

Science & Technology Briefs

Maglev Elevators Will Transform Architecture and Urban Design

Most modern elevators use a design similar to the safety elevator introduced by Elisha Otis in 1852—a motorized cable system that pulls a car up and lets it down, each in its own shaft. The motor is assisted by a counterweight of nearly half the weight of a fully loaded car.

That elevator technology, however, has three fundamental drawbacks: it constrains architectural designs; it requires a substantial amount of the building's space; and it has a height limit—no elevator using cables (wire ropes) can go higher than 600 m, as at that height the cables cannot support their own weight and will break.

In today's tallest building, for example, the 828-meter Burj Khalifa in Dubai, UAE, one must take two elevators in sequence to reach the top floor. Even taller projects, such as the 1,000-m Jeddah Tower in Saudi Arabia, are challenging the limits of construction and motivating the development of new solutions.

In 2017, German conglomerate ThyssenKrupp unveiled an elevator system capable of not only overcoming the three drawbacks of traditional elevators, but also accomplishes one of the most sought after features in elevators: the ability to move *horizontally*.

ThyssenKrupp has since spun off its elevator division into a new company called TK Elevator (TKE). In TKE's system, called MULTI, a linear motor drives magnetically levitated cars up and down a track embedded with electric coils that guide the cars (thus replacing the

traditional cable and counterweight design). The MULTI system cars can easily change direction between vertical and horizontal at floors that have horizontal channels.

Even though MULTI's shafts are also 25% smaller in cross-section than traditional elevator shafts, the system allows more than two cars to operate simultaneously in the same shaft, increasing capacity up to 50% and reducing wait time for passengers. MULTI also eliminates building height or design limitations as its shafts can be placed more freely about a structure. It is controlled wirelessly by a software algorithm. Safety concerns are addressed by such means as a multi-layer braking system.

TKE built a 246-m test research center in Rottweil, Germany, seen in this [video](#), to assess the safety, operability, and maintenance of this new technology.

It expects its MULTI system to reinvent the way people move through buildings, even facilitating transport between large adjacent structures. The system has yet to be deployed to any commercial building or government facility.

India Probe on Its Way to the Moon

On July 14, the Indian Space Research Organization (ISRO) launched the *Chandrayaan-3* orbiter-lander-rover mission to the Moon aboard India's heaviest-lift rocket, the LVM3 (Launch Vehicle Mark-3).

"*Chandrayaan-3* scripts a new chapter in India's space odyssey. It soars high, elevating the dreams and ambitions of every Indian. This momentous achievement is a testament to our scientists' relentless dedication.

I salute their spirit and ingenuity!"

If the mission is successful, India will become the fourth country to safely land a spacecraft on the Moon. Scheduled to arrive at the lunar south pole Aug. 23-24, the probe will carry out a two-week program of scientific explorations. Upon reaching a lunar orbit at 100 km altitude, the Spectro-polarimetry of Habitable Planet Earth (SHAPE) module will begin making spectral and polarimetric measurements of Earth. Instruments aboard the lander will determine the extent of water-ice on the south pole, a future landing site for humans.

As reported in India's *The Telegraph Online*:

"We expect this to be a game-changer mission—novel scientific experiments on the Moon and the LVM3's success are allowing us to inch toward the *Gaganyaan* mission, the human mission to the Moon."

This, from Anil Bhardwaj, Director of ISRO's Physical Research Laboratory, Ahmedabad, which built some of the payloads on this mission.

Eliminating Senescent Cells Prolongs Healthy Life

As reported in the May 16 [issue](#) of *SciTechDaily*:

"As we age, our bodies can accumulate aging, or senescent cells, which have ceased division but don't die. These cells can lead to chronic inflammation, which in turn can contribute to the development of diseases such as cancer and various degenerative disorders."

In a study [published](#) in the March 30, 2023 issue of *Cell*, nine scientists analyzed young and old human skin samples to learn more about

the elimination of senescent cells in human tissue. They found more senescent cells in older skin samples. However, in the samples from old individuals, the number of senescent cells did not increase as individuals got progressively older, indicating that there may be some regulatory mechanism.

Their experiments suggested that once a person becomes elderly, certain immune cells called killer CD4+ T cells become activated that keep senescent cells from increasing. The researchers found that aging skin cells express a protein produced by human cytomegalovirus, a pervasive herpes virus that establishes lifelong latent infection in most people without producing any symptoms. By expressing this protein, senescent cells become targets for attack by killer CD4+ T cells.

Shadmehr Demehri, MD, PhD, director of the High Risk Skin Cancer Clinic at Massachusetts General Hospital and an associate professor of Dermatology at Harvard Medical School, is quoted in *SciTechDaily*:

“Our study has revealed that immune responses to human cytomegalovirus contribute to maintaining the balance of aging organs. Most of us are infected with human cytomegalovirus, and our immune system has evolved to eliminate cells, including senescent cells, that upregulate the expression of cytomegalovirus antigens.”

These findings, which highlight a beneficial function of viruses living in our bodies, could have a variety of clinical applications. Again, Dr. Demehri:

“Our research enables a new therapeutic approach to eliminate aging cells by boosting the antiviral immune response. We are interested in utilizing the immune response to cytomegalovirus as a therapy to eliminate senescent cells in diseases like cancer, fibrosis, and

degenerative diseases.”

Eliminating intercellular junk is No. 2 on the list of the “Seven Deadly Things” of biomedical gerontologist Dr. Aubrey de Grey—the seven which cause damage to our bodies as we age. Each of them by itself, or in combination with one or more of the others, is ultimately responsible for death, he says.

Unusual Behavior of Sound Waves in Mars' Thin Atmosphere

Sound waves on Earth, moving through the air at sea level, travel at about 343 meters per second (mps). We commonly measure the approximate distance from us of a lightning bolt by clocking the delay between seeing the flash and hearing the thunder.

Experiments conducted by NASA's rover *Perseverance* on Mars, using its on-board microphones, have shown that, as expected, the speed of sound was slower—roughly 240 mps—owing to Mars' thinner, more carbon-dioxide-rich atmosphere. Surprisingly, however, scientists observed that while lower-frequency waves on Mars traveled at 240 mps, higher frequencies traveled slightly faster, at roughly 250 mps!

Planetary scientist Baptiste Chide of the Los Alamos National Laboratory, presented these findings in a [paper](#) at the 53rd Lunar and Planetary Science Conference, held March 7–12 in The Woodlands, Texas:

“Due to the unique properties of the carbon dioxide molecules at low pressure, Mars is the only terrestrial-planet atmosphere in the Solar System experiencing a change in speed of sound right in the middle of the audible bandwidth (20 Hz to 20 kHz).”

This finding could affect electronic or other communications by future colonists.

Galaxies That Should Not Exist in a Big Bang Universe

Last July, the James Webb Space Telescope's high-resolution images confronted scientists with a profound anomaly, as described seven months later by Joel Leja, an assistant professor of astronomy and astrophysics at Pennsylvania State University, as co-author of a Feb. 22 *Nature* magazine [article](#), “A Population of Red Candidate Massive Galaxies About 600 Million Years After the Big Bang”:

“We expected only to find tiny, young, baby galaxies at this point in time, but we've discovered galaxies as mature as our own in what was previously understood to be the dawn of the universe. The revelation that massive galaxy formation began extremely early in the history of the universe upends what many of us had thought was settled science. We've been informally calling these objects ‘universe breakers’—and they have been living up to their name so far.”

Operating from the presumption of a universe originating in a Big Bang approximately 13.8 billion years ago, the team expected to see small, not-very-dense galaxies, forming from small clouds of stars and dust that slowly accumulated.

But the team examined data showing six massive galaxies that evidently existed 13.1–13.3 billion years ago. Leja explained, “[These] objects are way more massive than anyone expected.” So massive, that they easily wipe away the various computer models' projections. He continued:

“We looked into the very early universe for the first time and had no idea what we were going to find. It turns out we found something so unexpected it actually creates problems for science. It calls the whole picture of early galaxy formation into question.”

The data may just up-end the Big Bang.