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DESIGNING CITIES IN THE SKY

More than perhaps any other 20th-century engineer, Fazlur Rahman Khan made it possible for human beings to live, work and dream in “cities in the sky.”

In his short life, Khan led a renaissance in skyscraper construction by designing buildings that are tuned to the dynamic forces of gravity, wind and earthquake. Mastering the principles of structural engineering, he gave unprecedented freedom to architects, with whom he worked closely.

Khan designed Chicago’s Sears Tower, once the world’s tallest building and now the fourth-highest. The city’s 100-story John Hancock Center, one of the world’s highest multi-use building, was also conceived by Khan.

Khan never acquired a household name, but a quarter-century after his death, his legacy lives on at Lehigh and in the lives and work of a new generation of structural engineers.

Lehigh honors alum
Fazlur Rahman Khan
(1929-1982) through
its Khan Lecture
Series.

One of those engineers, Mark P. Sarkisian ’85G, recently gave the premiere address in the Fazlur Rahman Khan Lecture Series to a standing-room-only audience in Sinclair Auditorium.

Khan, said Sarkisian, was a visionary who transformed skyscrapers into sky cities while staying firmly grounded in the fundamentals of engineering.

Faz Khan was an intuitive thinker whose genius grew from the belief that you can apply engineering fundamentals to very large-scale projects,” said Sarkisian, who, like Khan before him, is a partner in the international architectural and engineering firm of Skidmore, Owings & Merrill LLP.

It was Khan, Sarkisian said, who determined that by grouping beam-column frames into bundles, engineers could strengthen a tower, reduce the amount of steel and concrete necessary to support it, and create open space in a building’s interior. Khan showed how engineers could offset the impact of wind by tapering tall buildings and placing strategic indentations in them. And Khan helped develop the concept of using huge, exposed, diagonal braces, both for structural support of gravity loads and resistance to lateral loads from

wind, and also to merge engineering with aesthetics.

Part of Khan's genius, Sarkisian said, was his perspective.

"The technical man," Khan once wrote, "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."

Sarkisian's address, along with the other events in the Khan Lecture Series, was sponsored by the department of civil and environmental engineering, the department of art and architecture, and the P.C. Rossin College of Engineering and Applied Science.

Mark Sarkisian, '85G

A dream fully realized

Sarkisian's lecture, which was accompanied by an impressive, hour-long slide show, helped culminate a 25-year campaign by Lehigh to honor Khan.

Shortly after Khan died in 1982 at the age of 52, the late Lynn Beedle, university distinguished professor, began raising funds to endow a chair at Lehigh in Khan's memory. Khan had received an honorary degree from Lehigh in 1980.

Last year, Lehigh appointed Dan M. Frangopol as the first holder of the Fazlur Rahman Khan Endowed Chair of Structural Engineering and Architecture. Frangopol, an expert in life-cycle engineering, bridge engineering, structural reliability, and the maintenance and management of structures and civil infrastructures, organized the Khan Lecture Series, which continues on March 16 and April 20, 2007.

Khan was born in 1929 in Bangladesh (then part of India) and received his bachelor's degree in 1950 from the University of Dhaka. By 1955 he had completed two master's degrees and a Ph.D. at the University of Illinois at Urbana-Champaign. That year he joined Skidmore, Owings & Merrill, where he remained until his death 27 years later.

In addition to revolutionizing Chicago's skyline, Khan designed the U.S. Air Force Academy in Colorado Springs, the Hubert H. Humphrey Metrodome in Minneapolis, and the Baxter Travenol Laboratories in Deerfield, Ill., whose roof is suspended from cables.

Sarkisian (right)

tours Lehigh's ATLSS

structural research

center with Prof. Dan

Frangopol

One of Khan's most impressive structures, said Sarkisian, is the Hajj Terminal at King Abdul Aziz International Airport in Jeddah, which had to adapt to the harsh Saudi Arabian desert while

accommodating a uniquely uneven traffic flow. Lightly used most of the time, the airport overflows for a few weeks each year when thousands of Muslims make the annual pilgrimage to Mecca.

Khan's solution was a series of giant tents made of Teflon-coated fabric, suspended from high-strength cables and containing flexible stretches of open space to allow free movement of large numbers of people. Openings at the tops of the tents directed hot desert air up and out of the tents to cool the terminal.

"The challenge was to come up with a sustainable structure that would protect people from the elements – sun, heat and wind – while also performing at its peak occupancy for a very short period of time," said Sarkisian. "Khan answered this with a minimalist structure that could be built very quickly and would last for a long period of time. His fabric concept was very unusual for its time."

A meeting of the minds

Sarkisian never met Khan; he enrolled as a graduate student at Lehigh in 1983, one year after Khan died on a business trip to Saudi Arabia. After earning his M.S. in 1985, his career took off on a trajectory similar to Khan's. He has designed more than 50 major projects, including Chicago's NBC Tower, the Cathedral of Christ the Light in Oakland, and the U.S. Embassy in Beijing. He also holds a U.S. patent for a pin-fuse joint to make structures more stable in seismically active areas.

The Hajj Terminal at
King Abdul Aziz
International Airport
in Jeddah, Saudi
Arabia

"Fortunately enough," said Sarkisian, "I spent 16 years in the Chicago office of Skidmore, Owings & Merrill learning from and interacting with the structural engineers and architects who had worked closely with F

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The Cathedral of
Christ the Light in

Oakland, CA

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