Interview with Philip O'Brien
Professor Emeritus
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Interview conducted by Professor William Van Vorst

Van Vorst: Phil, let's start with some information about yourself—birthplace and education.

O'Brien: I'm a native of Hollywood and my family were immigrants from Canada. I went to school, parochial school, in Los Angeles at Loyola High School. Then I left early in the high school program, because I already qualified for UCLA and the University of California requirements when I was just a junior in high school, so I went to UCLA in 1942. I did my pre-engineering program there and then I joined the Navy. I was in the Navy—the officer candidate program—and they sent me to USC where I completed the engineering undergraduate program and then I came back to UCLA after the war in July of '46 and I did graduate work.

Van Vorst: You came back to do graduate work?

O'Brien: Well, that's an interesting story. Everyone has an anecdote. I was at China Lake and my roommate was a contract officer for a program doing a heat transfer simulation, a dynamic simulation of a rocket motor and Fred Romie, who was one of the people who transferred from Berkeley with [L.M.K.] Boelter to L.A., was doing the work and so I had some idea of what was happening at UCLA and it impressed me that somehow or other my engineering program to date was an old fashioned one. So, since I knew UCLA, when I got out of the Navy on about the 10th day of July of 1946, the first thing I did was to walk out to the UCLA campus. I walked up the steps of the old chemistry building where engineering was then located and I met Louis Grandi, who you remember was an electrical guy, and Grandi said, "You know, you have an engineering degree—we have a tremendous problem. We have all of these veterans who are going to appear here in a couple of months, we'd sure like to get you to work. Why don't you go in and see Boelter right now." And, I had no idea who Boelter was, so I went in and I sat down and I told Boelter, "I want to come to UCLA because I think you people know something that I don't know and maybe it's a more modern approach to engineering." So, he said, "How would you like to go to work next Monday?" And, so I stayed there for 46 years. [laughs]

Van Vorst: So, you did not know Boelter before you came to UCLA?

O'Brien: No.

Van Vorst: So, we came to UCLA around the same time. I wasn't sure if you came first, but you were there a couple of months before I was. You told us what brought you there, let's take a minute to get you to reflect and maybe describe Dean Boelter.

O'Brien: Well, he was extraordinary in the sense that he was so non-conforming about everything he did. In fact, there was this anecdote that someone in deciding whether he should be given the Dean's appointment at UCLA, spoke to Theodore von Karman at Cal Tech. And von Karman's story was, "Well, if Boelter gets the job he'll surely stir things up." So, I think that's what happened. I wasn't really aware how non-conformant he was until I was there, maybe it took me 10 years to really find out what was happening and compare it to the engineering education in the rest of this country. Boelter was very broadly educated, I think a self-educated guy. He did a lot of reading. He could read German, as you know, and he was always interested in bringing new technologies to the profession. So, personally I think he was someone who appealed to me because he was what I would call a philosophical person, somebody who took a broad view of everything and understood the social and the political and the economic aspects of any topic and he could speak on any topic, but on the other hand, he was not a particularly outgoing guy, he wasn't a party person. As you know, I don't think he took a drink until he was 65-years-old. Although he was willing to speak on any subject and was well informed, his formal preparation was something that some people felt was inferior, for example to his long time colleague, Morrough P. O'Brien. Morrough P. O'Brien was a polished public speaker. When he stood up in front of, particularly, an audience off the campus, captains of industry, everybody listened to him—M.P. O'Brien—and they were really impressed. But, Boelter would appear with a yellow pad, like you're holding in your hand, and he would have a few words scratched on it and he would start to talk and some people got turned off by that approach, that kind of casual approach where he was talking off the top of his head even though it might have been the most enlightened things that we could hope to hear.

Van Vorst: I will always have tremendous admiration for the way he forced himself to improve. I think after about 10 or 15 years of having to speak so much more as Dean, he really become more accomplished or perhaps he was able to think about things a little ahead of time.

O'Brien: Well, I think it's just the schoolteacher experience. You get really confident and pretty soon you're willing to speak on almost anything at a moment's notice.

Van Vorst: I know I'm reminiscing a little now and the point is for you to do that, but I remember sometimes having to ask him at the last minute if he would address a little group. He was always willing to do so and I don't think he ever let us down at all in the sense of not having something very profound to say. But, let's get on with your reminiscences. What were your duties, your responsibilities in those early days?

O'Brien: Well, the big problem was how are we going to service all of these guys who just got out of the Army, the Navy, the Air Force. They were 22 years old, they postponed their higher education for three or four years, they're supported by the GI Bill. In September, there's going to be 1,000-plus of them here appearing as freshman students. The strangest group of freshman we've ever seen, people who were at Okinawa, people who had been around the world and had seen machinery of technology. All of a sudden we're going to dump them into an engineering program that is going to be altogether new, never anything like it in this country, even, as far as I can tell there was no literature leading up to it, it was all in Boelter's head. So, what were we going to do? One of the first things we were going to do, I guess was to try to put together laboratory experiences in courses that are going to serve the needs of these people. What impressed me was that everyone was in perfect agreement. Almost everyone I knew in those days was willing to roll up his sleeves and get in the laboratory and use water surplus equipment, move into old buildings that were salvaged from shipyards, and put together a program for what I picture as the best students that ever appeared at the University of California. The most experienced, the most dedicated, the most serious, just a tremendous group.

My duties were to try to assist in various ways, but, as you know, Boelter always had outside money and at that moment he still had money from Hugh Dryden. You remember, Hugh Dryden was the head of the NACA, the predecessor of NASA. So, who paid for me? Though I hate to admit it, I believe that my starting pay was $1 an hour at UCLA as a junior engineer. Where did this $1 come from? I think it largely came from this outside grant where Boelter was the principal investigator. My immediate supervisor was Robert Bromberg, who later went to TRW, and the project had to do with how are we going to store aircraft out in the desert, how can we keep them cool, what kind of temperatures will we expect. In fact, we moved a Douglas 2 engineer plane onto the UCLA property and it was parked roughly where the Court of Sciences is today. It was my job to attach instrumentation to it, thermocouples and heat meters, and to get recording instrumentation and do the data management and then write up reports and things of that kind. It was my first job and along with it I was expected to be some kind of an assistant in the surveying courses. You know, anything that Boelter felt a person could do, he'd put it on your assignment sheet. I would say that almost from the beginning, I had what

I believe are the measures of the performance at the University, the public service jobs, the teaching involvement, the administrative jobs, the research jobs, all of those went in parallel and I was expected from the very beginning to be involved in all of those—maybe at a very much junior level—and I hardly could articulate what those different facets of my job were, but as I look back on it, I was doing all of those things.

Van Vorst: Where was your office?

O'Brien: Oh, the first place that I sat down was at a war surplus desk on the first level of that chemistry building in what I would call the corridor that was southerly and westerly. In fact, Boelter's office was in the far southwest corner. It was a hot, non-air-conditioned location. I suppose I shared room with 3 or 4 other people. There were other locations in the old chemistry building, which is now, I guess, named for one of the great professors of political science—[Charles] Haines. In fact, I knew Haines' daughter, Dorothy Haines—one summer I visited with her down in Laguna Beach. So anyway, the housing was very informal and was spread out all over the campus. In fact, one of the things that really impressed me is that we had the Mechanic [Arts] Building, which was really a tremendous facility for all of engineering. It had graphics, a machine shop, automotive shop, photographic equipment, a blacksmith shop—all of those things were kind of a gift from a strange program there, which had to do with training teachers for high school shop courses. Anyway, that was kind of a long answer to where I was housed! [laughs]

Van Vorst: Those are the kind of answers we want! Were the classrooms mainly in the chemistry building?

O'Brien: Well, as we began to expand, I remember being practically everywhere on campus since there was no engineering building, and anywhere that there was a place where we could assemble students, that's what we used. In fact, the old mechanics building had two or three classrooms and laboratories that were used more or less instantly, I guess in the second year because remember the first year was kind of a measurements laboratory, and the second year was maybe materials lab or materials processing, so as this group of veteran students progressed through pre-engineering we were trying to keep ahead of them by building laboratories to accommodate their needs.

Van Vorst: There were temporary buildings were brought in for labs.

O'Brien: Yes, I can remember the network building there right by Temporary Engineering Building II and, of course, what I would call the mechanical engineering laboratory that was really Wendell Mason's responsibility.

Van Vorst: That was a good little walk from your office to the mechanical building.

O'Brien: Yes, but you know in those days you could drive a car anywhere on campus. You could park a car across the ravine in front of the administration building, you could drive across the bridge and down around the education building and there was a road that went to the mechanics building and there was a parking lot down there too. [laughs]

Van Vorst: Times have changed. I was going to ask you what the campus was like then, but you've covered a good deal of that. I'm trying to remember how many buildings there were. There was the quadrangle of Royce, the library, physics, and chemistry.

O'Brien: Yeah, the newest building, I believe, is now known as Franz Hall, the most westerly wing of the psychology group and I believe that was completed just about the end of the Depression, which was only 10 years into the history of UCLA. As you know, UCLA started in '29, so by '39 the last building was the psychology building and in the middle '30s the gymnasiums were built and they really were beautiful buildings. I don't know what they're like today, but the men's and women's gyms were really modern and tremendous facilities.

Van Vorst: How would you describe the work environment in engineering? You alluded to it as a nice, cooperative atmosphere.

O'Brien: Oh, yes. You know, I was a youngster and a youngster is not that threatening a person, so I got along with everyone. I did some people who didn't quite understand what I was doing there. Wendell Mason was, I guess, the most famous representative of that attitude that Boelter was bringing in a bunch of mercenaries to do a job that was inappropriate to the way that Mason felt the University of California should operate. But, I do believe that by the time we saw him last in Jakarta, Wendell Mason had changed his view about how the University can relate to the educational program, as well as to the larger interests of society as represented by the research we were doing.

Van Vorst: Wes Orr was one of the early people.

O'Brien: Yes, of course, you know when we talk about Wes Orr, we are talking about ESMWT—Engineering, Science, Management, War, Training—and that was a program that people hardly understand today. The idea was to train Rosie the Riveter and people at every level of technology, and maybe you could remember the ships that were being built among the mud banks around San Francisco Bay, the barrage balloons over Douglas in Santa Monica. Armies of people, 50,000 people working in Santa Monica going from maybe a couple of thousand during the depression to tremendous

groups, and those people had to be trained. And, so, each state was given a job of war training and you remember it had the words Engineering, Science, Management—so, there was science in there, I don't know why particularly, but science was in there because it had an impact on the kind of production that we were doing. Russ O'Neill and others, Jack Dillon, were all people who had worked during the war with Boelter and the University of California was in charge of this war training program and M.P. O'Brien was the chief executive officer and Boelter was, I guess, M.P. O'Brien's chief lieutenant and maybe the most mobile of the people. In fact, there's this anecdote that the Southern Pacific Railroad gave the University five railroad passes every year of unlimited use and Boelter was a guy who always got one of those passes because he was on the road. [laughs]

Van Vorst: I hadn't heard that before. He certainly was the traveler, and also kept up monumental research and development activities in the headlight lab.

O'Brien: Yes, well that's another interesting thing. The relationship between the state's needs and the University's capabilities. As I understand the story, the Highway Patrol, in those days was in charge of motor vehicle activities before there was a Department of Motor Vehicles. The Highway Patrol came to the University and they were looking for somebody to make some kind of sense out of 200 different makes of automobiles that were being sold in the '20s in California that had all different kinds of lighting. So, Boelter was somewhere between electrical and mechanical and he was a youngster and so, they said, "Boelter, set up a lab and help the Highway Patrol to make measurements of automotive lighting, so we can have some kind of a standard for regulating that lighting here on the roadways in California." That's how Boelter's interest in lighting developed and the thing that was impressive to me was that he was able to detect the interdisciplinary aspects of lighting. Some people pictured lighting as kind of a hardware interest, but he approached it in what I would call the scientific way—the basic measurements, the basic geometry, the basic mathematics. For instance, there were a lot of geometrical relationships that were appropriate to lighting calculations that Boelter immediately recognized as being related to heat transfer calculations. So, for light laboratory experience he developed an interdisciplinary course that included lighting and heat transfer and he brought that course to Los Angeles and one of the first people to teach it was Robert Bromberg and later, as early as 1949, I began to teach that course.

Van Vorst: We'll come back to that a little later. If we can still focus on the early days, I wonder if you have any reaction to what you would call the intellectual climate on campus in those days?

O'Brien: In other words, was there some stimulating conversation going on about the engineering profession or were there people being philosophical about how engineering education ought to be organized? No, I think that the truth is that I didn't travel in those circles and whatever I learned was always kind of second or third hand. One of the things that impressed me, although we were in a tremendous growth—almost an explosive growth kind of phase—there was very little discussion about it. Everyone took it as though it was a natural thing and that we didn't have to be particularly philosophical. For instance, I believe that a lot of the laboratories we built around the machinery that was delivered war surplus to UCLA. I can't name them, but there was some very expensive and exotic machinery that was bought early on, but when you looked around at the student laboratories, I think that they were largely built around the experiences of the people who were there and the kind of hardware that was available to implement it. But, you know, were there great collegial discussions at the Faculty Club, though the Faculty Club didn't exist. Really, I believe I went for a lifetime with hardly ever feeling that I was part of a group that was involved in what I would call really intellectual stimulating discussion. I hate to admit that, but that's roughly how I would characterize my very long engagement, you know, 46 years was a long time to be in one job. It won't happen again!

Van Vorst: I ask that in part because it didn't take too long to realize that Boelter was really kind of an intellectual giant in his own right, yet he adapted so well to getting things done, doing what had to get done, and getting things started.

O'Brien: I don't believe that he did the job that he should have done in selling his program to us and to the rest of the country. He was not a public relations guy and I do believe that he had a receptive audience in the early faculty, and if he had just done a little bit more talking and tried to explain to us exactly what it was he had in mind rather than have us gain it by simply observing what was happening—he was not a Franklin Murphy. In fact, I have an interesting anecdote about that. Very late in the game of the Gadjah Mada-Indonesian project, we had some kind of a luncheon party at the Faculty Club in one of the big dining rooms. Franklin Murphy was prevailed upon to come and say hello to some kind of a dignitary from Gadjah Mada University and Boelter was there and Franklin Murphy, the Chancellor, walked in the door with his usual retinue and Boelter ignored him. Pretty soon word got around that I was somehow or other involved and Franklin Murphy came to me with a scowl on his face and said, "Why isn't anyone paying attention to me?" [laughs] So, Boelter was never a friend of Franklin Murphy and I wish he had been, maybe engineering would be all together different today.

Van Vorst: I agree. I always thought it was a pity that as the word got around, they couldn't talk to each other. Because, they both had great vision, were big picture types. I'm wondering, again, in the early days—well, you've answered this in a way. I was going to ask you about the students, but I think you captured that by emphasizing the veterans in those days, they were really good students.

O'Brien: Well, we do have to admit that it was a reflection of the times. There were no women and they were guys who mostly came from the immigrant groups. I think engineering has that history. They were not people from the upper middle class. They were poor people, they were second-generation people, they were largely white, and almost 99 percent men, so maybe that's not what a profession should be, but that's what it was at that moment.

Van Vorst: We've mentioned several people. Maybe you could let your mind dwell on some of the unforgettable types, some of the characters from those days that you might remember.

O'Brien: Yes, well, I think we should examine for a moment a little bit about what pre-engineering was under Wendell Mason. You may know that Wendell Mason was in the math department and he made the transition from Vermont Avenue to Westwood in 1929 and I picture that Wendell Mason was born about 1900, which I also think is approximately Boelter's birth date, so they were contemporaries. So, when I first saw Wendell Mason in 1942, he was Mr. pre-engineering and he was teaching surveying, properties of materials. But the other courses were largely handled by the people in this applied arts program, the graphics and so on were other people, but I believe in one way or another they all reported to Wendell Mason. So, here's Wendell Mason in the math department running a very applied program. And, he was given a very tremendous assignment when Boelter appeared—I believe that Boelter and Mason already knew each other because I think Mason did some graduate work at Berkeley. So, Boelter says, "Now, Mason, design laboratories." So, Mason traveled all around this country. I saw him at USC and other places and I think he did a tremendous job to try to put together, within his capabilities, the kind of laboratories that served us very well over maybe 25 years. So, he was an impressive person.

The other people, for instance, a moment ago we talked about John Miles who in this month in 1946 returned from the Bikini [Atoll] test wearing short trousers like I'm wearing today and a sunburn. I didn't understand John Miles at all. As I recall, he was a Cal Tech graduate who kind of specialized in applied math. The whole idea that it was possible to make a career out of something as narrow as what John Miles was doing really shocked me and I couldn't believe it. I don't know where he is today. I

believe he went on to a distinguished career at the university, but here was Boelter the great philosopher involved in everything and then all of sudden I meet a youngster who has defined his area so narrowly. For instance, Miles advised me, he said, "Don't get involved in any kind of laboratory work—it's not rewarding in any way." [laughs]

Van Vorst: I remember, too, John impressed me as one of those people who caught on real quick on how to get ahead in the university. He played it very wisely and shot up through the different ranks. And I remember the advice about not getting involved in labs. Unfortunately, I like labs! A little counterproductive.

O'Brien: I guess the other person who we would all remember is Myron Tribus. Myron Tribus went on to several major engagements in this country and he was a very energetic, precocious kind of a guy, but he was absolutely intolerable of any fool. [laughs] And most people were fools as far as he was concerned. [laughs] He really turned off some important people. For instance, I know a guy who has built a major technical business and has plants around this country and abroad who was chased away from UCLA by Myron Tribus.

Van Vorst: If you talk to Myron, he's still going strong, although he's pretty much on his own now.

O'Brien: He was really so far ahead of all of us in the area of thermodynamics, which I know is one of your specialties, but he was also a person with broad interests. I remember one time someone said, "Well, we need some photographs of the staff." So, Tribus says, "I'll do it!" So, he got out his camera and before long he had everybody photographed. [laughs]

Van Vorst: Let's go back to your early research. I remember your interest in illumination, lighting, radiation background. In fact, we were in that first class together with Bromberg that he taught, in '53, I think.

O'Brien: Oh, is that right, isn't that interesting? Well, you remember, I suppose, that it was more radiation geometry than anything, but somehow or other I inherited that activity because, well, the principal reason was some machinery that Boelter bought. He decided that spectrophotometry was going to be a big area. So, he bought several spectrophotometers and somebody had to be in charge of these things. And so, I was given the job of getting intellectually involved using them to serve other people on the campus. For instance, [Frederick] Crescitelli in zoology, [George] Mount in psychology, people in the beginning of the medical school were all users of that machinery. And then, of course, there were industrial users. Out of that, I became the service to industry guy. The guy who would negotiate with the local industry what could we do for them, in terms of

our machinery, in terms of our intellectual abilities. They would write a purchase order and then we'd do some kind of a little job. So, the radiation, as represented by those spectrophotometers, both the Beckman and… What's interesting is our old Beckman is still alive, but the other machine, the AC Hardy spectrophotometer, of course, has been obsolete now for a couple of generations, but those machines were significant in their time. I tried to do the best I could to make them available both on the campus, through Extension teaching—I once taught a course that was almost exclusively attended in the evening by workers at Technicolor. Maybe 30 or 40 people from Technicolor were told to go to UCLA and take the course on color imagery.

Van Vorst: I seem to remember you doing something with eggs one time.

O'Brien: Well, you see, that relates again to Boelter's broad interests. Boelter was drawn to the university farm—the [UC] Davis campus, by agricultural engineering, particularly the question of orchard heating. He was a heat transfer guy and agriculture is a tremendous thing in this state. So, what could be done to bring some type of technology, modern approach to agriculture; out of that, there was a federal program that had to do with rural electrification. In fact, from time to time I discover that it still exists. It's one of these federal programs that no one can get rid of! [laughs] So, there was some money available through Davis to look into the scientific approach to egg handling and Boelter passed that off on me. It was a little bit of money over many years and it kind of introduced me to some applied statistics, the use of computers—digital computers—it represented income for several graduate students, including one guy who is now a University of California professor. The intersection between agriculture and engineering is something that Boelter promoted. Remember Russ Perry went down to Jogjakarta and Russ was one of those people who embraced agriculture and the engineering aspects of agriculture for a lifetime.

Van Vorst: I'm trying to recall, illumination and radiation really became your field.

O'Brien: Yes, you know it was a curiosity in the sense that I became active in particularly the math of radiation transfer. I designed an analog computer, a specialized analog computer that was copied around the world. When I went to Japan one time, I discovered that 20-30 of them had been built in Japan. I was entertained by captains of industry who used my analog computer. [laughs] So, here I was at the university teaching, running a laboratory, and being involved in lighting and radiation, but almost all of my consulting had to do with heat transfer. I was a consultant at JPL for 23 years and it largely had to do with software associated with heat transfer. So, there was a strange division of my interests—my professional interests, my summer jobs, my consulting was all in this area

of software for heat transfer, while my university research was colorimeter and lighting and I taught in that area. Again, I was using Boelter's methodology of analogy—everything I learned in one area, I could apply to another. So, he was a great teacher in putting forward the concept that you can learn by analogy, both at the mathematics level—here's this differential analyzer behind us, the mechanical performance performed according to the differential equation performance. So, that's an analogy. Interestingly enough, I met Vannevar Bush at OSRD [the Office of Scientific Research and Development] in 1950 as part of the H-bomb project. That was the only time that I ever saw him. He designed the differential analyzer in 1930, so here Boelter was buying this machine in 1946 and the machine was already 16 years old.

Van Vorst: Those early days with the computer. I didn't realize that you played such a role. That's quite an achievement to look back on.

O'Brien: Well, you know there was the transition from the analog to the digital that goes a little bit beyond 1952, although I was one of the early users of the Southwest Automatic Computer, the SWAC, that you remember was built on our campus, and one of the guys that worked on it later became the president of University of California and it was supported by money from outside, the National Bureau of Standards, and everything went well until somebody decided that the National Bureau of Standards was not in an appropriate location. They had to give up that expansion into computers.

Van Vorst: A sideline, of course, but a very interesting one—the colleague that later became president of the University was also one of the few that refused to sign the oath.

O'Brien: Yes, he was a great critic of Boelter, too. We don't have to name him, of course, there aren't that many. [laughs] But, he didn't like Boelter because Boelter knew people in Washington, he knew people in Sacramento. He knew how to get money around what [David] Saxon thought was the normal university protocol. The thing that really got Saxon unhappy was the Institute of Traffic and Transportation Engineering, which was a line item directly from the state to our campus. It was not through the university budget and I don't know why he latched onto that as an example of some kind of rough riding over the university system, but he spoke about it many times and he really didn't like. Chuck Young talks about "the days of the strong deans." What's he talking about? He's talking about the days of Stafford Warren and Boelter and the guy who was the head of the education department and really when he says, "the days of the strong deans," he's going back to Franklin Murphy's days and earlier when we had very weak central administrations.

Van Vorst: I identify with that period, as do you, of course. The early relations of engineering and medicine are of interest too, primarily because Boelter and Warren got along so well. I remember Boelter sending me over for a meeting, he put me on some committee, and as soon as Warren heard I was from engineering, we were big friends and he was saying how engineering seemed to be the only other department that could understand the problems in building an empire so to speak—physical building problems.

O'Brien: But, then let's think about another intersection between early engineering and medical practice—the prosthetic program and the physiology activities of Craig Taylor. It always seemed to me that Stafford Warren did not find a way to make a connection to that even though that program with Veteran's Administration support went on and on, maybe for 30 years. Finally, John Lyman put it to bed, but I think it was a tremendous opportunity for applied physiology to interact between medical practice and what was happening in engineering and that never really did happen, to my knowledge. I knew Stafford Warren and he was a very nice person. As a matter of fact, one of the things I did, which is ridiculous when I think about it, was the lighting on the painting of Stafford Warren and the other founders, Elmer Belt and other founders of the Medical School, the lighting was inappropriate and I went down and worked all that out for them. [laughs]

Van Vorst: There's another good contribution. Didn't you take over Boelter's course, "The Engineer and his Professional Duties?"

O'Brien: Yes, I guess I have the dishonor of being the guy to put it to bed. When I retired, it was never offered again. But, on the other hand, we were talking about the early days and the thing that impressed me about the early days was that it was one of those courses that was required of all of the engineering students. The faculty, as well, was required to teach it very broadly. The question is how do you go about getting a psychologist and a physiologist and a mathematician and people from all different disciplines to stand up in a classroom and guide students in writing and public speaking and addressing problems that are political and social and economic in nature and looking at the engineering program broadly, I just don't know how Boelter was able to put that together, but that's what really happened. I think it evolved in various ways.

Of course, there was long period of time when Al [Alfred] Ingersoll and I were kind of the sole purveyors of the course, but there was also a time when Harry Case, a psychologist, was involved in a big way and maybe even yourself, so I'm sure that it's changed its complexion, but we have to go back to Boelter and his original ideas.

It is my understanding that the course started at Berkeley under Boelter's energies and it had to do with meeting a need that every engineering student at one time had to have a thesis—every engineering undergraduate had to have a thesis and certain undergraduates found it difficult to interact with the faculty, so Boelter introduced that course to meet the requirements of the senior thesis at Berkeley, and so, he brought the course with him to Los Angeles.

Van Vorst: I didn't know that history and I was always impressed with the course. I bring this up actually because it's a development you'd be interested in. After you retired the course was not continued and that seemed to be happening around the country and the accreditation people started to worry about that. The professionalization, so to speak of engineering and the course, in essence, is being reinstituted and Don, here, is very active in putting the course together with Russ O'Neill. It revolves more around professional ethics now, but it's not unlike the course you had.

O'Brien: I'm pleased to hear that something is being done, but I believe that there are other forces at work that are destroying the engineering profession. I'm not even sure that it ever was a profession. We talk about ethics and engineering societies and that was another area that Boelter was very much involved in. He didn't believe in all of the specializations—mechanical, electrical, civil societies. He thought we ought to have a single engineering society, analogous to the AMA or the American Bar Association—that never happened. It didn't even happen on our own campus. The engineering society disappeared.

Van Vorst: We had it for a while. I remember the people who were then forming the Society for Professional Engineers came by and unfortunately, Boelter was very busy and couldn't spend any time with them, but they had visions, very much, of being the society. Of course, it was much too late to wipe out the others, but they thought they could be the focus of the professional side of engineering and they haven't done badly.

O'Brien: The problem is that they were too much involved with the civil engineering end of the thing because that's where the money was. They did not represent the industry broadly.

Van Vorst: Do you want to talk about engineering as a profession, if it ever was one?

O'Brien: Well, that's modern history, not so much ancient history. I think the difficulty is that we are too specialized—we have all of these tools, the computer being principal among them—that makes specialization something that can be mechanized. So, unless we have a profession that's broadly based, then it's not a profession at all. I'm almost reluctant to say this, but we're going to have a profession where the students are almost

exclusively immigrants and the faculty is almost exclusively immigrants. Let's talk about the profession of law as represented by the people who are in the Congress. They represent the mainstream of society. If you look at the engineering professions and engineering organizations today, I think you begin to see that we have people who are not widely represented of society. They are people who are very narrow and can be made obsolete more or less instantly by changes. So, unless somehow or other we can go back to some of things that we discussed 50 years ago about the organization of engineering, I picture that there will be no engineering profession, but rather a set of people who have titles that are as narrow as what they do on the job.

Van Vorst: Those are rather profound thoughts. I have not been able to articulate it quite that well, but I think my own concerns about the future of the profession revolve around a lot of the things you have said and I think of this, too, that when it comes to what to do about it.

O'Brien: Well, there were times when the engineering profession was dominated by an immigrant group, the Irish. The Irish were forced out of Ireland by economic and social reasons in the 1850s. They came to this country as laborers, as poor people. The Civil War came along, technology exploded—particularly, the railroads exploded—and the people who were running the railroads and building the railroads were the Irishmen. At the same moment, in 1862, Abraham Lincoln signed the Land Grant College Act. The Land Grant colleges were formed, University of California was one of them, and schools had to be populated by people who understood technology and there was a time when every Land Grant School in this country mainly had professors who were of Irish descent. As a matter of fact, Engineers' Day was always St. Patrick 's Day, all over this country. So, we survived that, we can survive what we have today. [laughs].

Van Vorst: It's good to have that note of hope. Why don't we let you kind of wander a bit and tell us some of the things that stand out in your years at UCLA—people, events, whatever?

O'Brien: There are some interesting anecdotes that I saw from a distance, but to give you an idea of how we were really not able to respond to society's needs is the famous Admiral [Hyman] Rickover nuclear submarine heat transfer business. As I understand the story, Rickover came to Boelter and said, "You're a heat transfer guy, we're going to build a nuclear submarine. The heat transfer in these little tiny tubes is going to be a tremendous flux, you guys know how to do it experimentally and analytically, why don't you go ahead and do it?" So, we geared up in the building that I call the Mason Mechanical Engineering Lab, it had a great big generator and it had a stainless steel tube about the size of my little

finger. They were going to dissipate a 1,000 kilowatts or some big number.

Anyway, they could not move fast enough. Rickover came over and said, "You guys are going to work every day around the clock." Boelter's answer, "We don't do that at the University of California." So pretty soon a truck arrived, they packed up all the stuff and disappeared.

The nuclear submarine has been tremendously successful, but it's just a measure of how things were moving in technology at that time. Here, 20 years earlier Boelter could put together a headlight laboratory and meet the needs of the people of the state. Twenty years later, Rickover appears to meet the national needs and we just can't do it. It was an unrealistic expectation to being with. Why did Boelter even agree to it from the beginning?

I felt the same way about the weapons effect program that I was involved in roughly from '49-'52 when the H-bomb ended it. Walter Hurty was the principal guy, but Boelter obviously was once again, the person who negotiated it all and put it all together. Everyone had to have clearances, guards were standing outside, and when I looked around it just seemed to me that we shouldn't be doing this kind of thing. I was involved in it, I was on the payroll going down to bomb tests in Nevada and down at Eniwetok [Atoll], but then it was all over, no one ever said, "Isn't it wonderful that you did all of this?" Here I had a young family and I left them to go down to Eniwetok for three months. I got back and it was just like nothing had ever happened. [laughs]

Van Vorst: Your point about why were these things undertaken is certainly a good one. I remember particularly the Rickover situation was such a conflict between, as you say, working around the clock, getting the job done on Rickover's agenda and, yet, looking into research on boiling on the university standpoint, they found that people really didn't know too much about boiling and so, naturally, everybody on the UCLA side wanted to get into projects studying more and some good projects came out of it. Of course, that wasn't what Rickover wanted. Obviously, there was never a meeting of the minds.

O'Brien: And, you know, the organization of Boelter being the principal investigator for everything really was a mistake. He did have the reputation and he did have the power of the university behind him, but it did not build the reputations of the people who worked on those projects. I talked boiling, was it [N.] Zuber who developed the fundamental ideas, I guess he's recognized for that, but many of these projects went on for years. You and I worked on some and when it was all over, actually we made enemies rather than friends.

Van Vorst: That certainly happened to me on the Indonesia project, strangely enough. I remember in the early days I talked to Boelter about my authority, such as it was. In fact, I'm not sure how it happened, but I asked him if he would be good enough to sign a piece of paper essentially saying that I had authority to do this, that, and the other thing. We had one failure, as you may remember, with one person who had a lot of problems adapting to Indonesia.

O'Brien: Well, he had a lot of trouble adapting anywhere, sure. It was Boelter's fault, it was Boelter's responsibility.

Van Vorst: But, anyway, I essentially ordered the guy home one time and Boelter got terribly excited and said, "How can you do that?" He said, "Do you have a piece of paper or anything?" And I said, "Yes, sir, I do!" That was one of the highlights of my life.

I think you and I were right at the top of the group that really loved Boelter and gloried in working with him. And yet, looking back, we can certainly see some things that we didn't promote ourselves very well.

O'Brien: The opportunities were so tremendous and were so varied I would never trade my career, particularly the first half of it, for any other regardless of what the rewards were—the monetary or social rewards. The opportunities on the job were so exciting and so interesting and at the cutting edge of whatever we were doing and really we have to say that it was the prestige of the University of California that allowed us to have those engagements.

Van Vorst: Well we're sort of looking back over the whole history. I wonder if you see any milestones that shaped events as you think back?

O'Brien: What are the milestones? Since I was not really knowledgeable about the interpersonal problems on the campus at the higher levels, I don't know. The thing that seemed clear to me is that Boelter was not sensitive to the needs of the new faculty as they arrived. People came from other environments and he was not able to sell them, indoctrinate them, I hate to use words like that. He needed, I think, to select people who were convinced that he was doing something that was significant and that they could subscribe to. They got to the campus and before long, they said, "Well this doesn't look anything like electrical engineering and we don't want to have anything to do with it and I'm a full professor and you can't push me around." That's when the whole thing began to fall apart, I believe.

Van Vorst: That's a good analysis. When we joined, he had time to tell us a little more of what he wanted to do, but we're probably thinking of some of the same people, who perhaps never had that privilege and might not have accepted it if it had been offered. I don't know quite how to evaluate it, but in some cases I know that people were told during the recruitment process what we were trying to do and agreed to it, thought it was wonderful, but then when they got their appointments it seemed as though they never heard it. There was just a tremendous challenge and I guess it wasn't met.

O'Brien: Well, the university is a big place and has a long history and we just have to say that innovations have to be designed very, very carefully and they have to be evolutionary in nature. The revolutionary program that Boelter brought, I guess, was almost designed to self-destruct.

Van Vorst: When I started thinking back about what was happening, Tom Hicks said, "You know, part of the problem may be being too much ahead of your time. Maybe Boelter was 50 years ahead of his time." I'm not sure that's right, but it certainly is tough being a pioneer in something like that.

O'Brien: Well, he saw that this was an opportunity, maybe not of a lifetime, in his own lifetime, but of the university, the opportunity of the university to be in a major leadership position and he had the energy and the know-how to do so, but the university was not ready for him.

But, I think there were other people too who could have been encouraged more and there were people who were maybe stressed unnecessarily. I've always felt badly about Craig Taylor, for example. It seemed to me that that was quite unnecessary and I picture that he was being asked to do more things than were significant. I mean more things that he was capable of doing. They were all important things, but they were all being loaded on him—the space program being the thing that was coming along in a big way.

But, we haven't talked about this intersection between the design of systems for people and psychology and physiology and the economics and so on. You remember Craig Taylor and Boelter got together and wrote a little paper where they defined what they called "biotechnology." Now, it has quite a different meaning today, but what it was in those days was the intersection between engineering and psychology, ergonomics, and physiology, and social programs of various kinds, training, and safety and it was a required course and I thought broadly subscribed to by the faculty. Many different people taught the course. There was even team teaching efforts at various times and I think it was an important part of the total unified program. It was a tremendous unhappiness on my part to see it fall apart and disappear. I would go to faculty meetings where people would

say, "Well, I don't even know what that's about, I don't want to have anything to do with it because no one has ever explained it to me." Now that we hear about how important ergonomics are and the interface between the human and the computer and organization and think about how far ahead we were in that respect.

Another thing is the Institute of Traffic and Transportation Engineering. It went through various phases of being highly applied, sometimes being largely a program that you might call human performance, other times it had instrumentation aspects to it. Why in the world wasn't that something that continued and an integral part of the educational program? But, it died along with all of the other innovations.

Van Vorst: I think it was almost killed when he died. I don't claim to know a lot about that, but I do know certain segments of the faculty considered it a non-engineering activity and thought it did not bring any credit to the department. My guess is they're the element that doesn't like to go near the laboratory and can write research papers like you and I might write a letter. It was definitely a controversial issue when we lost it.

O'Brien: Yes, well just so many things that I think could have had an impact on what we were doing in our educational program, as well as on society—we just dropped the ball. There are other aspects of our history—this business of how did we relate to the computer? I don't think that many people understand that really the people in a leadership position with respect to the digital computer were Extension people. People from RAND Corporation and others, they were the ones who really put us on the map and got us started in a major way. Now we have a big computer science department. I don't know whether they remember where they came from, but it was the influence of outside teachers. You know, you and I were involved in what we called the Off-campus Graduate Program and, of course, there was the Concurrent On-campus Graduate Program; thousands of people were able to finish the M.S. degree while they were fully employed. The people who taught those courses had a big impact on our curriculum and on the development of our program. Boelter understood that, he knew that there were outside individuals with the kind of competency that was absolutely necessary to keep us at the leading edge in technology broadly, in computers. This is one area when I'm talking about the transition between the analog age to the digital age.

Van Vorst: Speaking of Extension service that was something that I thought Boelter was just exceptional at. Somehow a spirit of belonging was extended to people in the Extension program—the instructors. I remember we used to have a dinner at least once a year. And all the extension instructors talked about what they were doing. I guess you'd call it an outreach program today. That seems to be a key phrase, but there was really a definite

reaching out to the professional engineering community and I'd have to be privy to some of the objection to that from the true academics on campus, they just didn't think that really belonged at that time. The whole effort was weakened.

O'Brien: They would invite people from China Lake or San Diego to the campus and get the "flavor" of the campus as if there were some kind of magic perfume on the campus. [laughs]

One of the things that impressed me that I recall from the early days, people didn't ask the questions about schedule. We had Monday, Wednesday, and Friday labs, we had Tuesday, Thursday, and Saturday labs. It was very common early on to be there early Saturday morning. If you had an assignment to teach a course at 7:00 in the evening that was no different than whether it started at 8:00 in the morning and if there were people complaining about, it wasn't known to me. I thought, isn't this wonderful? Everyone subscribes to the idea that we're serving the student. We don't have this real narrow approach where we only want to see five graduate students twice a week or something. If there's a classroom full of people that includes undergraduates, people from industry, a concurrent kind of a course, no one questioned that. But, then finally we went into the '50s and a little later we got bigger, then I guess there were some problems. I guess some people didn't like teaching after the cocktail hour.

Van Vorst: I remember one semester where I had one of those 7:00-10:00 programs and an 8:00 class the next morning. It was a little rough, but actually you're right. I didn't gripe about it, I didn't think harshly about it. Actually, in a way, I would say that's one of the things that bothered Tribus so much, that loss of feeling a commitment to teaching to the students at the expense of bringing in research money and that sort of thing.

O'Brien: But, we see that broadly. I just saw an editorial in the paper the other day, the president of Notre Dame University said, "We have a commitment to the undergraduate student and we are going to put our energies into the undergraduate student." Well, maybe private schools can do that, but it's going to take a major change in the way that the University of California is organized to bring back where we were 50 years ago with respect to the undergraduate.

Van Vorst: Do you have any general closing thoughts or philosophy?

O'Brien: Well, I did make some notes. We did have a really unique program and the thing that worries me is that it was never recognized nationally. And who fell on their face in that regard? I guess all of us could have been doing something more to sell the fact that we were doing something new.

I think that our research was on the cutting edge of new technology. Whether we talk about computers, whether we talk about the way we organize models. It was a period of explosive growth and it's wonderful to be in an organization when we're growing and we all subscribe to the same values. It really was a great opportunity.

But, on the other hand, we've discussed the fact that it was a non-conforming kind of an organization within the university protocol. Boelter was proposing something and we were practicing activities that were beyond the normal ivory tower approach. Another thing is, the faculty was forced into this broad or systems way of thinking about things and that is contrary to the way people are appointed and promoted. There was very little, I think, effective internal education about what we were doing. We didn't have a good seller of corporate image. Unfortunately, it was a one-man show in many ways. We didn't have what I think were good connections with the community leaders and such a thing would have made a big difference in the way that engineering could grow if we had undertaken that.

Anyway, I guess my conclusion is, I wouldn't trade the experience for anything. It was a wonderful career and I don't feel badly about remembering anything about it. Usually, people at my advanced age try to forget things, but I remember just about everything I did as an experience that was absolutely unique and I really feel very good about it. So, I thank you all for coming to hear me.

Van Vorst: We thank you for all your great contributions to our program and we had a lot of fun talking over those days.