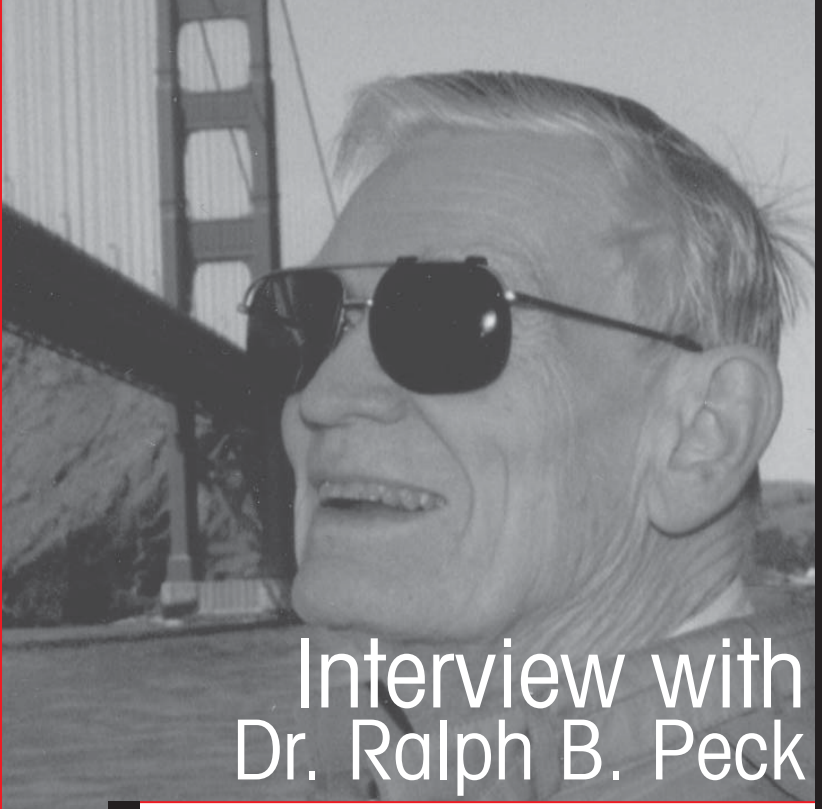

Interview with Dr. Ralph B. Peck

On June 21, 2005, STRUCTURE magazine Editorial Board members, Evans Mountzouris, Steve Schaefer and Jim DeStefano, had the privilege of interviewing Dr. Ralph Peck, one of the founding fathers of the field of soil mechanics and the advancement of geotechnical and structural engineering. Dr. Peck was an educator and researcher at the University of Illinois for over 30 years and has been a consultant on many major projects, including the Chicago subway system. He has authored and co-authored numerous technical papers and books, most notably, the landmark books "Soil Mechanics and Engineering Practice" and "Foundation Engineering", which combined soil mechanics and foundation engineering under one cover. Although Dr. Peck is presently retired, he still remains active in his contributions to geotechnical engineering.

Structure *Dr. Peck, you were there when soil mechanics was born as a technology and you worked with some of the original founders, like Karl Terzaghi. Do you want to talk a little bit about what that was like?*

Dr. Peck I can tell you how I got into the gang. After I finished my doctoral at RPI, I started working for the American Bridge Company as a structural detailer, preparing to be a Bridge engineer. I worked for them for just a few months in 1939 when there came a short recession and we all got laid-off. I wrote to Linten Grinter at the Illinois Institute of Technology. He said "I can't give you a job in structures, but if you go to Harvard and learn something about soil mechanics, I can offer you a job." I didn't see anything any better on the horizon and I decided that soil mechanics sounded new and different, so I wrote Arthur Casagrande at Harvard and asked if I could come. Arthur had a consulting job in Boston that furnished a lot of samples that needed testing. I found myself working in the laboratory at Harvard, mostly on Casagrande's consulting jobs.

This is when Terzaghi came to Harvard after having escaped from Vienna. One day I was asked if I could have a conversation with Terzaghi and tell him what the English equivalent for certain terms were for a book he was writing. We spent about ¾ of an hour together and I figured that was pretty lucky for me. The other students at Harvard had not seen that much of him yet.

Terzaghi went to Chicago to address the local engineering societies, knowing that there was a new subway to be built. He gave a lecture on the dangers of excavating for a subway beneath a large city on soft ground. He wound up with both subway engineers and the State Street property owners association bidding for his services. He set up some conditions: they had to hire a man of his choice, they had to set up a soil mechanics lab, and they had to make the borings and samples the way he would recommend. After a week, Terzaghi received a telegram that said, "Your terms are accepted, where is the man?" Since I wasn't working towards a degree, I got the job.

I found myself and my wife in Chicago about three days after that. I set up the laboratory for the city, conducted the boring program and laid out the testing program. Terzaghi visited quite often. We spent quite a lot of time on the project and our relationship developed from there on.

Structure *What did you learn about soil mechanics from the Chicago subway project?*

Dr. Peck The Chicago subway was the right job at the right time. When we appeared on the scene, subways were being constructed under North State Street that were causing all kinds of settlements. It looked like they were going to pretty well wreck the city. We began very early to investigate things that were happening, including excessive settlements or collapses. We weren't very concerned with theory at the time. It was a case where a contractor would build a piece of subway and there would be large settlements over it. Some of the buildings near by would crack up, and occasionally one would collapse.

We developed various techniques for measuring the loads in the struts of open cuts, for example. We learned what construction procedures lead to excessive movements and damage, and what procedures could be used that would improve the situation. We made observations called squeeze tests which simply involved measuring everything that we could measure under ground in the tunnels, as well as what was going on at the surface of the street. We learned that the volume of lost ground represented by the settlements above the tunnels and on the street was roughly equal to the inward movement we could measure in the tunnels before they could get the tunnel structure in to stop the movement.

It became obvious that the contractors could no longer say that movements were an act of God. It was obvious there was a connection between the damaged streets and buildings and the movements we could measure inside the tunnel. Similar things happened with the timber bracing of the open cuts, and we worked out procedures for measuring the loads in the struts that brace the two sides of an open cut. When the contractors mostly went to steel bracing, we made measurements of the loads in the steel bracing by strain gages.

Structure *How did you come to teach at the University of Illinois?*

Dr. Peck During the subway project, I occasionally lectured at the University of Illinois. I asked Terzaghi if I could go and teach there, since I had been offered a job. He said, "No, you cannot go to Illinois, you don't know enough yet." But, he suggested that I get some kind of construction job that involved soils.

This was at the time when World War II began. The Republic Steel Company was building a plant in Cleveland and I got involved in that, and then got Terzaghi involved. It turned out to be quite a difficult job. After that was finished, Terzaghi said, "I will now let you go to Illinois, on the condition that we will continue to have a few jobs together." Of course that sounded fine to me.

I went to Illinois and Terzaghi also lectured at the University while he was still a professor at Harvard. I spent the next 30 years at Illinois. Terzaghi and I did continue to have jobs together as long as he lived. I still go back to Illinois every semester and give a couple of lectures.

Structure *When you wrote the "Soil Mechanics and Engineering Practice" text with Karl Terzaghi, that was quite a landmark accomplishment. I'm not aware of any comprehensive text that predated that on the subject of soil mechanics. Did you feel like a pioneer at the time?*

Dr. Peck Oh yes. It took us a long time to write that. Terzaghi thought initially that he would write the book and I would put it in good English. We wrote it about three times; the first time he read the manuscript he was very disappointed, to say the least, so we started over from scratch. The book took us about seven years. As time went by, my association with the book turned a little more from editing to rewriting. It was essentially his book, but he put my name on the map.

Structure *Subsequent to that you wrote "Foundation Engineering" with Hanson and Thornburn.*

Dr. Peck That came about from class notes on the course that I taught when I first went to Illinois. Up to that time, there were books on foundation engineering which emphasized the structural aspects almost entirely. There were a few books that emphasized the soil mechanic aspects, but nothing that combined the two. Our book was for engineers to use in practice. It had the essential features of soil mechanics that I thought every structural engineer should know about.

Structure *What is your impression of the way the field of geotechnical engineering has evolved and the current state of the practice?*

Dr. Peck It has changed a lot and I guess it is probably not surprising or bad that it has. It has leaned quite strongly in the last decade or two to environmental issues. The field has broadened out from soil mechanics.

Structure *Do you have an opinion on the direction of geotechnical engineering education today in the universities?*

Dr. Peck I am not too happy with some aspects of it. Book knowledge is a very important part of geotechnical engineering. It is fine to take samples and run tests on them, but those results aren't as useful as they could be if you also paid attention to the geological history of the materials that you are sampling. The behavior of the material is disclosed during construction, and I think that the emphasis in general has always been a little too much on the behavior of the samples.

I really think that there is definitely not enough emphasis on the geology, on the geomorphology of the site, and how it got the way it got. There are very few universities that offer courses in engineering geology, not very many that cross-pollinate between the geology and engineering departments.

We can learn about the behavior of soils by studying the geology and taking measurements in the field during construction operations. We can't get that without going out and getting our hands dirty on a series of jobs.

We need to know what the physical properties of the soil are. That includes what the geology has done to it; but we also need to know what the construction operation does to the soil and we need to know what the soil movements will do to the structures. We have to know the soil to understand what we have to do. And then we have to make the observations that indicate whether we need to modify what we are doing.

Structure *What project was the most challenging of your career?*

Dr. Peck There were several. One of the most interesting ones to me was probably the last one I worked on, and I had a very small part in it. I don't know if you have heard of the Rion — Antirion Bridge in Greece. It was opened at the time of the Olympics. It crosses the Gulf of Corinth, near Patras. The Gulf of Corinth has soft sediments in the bottom and is very deep. The French engineer who designed the foundations came up with the idea of providing a large caisson for each foundation. Each was about the size of a football field. It was built on shore in dry dock, towed into place, and sunk to the bottom of the Gulf. There were four of these in the total bridge. The bridge just received the Opal award of ASCE for the outstanding civil engineering project of the year. It was the first time it had been given outside of the United States. I have to rank that project pretty high, even though I had little to do with it except to give them my blessing.

Certainly one of the most challenging jobs was the James Bay project. I forget how many dams they had — 300 and some, something like that, including several very high ones. I was really impressed. When the job first started there was a question of whether the Canadians would do this. Do they have the background? It turned out that yes, they could indeed. It was a job that lasted for 25 years, filling four major dams on one river, three hundred plus smaller dams and, of course, the reservoirs. The project was a very interesting challenge because of the remoteness of the site and the severity of the climatic conditions. I was born in Canada and I have a certain affinity for the country. So that one certainly stands out.

I worked on several subway projects and each one had its own challenges, like the BART system in San Francisco and the Washington D. C. metro. I think tunnels and dams are sort of equal first loves. Foundations I like, but tunnels and dams impose a considerable challenge. Almost every job is different.

Structure *Is there any advice that you would want to give to young engineers starting out in foundation or soil engineering today?*

Dr. Peck I think the most important thing is to get jobs that involve working in the field. You don't necessarily have to be a construction man, although it helps for awhile. Until you really know what goes on in the field, how people do things and how the movements that occur are related to the loads that you measure, quality of the workmanship and so on, you don't really understand how soil is behaving. My advice to all my students has always been to get yourself jobs in construction which is the same advice Terzaghi gave me before I started teaching.▪

STRUCTURE magazine extends its deepest thanks to Dr. Peck for taking the time to talk to us.