palo Alto, Stanford, and I said,
“Look gentlemen, if we get a patient on an artificial heart, would you consider having us fly him to Palo Alto? And bridge him to a transplant?” “Well, if he was not infected and met our criteria, yes, we could do that.” So I presented that as one alternative for the patient in Utah. Well, there was a young man on the IRB that said, "Oh, you can't do that Dr. Olsen. You fly him in an airplane, he's in a pressurized cabin at somewhere around 6800 feet. And your heart won't pump at that." Well, this was foolish, I said, "No, regardless of that, that's an independent pump." And so he argued pretty hard and vehemently, and I didn’t know exactly who he was, background-wise, but I had a sheep on the artificial heart. I put him in the back of a truck in December and drove him up to Snowbird, Utah, where there was a sign: 6800-foot elevation. And I posed the sheep in the back of the pickup truck and took a photograph and gave it to him. That took care of that one. So the people at the FDA, they didn't want us to put the artificial heart into the patient until he was near dead. And so, Bill wrote up a protocol, Bill DeVries, and he said he would put it in a patient that was on a heart lung machine for corrective heart surgery, and couldn’t get him weaned off. And they finally approved that. Well, after four years Bill never did have a patient [who was] un-weanable. He had several people with severe heart conditions that signed the approval, but they all recovered from his surgery. So that didn’t work. So then, it’s a little bit humorous. There was a retired Navy man in Florida who was in the fire department. And he had an attorney, and his attorney came to Utah and threatened a lawsuit against the University of Utah for this retired sailor to be the first recipient of the artificial heart. And he threatened to come to the University of Utah hospital and sit on the steps until he got the heart.

[DO:] And so we tried, and tried, and tried to get people to appreciate the fact that we didn't want to put the artificial heart in a sick, dying patient. All the years and all the success we had in calves was [because] we selected only healthy calves to put the artificial heart in. And we were criticized heavily for that. But I pointed out that in young calves and sheep you didn't find heart disease. You didn't really have comparable. I even went to the mountains in southern Utah, where you got right heart failure in calves because of lack of oxygen and the air they were breathing and the right heart would dilate and go into right heart failure. And I tried to put the artificial heart in those animals. But this was a unique situation, and I was not very successful in keeping those alive. Then Dr. Jeffrey Anderson at the LDS Hospital was a consultant on a patient in Seattle, Washington--Dr. Barney Clark. And he said, "Dr. Barney Clark doesn’t need a heart yet, but he will. He’s heading in that direction.” So they started corresponding. And finally, he came to Salt Lake City. He and his wife, and his cardiologist from Seattle came and visited the laboratory. And they came in on a day that I was just taking one calf off of the operating room table. The worst time at all to see a patient, you know. You’ve still got blood all over the patient and it’s just a terrible sight. But they asked a lot of important questions, and we gave them important answers. And we had additional calves in the barn, standing up eating hay, and walking on the treadmill. And they were impressed. And Barney said to me, "Well, someday maybe, but I’m just not ready for it yet.” But less than one year later, his cardiologist advised him to come prepared. We were scheduled to do it on the second day of December, 1982. But he was having some rapid tachycardia on the monitors there in the hospital. And the attendings felt that he could die before morning. So we started him that evening about 8 o’clock to put the artificial heart in. And since I had been training, or working with Bill DeVries for three years to teach him how the artificial heart worked and how we implanted it in calves. And
Dr. Lyle Joyce was hired as a young surgeon to help in the cardiothoracic surgery area. And he worked with me for about two years. Lyle was a superb surgeon. Bill was a little shaky at times. But anyway, they both wanted me to be involved in the implant because I had more experience in the calf than anybody, so we did it. It was impressive. We opened Barney's chest. Bill and Lyle, and I helped do some of it. And when we put the spreaders on to spread the chest, I saw a very large left atrium. It had been dilated and was very thick and huge. And I said, "Bill, we're going to have to cut and trim that atrium, because it will fall into the mitral valve and the heart won't pump blood because it won't have any blood." "Oh no," he said, "We're going to save that." Well, we switched the left heart in, dropped it in the chest, sutured the right heart in, and put it in. "Okay, let's beat the heart." Well, it beat about two beats and then there was no more blood. And I kept telling Bill, "We've got to take that redundant left atrium out." "No, no, no," he said, "I think it's the valve that's sticking, the mitral valve here that won't let the blood in." So we took the heart out, put him back on the heart lung machine. Three different times, took the heart out and repositioned it. Rob, he was invited to come in and give his opinion. He said, "No, the valve's all right," he said, "I think it's the position of the heart." And I had told Bill that in the cadaver studies that I had done in Germany, in Rostock, East Germany, that if you open that left pericardial sac and let the left heart sink down deeper into the left hemothorax, then you have a lot of better space. And so we did that with Barney. So I was still talking about trimming the left atrium. "No, no, no." And so one time Bill was reaching way down behind the heart, and he said, "I'm trying to feel that valve orifice and see if this is occluding it." And he said, "Oops, I just put my finger through the wall of the left atrium." So to close that off we had to remove it. And we removed it and put the heart back in and it worked fine. But Bill published three or four articles and he talked it about all the time, changing the left ventricle. He claims we put a new left ventricle in. Well, Tom Kessler, who had built the hearts over the years, had a serial numbering system that showed that this was an equal pair of hearts designed for Barney Clark and the serial numbers on them corresponded directly. So when, Bill kept arguing, "No, I changed the heart, left heart." Well, a surgeon that's willing to talk about all his steps would have had to explain how he got that heart out without pulling the drive line, dirty drive line in through the chest. How he would have to cut it off within the chest and pull it out. And he didn’t mention that at all in any of his discussion, any of his write ups. He insisted he changed the heart. And he still believes that he changed the heart, left ventricle, but on day five, I think it was, the mitral valve, [inaudible] valve broke, the strut, the welded strut to the ring broke, and we did change the heart then. But it was really the atrium that caused the malfunction of the heart.

[DO:] There was another thing that bothered me a great deal about it. Every time I invited Bill and Lyle to assist me or help me, or learn from putting the artificial heart in a calf, I had that calf on a membrane oxygenator. And I had a cell-saver in the heart lung circuit to wash the cells and salvage the cells. And lo and behold, we come to doing the most important surgery of all time and he [Barney Clark] was on a bubble oxygenator. And the perfusionist commented, "His serum is red." In fact, I had never heard, I believe it was somewhere around 680 milligram percent plasma-free hemoglobin. And all of this, of course, had to be filtered out by the kidneys, so you immediately have kidney failure too. And there was no cell-saver in the circuit and there was no membrane oxygenator. I asked Dr. Lyle Joyce later, I said, "Hey, Dr. Joyce, who made the decision that we don't have a membrane
oxygenator?" Well, he says, "Bill. He was in charge of the surgery and it was his patient."
Well, he went into renal failure of course. And they tried Lasix and that wouldn't work. So
they called me and I went up from the laboratory, and I said, "Well, I can increase the
driving pressure on the right heart, left heart, excuse me, left heart. Increase the pressure,
increasing drive, a little bit flow and the kidneys will work." So I did; I increased the
perfusion and he started making urine beautifully, and he continued to make urine. But in
addition then to the plasma free hemoglobin that had to be rinsed out through the kidneys,
there were all the ghost cells, the ruptured red cells that had to be picked up by the
reticular endothelial system. That meant that they were so saturated that if there were any
circulating bacteria, they would miss it. So I was very worried about that. And then on day
six, I think it was day six, he had seizures--Barney had seizures, grand mal seizures. Now I
didn't know much about that. But since I had increased the flow of the blood to the kidneys
for urine production, they thought there was a misbalance, metabolic misbalance because
now he's been very, very low perfusion and now I’ve increased it up and there was a
misbalance and that caused seizures in the brain. Well, I talked to my friends at Palo Alto
and said, "Look, you take these sick patients that are just in heart failure and you put a
young person’s heart in that patient and the patient's overloaded with fluids anyway, and
so the cardiac output goes up dramatically, have you ever seen seizures?" "No, we’ve never
seen seizures." So I had a hard time believing it. So anyway I had a bunch of calves on the
artificial heart and I put them into renal shutdown because I just lowered the driving
pressure on the heart. Now I turned it up as high as I c
one of them. Well, approximately ten years after Barney Clark had died, a urologist from
the university came to me and wanted to study some renal function, and he wanted to do
some experiments on calves and lower the urine production by lowering the drive
pressures and so forth. And then he said, "Don, would you go through the hospital records
with me on Barney? Let’s see if we can correlate some pressures and flows and so forth." So
we started looking at it. And he said, "Oh dear. Look at this: day six when he had the
seizures there was a drug aboard his tested every week, came back tested in a value and on
day six the level of that particular drug was ten times the known seizure level of humans."
In fact, this urologist told me that he thought had we not had the artificial heart in Barney
Clark, had he been on a normal heart, he’d had gone into a serious arrhythmias and died
with that level. Where did it come from? Barney had been using a drug through an atomizer
or something, and it was a product in that; and evidently his wife, or his family or someone
had been buying it for him unbeknownst to Bill, because the drug was not on the medical
list of any drugs to be given. And when I talked to Lyle Joyce about that, ten years later.
"Don, I don’t remember reading anything about that, are you sure?" And I said, "Yeah, I'm
sure." I sent him a copy of the data. And I called Bill DeVries and I said, "Bill, I found out
what caused the seizures in him, in Barney." And he said "No, Don, that isn’t true. Barney
was my patient and I watched that closely and I don’t believe it. No, don't tell me that." To
this day he hasn't accepted that.

SP: Sounds like perhaps aminophylline.

DO: Aminophylline. Yes. Ten times the known seizure level. And the urologist I was talking
to and working with said had he [Clark] not had the artificial heart, he’d have cardiac
arrhythmias and very well have died.
Donald B. Olsen interview, June 19, 2014

SP: I would agree, I would agree absolutely. Fascinating. Now--

DO: Now we had the heart break on day four or five, I think four, the valve broke. And so we replaced that. But before that he was accumulating a little bit of subcutaneous emphysema. At the upper edge of the thoracotomy incision. And Lyle called me up to come up and be in attendance for that re-operation. But luckily they just opened up a little bit and there were some little blebs on his lung that was rubbing on his sutures. Closed that up a little bit and that was the end of that. But then later we had to open his chest and replace the left ventricle.

SP: Most of us got on the bandwagon. There was a big multicenter of study and we all put in the so-called Jarvik hearts. But most of us then quit, except for Jack Copeland. Who has put in probably over nearly 150 hearts? And it is commercialized. I looked at them today and they're down to 50 ccs, small. And what’s your thought? I mean, everyone is switching over to axial flow and yet Jack has persisted and it seems to be a viable of support device.

DO: Dr. Kolff had started a little company called Kolff Associates to build the artificial heart outside of the university, in hopes to get FDA approval and so forth. So we were thinking we were getting closer and closer to human application and Rob Jarvik came into my office one day and he said, "Okay, Don, we're set for life now, I just sold two artificial heart training programs—one to Louisville, Kentucky, and the other one to Miami, Florida." I don't remember exactly the name in Miami, but it was two big insurance companies. And he said they're going to come to the lab every month for eighteen months and they're going to pay us $2 million apiece." And I said, "What for?" And he said, "To train them to put artificial hearts in people." I said, "Rob, congratulations. You've just killed Kolff Medical and destroyed the whole thing," "What do you mean?" I said, "Well you sold to two companies that have put enough money in for a training program that is ridiculous." I said, "We don't have to train these guys how to do cardiac surgery, they know how to do cardiac surgery." "Well," he said, "How long do you think it would take?" And I said, "Let me think about it a moment." I said, "I can train them to do this with two calves." I said, "Two calves. First day in, we give a little lecture, we put an artificial heart in a calf and they spend the night with it, watching it, you know, helping it through its critical care. And the next day we do a second one and then we take the heart out of this one and prepare it for transplant." "No, you can't do that." And I said Rob, "These guys, some of them have already done transplants. And they can do it." And he didn't like that at all. He wanted to make this big glorious money. Well, hell, there was no one else in the world that could do that besides these big insurance companies. But Kolff saw it right away. And so I set up a training program. I made a training film so we could show them exactly what we did and why. And I used to tell them that we're teaching them a little bit about plumbing—not heart surgery, but plumbing. Because I said you're accustomed to taking out a heart and you tip it up if you need to get behind it and you always drop it back in, well, sure it's going to fit. But now we're going to take these two plastic hearts, right and left ventricle, and we're going to put it in there. Now we've got to make sure everything fits without encroaching on other things. And so I call it plumbing. And Kolff bought it right it off. So we started in training them. Jack [Copeland] was the first one I did. And at one time there were twenty-three groups approved by the FDA to implant the Jarvik heart, and twenty-one of those twenty-
three I had trained either in my laboratory, or in their research facility. Denton Cooley came to my laboratory. Well now, I knew he’d already done two human heart implants, artificial heart implants. "Dr. Cooley this is the way I’d do it," he’s on one side of the calf and me on the other side. And I trained a lot of surgeons in Vienna, Austria, Rostock, East Germany, Berlin, Germany, and even Rene Favaloro in Buenos Aires--great surgeon, great man. I went down and trained him.

SP: Well when we brought our team out--

DO: Yeah, you came out.

SP: --we were very humble and anxious to learn how to do it. Just because you can do something else doesn’t mean that you can perform something that you’ve never done before.

DO: But I tried to keep it simple.

SP: It was.

DO: And keep it on your level. Because you already knew all about heart surgery and artery surgery, and cardiac surgery in humans. I didn't have to take eighteen calves, eighteen months--that was ridiculous.

SP: Never would have gotten any clinical groups to do that.

DO: No.

SP: Those two insurance companies [were] the only ones.

SP: Just to finish up with the artificial heart and Barney Clark, obviously you had to be more than a physician surgeon. You also had to be somewhat of a politician.

DO: Yes.

SP: Would you kind of just share with us the aspects of "Reader's Digest" and the information that was collected?

DO: Well, I was quite amazed at the amount of information that the Selbys--Mr. and Mrs. Selby were the authors--had accumulated and particularly disturbing to me was the disjointed interviews of Bill DeVries. I mean, we talked about the redundant size of the left atrium. Selby went to Lyle Joyce and Lyle told him, "No, we didn't change that left ventricle." Come to me. "No, I didn't change that left ventricle." So he went back to Bill three different times and said, "Hey look, your co-surgeons didn't change that left ventricle." "Well, they're wrong." And if you read Bill's responses to these questions, he would start--he'd be asked a question, straightforward question, he'd start a straightforward answer for it and then all the sudden he'd deviate off to the right or left. And it's the most disjointed—oh, I've got 487 pages, double-spaced, typewritten pages of his interviews. And they are the most disjointed things. Whereas, Lyle Joyce, you know, A, B, C, D, boom, boom, boom. And the other people were a similar way. The anesthesiologist went into great detail. Because
you know they were afraid that Barney Clark was going to die before morning. So the anesthesiologist [inaudible], had a problem. He could not give any anti--

SP: Protamine?

DO: No, no, no that’s wrong. Any pre-anesthetics.

SP: Yes.

DO: So, "Dr. Clark we’re going to have to go without anything now down to the OR, you going to be all right?" "Yes," he says, "I'll be fine." But he talked to him as he goes down the hallway with no monitors on him at all because they left that in the other room. So they get him into the OR. "Now Dr. Clark, you're pretty big and so forth. Can you slide yourself over onto the OR table?" "Well, yeah, well I might need a little help." And so they slide him over. And, "Now, Dr. Clark, we’re going to put in an arterial line here, this’ll stick a little bit." And talked him through it. And the IV lines and so forth and just talked him through and without any pre-anesthetic. And I know when I had my coronary bypass surgery, I would welcome that. But he had nothing and the anesthesiologist just talked him through it. Created a confidence level with him. And so as soon as he was on the OR table and started to be anesthetized, the nurses had all the instruments and everything all laid out, and the artificial heart and so forth. And Lyle and I went and scrubbed. And we were on the same side of the table. Lyle was at the front and I was next to him. And I just made sure I took care of the observation of the heart lung machine. And we were just about ready to put him on the heart lung machine and I noticed the clock, 12 midnight. And his heart just stopped beating. Just stopped. I said, "Bill, you got to go." So. I was quite relaxed through that. I didn’t feel too much pressure. Because well you know it wasn’t my name on the checkbook so to speak.

SP: Amazing. I wanted to ask you about the NIH and the granting mechanism.

DO: Yes.

SP: You being one of the largest recipients of NIH grants for the artificial heart program. And how did that work for you?

DO: Well, early on Dr. Kolff would just have the grants. And then he got a little low on money. So I started writing grant proposals. And I was very fortunate in that I was able to express myself through grant writing, to make the people who were reviewing it see and understand exactly what I wanted to do. And so I started early on getting funded. And at one point I received this letter from medical accountant reporters saying that in the 25-year period, I was above the 95% of all grant applications then. And I had established myself as a top grant writer. But I had a secretary that was working for Dr. Kolff in 1972, that I could give her my ideas and she could fill out all the grant form application blanks and successfully do so.

SP: That just goes to show and I’m glad you showed that we’re not islands unto ourselves. No matter how big or small our egos may be, we work as a team.
DO: Yes. Dr. Kolff would make giant steps. I mean instead of going from a, b, c, and d. He would go from A to jump to D and on to C and so forth. But I took it step by step, by step. So that the reviewer knew exactly what and when I was going to do it.

SP: That’s good advice. Well, we talked a lot about the total artificial heart. But you also worked with many other groups on cardiac assist devices, and perhaps--would you reflect on some of your experiences there?

DO: In 1977-78, I was invited as a Humboldt, Alexander von Humboldt visiting professor in Berlin for University of Berlin. And while there people and Professor [inaudible] down in, oh dear? Czechoslovakia wanted me to come help him with the artificial heart. So I went down there twice. And the third time I was scheduled to go down, he called me up and he said, "Dr. Olsen, the Russians have heard that you're coming to do surgery with me here on the artificial heart, and so their whole artificial heart team is coming out to watch. Is that all right with you, or do you want me to change it." I said, "No," He said, "I can't really stop them." I said, "No, that's all right." So these people, the whole team, two surgeons, cardiologist, anesthesiologist, and so forth, pump tech, rode a train for several days from Moscow to watch me do surgery. And they came every year. Every time I’d go over there. And then remember one of the last things that Nixon did before he left the presidency was established an exchange program on the artificial heart and heart disease between Moscow and the U.S. He appointed, of course, Michael DeBakey to head up the U.S. team. And Shumakov, was the son-in-law of the Minister of Health of Russia. And he was heading that up. Well, Dr. DeBakey went one time to the Russian group. And then he invited me to go from then on. So my wife and I would travel with Mr. and Mrs. DeBakey. And they came to my laboratory, and that was an interesting group. We soon learned that you never left anything out on the table, the desktop, countertops. You put them away. I had to teach them how to intubate a calf. Because a calf’s mouth is quite long you know and you didn't have a speculum to get in and hold that epiglottis down so I just did it by palpation and feel. And it was interesting.

SP: Well, even the calf’s circulation is different with the extra subclavian artery or--

DO: When I first started putting the artificial heart in, I followed the regular way with the clinical cardiothoracic surgeons, lay the calf--who is flat in chest side to side--on his back, raise him up, and then go in through the midsternal split. Well, the sternum is quite thick on a calf 2 or 3 inches. And then you get in there, in the chest. And the vessels you want to do the suturing anastomosis [on] was way deep. So you're working in a deep hole. And I soon decided that was not the right way to go. So I modified it to the right side thoracotomy and then I can put the jugular cannula in, pick up the venous blood and the carotid to return the arterial blood. So I didn't have any of the circuit in the incision site. And [it was] kind of funny one time. I told Dr. Kolff, I said "Dr. Kolff, I’ve been studying a calf heart," and I said, "I think I can save the outflow valves. The aortic and the pulmonary artery." "No," he said. "Don," he said, "If that was possible the good surgeons would have already done it." Well, I kept doing it on the cadaver hearts and finally he left town. So the first calf after he left town, he's going to be gone three weeks, I save the aortic and pulmonary valves. And they got along fine. So I knew what day he was coming back. And no matter what time of day Kolff came back to the U.S. from one of his trips, he would go to the calf barn, look at
the calves and then he would call me, middle of the night. So I knew he was coming back. So I took an x-ray of this calf standing up, showing the two rings from the inflow valves and nothing for the outflow valves. And I named the calf AOPA. And so I told the calf sitter, I said, "Now here's a radiograph. Dr. Kolff's going to come in and want to know all about that calf." Because he was beautiful, doing a great job. So I said, "You tell him the name of the calf is AOPA. And here's an x-ray showing he doesn't have any outflow valves." So Dr. Kolff came in he said, Oh that calf looks nice and healthy, what’s his name?” "AOPA." "AOPA, that’s a funny name, well, aortic and pulmonary valve. And they showed him a radiograph. Well, it was 12:30 at night. He called me on the phone. "Don, I just saw your valve job." He said, "That’s great. Thank you. Congratulations." Kolff would complement me. He didn’t give many accolades, but if you did a good job and were consistent he would acknowledge it. Then I started to work on saving inflow valves. And I had Tom Kessler prepare the anastomotic grafts. But locating the chordae tendinaea was the problem. Tough, yeah.

SP: Over the years, you’ve obviously had to deal with regulatory agencies. You mentioned the local IRB which was more than difficult.

DO: Yes.

SP: How was your interaction with the FDA? For a number of years from ’74-75 we were pretty free-wheeling, until they started passing regulations related to devices.

DO: Yes. That’s when it became hairy. Since my name was not on the application, Bill DeVries wrote the application for the clinical application, clinical use. And so I didn’t get too involved with them. But let me tell you, I was so surprised when three or four days before we did Barney Clark, Barney had flown down to Utah and he was in the hospital. Oh, he’s here, the fellow that works at the FDA. John. What’s John’s last name?

SP: He wasn’t the director?

DO: No.

SP: John Watson.

DO: John Watson flew unannounced into Salt Lake City, three or four days before we did Barney Clark. And he did not talk to me, but he talked to Bill DeVries. And several questions he wanted to ask Bill was, "Bill, how much money did Don Olsen spend on you with FDA money, NIH money?" "None," he said, "I went to him a couple times and wanted salary. And he said he’s too tight he didn’t have any money. And so," he said, "I didn’t get any money." I told Bill DeVries. I said, "He felt that if you had gotten NIH money he had a lever to get you to stop. Because he told him not to put the artificial heart in. He said, "Bill, you will destroy Yuki Nosé and Bill Pierce, who have spent their careers building this artificial heart [inaudible] surgery. And now they’ll all be destroyed if you go and do this surgery.”

SP: Interesting, interesting. Well, let’s begin to wind down because this has been a terrific discussion. But perhaps you could reflect on the next fifty years. With you being here or not, what would you like to see happen and what would you predict that might be happening? We’re going to talk about biologics, mechanicals, some combination of the two.
DO: Let me tell you about an experience that I really enjoyed doing. And it got a lot of PR. A couple years, I think one year before we did Dr. Barney Clark, I decided that if the artificial heart were going to be used extensively in the human, it might be used as a temporary bridge to cardiac transplantation. Well, knowing calves like I knew since I was raised on a dairy farm, there was the unique situation of twin calves. Calves that are twins--I didn’t know this until I went through veterinary school--but the vessels in the one placenta anastomose with the vessels in the other placenta so that the stem cells, hormones, and everything got mixed. And I knew from my experience on dad’s dairy farm that any heifer calf born twin to a bull was sterile. Never conceive. So I proposed—well, after I got to veterinarian school, I learned what happened. The testes of the bull starts to produce testosterone before the estrogen is produced for the ovaries and so you have a female calf starting to be a female and the testosterone comes in and it turns her hermaphroditic. Known as a hermaphrodite. Anyway I proposed to NIH a six-year study of a temporary bridge to cardiac transplantation using twin calves. And my basic protocol was to put the artificial heart in one of the twins, keep it about 90 days plus or minus a few, and then transplant the twin’s heart in the chest after removing the artificial heart. Then my protocol called for about six months on the twin’s heart and then terminate the animal and look at all the tissues and demonstrate that they were in fact intact, healthy. And one of the reasons I wanted to do this study again was that we had a very astute bioengineer back east. And he wrote an article and published it, criticizing the work on the artificial heart because we had higher DPDTs in the driving. And this would interfere with organ function. So I used these twins. So, I’ll tell you, I did a whole group of calves, twenty, I think. But one of the pair I bought, I called it a name male calf Charlie, female Diane—that tells you about when I did it--and we put the artificial heart in Charles. We kept him 85 days. Took the heart out, put Diane’s heart in his chest. At that time, Charles weighed 360 pounds. Diane’s little heart fit very easy in big Charles, male calf. And at about six months we had to have calf sitters, 24 hours a day with the calves as you remember. So I told some male calf sitters there one day, I said, "Well, Charles been on that artificial heart now, or on the transplant heart six months it’s time we terminate him and look at all his tissues." "Oh, Dr. Olsen, you can’t kill Charlie, he's special, he’s unique, he’s unique, you can’t kill him. Besides when you killed those other calves all the tissues were normal, you didn’t learn a damn thing." Yeah, well that’s the protocol that I’m funded for. And so the following Monday, six beautiful young ladies that calf-sit for me came in. "Dr. Olsen, you can’t kill Charlie, he’s special. He’s got this unique personality." Well, Charlie didn’t have, he had a natural heart, and so I had all these little stalls that I put the calves in with the heart driver above and the air tubes going into the chest. And so they're turning Charles loose. And he’d go over and eat the hay out of this calf, or the grain out of that calf. And these calf sitters would come into the room, you know, in the barn where we had maybe eight to ten, twelve calves, and holler, "Charlie," and he’d come running over and they’d feed him pizza pie, or sugar cubes, his favorite. And he’d come running over like a pet dog, you know, and eat the sugar cubes. And these girls said, “You can’t kill him, he’s special.” And their tears, oh they just melted me. So I kept Charles. Well, he’s an intact Holstein bull and he’s gaining about three kilograms a day.

SP: Oh my god.
When he got about 750 to 800 pounds, he’d still be like a puppy dog; you go in there and holler “Charlie,” and he’d come running over and you’d have to have sugar cubes for him. Well, I called a dairy man, a friend of mine. He had 200 head of milk cows. I said, “Would you take Charles as a herd sire?” “Well, yeah I’ll do that.” I said, “Well, he’s not mean at all, he’s gentle as a kitten.” So we hauled him out to the dairy man. He had milked 200 cows, so he had fifty cows in four different corrals. He put Charles in with a corral of fifty cows. And I had to go in and stop in once in a while just to see old Charles. You walk in there and here old Charlie is, with his fifty cows, and you’d holler, “Charlie, Charlie.” He’d come running through them and you’d rub his nose and rub ears. And he’d want sugar cubes, of course and was doing fine. Well, three years and three months from the time I put Diane’s heart in his little chest, when he weighed 360 pounds, my dairy man called me and said, “Doc, we’ve got to get rid of old Charlie.” I said “Why, he’s not mean, I was up there just a couple weeks ago.” And I said, “Gentle as a kitten.” “Oh yeah, he’s gentle, he’s not mean at all.” I said, “Why do we have to get rid of him?” “He has daughters old enough to breed.” “Uh oh.” So we took him to the slaughterhouse. And I’ve said before when I’ve given this speech that shortly after we put the artificial heart in human beings, all the records I’d established in calves, were broken, longevity and so forth. But here’s two records. At the slaughter, Charles weighed 1875 pounds.

SP: Wow.

DO: Diane’s little heart had grown in perfect harmony with somatic body growth--because of the pituitary gland growth hormone. And he sired fifty-five calves.

SP: Oh my goodness.

DO: Those records are still standing.

SP: [Laughter] Well, good. Before we finish is there anything else that you want to say, advice to any young folks? What you would have done differently if you had the opportunity to do it again?

DO: Well, a lot of people ask me the question, “Don’t you wish you’d been an MD instead of DVM?”

SP: I’m glad you didn’t.

DO: I said, "Well no, DVM opened a lot of extra doors for me." I said, "I didn’t' have to worry about patients, and insurance, all that stuff." And so no, I’ve been very pleased. I’ve worked very hard. Spent a lot of time travelling. You know I used to take my wife travelling with me as I’d go around the world teaching people how to put the artificial heart in calves and patients. She and I have literally flown around the world three different times. She got tired of travelling with me so I started taking my grandkids. If you can imagine me shopping for dresses in Rome, Italy with teenage granddaughters [laughter]. But it was a lot of fun. A lot of fun. Took one of my older grandsons the first time out, we ran into a topless swim area up in North Germany. It was embarrassing. But you know I advised a lot of students as they were going to school; in fact, twenty-eight years ago I spent overnight at the Saint Mark’s Hospital in Salt Lake City, overnight. And the overnight five physicians who were on the
staff there came to see me. All five of whom attended my calves and artificial hearts. All five of whom I’d written letters of recommendations to go to medical school. And they were thrilled to see me there and supported me. And I had a lot of fun. The most frequent problem I encountered was they’d say well I’d like to do that but it’s too crowded, too crowded, it’s too crowded, look at all these people and I had a comment for them and I’d say look, ”Let me tell you something and you can believe it forever. It is never crowded at the top. You scratch and you dig, and you claw and you climb, and you get to the top and there’s nobody up there.” So I had a lot of fun with a lot of students.

SP: That’s a wonderful comment and I cannot thank you enough for your nearly 500 peer reviewed papers, your contribution to ASAIO, and our entire field. And everything I’ve learned from you over the years. It’s been an honor and a pleasure to sit here and have this discussion.

DO: Well thank you.

SP: Thank you

DO: I’m honored.

[ Music ]