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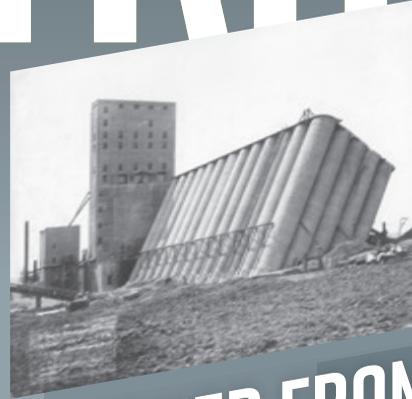
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# GEOSTRATA

MAY // JUNE 2020



LESSONS LEARNED FROM FAILURES



# GEO-FORENSICS



# GEOSTRATA

May // June 2020

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## Raymond J. Krizek, PhD, PE, NAE, Hon.M.ASCE

By Karam A. Jaradat, PhD, Aff.M.ASCE, and Seyed M. Zeinali, S.M.ASCE



Raymond J. Krizek

**R**aymond J. Krizek has made several fundamental contributions to geotechnical engineering. Some of his research and professional collaborations have resulted in environmentally acceptable methods to dispose of large-volume industrial wastes and sediments, an improved understanding of micro-fine cement grouts, and a more economical design of reinforced concrete pipe. The efforts of his team have provided the rationale and supporting data for several ASTM standards for evaluating the properties of grouts and grouted soils.

Krizek received a civil engineering bachelor's degree from Johns Hopkins University in 1954, a master's degree from the University of Maryland in 1961, and a PhD from Northwestern University in 1963. In 1963, he joined the faculty of the Department of Civil Engineering at Northwestern University, where he currently serves. He was the department chair from 1980 to 1992 and in 1987 was named the Stanley F. Pepper Professor of Civil and Environmental Engineering. Since 1994, he has served as the director of two professionally oriented MS programs — the Master of Project Management (MPM) program for



Photos from National Academy of Engineering induction ceremony of Raymond Krizek in 2001. A) Krizek with NAE Chair George M.C. Fisher (l) and NAE President William A. Wulf (r). B) Krizek with his fourth-grade teacher Sister Ann Teresa (1941-1942) at St. Clement's School in Rosedale, MD. Election Citation: For advancements in soil-structure interaction, disposal of waste slurries, mechanical properties of grouted sands, and engineering behavior of soils.

young engineers and architects with limited work experience, and the Executive Management for Design and Construction (EMDC) program, an online course of study for aspiring executives with 8 to 10 or more years of experience. He has published more than 300 papers in journals and proceedings and is the editor or co-editor of 10 books.

Among his many noteworthy honors are the C. A. Hogentogler Award (ASTM, 1970), the Walter L. Huber Civil Engineering Research Prize (ASCE, 1971), Palmes Academiques from the French Ministry of Education (1993), the Karl Terzaghi Award (ASCE, 1997) and Lecture (ASCE, 2006), and the Wallace Hayward Baker Award (ASCE, 2003). He served as president of the Geo-Institute (1997-1998), and was named an honorary member of ASCE in 2002. In 1999 and 2001, he was

elected to the Spanish Royal Academy of Engineering and the U.S. National Academy of Engineering, respectively, and in 2003 he received a Honoris Causa Doctorate from Universidad de Cantabria in Spain. His most recent honor is an ASCE OPAL award for education in 2020.

**Q: Why did you choose civil engineering over other majors?**

Honestly, it was fate. Because my parents couldn't afford college, I took virtually every placement exam I could find to get some support. Thrilled at winning a full-tuition scholarship to Johns Hopkins University, I didn't realize that the scholarship was in engineering. While I always enjoyed math, I'd never thought about being an engineer. But the more I thought about it, civil engineering seemed a logical choice because I was interested in

“building things” as a child. The result clearly worked out well.

**Q: After graduating in 1954 and then entering the working world, why did you start graduate studies at the University of Maryland a few years later?**

Upon graduation with my bachelor's degree, I was commissioned as an officer in the Army Corps of Engineers and faced a two-year active duty commitment. By pursuing a master's degree, however, my active duty obligation was delayed for a year, which led me to a summer job doing stress analysis on airplanes. Unfortunately, the job was disappointing and raised doubts about whether I really wanted to do this kind of work for a career, so I cancelled my plans for graduate school, which left me with nine months to go before reporting for active duty. I started working for

// Lessons Learned from GeoLegends



EPA site visit to dredged spoil disposal site in Toledo, OH. Photo shows piston sampling to obtain undisturbed samples for laboratory testing. Krizek is shown on left side of photo in a hat, khaki-colored shirt, and pants. (Circa 1970.)



Looking to the northeast, here's an aerial view of four dredged material disposal sites along the Maumee River in Toledo, OH (circa 1970). From bottom left along river: Riverside, Penn 8, Penn 7, and Island (mouth of river) sites.

a computer company, but really didn't like this work either. When June arrived, I started my two-year, active-duty hitch at Fort Belvoir, VA. After basic training, I was assigned to teach in the Engineer School at Fort Belvoir. While I didn't realize it at the time, this was a milestone in my life. I truly enjoyed this assignment and decided that teaching at the university level would be my career, which prompted my return to graduate school.

**Q: How did you complete your PhD from Northwestern in just two years?**

After completing two years of active duty, I accepted a position at the University of Maryland as a full-time faculty member with the rank of instructor. I had to teach three undergraduate courses per semester

and take two graduate courses toward a master's degree to be eligible for an assistant professor position because a PhD wasn't then required at many universities. Soon after Sputnik was launched in October 1957, it seemed like overnight every university in the country started hiring engineering and science faculty — but now a PhD was required for an appointment. The Civil Engineering Department at Maryland added two faculty holding PhDs, and their charge was to start a PhD program. So I and two classmates began pursuing the first PhDs awarded by the Department. During the next four years, I earned my MS and completed most of the courses toward my PhD. In the spring of my fourth year, I wanted to take a course in elasticity, but the department head

forced me to take his structures course. This was the last straw in a recurring series of confrontations with him, so I quit and transferred to Northwestern. My arrival there benefited from fruitful research over two summers with Robert L. Kondner at Hopkins, who subsequently accepted a faculty position at Northwestern and became my PhD advisor. So I hit the ground running, having already completed a lot of pertinent coursework, drawing on my considerable background on my PhD research topic, and meeting with an advisor with whom I already had a working relationship.

**Q: What are some of your personal hobbies or interests?**

My wife would say that I have few, and she's probably right. I've always been



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Krzek (r) receiving an honorary doctorate from Dr. Enrique Castillo Ron; University of Cantabria, Spain (2003).

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A graduate student should possess three highly desirable qualities: 1) a strong working knowledge of mechanics, mathematics, and physics with an ability to think “out-of-the-box,” 2) a wholesome and industrious work ethic that includes the ability to accept disappointments without giving up, and 3) an ability to communicate unambiguously to others at all levels.

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interested in building things, although this interest has waned in recent years. As a graduate student renting a room in a private home, I built a garage for my landlord. Within the past decade, I built a nice 12-ft by 32-ft room in the attic of a three-car garage for my son, and a tree house for my grandson. I like most sports and often go to Northwestern baseball, softball, and lacrosse games. Baseball has always been my favorite sport, and I played it at many levels, stopping just short of professional. Currently, I try to work a crossword puzzle and a Sudoku each day to keep my aging mind sharp.

**Q: Who were your mentors, and how did they help shape your career?**

I've been very fortunate to have had excellent mentors who played prominent roles during my career. The

first was Professor Walter Boyer during my undergraduate years at Hopkins. He piqued my interest in geotechnical engineering by encouraging me to take a graduate-level course while still a senior, and then his continuing friendship in the ensuing years. Professor Ed Barber at the University of Maryland elevated my interest in geotechnical engineering on a project to develop an engineering soil map for the state of Maryland. My two most influential mentors at Northwestern were Professors Jorj Osterberg and Robert Kondner. Professor Osterberg opened my eyes to the world of consulting opportunities in the evolving discipline of geotechnical engineering, and Professor Kondner whetted my appetite to pursue the multitude of research challenges that appeared on the horizon.

**Q: What's special about geotechnical engineering compared to other civil engineering disciplines?**

I got into geotechnical engineering largely for two reasons. The first was the influence of my mentors, and the second was my interest in the rheological properties of soils and how particulate natural materials could be characterized by concepts from the theories of elasticity, plasticity, and viscoelasticity. Remember, this was more than half a century ago, when we didn't know what we know today.

**Q: Why did you accept a position at Northwestern University after completing your doctoral studies there?**

When my father died unexpectedly at age 49, I had every intention of returning to the east to be near my mother and sister, who lived in Rosedale, a



Geo-Hero Luncheon Honoree Professor Jorj Osterberg (bottom right) with Professors Ralph Peck (bottom left) and Charles Dowding, Raymond Krizek, and Richard Finno (top l to r) at Geo-Denver 2007.

## // Lessons Learned from GeoLegends



Krizek family photo. L to R: son Kevin, Krizek, wife Claudia, and son Robert.



L to R: Seyed Zeinali, Raymond Krizek, and Karam Jaradat.

suburb of Baltimore. However, virtually every university was hiring in engineering and science, so I considered opportunities outside the east and ended up with six offers, including one from Northwestern. Even though Northwestern offered the lowest salary, it was the best university, so I accepted a three-year appointment. Looking back over the past half a century plus, I obviously made the right choice.

**Q: What was the biggest challenge you faced during your first years at Northwestern?**

There were two big challenges, actually. The first was the same as for any new assistant professor embarking on a career at any research-oriented university: figuring out how to best compete with more-established colleagues to obtain funding for the research I wanted to undertake. I could do this alone or team up with a more established colleague. Both options had risks, but, for a variety of reasons I went the solo route. The going was tough at the outset, but eventually resulted in a series of successes. The second challenge centered around my family responsibilities halfway across the country and ended, unfortunately, with my mother's death.

**Q: You've received many prestigious awards and recognitions throughout your career. Which is your most precious award and why?**

This is like asking a kid which is his favorite candy. However, my answer is that my induction into the National Academy of Engineering was the most noteworthy and precious to me. This honor is achieved after a thorough evaluation by your peers and, in a sense, recognizes both one's lifetime contributions and the impact that some part of one's work has had on some aspect of the engineering profession. Also very high on my list are election to the Spanish Royal Academy of Engineering, an honorary doctorate

from the University of Cantabria in Spain, the Terzaghi Award, and the recent OPAL Award for Education. The OPAL is especially rewarding because it demonstrates that success in research doesn't preclude meaningful contributions to education-oriented endeavors.

**Q: What's your proudest accomplishment?**

I've said many times that my graduate students are the jewels in my crown. I've been privileged to work with the best group of graduate students with whom a professor could ever hope to interact. These folks represent the best that we have to offer, and their impact on our profession will be felt for many years to come. They include more than 60 PhD- and over 600 master's-level students, about 60 of whom are geotechs.

**Q: What aspects of research and/or teaching do you most enjoy?**

One heartwarming highlight of a research endeavor is the "a-ha" moment when one finally "sees the light" or "makes a breakthrough" after a long period of puzzlement when things just don't seem to be working out and you're almost ready to give up. From a teaching perspective, a similar phenomenon often occurs when success is achieved after several unsuccessful attempts to explain a concept to a student. I also feel a very rewarding sense of accomplishment when an alum from 20, 30, or 40 years ago tells me, "I remember when you said such and such — and I have always tried to follow your advice." The bottom line is that any of these occurrences will make my day and leave me with the feeling that my efforts are indeed worthwhile.

**Q: What top three qualities should a graduate student have?**

Three highly desirable qualities are 1) a strong working knowledge of mechanics, mathematics, and physics with an ability to think "out-of-the-box,"

2) a wholesome and industrious work ethic that includes the ability to accept disappointments without giving up, and 3) an ability to communicate unambiguously to others at all levels.

**Q: How do you see the field of geotechnical engineering 50 years from now?**

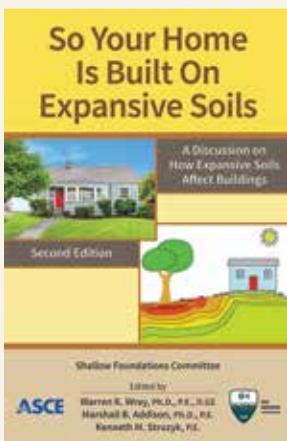
One of the biggest challenges for geotechnical engineering practice will be to convince clients to value our professional services and not subject them to a low-bid selection process. If you were to undergo a heart operation, I'm quite sure that you wouldn't select your surgeon based on the lowest bid. Another age-old challenge will be characterizing a site to understand the nature and distribution of the subsurface soils. My hope is that within

the next 50 years we will have developed an ability to identify subsurface stratifications and inclusions simply by "scanning" the underlying soils, thereby reducing substantially, but probably not eliminating entirely, the need for soil borings. 

► **KARAM A. JARADAT, PhD, Aff.M.ASCE**, is a geotechnical engineer at Jacobs in Herndon, VA. At the time of the interview, he was a PhD candidate at Stony Brook University in Stony Brook, NY. He can be reached at [karam.jaradat@stonybrook.edu](mailto:karam.jaradat@stonybrook.edu).

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### So Your Home Is Built on Expansive Soils

A Discussion on How Expansive Soils Affect Buildings

Shallow Foundations Committee; Marshall B. Addison; Kenneth M. Struzyk; Warren K. Wray

Written for the layperson in clear, easy-to-understand terms, this updated edition will assist homeowners in understanding why some soils and conditions lead to problematic shrinking and swelling. Both the nature of the soil behavior and how buildings respond are addressed. This comprehensively updated report discusses the difference between cosmetic damage and structural damage resulting from soil shrinkage or heave movement and provides information on both prevention and mitigation of damage.

This book will be of interest not only to homeowners but also construction industry professionals and engineering practitioners.

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