SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

Weekly Discovery

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25 Sep – 29 Sep 2023

ARCHITECTURE

An Architect's Guide to Copenhagen: Dan Stubbergaard and the "Bustling City Designed for Living"

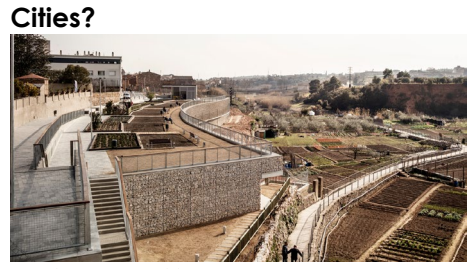
"Copenhagen is a living testament to its architectural legacy, innovative urban development, and commitment to sustainability and liveability. The city inspires the whole world with its quality of urban life, made up of efficient and intelligent mobility systems, along with vibrant and interesting public and private spaces. It is in this context that the city has been awarded the title of World Capital of Architecture by UNESCO for 2023, and hosted the World Congress of the International Union of Architects. These milestones represent unique opportunities to highlight the crucial role of architecture and urban planning in building a sustainable future, establishing the city as a prominent international forum for discussing crucial issues related to the urban environment and the ongoing search for innovative solutions.

Visit Copenhagen has developed a series of four videos to explore the city's architectural wonders, guided by local architects. In the first one, Danish architect Dan Stubbergaard – founder of Cobe– takes us on a captivating tour of Copenhagen, sharing his insights into what makes the city truly exceptional for its inhabitants."

Source: Archdaily (15 Sep 2023)

ARCHITECTURE

More than Parking Lots: Can Parking Facilities Provide New Spaces to Cities?



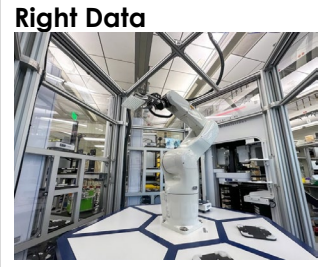
"While most cities around the world seek to implement more sustainable and environmentally friendly modes of transportation, encouraging new urban mobility habits in their residents, the use of automobiles still persists, occupying significant parking spaces in urban centers. Finding a way to integrate these uses, provide new spaces for their citizens, and leverage their facilities for ecological, productive, and other purposes is the challenge faced by many professionals in architecture and urban planning.

There are economic, social, and cultural factors that influence the determination of the uses a space will acquire based on the needs of its population and the context in which it is implemented, among other reasons. Understanding the role of parking facilities in the city and the territorial dynamics revolving around them is part of the design process and the decision-making of professionals who will determine how to plan and organize these spaces in order to achieve the well-being and comfort of their users."

Source: Archdaily (22 Sep 2023)

BIOTECHNOLOGY

AI Can Help to Speed Up Drug Discovery — But Only if We Give It the Right Data



"There is a troubling crunch point in the development of drugs made from proteins. Fewer than 10% of such drug candidates succeed in clinical trials1. Failure at this late stage of development costs between US$30 million and $310 million per clinical trial2, potentially costing billions of dollars per drug, and wastes years of research while patients wait for a treatment.

More protein drugs are needed. The large size and surface area of proteins mean that medicines made from them have more ways to interact with target molecules, including proteins in the body that are involved in disease, compared with drugs based on smaller molecules. Protein-based drugs therefore have broad potential as therapeutics.

To unblock the drug-development bottleneck, computer models of how protein drugs might act in the body must be improved. Researchers need to be able to judge the dose that drugs will work at, how they will interact with the body's own proteins, whether they might trigger an unwanted immune response, and more."

Source: Nature (19 Sep 2023)

COMPUTER MONITORS

The Endless Quest for the Perfect Computer Display

"Computer monitors have improved tremendously since the first mainstream color LCDs edged out CRT displays two decades ago. But odds are high the motion performance of the monitor you're using right now is far from perfect.

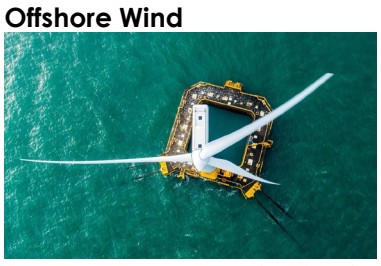
This is the reality of modern displays with a 60-hertz refresh rate, which refresh their image 60 times each second. However, not all displays share this limitation. Apple delivers a 120-Hz refresh rate in the iPhone Pro and MacBook Pro. Sharp's cutting-edge Aquos R8 smartphone provides a refresh rate up to 240 Hz. And displays built for competitive e-sports, like the Alienware AW2524H, push refresh rates up to 500 Hz.

"If the ideal means the fastest and smoothest graphics, then 500-Hz refresh is the most ideal at the moment," says Yoon Lee, vice president of displays at Dell Technologies."

Source: IEEE Spectrum (22 Sep 2023)

ENERGY

Inside the Global Race to Tap Potent Offshore Wind



"N A HANGAR at the University of Edinburgh, a triangular steel contraption sits beside a giant tank of water. Inside the tank, a technician in a yellow dinghy adjusts equipment so that the triangled structure can be hoisted into the water to see how it deals with simulated waves and currents. One day soon, a platform 50 times as large may float in the deep waters of the North Sea, buoying up a massive wind turbine to harvest the steady, strong breezes there. About an hour's ride up the coast, full-scale 3,000-tonne behemoths already float in Aberdeen Bay, capturing enough wind energy to electrify nearly 35,000 Scottish households.

The prototype at the FloWave facility—one of 10 new floating wind-power designs tested here—is progressing fast, says Tom Davey, who oversees testing. "Everything you see here has been manufactured and put in the water in the last couple months."

Source: IEEE Spectrum (23 Sep 2023)

ENERGY STORAGE

NASA Battery Tech Might Deliver for the Grid

"Technologies for space are designed to be tough, safe, and long-lasting. So what happens when you bring the battery chemistry deployed on the International Space Station, nickel-hydrogen, down to Earth?

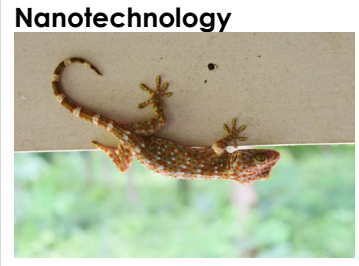
"[It's] the most durable battery ever invented," says Jorg Heinemann. Nickel-hydrogen batteries, he says, can last for 30,000 charge cycles, is fireproof, and outperforms lithium-ion batteries on a number of key metrics for energy storage at the large scale.

Heinemann is CEO of EnerVenue, a Fremont, California-based nickel-hydrogen battery manufacturer. "Our cost is comparable to where lithium-ion is going, and we use earth-abundant materials," he says. "Nickel is the most expensive thing we use. We operate at a ninety percent round-trip efficiency, more efficient than lithium-ion. And there's basically no maintenance on this battery, it was designed for sending up on a rocket ship into outer space."

Source: IEEE Spectrum (24 Sep 2023)

ENERGY STORAGE

Scaling Up the Power of Nanotechnology



"In a new study, researchers at the University of Missouri created a proof of concept of a nanocapsule — a microscopic container — capable of delivering a specific "payload" to a targeted location.

While beyond the scope of this study, the discovery could one day impact how drugs, nutrients and other types of chemical compounds are delivered within humans or plants. The power of the forward-thinking idea for this tiny delivery mechanism comes from its inventive structure, said Gary Baker, an associate professor in the Department of Chemistry and study co-author.

"We have the ability to uniformly prepare nanocapsules in a cookie-cutter fashion by joining them together using calcium metal ions as building blocks or linking logs," Baker said. "By doing this, we can generate multiple identical reservoirs which can transport different types of substances, or payloads. Additionally, we have proof that the substances within can transfer through the barrier of these nanocapsules into an external solution."

Source: University of Missouri (21 Sep 2023)

EV

Solar-Powered Electric Motors for EVs That Never Plug In

"Researchers from Odisha University of Technology and Research, in India, have developed a model for a direct-current electric motor powered by a photovoltaic array. The system relies on AI to optimize the solar array's output and operate the motor at 88 percent efficiency; real-world DC electric motors have efficiencies of 75 to 80 percent. Such solar-powered motors could someday be used in industrial machines, household appliances, and even electric cars.

Bismit Mohanty, the lead author on the study, says the focus of the model was on boosting the overall efficiency of the system, to obtain the highest output of the motor for the solar power available. The efficiency gains come from the AI algorithm, which optimizes the power output from the solar array, as well as the motor's regenerative braking system and a battery that can be charged from both the solar array and the braking system."

Source: IEEE Spectrum (18 Aug 2023)

MACHINE LEARNING

'They Went to the Bar at Noon': What This Virtual AI Village is Teaching Researchers

"What happens when you give ChatGPT, OpenAI's chatbot, a cartoon body and stick it in a small town with two dozen other AI citizens? That's what researchers at Stanford University in California and at Google hoped to learn when they created the virtual world of Smallville and populated it with 25 AI-powered characters that they call generative agents. Over the course of their two-day virtual existence, the agents moved about the town — complete with a few houses and businesses, a university and a park — made friends, and planned a party.

Each generative agent runs on an artificial intelligence (AI) language model and has a 'memory stream', which is seeded with a description of the agent's identity. That might include their name, job and descriptions of their personality and relationships…"

Source: Nature (20 Sep 2023)

MACHINE LEARNING

Dellekamp Schleich Uses Trusses for "Mexico's Largest Mass-Timber Building"

"Local architecture studio Dellekamp Schleich has created an office building in Mexico City that it says is the country's largest and tallest mass-timber structure to "set an example for innovative construction methods".

Called El Jardín Anatole, the 940-square-metre structure was placed in the former courtyard of a historic house in a residential neighbourhood in Mexico City "with potential for density," the studio said.

The four-storey office and retail building has a structure that consists almost completely of engineered timber derived from oak trees from the north of Mexico, except for a dramatic V-shaped steel truss at ground level and concrete used for the elevator and stairwells."

Source: Dezeen (26 Sep 2023)

MACHINE LEARNING

AI Predicts Chemicals' Smells from Their Structures

"Smells are the only type of sensory information that goes directly from the sensory organ — the nose, in this case — to the brain's memory and emotional centres; the other kinds of sensory input first pass through other brain regions. This direct route explains why scents can evoke specific, intense memories.

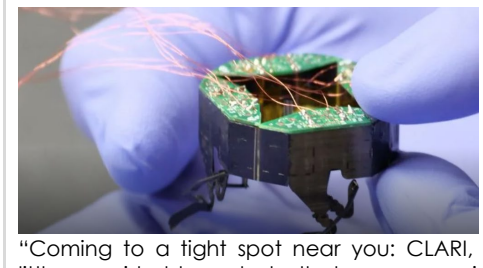
"There's something special about smell," says neurobiologist Alexander Wiltschko. His start-up company, Osmo in Cambridge, Massachusetts, is a spin-off from Google Research that is trying to design new smelly molecules, or odorants.

To explore the association between a chemical's structure and its odour, Wiltschko and his team at Osmo designed a type of artificial intelligence (AI) system called a neural network that can assign one or more of 55 descriptive words, such as fishy or winey, to an odorant…"

Source: Nature (31 Aug 2023)

ROBOTS

Tiny, Shape-Shifting Robot Can Squish Itself into Tight Spaces



"Coming to a tight spot near you: CLARI, the little, squishable robot that can passively change its shape to squeeze through narrow gaps—with a bit of inspiration from the world of bugs.

CLARI, which stands for Compliant Legged Articulated Robotic Insect, comes from a team of engineers at the CU Boulder. It also has the potential to aid first responders after major disasters in an entirely new way. Several of these robots can easily fit in the palm of your hand, and each weighs less than a Ping Pong ball. CLARI can transform its shape from square to long and slender when its surroundings become cramped, said Heiko Kabutz, a doctoral student in the Paul M. Rady Department of Mechanical Engineering.

Kabutz and his colleagues introduced the miniature robot in a study published Aug. 30 in the journal "Advanced Intelligent Systems."

Source: Boulder (30 Aug 2023)