SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

Weekly Discovery

We SHARE to inspire and ignite ideas!

1 Jan – 5 Jan 2024

AI

Spectrum's Top AI Stories Of 2023 the AI Apocalypse, ChatGPT Hallucinations, Nvidia's Success, And More

"2023 may well go down in history as one of the most wild and dramatic years in the history of artificial intelligence. People were still struggling to understand the power of OpenAI's ChatGPT, which had been introduced in late 2022, when the company released its newest large language model, GPT-4, in March 2023 (LLMs are essentially the brains behind consumer-facing applications).

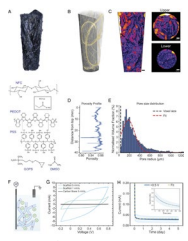
All through the spring of 2023, important and credible people freaked out about the possible negative consequences—ranging from somewhat troubling to existentially bad—of ever-improving AI. First came an open letter calling for a pause on the development of advanced models, then a statement about existential risk, the first international summit on AI safety, and landmark regulations in the form of a U.S. executive order and the E.U. AI Act.

Here are Spectrum's top 10 articles of 2023 about AI, according to how much time readers spent with them. Take a look to get the flavor of AI in 2023, a year that may well go down in history... unless 2024 is even crazier."

Source: IEEE Spectrum (27 Dec 2023)

AGRICULTURE

eSoil: A Low-Power Bioelectronic Growth Scaffold That Enhances Crop Seedling Growth



"Active hydroponic substrates that stimulate on demand the plant growth have not been demonstrated so far. Here, we developed the eSoil, a low-power bioelectronic growth scaffold that can provide electrical stimulation to the plants' root system and growth environment in hydroponics settings. eSoil's active material is an organic mixed ionic electronic conductor while its main structural component is cellulose, the most abundant biopolymer. We demonstrate that barley seedlings that are widely used for fodder grow within the eSoil with the root system integrated within its porous matrix. Simply by polarizing the eSoil, seedling growth is accelerated resulting in increase of dry weight on average by 50% after 15 d of growth. The effect is evident both on root and shoot development and occurs during the growth period after the stimulation. The stimulated plants reduce and assimilate NO3− more efficiently than controls, a finding that may have implications on minimizing fertilizer use. However, more studies are required to provide a mechanistic understanding of the physical and biological processes involved. eSoil opens the pathway for the development of active hydroponic scaffolds that may increase crop yield in a sustainable manner."

Source: PNAS (26 Dec 2023)

ARCHITECTURE

Younghanchung Architects Creates Small Study Space in Seoul as A "Microcosm for Oneself"

"A desire to "eliminate unnecessary spaces as much as possible" drove the design of Tiny Forest, a flexible study space in Jongno-gu, Seoul completed by YounghanChung Architects.

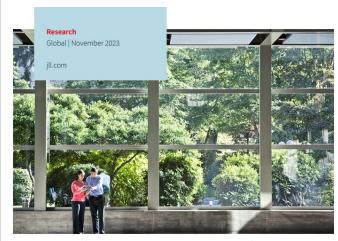
The two-storey building was created for a retired university lecturer who wanted a space separate from her main home to serve as a study and gathering space for entertaining guests.

Tasked with this brief, YounghanChung Architects drew from a space found in traditional Korean homes called a sarangbang, where typically the man of the house would entertain guests or enjoy hobbies."

Source: Dezeen (29 Dec 2023)

ARCHITECTURE

The Commercial Case for Making Buildings More Sustainable

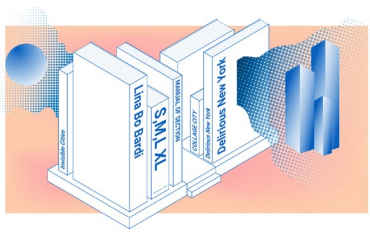


"Creating a more sustainable and resilient future requires today's buildings to undergo marked transformation in their infrastructure and operations. From industrial complexes designed in decades past to glass-clad skyscrapers in central business districts, many buildings might be fit for purpose today but will not make the grade in the coming years as low-carbon, resilient spaces. Yet in today's testing economic environment, many real estate executives, both occupiers and investors, tasked with future-proofing their real estate portfolios are finding it hard to build the business case for action and secure buy-in from senior leaders. The global economy is going through a difficult period amid rising interest rates, elevated inflation and a sluggish trade recovery. Investment in real estate is down and fundraising is more challenging. The office sector, in particular, is experiencing dynamic shifts in demand with the impact of hybrid work on lease renewals. Despite the shorter-term hurdles, developing and implementing clear decarbonization and resilience strategies now is the smart decision for longer-term performance. In many respects, the commercial case for sustainable buildings has never been stronger."

Source: JLL (Nov 2023)

ARCHITECTURE

The 126 Best Architecture Books



"Architecture has deep wells of research, thought, and theory that are unseen on the surface of a structure. For practitioners, citizens interested, and students alike, books on architecture offer invaluable context to the profession, be it practical, inspirational, academic, or otherwise. So, for those of you looking to expand your bookshelf (or confirm your own tastes), ArchDaily has gathered a broad list of architectural books that we consider of interest to those in the field.

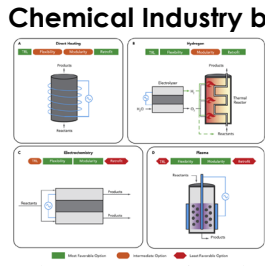
In compiling this list, we sought out titles from different backgrounds with the aim of revealing divergent cultural contexts. From essays to monographs, urban theory to graphic novels, each of the following either engage directly with or flirt on the edges of architecture.

The books on this list were chosen by our editors, and are categorized loosely by type. Read on to see the books we consider valuable to anyone interested in architecture."

Source: Archdaily (30 Dec 2023)

CHEMICALS

Researchers Aim to Decarbonize Chemical Industry by Electrifying It



"With so many of the items we interact with in our daily lives — from soaps and fertilizers to pharmaceuticals to petrochemicals — deriving from products of the chemical industry, the sector has become a major source of economic activity and employment for many nations, including the United States and China. But as the global demand for chemical products continues to grow, so do the industry's emissions.

These emissions are approaching a tipping point, and the companies responsible for creating these necessary products are increasingly looking at options to help offset their pollution outputs….

Now, a new research organization has arisen to tackle the most daunting task looming over the industry: How to make industrial chemistry — especially petrochemistry — greener and more sustainable, partly to meet the escalating demands of these greenhouse emission regulations. The multi-institutional effort is called Decarbonizing Chemical Manufacturing Using Sustainable Electrification, or DC-MUSE, founded at the NYU Tandon School of Engineering and encompassing a number of schools and institutions."

Source: IEEE Spectrum (2 Jan 2024)

DESIGN

Vorkoster Smart Lid Detects When Food Has Gone Off

"Berlin-based designer Kimia Amir-Moazami hopes to tackle the issue of food waste with a container system that reveals if something is safe to eat or not.

Vorkoster is a smart lid that uses PH-sensitive film to detect if a food product has expired. The film gradually changes colour as the food product begins to spoil, making it easy to see whether it's still edible.

This can provide an accurate indication of food freshness so that people don't have to rely on generic expiry dates, which can lead to food being thrown out unnecessarily."

Source: Dezeen (31 Dec 2023)

MACHINE LEARNING

Will Superintelligent AI Sneak Up on Us? New Study Offers Reassurance

"Will an artificial intelligence (AI) superintelligence appear suddenly, or will scientists see it coming, and have a chance to warn the world? That's a question that has received a lot of attention recently, with the rise of large language models, such as ChatGPT, which have achieved vast new abilities as their size has grown. Some findings point to "emergence", a phenomenon in which AI models gain intelligence in a sharp and unpredictable way. But a recent study calls these cases "mirages" — artefacts arising from how the systems are tested — and suggests that innovative abilities instead build more gradually.

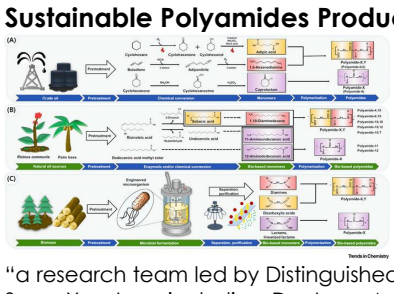
"I think they did a good job of saying 'nothing magical has happened'," says Deborah Raji, a computer scientist at the Mozilla Foundation who studies the auditing of artificial intelligence. It's "a really good, solid, measurement-based critique."

The work was presented last week at the NeurIPS machine-learning conference in New Orleans."

Source: Nature (22 Dec 2023)

MATERIALS

KAIST Presents Strategies for Environmentally Friendly and Sustainable Polyamides Production

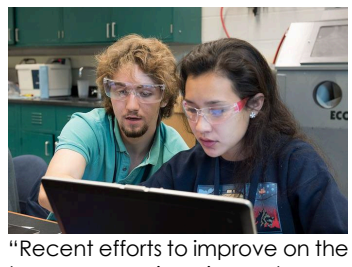


"a research team led by Distinguished Professor Sang Yup Lee, including Dr. Jong An Lee and doctoral candidate Ji Yeon Kim from the Department of Chemical and Biomolecular Engineering, published a paper titled "Current Advancements in Bio-Based Production of Polyamides". The paper was featured on the cover of the monthly issue of Trends in Chemistry by Cell Press.

As part of climate change response technologies, bio-refineries involve using biotechnological and chemical methods to produce industrially important chemicals and biofuels from renewable biomass without relying on fossil resources. Notably, systems metabolic engineering, pioneered by KAIST's Distinguished Professor Sang Yup Lee, is a research field that effectively manipulates microbial metabolic pathways to produce valuable chemicals, forming the core technology for bio-refineries. The research team has successfully developed high-performance strains producing a variety of compounds, including succinic acid, biodegradable plastics, biofuels, and natural

RESEARCH MANAGEMENT

Can We Trust Students to Collect Data Ready to Use in Scientific Research?

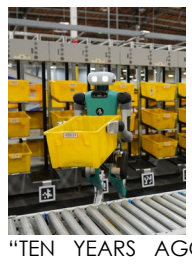


"Recent efforts to improve on the openness and transparency in science have already begun paying off towards greater integrity in the way researchers do and report science. It is now common practice for scientists to pre-register their studies and share openly their materials and data, so that their research is easily available to scientific scrutiny and collaborations.

However, behaviors during data collection are still somewhat of a "black box", especially when done by students. In fact, there are plenty of questionable and even fraudulent behaviors, such as telling participants the specific hypotheses of interest before starting the study or even instructing them to answer in a certain way, which are almost impossible to detect."

ROBOTICS

Humanoid Robots Are Getting to Work



"TEN YEARS AGO, at the DARPA Robotics Challenge (DRC) Trial event near Miami, I watched the most advanced humanoid robots ever built struggle their way through a scenario inspired by the Fukushima nuclear disaster. A team of experienced engineers controlled each robot, and overhead safety tethers kept them from falling over. The robots had to demonstrate mobility, sensing, and manipulation—which, with painful slowness, they did.

These robots were clearly research projects, but DARPA has a history of catalyzing technology with a long-term view. The DARPA Grand and Urban Challenges for autonomous vehicles, in 2005 and 2007, formed the foundation for today's autonomous taxis. So, after DRC ended in 2015 with several of the robots successfully completing the entire final scenario, the obvious question was: When would humanoid robots make the transition from research project to a commercial product?

The answer seems to be 2024, when a handful of well-funded companies will be deploying their robots in commercial pilot projects to figure out

SUSTAINABLE ARCHITECTURE

The Paradox of Sustainable Architecture: Durability and Transience

"To convey the might and prestige of their empire, the Romans constructed enduring architecture as symbols of their long-lasting reign. Emperors employed grand public works as assertions of their status and reputation. Conversely, Japanese architecture has long embraced ideas of change and renewal, evident in the ritualistic rebuilding of Shinto shrines. A practice, known as shikinen sengu, is observed at Ise Jingu, where the shrine is purposefully dismantled and reconstructed every twenty years. Across the world, philosophies around permanence and impermanence pervaded architectural traditions. Amidst the climate crisis, how do these tenets apply to modern architectural design?"

products, using systems metabolic engineering tools and strategies."

Source: Eurekalert! (25 Dec 2023)

Source: Eurekalert! (28 Dec 2023)

whether humanoids are really ready to get to work."

Source: IEEE Spectrum (30 Dec 2023)

Source: Archdaily (1 Jan 2024)