ANNE S. KIREMIDJIAN

In step with the abounding vitality of the time, structural engineer **Fazlur Rahman Khan** (1929-1982) ushered in a renaissance in skyscraper construction during the second half of the 20th century. Fazlur Khan was a pragmatic visionary: the series of progressive ideas that he brought forth for efficient high-rise construction in the 1960s and '70s were validated in his own work, notably his efficient designs for Chicago's 100-story John Hancock Center and 110-story Sears Tower -- the tallest building in the United States since its completion in 1974.

Fazlur Rahman Khan

Lehigh endowed a chair in structural engineering and architecture and has established this lecture series in Khan's honor. It is organized by **Professor Dan M. Frangopol**, the university's first holder of the Fazlur Rahman Khan Endowed Chair of Structural Engineering and Architecture, and sponsored by the Departments of Civil & Environmental Engineering, and Art, Architecture & Design.

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ATLSS

2023 Khan Distinguished Lecture Series

The Fazlur Rahman Khan Distinguished Lecture Series honors Dr. Fazlur Rahman Khan's legacy of excellence in structural engineering and architecture

Initiated and Organized by **PROFESSOR DAN M. FRANGOPOL**
The Fazlur Rahman Khan Endowed Chair of Structural Engineering and Architecture
Department of Civil and Environmental Engineering, ATLSS Engineering Research Center,
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ANNE S. KIREMIDJIAN

The C. L. Peck, Class of 1906 Professor in Engineering
Department of Civil Engineering and Stanford Doerr School of Sustainability
Stanford University, Stanford, CA

"Time-Dependent Earthquake Risk Assessment Modeling with Life-Cycle Analysis"

Friday, October 27, 2023 – 4:30 pm

Lecture will be live streamed, must REGISTER HERE for live stream link

http://www.lehigh.edu/frkseries

Anne S. Kiremidjian is the C. L. Peck, Class of 1906 Professor in the School of Engineering at Stanford University where she teaches and conducts research on earthquake hazard, risk, and resilience modeling, and structural health monitoring for extreme events. She and her students have developed some of the first seismic hazard maps for California and all countries in Central America except Mexico, time-dependent earthquake occurrence models, dynamics based analytical fragility functions for buildings, and time-dependent fragility functions for deteriorating structures. In 1985 together with her students and faculty from electrical and mechanical engineering, she developed the first wireless accelerometer and the overall concept of wireless structural health monitoring for which Stanford holds a patent. Her research is published in more than 350 articles. She was the director of the John. A. Blume Earthquake Engineering Center at Stanford and has served on numerous committees and boards at Stanford, various university consortia and national and international organizations. She was a co-founder of two technology companies – K2 Technologies, Inc. and Sensametrics, Inc. She has given more than 40 invited, keynote and distinguished lectures. Dr. Kiremidjian has been recognized with the Extraordinary Achievement Award in Loss Estimation from Applied Technology Council, the C. Martin Duke Award from the American Society of Civil Engineers, the John Fritz Medal (one of the highest honors across all of engineering) from the American Association of Engineering Societies, the Lifetime Achievement Award in Structural Health Monitoring, and the Egleston Medal from Columbia University. She is a member of the National Academy of Engineering, Distinguished Member of the American Society of Civil Engineers, and Honorary Member of the Earthquake Engineering Research Institute.

Time-Dependent Earthquake Risk Assessment Modeling with Life-Cycle Analysis. Earthquake risk assessment models have ignored structural deterioration and regional infrastructure growth over time. The risk is dynamic and has to consider the time dependence of large earthquake occurrences, structural deterioration, seismic design code changes, and increase in building stock over time. A time-dependent earthquake risk model is developed by our research team that considers the problem of increasing vulnerability of structures due to corrosion and contributions to the risk by various environmental factors. Key time dependent risk components include the earthquake hazard rate, the probability distribution of structural capacity given the earthquake demand and the decision variable dependence on monetary discount rates. Life-cycle cost analysis is used to evaluate the contribution of different repair components after every damaging earthquake event. Components in the life-cycle impact analysis include estimation of greenhouse gas potential, ozone depletion potential, acidification potential and several others. Results from applications of the methodology to a single reinforced concrete bridge column show that structural deterioration does contribute to the risk over time and if ignored can result in underestimation of that risk. Moreover, the risk significantly decreases with improved seismic design. Similarly, the contribution of various life-cycle impacts is most pronounced for older structures that have greater potential for deterioration.

FAZLUR RAHMAN KHAN (1929 - 1982) One of the foremost structural engineers of the 20th century, Fazlur Khan epitomized both structural engineering achievement and creative collaborative effort between architect and engineer. Only when architectural design is grounded in structural realities, he believed — thus celebrating architecture's nature as a constructive art, rooted in the earth — can "the resulting aesthetics … have a transcendental value and quality." His ideas for these sky-scraping towers offered more than economic construction and iconic architectural images; they gave people the opportunity to work and live "in the sky." Hancock Center residents thrive on the wide expanse of sky and lake before them, the stunning quiet in the heart of the city, and the intimacy with nature at such heights: the rising sun, the moon and stars, the migrating flocks of birds. Fazlur Khan was always clear about the purpose of architecture. His characteristic statement to an editor in 1971, having just been selected Construction's Man of the Year by *Engineering News-Record*, is commemorated in a plaque in Onterie Center (446 E. Ontario, Chicago): ***"****The technical man must not be lost in his own technology. He must be able to appreciate life; and life is art, drama, music, and most importantly, people."*

SEI ASCE STRUCTURAL ENGINEERING INSTITUTE Lehigh Valley Chapter

1 PDH will be awarded to eligible attendees for each lecture
(minimum webinar participation time of 55 minutes is required)

Please contact the Khan Chair office at 610-758-6123 or Email: infrk@lehigh.edu with any questions.