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Vigyan Setu e-magazine

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Vigyan Setu e-magazine

A quarterly, bilingual e-magazine of Vigyan Setu Foundation®

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Vigyan Setu e-magazine is a quarterly, bilingual publication by Vigyan Setu Foundation that bridges the gap between science and society. Curated with creativity, curiosity, and critical thinking, this e-magazine features insightful articles, creative expressions, and real-world applications of science, technology, and innovation. It aims to nurture scientific temper, celebrate young minds, and spotlight emerging researchers whose work is shaping a sustainable future.

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About the Cover

THE JADUKATA BRIDGE, MEGHALAYA

The Jadukata Bridge, located in the Southwest Khasi Hills district of Meghalaya, is an impressive example of modern engineering, spanning the Kynshi River, also known as Jadukata River. It is a single-span cantilever bridge with a central span of approximately 140 meters, making it one of the longest span cantilever bridges in India. The bridge, constructed using prestressed concrete, is designed to withstand the region's challenging terrain and heavy monsoon rains.

It plays a crucial role in connecting the remote areas of Meghalaya to the rest of the state, facilitating trade, transportation, and movement, especially along the crucial routes leading to the Indo-Bangladesh border. Surrounded by lush forests and steep hills, the Jadukata Bridge is not only a vital infrastructure project but also a striking landmark, blending technical ingenuity with the region's natural beauty.

***Photo credit*: Google images**

From the Editor's Desk

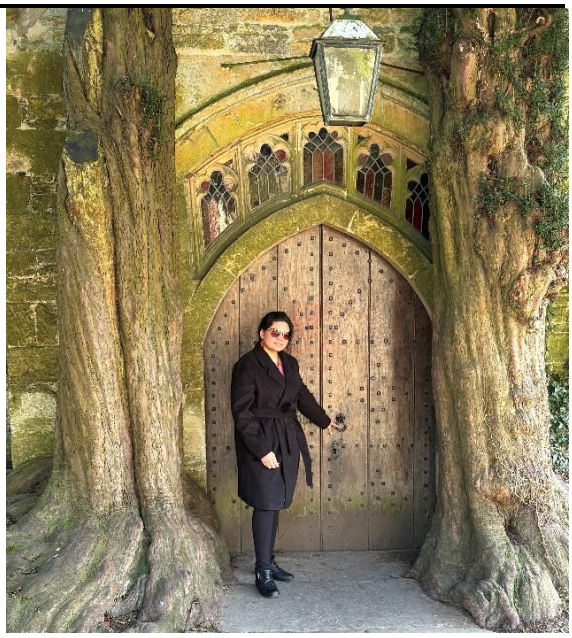
Dr. Neha Sharma

"We keep moving forward, opening new doors, and doing new things, because we're curious and curiosity keeps leading us down new paths." – Walt Disney

A new year brings brand new ideas and avenues to explore. I would like to take this opportunity to welcome and introduce our new editorial team, who have collaborated to bring out this year's issues of VIGYAN SETU e-magazine as a grand success! So here is presenting you the 1st Issue of the 5th Year of VSF's (Vigyan Setu Foundation®) quarterly, bilingual e-magazine carrying articles, write-ups, and news around the globe, anecdotes, poems, puzzles and much more to sensitize you, amuse you, and make you aware of how Science is a Way of Life.

This issue introduces a trending topic of data centres and the possibility of these being submerged underwater by Dr Punit Kumar and Dr Sanjeev Kumar Varshney. Fireflies (Jugnu) are diminishing at an alarming rate has been highlighted by our Hindi subject expert, Mr. Gaurishankar. We then get to explore Science Tourism in J&K through our write-up through vivid the perspective of Mr. Mir.

An interesting scientific poem in Hindi has been shared by esteemed poetess who goes by her pen name Radhika. Dr Mohapatra has reported her lessons learnt from the national seminar on the Future of Camels in India. Ancient to modern science has been expressed by Dr Sen in the Hindi article on Time Dilation. Dr Balwan has shared an expert article on the advances and scope of AI in Animal Science.



Two beautiful poetries in Hindi and English on science and society have been shared by our young writers! While Etisha Parmar has touched our hearts through an article on compassion towards companion animals.

In this e-magazine, for the science driven organization, we introduce Himalayan Pastoral Trust and their initiatives, covered by its founder, Mr. Sulaiman.

Lastly, this issue concludes with a Call for Nominations for a special supplement featuring *"Rising Stars of Viksit Bharat"* — a dedicated space to highlight young researchers whose innovations and contributions are shaping a better future. Further details can be found in the flyer.

We are very grateful to our contributors for sharing a piece of their expertise and the overall efforts and support of the editorial team, without whom none of this would be worth the quality time of our readers.

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Dr Neha Sharma is an experienced acoustic engineer specialising in building and environmental acoustics. She has undertaken post graduate research in physical and material acoustics. Her doctoral studies focused on exploring the acoustic capability of sustainable materials by effective characterisation, modelling, and experimental approaches. Along with her interest in scientific endeavours, she also carries competence in Innovation, Management and Leadership.

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Submerged Data Centres:

Exploring the Potential of Underwater Data Infrastructure

Dr Punit Kumar and Dr Sanjeev Kumar Varshney

The exponential growth of digital data, coupled with the increasing demand for computing power, has fuelled the proliferation of data centres worldwide. These data centres are the backbone of the digital age, supporting the storage, processing, and distribution of vast amounts of information that drive our interconnected world.

As the demand for data continues to grow exponentially, so does the need for innovative solutions to address the challenges of energy consumption, land use, and environmental impact associated with traditional data centre infrastructure. In recent years, the concept of submerged data centres, also known as underwater data centres, has emerged as a promising alternative that offers unique advantages in terms of energy efficiency, cooling, and environmental sustainability. Let's explore the potential of submerged data centres, examining their design principles, operational benefits, challenges, and implications for the future of data infrastructure.

Submerged data centres involve the deployment of server racks and associated infrastructure within specially designed underwater enclosures or modules submerged in bodies of water such as oceans, lakes, or reservoirs. These submerged facilities leverage the natural properties of water, such as its high thermal conductivity and ability to absorb heat, to provide efficient cooling for the enclosed hardware. By harnessing the ambient temperature of the surrounding water, submerged data centres can significantly reduce the energy consumption required for cooling, which accounts for a significant portion of the total energy usage in traditional data centres. Additionally, the underwater environment offers opportunities for renewable energy integration, such as tidal, wave, or hydroelectric power generation, further enhancing the sustainability of submerged data infrastructure.

Submerged data centres are designed to withstand the harsh conditions of underwater environments, including pressure, corrosion, and marine life. The enclosure housing the server racks is typically constructed from corrosion-resistant materials such as stainless steel or composite materials, with sealed compartments to prevent water ingress and ensure buoyancy. The server racks themselves are equipped with waterproof casing and cooling systems optimized for underwater operation, utilizing liquid cooling or direct water immersion to

dissipate heat efficiently. Power supply and networking infrastructure are also adapted for underwater deployment, with redundant systems and protective measures to ensure reliability and data integrity.

Submerged data centres offer potential environmental benefits beyond energy efficiency and renewable energy integration. By locating data infrastructure underwater, these facilities can alleviate the pressure on land resources and reduce land use conflicts associated with the construction of conventional data centres. Further, submerged data centres have the potential to serve as artificial reefs or marine habitats, providing shelter and substrate for marine life and contributing to ecosystem restoration and conservation efforts. However, it is essential to carefully assess the environmental impacts of submerged data centres, including potential effects on water quality, marine biodiversity, and coastal ecosystems, to ensure responsible and sustainable deployment.

Several pioneering projects and research initiatives have been undertaken to explore the feasibility and viability of underwater data centres. One of the most notable experiments is Microsoft's Project Natick, which involved deploying a prototype underwater data centre off the coast of Scotland. The team proved that the underwater data centre concept was feasible during a 105-day deployment in the Pacific Ocean in 2015. Phase - II of the project included contracting with marine specialists in logistics, ship building and renewable energy to show that the concept is also practical. In this phase, the project Natick team deployed the Northern Isles data centre, 117 feet deep to the seafloor in 2018. The submerged data centre, housed in a cylindrical steel container, was equipped with servers, cooling systems, and renewable energy sources such as tidal turbines and solar panels. The project aimed to assess the performance, reliability, and environmental impact of underwater data infrastructure in real conditions.

Underwater data centre company Highlander deployed a commercial facility in the sea near Hainan Island, China in November 2023. The 1,300-tonne system was submerged, 35 meters underwater and used the sea to cool its computers. While specifics were not shared, the company said that the module can process more than four million high-definition images within 30 seconds, ‘equivalent to 60,000 traditional computers working simultaneously’. Highlander hopes to eventually deploy 100 such modules at the site, which it says would save 68,000 square meters of land, along with 122 million kilowatt hours of electricity and 105,000 tons of freshwater per year.

Another notable initiative is the European Marine Energy Centre (EMEC) in Orkney, Scotland, which serves as a test bed for renewable energy technologies, including tidal and wave power. EMEC has partnered with data centre operators and technology providers to explore the integration of data centres with marine renewable energy systems, leveraging the abundant energy resources available offshore.

In addition to these large-scale experiments, academic institutions, research organizations, and technology companies worldwide are conducting experiments and simulations to study

various aspects of underwater data centres, including hydrodynamics, thermal management, corrosion resistance, and environmental impact. These experiments involve computational modelling, laboratory testing, and field trials to evaluate different design configurations, materials, and operational strategies for submerged data infrastructure.

Underwater data centres offer several potential benefits compared to traditional land-based facilities, driven by their efficient cooling, renewable energy integration, and reduced environmental footprint. By leveraging the cold and stable temperatures of the ocean, submerged data centres can achieve efficient cooling without the need for energy-intensive air conditioning systems, resulting in significant energy savings and operational cost reductions. Moreover, the underwater environment provides opportunities for renewable energy integration, such as tidal, wave, or ocean thermal energy conversion (OTEC), which can further enhance the sustainability of data infrastructure.

Another advantage of underwater data centres is their potential to reduce land use conflicts and environmental impact associated with land-based facilities. By locating data infrastructure offshore or in underwater environments, submerged data centres can alleviate the pressure on land resources, mitigate the visual and environmental impact of data centre facilities, and contribute to ecosystem conservation and restoration efforts.

However, to become practical at scale, underwater data centres would need to overcome some steep challenges, including:

Hardware maintenance: Probably the biggest challenge of underwater data centres is maintaining hardware. When a server or disk drive needs to be replaced, sending personnel underwater to do the work, or hauling the data centre to the surface is exponentially more difficult than with land-based data centres. Robotic automation could help mitigate this challenge, but until that technology matures, most data centre maintenance will still need to be handled by humans.

Network connectivity: The only feasible way to ensure high performance network connectivity for underwater data centres is to connect them to network cables. That's doable but expensive, especially for underwater data centres located far from the shore.

Physical security: In some respects, underwater data centres are super secure against physical intruders, because it would be exceptionally difficult for trespassers to break into them unnoticed. On the other hand, underwater data centres could be prone to attacks by terrorists or nation state actors, who are likely to find it easier to target a facility located at the bottom of the sea than one on defensible dry territory.

Energy sourcing: While sourcing energy from renewable offshore sources is attractive, these sources aren't always reliable. Offshore wind farms stop working on calm days, for example, and ocean currents may shift, idling generators that depend on them. Underwater data centre engineers would need to develop backup

power sources to make these data centres reliable.

Maintaining optimal physical conditions: The maintenance of temperature for underwater data servers at sea depth presents a major challenge. The equipment must withstand high pressure, which can affect cooling mechanisms. Efficient heat dissipation of heat in an environment with limited convection is complex. Moreover, preventing corrosion from saltwater requires robust materials and protective measures.

Seismic activities: Seismic activities pose significant challenges to underwater data centres. Earthquakes can damage the physical structure, leading to potential leaks or collapses. Seismic vibrations can disrupt the functioning of delicate electronic components and cooling systems.

Impact on marine ecology: Waste heat from data centres can alter local water temperatures, affecting marine life sensitive to temperature changes. Potential leaks of cooling fluids or other chemicals can pollute the marine environment. Operational noise from cooling systems and other machinery can disturb marine animals, particularly those reliant on echolocation. The installation and presence of data centres can also disrupt seabed habitats, affecting benthic organisms and the overall ecosystem. Equipment and power cables may generate electromagnetic fields that can interfere with navigation and communication of certain marine species.

The concept of submerged data centres represents a paradigm shift in data infrastructure design and operation, offering a scalable, sustainable, and resilient solution for meeting the growing demand for digital services while minimizing environmental impact. As technology advances and experience grows, submerged data centres are expected to become increasingly viable and attractive options for data storage and processing, particularly in coastal regions and areas with abundant water resources. Moreover, the lessons learned from submerged data centre projects can inform the development of innovative approaches to sustainable infrastructure deployment and management across various sectors, contributing to a more resilient and interconnected world.

Submerged data centres hold significant promise as a novel approach to addressing the challenges of energy consumption, land use, and environmental impact associated with traditional data centre infrastructure. By leveraging the natural properties of water and integrating renewable energy sources, submerged data centres offer efficient cooling, reduced energy consumption, and enhanced sustainability compared to land-based facilities. While challenges remain, ongoing research, development, and deployment efforts are advancing the feasibility and viability of submerged data centres as a key component of the future data infrastructure landscape. As we navigate the digital transformation era, submerged data centres have the potential to play a transformative role in shaping a more sustainable and resilient digital future for generations to come.

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विलुप्त हो रहे दिप-दिप करते जुगनू

गौरीशंकर वैश्य विनम्र

दुनिया में अलग - अलग प्रकार के अनेक जीव - जन्तु हैं। प्रत्येक की अपनी विशेषता होती है। कुछ जीव गाँव और शहर दोनों स्थानों पर दिखते हैं, तो कुछ जीव केवल गाँव और झाड़ी - जंगलों में दिखाई देते हैं। ऐसे ही जीवों में हम सभी का जाना - पहचाना एक कीट है जुगनू (लाइटिंग बग या फायरफ्लाई)। जुगनू नर्म और नम क्षेत्रों में पाए जाते हैं। वे ऊष्णकटिबंधीय क्षेत्रों के साथ स्थानों में भी पनपते हैं। वे झीलों, नदियों, मैदानों और तालाबों के पास जंगलों, खेतों और दलदलों में पनपते हैं।

एक समय था, जब गाँवों में किसी प्राकृतिक जगह पर बड़ी आसानी से जुगनुओं का पूरा झुंड का झुंड देखने को मिल जाता था। आसपास झाड़ियों में रात में दिप - दिप करते जुगनू सबके मन में सहज ही कौतूहल पैदा कर देते थे, किन्तु अब जैसे सब बीते दिनों की बातें हो गई हैं।

पर्यावरण प्रदूषण का प्रभाव सम्पूर्ण प्रकृति पर पड़ रहा है, इसलिए जुगनू भी अब कभी-कभी ही दिखते हैं। अब जुगनू कीट दुनियाभर में लगभग विलुप्तप्राय की श्रेणी में आ चुके हैं। इन्हें प्रकृति ने चमकने की कला दी है, जिसके पीछे अपना कारण और विज्ञान होता है। ये किसी बिजली के नन्हें बल्ब की तरह जलते - बुझते रहते हैं। लोगों को,विशेषतः बच्चों को इन्हें दिप - दिप करते हुए देखना अधिक पसंद है।

दुनिया में जुगनुओं की लगभग २००० प्रजातियाँ हैं। चिन्ता की बात है कि अब वे लगातार गायब हो रहे हैं। ऐसा इसलिए है कि हमारा वातावरण तेजी से बदल रहा है और यह जुगनुओं के अस्तित्व के लिए ठीक नहीं है। आपको यह जानकर आश्चर्य होगा कि दुनियाभर में जितने भी कीट - पतंगे हैं, उनमें जुगनुओं की भागीदारी लगभग ४० प्रतिशत है ।

क्यों चमकते हैं जुगनू?

वैज्ञानिकों के शोध के अनुसार, जुगनू हमारे ग्रह पर डायनासोर के युग से हैं। ये विचित्र कीट हैं, क्योंकि इनके पेट में प्रकाश उत्पन्न करने वाला पदार्थ होता है। जुगनू अपने पेट में ल्यूसिफेरिन नामक प्रोटीन के कारण चमकता है। ल्युसिफेरिन नामक एंजाइम और मैग्नीशियम आयनों 'एडेनोसिन ट्राइफॉस्फेट' नामक रसायन जब कोशिकाओं से आक्सीजन ग्रहण करते हैं,तो एक रासायनिक अभिक्रिया होती है और जुगनू चमकने लगते हैं। इस प्रक्रिया को 'बायोल्यूमिनीसेंस' कहते हैं। इस प्रकाश में गर्मी न के बराबर होती है। रासायनिक अभिक्रिया की लगभग सौ प्रतिशत ऊर्जा प्रकाश बन जाती है।

जुगनू और दीप्तकीट कोलियोप्टेरा संघ के लैंपिरिडी परिवार के जीव हैं। यह ग्रीक शब्द 'लैम्पेन' से आया है, जिसका अर्थ है - चमकना। ये वास्तव में भृंग हैं। दीप्तकीट (ग्लो वर्म) एक पंखहीन कृमि जैसी प्रौढ़ मादा या लार्वे होते हैं। जुगनू बहुत छोटे और पंखयुक्त नर होते हैं। ये दोनों भारत के अलग - अलग भागों में पाए जाते हैं, किन्तु नम ऋतु में मैदानों में, विशेष रूप से छोटी - छोटी-छोटी पहाड़ियों वाले नम क्षेत्रों में बहुत होते हैं। ये अंटार्कटिका को छोड़कर सभी महाद्वीपों में ये पाए जाते हैं। इन्हें हिन्दी में 'जुगनू,', संस्कृत में 'खद्योत ', बंगाली में 'जोनाकी पीका' और असमिया में 'जोनाकी पोरुआ' कहा जाता है।

चमकने का प्रयोजन

जुगनू से निकलने वाला प्रकाश फीका, हरापन लिए हुए कुछ सफेद , पीला और लाल रंग से मिश्रित होता है। स्विच खोलते ही प्रकाश तेजी से फैल जाता है, किन्तु स्विच बंद किए जाने पर अपेक्षाकृत धीरे-धीरे मंद होता हुआ मिटता है। यह रात्रिचर प्राणी है।जुगनुओं का यह व्यवहार बताता है कि उनकी हर चमक अपने 'साथी 'को तलाशने और आकर्षित करने के लिए प्रकाशीय संकेत होता है। ये रात में भोजन की तलाश में भी चमकते हैं। नर और मादा की शारीरिक बनावट में अंतर होता है। नर जुगनू के शरीर पर दो पंख होते है, इसलिए वे उड़ते हुए चमकते हैं। मादा जुगनू के शरीर पर पंख नहीं होते, इसलिए वे एक ही स्थान पर चमकते रहते हैं। जुगनू के अंडे भी चमकते हैं, लेकिन दिन के समय अधिक प्रकाश होने के कारण उन्हे हम देख नहीं सकते।

जुगनू अपनी रक्षा करने में स्वयं सक्षम

इनकी चमक से आकर्षित होकर छिपकली जैसे जीव इन पर आक्रमण करते हैं. तो ये रक्त की बूँदें उत्पन्न करते हैं। इसके रक्त में ल्युसिबुफैगिन्स नामक एक रक्षात्मक स्टेरॉयड होता है,जो संभावित शिकारियों के लिए उन्हें अप्रिय बनाता है। एक बार जब शिकारी उन्हें काट लेते हैं, तो वे अप्रिय स्वाद को जुगनू की चमक से जोड़ देते हैं और वे बिजली के कीड़ों पर हमला करने से बचते हैं।

स्वस्थ पर्यावरण का संकेत हैं जुगनू

ये तारों की भाँति टिमटिमाते नन्हें जीव स्वस्थ जीवन का संकेत देते हैं। यदि ये जीव आपके आसपास रह रहे हैं,तो समझ लेना चाहिए कि जहाँ आप रह रहे हैं, वहाँ का वातावरण जीने योग्य है। वस्तुतः जुगनू बदलते वातावरण के प्रति बहुत अधिक संवेदनशील होते हैं। यह जीव वहीं जीवित रह सकते हैं, जहाँ शुद्ध वातावरण हो , भूमि कीटनाशकों के प्रभाव से मुक्त हो, प्रकाश प्रदूषण से मुक्त हो और पानी में विषैले रसायनों का मिश्रण न हो। इस प्रकार ये छोटे से जीव हमें

कैंसर जैसी मृत्युदायक बीमारी से भी बचा सकते हैं।

वर्ष २०१५ में नेचर कम्युनिकेशन में एक लेख प्रकाशित हुआ था, जिसमें कहा गया था कि स्विट्जरलैंड के कुछ वैज्ञानिकों ने जुगनुओं को चमकने में मदद करने वाले प्रोटीन को एक केमिकल में मिलाकर जब इस मिश्रण को एक ट्यूमर वाली कोशिका से जोड़ा गया, तो वह चमक उठा।

जुगनू से संबंधित कुछ रोचक तथ्य

जुगनू के लार्वा मांसाहारी होते हैं। यह मृदु घोंघों को खाता है और प्रतिदिन लगभग आधा दर्जन घोंघे चट कर जाता है। घोंघे को अपनी टांगों से मजबूती से पकड़ कर दीप्तकीट इसकी पीठ पर चढ़ जाता है और इसके मांस को टुकड़े - टुकड़े करके भक्षण करता है। ऐसा करते समय वह अपना प्रकाश बंद रखता है। ये कीड़े, स्लग और मच्छरों को भी खाते हैं। ये कीड़ों को सुन्न करने वाले रसायन का इंजेक्शन लगाकर खाते हैं। कुछ वयस्क जुगनू फूलों का पराग खाते हैं तथा कुछ वयस्क दूसरे जुगनू को खाते हैं। दीप्तकीट जमीन पर होते हैं, जबकि जुगनू पेड़ों पर इस प्रकार उड़ते हैं, जैसे रात को आकाश में असंख्य तारे जगमगाते हैं।

कोटुरिस मादा जुगनू दूसरी प्रजाति के नर जुगनू को खाना पसंद करती हैं। यदि कोई जुगनू पालना चाहे,तो उसे चीनी, पानी और फूल खिला सकता है।

जुगनुओं के बड़े समूह कभी-कभी एक साथ या एक समय ही पलकें झपकाते हैं।

जुगनुओं का औषधीय और वैज्ञानिक महत्व

जुगनुओं से प्राप्त रसायनों को रोगग्रस्त कोशिकाओं में इंजेक्ट किया जाता है, तो वे कोशिकाओं में होने वाले परिवर्तनों का पता लगा सकते हैं, जिनका उपयोग कैंसर से लेकर मांसपेशियों की दुर्बलता तक कई बीमारियों का अध्ययन करने के लिए किया जाता है।

जुगनू के रसायनों से बने इलेक्ट्रॉनिक डिटेक्टरों को अंतरिक्ष यान में लगाया जाता है, जिससे बाहरी अंतरिक्ष में जीवन का पता लगाया जा सके, साथ ही धरती पर खाद्य - पदार्थों की खराबी और बैक्टीरिया के संक्रमण का भी पता लगाया जा सके।

मानव बन गया है इनका शत्रु

देहरादून स्थित वाइल्ड लाइफ इंस्टीट्यूट आफ इंडिया (डब्ल्यूआईआई) में वरिष्ठ वैज्ञानिक रहे वी. पी. उनियाल के अनुसार - "मैंने डब्ल्यूआईआई परिसर में जुगनुओं की आबादी को तेजी से घटते हुए देखा है। "आज यह स्पष्ट है कि बहुत से स्थानों से जुगनू गायब हो चुके हैं। जुगनुओं की संख्या कई कारणों से कम हो रही है। इनमें बढ़ता शहरीकरण एक प्रमुख कारण हो सकता है।

गाँव में तेजी से पेड़ कट रहे हैं, जिन क्षेत्रों में कभी घास और झाड़ियाँ उगा करती थीं, उन्हें अब तेजी से साफ किया जा रहा है। यह जुगनुओं का घर था। वर्ष २०१८ में इकोलॉजी एंड इवोल्यूशन की एक रिपोर्ट प्रकाशित हुई थी, जिसमें बताया गया था कि प्रकाश प्रदूषण के कारण जुगनू रास्ता भटक रहे हैं, यहाँ तक कि वे इससे अंधे तक हो सकते हैं। वे एक-दूसरे का प्रकाश नहीं देख पाते। इससे अप्रत्यक्ष रूप से उनका जैविक चक्र प्रभावित होता है, क्योंकि ऐसी स्थिति में वे अपना साथी नहीं खोज पाते। वास्तव में घने पेड़ और झाड़ियाँ इन्हें प्रकाश प्रदूषण से बचाती हैं, जो लगातार काटने से घट रहे हैं। खेतों में कीटनाशकों के अंधाधुंध प्रयोग ने भी जुगनुओं के अस्तित्व के सम्मुख संकट खड़ा कर दिया है। जुगनू अपने जीवन का बड़ा हिस्सा लार्वा के रूप में जमीन, जमीन के नीचे या पानी में बिताते हैं। यहाँ उन्हें कीटनाशकों का खतरा रहता है और इसी के साथ समाप्त हो रहा है सितारों की तरह धरती पर जगमग करने वाले जुगनुओं का संसार।

परागण पर पड़ा है दुष्प्रभाव

जुगनू जलवायु परिवर्तन का संकेत देते हैं। ये प्रकृति - मित्र भी कहे जा सकते हैं, क्योंकि ये परागण प्रक्रिया में भी सहायक हैं। पर्यावरण अध्ययन संबंधित रिपोर्ट बताती हैं कि वैश्विक स्तर पर जलवायु की स्थितियाँ बदलने के कारण जुगनुओं के प्राकृतिक आवास सिकुड़ रहे हैं और इनकी वृद्धि कम हो रही हैं। वसंत ऋतु में जुगनुओं का बाहुल्य होता था, किन्तु वर्ष २०१६ में साइंस में प्रकाशित एक १२ वर्षीय अध्ययन बताता है कि जलवायु परिवर्तन के कारण अब वसंत ऋतु के गर्म होने से जुगनू नहीं दिखाई पड़ रहे हैं। जुगनू ऐसे समय गायब हो रहे हैं, जब दुनियाभर में कीट - पतंगों की संख्या काफी घट चुकी है। इससे एक तरफ परागण में कमी का खतरा उत्पन्न हो गया है, दूसरी ओर फसलों को नुकसान पहुंचाने वाले कीटों की संख्या में वृद्धि होगी, इससे खाद्य - असुरक्षा और फलों के कम उत्पादन की स्थिति का सामना करना पड़ सकता है।

कीट - पतंगों को विलुप्त होने से बचाने के लिए खोजना होगा समाधान

'नेचर क्लाइमेट चेंज ' में प्रकाशित एक शोध के अनुसार, आने वाले ५० से १०० वर्षों में पृथ्वी पर मौजूद तमाम कीट - पतंगों की ६५ प्रतिशत संख्या विलुप्त हो सकती है। इस शोध में बताया गया कि सब कुछ तेजी से बदलते जलवायु के कारण हो रहा है। गंभीर जलवायु परिवर्तन के कारण ऊष्मीय दबाव बढ़ रहा है, जिससे कीट - पतंगों की संख्या स्थिर हो रही है और इससे इनके विलुप्त होने के खतरे और भी बढ़ गए है। अतः जलवायु परिवर्तन और पर्यावरण प्रदूषण को सुधारने के लिए सम्पूर्ण विश्व को मिलजुल कर जुटना होगा। इसमें और विलम्ब करना समस्त मानव जाति के लिए घातक होगा।

गौरीशंकर वैश्य विनम्र
११७ आदिलनगर, विकासनगर,
लखनऊ २२६०२२
दूरभाष ०९९५६०८७५८५

Science Tourism in Jammu and Kashmir

Mr Hilal Ahmad Mir

Scientific tourism is conceived as a bridge between the world of science and tourism

Science tourism refers to a type of travel where people visit destinations primarily to learn about science, explore scientific landmarks like museums, laboratories, observatories, and universities, or participate in scientific events like observing a solar eclipse, essentially combining tourism with the pursuit of scientific knowledge, and understanding. It can also include opportunities to engage in hands-on scientific research depending on the location and program offered.

Key points about science tourism:

1.Focus on learning: The primary goal is to gain scientific knowledge through visits to research facilities, exhibitions, and interactive experiences.

2.Diverse attractions: This can include visiting historical scientific sites, natural phenomena like geological formations, wildlife observation areas, and even participating in citizen science projects.

3.Educational aspect: Science tourism aims to educate the public about scientific concepts and current research happening in different fields.

4.Potential for engagement: Some programs allow tourists to actively participate in scientific research, like data collection or assisting with experiments.

Examples of science tourism activities:

A. Visiting a planetarium to learn about astronomy

B. Taking a tour of a marine research centre to observe marine life

C. Exploring a geological park to see unique rock formations

D. Attending a science festival or conference

E. Visiting a historical scientific site like the birthplace of a famous scientist.

Scientific tourism is conceived as a bridge between the world of science and tourism, bringing together inhabitants of the territories and their visitors, of all nationalities and cultures, motivated by the advancement of human knowledge. This tourism is based on the scientific method and the advancement of knowledge to contribute to the understanding and resolution of environmental and social challenges of territories attractive for tourism.

Science tourism is a niche form of travel that focuses on the exploration and appreciation of scientific and technological landmarks, research facilities, and natural phenomena. It enables travellers to engage with scientific concepts, participate in educational activities, and gain a deeper understanding of the natural world and human innovation.

Key aspects of science tourism include:

1. Educational Experiences: Travelers often visit museums, interactive science centres, planetariums, and research institutions to learn about scientific principles in an engaging way.

2. Natural Phenomena: Some science tourism focuses on natural wonders, such as geological formations, astronomical events, or ecosystems, where visitors can observe and learn about the science behind these phenomena.

3. Field Research and Ecotourism: This type of tourism may include opportunities to participate in field research or conservation efforts, allowing travellers to assist scientists and understand ecological and biological processes.

4. Technological Sites: Visits to significant technological landmarks, such as space centres, laboratories, and factories, where visitors can learn about the latest advancements and their implications.

5. Workshops and Courses: Some science tourism experiences might offer hands-on workshops or classes led by experts in various scientific disciplines.

Science tourism promotes curiosity, education, and an appreciation for the complexities of the natural and technological world, often combining leisure with learning.

The evolution of tourists' motivations and behaviours has promoted the emergence of new approaches to tourism, diverging from the traditional sun and beach, and mass tourism. A market niche whose main motivation for travel is scientific knowledge and, above all, the interest in participating or collaborating in scientific studies of various disciplines, has shaped what is currently known as Scientific Tourism (ST). Successful ST contains all the attributes of ecotourism in addition to human capital as a key factor and, in some cases, high-level technical equipment. Opportunities for ST have emerged across diverse disciplines and in the different stages of the methodological process of research, creating tourism experiences that attract a variety of interests.

There are four main categories of ST:

1.Cultural Trips, which contain a scientific element and focus mainly on the transmission of knowledge.

2.Scientific Expeditions, such as adventure travel, expeditions and sport trips with a scientific purpose.

3.Eco-Volunteering, which focuses on the participation of non-scientists or trainees in ongoing research processes.

4.Scientific Research, where the approach is purely scientific production but with a component of knowledge transmission and research processes by members or participants associated with the project.

DACHIGAM NATIONAL PARK

Dachigam National Park is in the Zabarwan Range of the Western Himalayas. It is the highest elevated reserve of India and best known for Hangul deer.

Dachigam National Park is the northernmost reserve of India which is located 22 km from Srinagar (Jammu and Kashmir) and highest elevation reserve. Dachigam was named after the ten villages that were relocated to make way for this park. The park is divided into two sections known as the Upper and Lower Dachigam sectors and it is best known for being the home of the Hangul deer. Since 1910, this park has been a protected area, initially under the supervision of the Maharaja of Jammu and Kashmir and then under the relevant government authorities and in 1981, it was upgraded and designated as a National Park.

This National Park is home to a number of lakes, rivers, flowery meadows, waterfalls, and dense coniferous forests. Its appearance changes with the change of season. In the winter, temperature goes below zero degree Celsius, and the park is covered in a white snow, while in the spring, the park's main attraction is its blossoming flowers and fruit trees. In the summer, temperature reaches to 14 degrees Celsius, leading to melting of snow, revealing waterfalls and streams. As autumn approaches, the leaves of the trees change to vibrant hues of red, gold, yellow colour. Throughout the year, Dachigam National Park remains unpolluted and colourful. The Dagwan River, flows from Marsar Lake, is a well-known fishing spot.

Topography

Zabarwan Range of the Western Himalayas is home to Dachigam National Park. Its topography ranges from 5,500 to 14,000 ft above sea level. Because of the wide range of terrain, the park is divided into uneven sections, with terrain ranging from gently sloping grasslands to sharp cliffs. A portion of the park lies above the treeline, where its beauty is enhanced by rocky mountains and crevices.

Climate

The temperature in Dachigam National Park remains moderate throughout the year. Summers in Dachigam are short lived and snowfall lasts the entire winter season. Temperatures begin to rise in April and continue to rise until June. Light showers are common in July and August. In the summer, the maximum and minimum temperature ranges from 14 to 8 degrees Celsius respectively. In the winter, the maximum temperature rises to only 4 degrees Celsius, with a minimum temperature of about -2 degrees Celsius. The month of December marks the beginning of snowfall.

Flora

Dachigam National Park contains approximately 500 species of herbs, 50 species of trees, and approximately 20 species of shrubs. This park is lush with flowers, greenery, meadows, and grasslands, apart from the winter season when it is covered with snow. The scenic beauty portrayed by blue poppy flowers is a sight to behold. Pear, Apple, Chestnut,

Walnut, Willow, Oak, Poplar, Birch, Chinar, Pine, Peach, Apricot, and Elm trees adorn the park. Some of the main tree species are *Pinus graffiti, Abies pindrow, Morus alba, Ulmus wallichiana, Betula utilis, Salix spp, Populus spp, Prunus armeniaca, Quercus robur, Aesculus indica* etc. Prominent shrub species found here are *Berberis spp, Desmodium tiliaefolia, Indigofera heterantha, Parrotiopsis jacquemontiana* etc.

Fauna

Dachigam National Park is famous for the Hangul also known as Kashmir Stag. They can be easily spotted in the winter, when they congregate in the lower valleys. Some of the important mammal species found in Dachigam national park are Kashmiri Stag, Musk Deer, leopards, Himalayan Grey Langurs, Leopard Cats, Himalayan Black Bear, Himalayan Weasel, Yellow-throated Martens, Jungle Cat, Long Tailed Marmots, Yellow-throated Marten, Jungle Cat, Himalayan Brown Bear, The Otter, Himalayan Fox, Serow etc. There are also numerous rare birds such as Black Bulbuls, Cinnamon sparrows, Himalayan Monals, Kashmir Flycatchers, and colourful pheasants such as the crimson tragopan, iridescent monal pheasant, blood pheasant, and koklass pheasant.

Dachigam National Park is in the Himalayan Mountain range and is adorned with natural beauty. This park is teeming with beautiful animals and fruit bearing trees. This is a place where one can experience beautiful scenery beyond imagination. The Park is well-known for its diverse wildlife and bird species and is home to the world's last viable Hangul population. Large part of the park is covered with coniferous forests and the mountainside is densely forested with wild trees. It is home to more than 500 species of herbs, 50 species of trees, and approximately 20 species of shrubs.

It was designated as a Wildlife Sanctuary in 1951 and in 1981, it was declared as a National Park.

OVERA-ARU WILDLIFE SANCTUARY PAHALGAM

The Overa-Aru Wildlife Sanctuary is situated near Pahalgam, one of the districts in Jammu and Kashmir. The sanctuary is spread in a wide area, and it covers more than 500 sq. km. Those who are planning to visit this place can visit the mountains in this area, and if we talk about the height of those peaks then they are up to 5,400 m. The sanctuary is home to rare and endangered species such as the musk deer, brown bear and snow leopard. These species are conserved by the state and the central government. Tourists from different parts of the country visit his place for the sight of such beautiful and exotic species of birds and animals. If you ever plan to visit Kashmir, then you must visit this wildlife sanctuary for the everlasting experience.

Ideal for: Family and friends

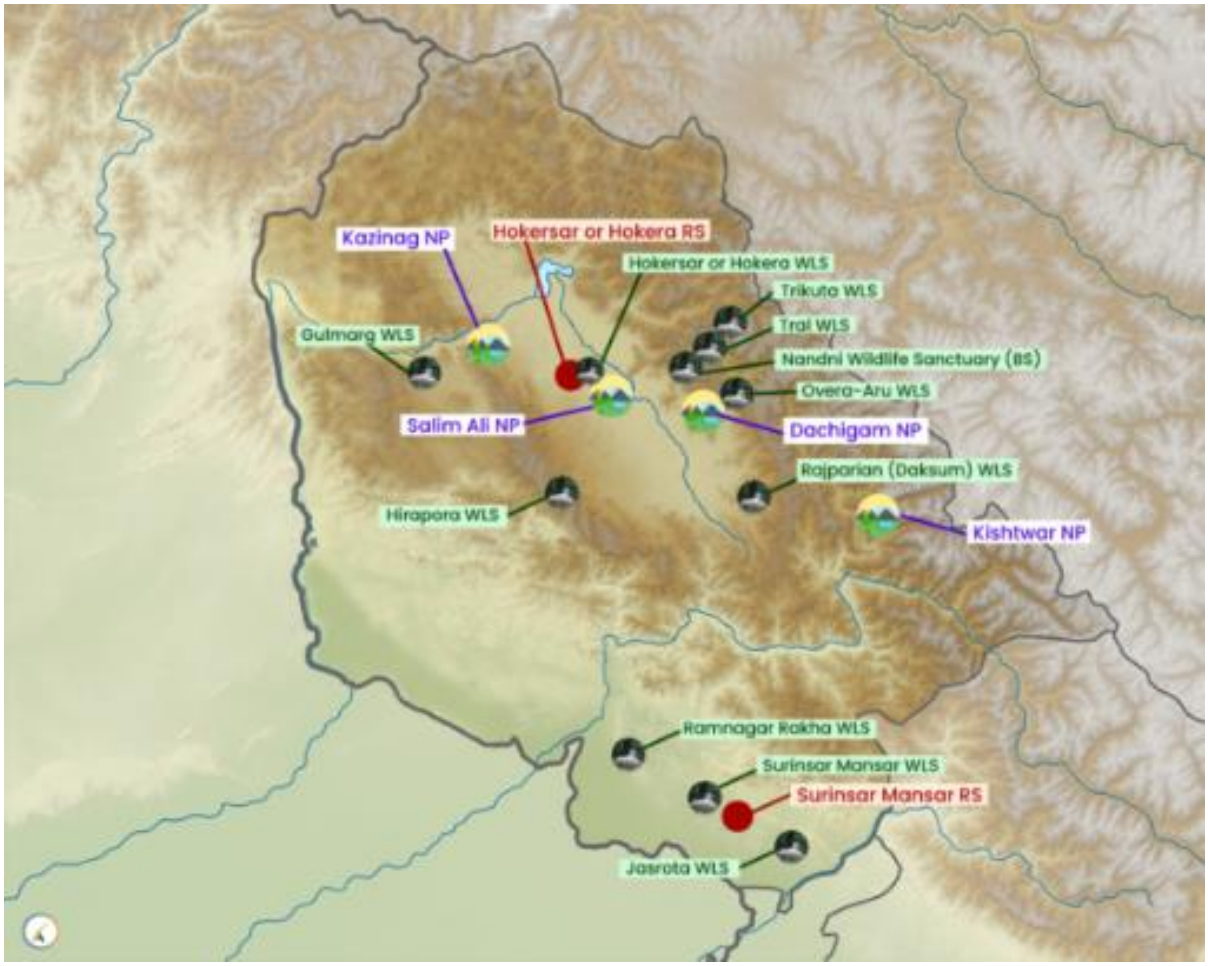
Ideal trip duration: 2-4 hours

Location: Forest Block, Jammu and Kashmir 192126

Best time to visit: May to August

How to reach: By road transport

In Jammu & Kashmir there are various botanical Gardens; biological museums, national parks, wildlife sanctuaries that contributes tourism rather attracts the tourists to visit such awesome destinations. In district Anantnag there exists many botanical Gardens and wildlife sanctuaries that are famous in the world for their immense natural setting and scenic beauty. Botanical Garden Kokernag Botanical Garden, Verinag Botanical Garden, Achabal and Daksum Wildlife Sanctuary and Pahalgam Wildlife Sanctuary and the likes are those places, tourists love to visit.



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विज्ञान कहमुकरियाँ

राधा गुप्ता 'राधिका'

कहमुकरी लोकभाषा का एक छंद है। विज्ञान संचार को प्रभावी एवं जनव्यापी बनाने हेतु विज्ञान को लोकभाषा से जोड़ना अत्यंत आवश्यक है। कहमुकरी जैसा कि नाम से विदित है " कह कर मुकर जाना" । यह दो सखियों के बीच की बातचीत को दर्शाता है। इसमें चार पंक्तियां होती हैं। कहमुकरी छंद में पहली तीन पंक्तियों में किसी वस्तु के लिए एक पहेली सी होती है जिसका जवाब चौथी पंक्ति में छुपा होता है। चौथी पंक्ति "ए सखि साजन" या "क्यों सखि साजन" से शुरू होती है। अमीर खुसरो ने इस विधा पर बहुत काम किया। उनकी कई कहमुकरियाँ बहुत प्रसिद्ध हैं।

प्रस्तुत है कुछ विज्ञान कहमुकरियाँ –

जिसने मुझको कभी न रोका
जो न देता कभी भी धोखा
अनजान डगर पर रखता ट्रैक
ए सखि! साजन ? "नहि गूगल मैप" ।

मुझे अपनी और वो खींचे
हर वस्तु साधे आँखें मींचे
अद्भुत है उसका आकर्षण
ए सखि! साजन ? नहि "गुरुत्वाकर्षण"।

बिना बात भी वो मुझे हंसाता
सारे दुख पल भर को भुलाता
प्रभाव देख होती सरप्राइज़
ए सखि ! साजन ? नहिं "नाइट्रस ऑक्साइड"।

मुझको मंज़िल पर पहुँचाए
नई राह पर साथ निभाए
विश्वास बड़ा ना उसमे ऐब
ए सखि ! साजन ? नहिं सखि "कैब"।

भरी नींद में मुझे जगाता
ज़िम्मेदारी याद दिलाता
तानें रहता अपनी आर्म
ए सखि! साजन ? नहीं "अलार्म"।

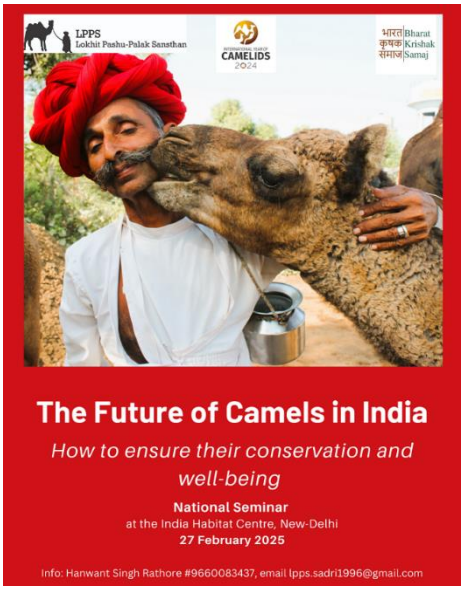
राधा गुप्ता 'राधिका'
एजुकेटर,कवयित्री, विज्ञान संचारिका
ए २ - ९७, जनकपुरी, नई दिल्ली ११००५८

Future of Camels in India –

A report on the National Seminar

Dr Smruti Smita Mohapatra

The FAO (Food and Agricultural Organization) of the United Nations has extended the International Year of Camelids 2024 into 2025. As the camel population in India continues to be threatened, its traditional camel herding communities are losing livelihoods and resources, and ancestral knowledge systems about managing camels in harmony with the fading environment.



Thus, a National Seminar was organized by Lokhit Pashu-Palak Sansthan (LPPS) and the Bharat Krishak Samaj (BKS) on 27 February 2025 at the India Habitat Centre, New Delhi with different stakeholders suggesting innovative ideas and approaches. In the context of the extended International Year of Camelids, this multi-stakeholder national seminar on the Future of Camels in India was attended by the FAO India representative Takayuki Hagiwara. Facilitated by Dr. Nitya Ghotge, papers were presented on the role of camels in livelihoods by vets, researchers, developmental professionals, camel herders, and experts. Dr. Ilse Kohler Rollefson presented the status of the camel in India in a global context. Representatives of the Department of Animal Husbandry and Dairying of the Government of India and Rajasthan were also present, as well as various animal welfare organizations.

A tale of the camel herders themselves, including those from Godwar who supply milk to Camel Charisma Private Limited also shared their views. Kumud Dadlani highlighted the potential of camel products in the culinary arts. The UAE-based Augusta DeLisi presented why she sources cruelty-free camel milk from Rajasthan for Nomadic Nutrition. The head of the Food Division of Fab India talked about the perspectives on camels in the wellness industry. Camel breeders from Rajasthan, Gujarat, and Maharashtra also shared their perspectives. Four working groups on - the promotion of camel milk, the Rajasthan Camel (Prohibition of Slaughter and Regulation of Temporary Migration or Export) Law, involvement of youth for camel herding and conservation of rangelands, and CPR management presented the recommendations on the topics assigned.

Background note on the National Seminar can be accessed here.

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प्राचीन भारतीय ग्रंथों में टाइम डाइलेशन

समय विस्तारण

डॉ दिव्येन्दु सेन

क्या होगा अगर दो जुड़वां भाइयों को अलग अलग गुरुत्वाकर्षण क्षेत्रों में रखा जाये? क्या अन्य ग्रहों या उपग्रहों पर और हमरी पृथ्वी पर रखी परमाणु घड़ियों में समय का अंतर आता है?

वैसे तो समय विस्तारण या टाइम डाइलेशन की भविष्यवाणी अल्बर्ट आइंस्टीन ने अपने सामान्य और विशेष सापेक्षता के सिद्धांत में १९१५ में की थी। अब इसे प्रायोगिक रूप से सिद्ध भी किया जा चुका है किन्तु क्या इसका वर्णन हमारे प्राचीन ग्रंथों में भी देखने को मिलता है ?

क्या है समय विस्तारण?

अलग अलग गुरुत्वकर्षणों के क्षेत्रों में समय अलग अलग गति से गुजरता है, जिसे जर्मनी में पार्टिकल एक्सेलेरेटर (कण त्वरक) के प्रयोगों द्वारा सिद्ध भी किया जा चुका है। इसका परीक्षण वायुमंडल में भी किया गया है। समय विस्तारण का सम्बन्ध वेग से भी है अर्थात जितनी तेजी से वस्तुएं गति करेंगी समय उतना धीमा गुजरता है।

जुड़वां भाई और समय विस्तारण

समय विस्तारण को एक उदाहरण से समझ सकते हैं । जुड़वां भाइयों में से एक भाई अगर अंतरिक्ष में तीव्र वेग के साथ दूसरे ग्रह पर पहुचता है और कुछ समय रहने के बाद वापस पृथ्वी पर लौटता है तो उसकी आयु अपने दुसरे भाई जो पृथ्वी पर ही था, से कम होगी, क्यूंकि वहां समय पृथ्वी के समय से धीरे व्यतीत होता है। इसी प्रकार अलग अलग ऊंचाई (गुरुत्वीय क्षेत्र) पर रखी परमाणु घड़ियों में समय भी अलग अलग प्राप्त होता है।

पौराणिक ग्रंथों में समय विस्तारण

क्या अल्बर्ट आइंस्टीन के विशेष सापेक्षता सिद्धांत से पहले भी समय विस्तारण के उदाहरण मिलते हैं? हिन्दू पौराणिक ग्रंथों में ऐसे उदाहरण देखे जा सकते हैं, यहाँ दो उदाहरण प्रसिद्द हैं।

पहला तो भगवन राम के पूर्वज राजा मुचुकुन्द का है, जब राक्षस और देवताओं के बीच युद्ध हुए तब देवताओं ने राजा मुचुकुन्द को उनकी वीरता के कारण उनके साथ राक्षसों के विरुद्ध युद्ध करने हेतु आमंत्रित किया, राजा अपने परिवार को छोड़कर स्वर्ग में (अंतरिक्ष में) युद्ध लड़ने जाता है। कई वर्षों तक युद्ध करने के पश्चात् राजा वापस पृथ्वी पर अपने परिवार के साथ रहने के लिए देवताओं से आज्ञा लेता है लेकिन देवता उन्हें बताते हैं की आपके यहाँ के कुछ वर्षों में पृथ्वी पर पूरा युग परिवर्तित हो गया है, (राम का युग त्रेता जबकि अगला युग द्वापर था)। अब

आपका कोई वंशज पृथ्वी पर नहीं है। यहाँ का समय पृथ्वी की तुलना में बहुत धीरे व्यतीत होता है। राजा युद्धों से थककर बिना विघ्न के सोने का वरदान लेकर धरती पर आता है। बाद में, द्वापर युग में श्रीकृष्ण इनके तप का उपयोग कालयवन (यवन शासक) को मारने के लिए किया था । (अध्याय ५१, भगवद्गीता)

दूसरा उदाहरण राजा ककुद्मि और उनकी देवी पुत्री रेवती का है, पृथ्वी पर रेवती के सुयोग्य वर न मिल पाने की स्थिति में राजा अपनी पुत्री के साथ ब्रह्मलोक (अंतरिक्ष कह सकते हैं) गये। वहां देवताओं के संगीत में मगन होने के कारण राजा ने अपनी पुत्री के साथ बाहर ही प्रतीक्षा करने का निर्णय लिया । कुछ समय बाद जब उन्होंने सुयोग्य वारों की सूचि जब ब्रह्मा जी को दी तो उन्होंने बताया की आपने जितनी देर बहर प्रतीक्षा की लगभग एक घंटा, उतनी देर में तो पृथ्वी पर २७ चतुर्युग (चार युग सतयुग, त्रेता युग, द्वापर युग और कलयुग = ४,३२०,००० वर्ष) व्यतीत हो गये हैं और आपकी सूचि में वर्णित वर उनके वंशजों समेत मर चुके हैं। (भागवत पुराण, ९.३.२९ - ९.३.३२)

इस प्रकार हमारे ग्रंथों में और वर्तमान किये गये प्रयोगों में समय विस्तारण की समानता मिलती है फिर भी समय विस्तारण की धारणा बहुत रोमांचित करने वाली है। आधुनिक वैज्ञानिक इसके अन्वेषण में लगे हैं किन्तु प्रकाश की आवृति, गुरुत्वाकर्षण और सापेक्षिक वेग से समय विस्तारण का सटीक अनुमान लगाना अभी काफी कठिन कार्य है ।

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Artificial Intelligence (AI) and Animal Science

Dr Wahied Khawar Balwan

Artificial intelligence (AI) stands at the forefront of modern scientific innovation. It has revolutionized our understanding of the world around us and its effects on animal science have been profound. With continued advancements in AI technology, new opportunities to explore the unknown will continue to arise offering us unprecedented insight into this fascinating field. AI technology offers immense potential for animal scientists to improve their work. Automated tracking and predictive analytics allow data analysis on an unprecedented scale, enabling greater insight into complex biological systems than ever before. This can lead to improved animal welfare through better resource optimization, as well as more informed decision making in conservation efforts. AI also helps to reduce the workload of researchers by automating mundane tasks that would otherwise take a long time to complete. The good news is that it's unlikely that AI will completely replace animal scientists any time soon; however, certain roles within the field may become automated by technology over time. So, while it's important to pay attention to advances in AI technology, it's also possible to use them for advantage and secure the place in the workforce of tomorrow. Moreover, this technology continues to evolve, so too will its impact on our lives and careers.

INTRODUCTION

Artificial Intelligence (AI) is a rapidly evolving field of technology that has become increasingly popular over the past few years. It's often used to refer to machines and computer systems which can make decisions, solving problems and learning from their environment. AI can be further broken down into two main categories namely machine learning and deep learning. Machine learning involves algorithms being fed data to recognize patterns and make predictions about future outcomes. Deep learning requires more complex algorithms which are designed for tasks such as natural language processing or predictive analytics. The potential applications of Artificial Intelligence are vast ranging from health care diagnostics to financial services automation. With its ability to analyse massive amounts of data quickly and accurately, AI promises to revolutionize many industries including animal science by automating repetitive processes, improving decision making accuracy and providing personalized recommendations based on user preferences. As this technology continues to evolve, so too will its impact on our lives and careers.

Artificial intelligence (AI) stands at the forefront of modern scientific innovation. Its research applications range from medical diagnostics to climate tracking, with the scope of AI research expanding continuously. Of note, AI is making particularly significant strides in animal

science research. The rapid emergence of advanced AI techniques, such as machine learning and deep learning, as well as the emergence of big data, has marked the beginning of an era of intelligent data-centric animal science research. Although AI has been popular for some time, its incorporation into animal science research has not kept pace with its application in other biological fields. Thus, the question arises as to why AI technologies have not been promptly adopted in animal research. A possible factor for the lack of application may be the inefficiency of computational resources and scarcity of expansive animal science datasets. Additionally, zoologists or animal scientists may lack the foundational knowledge required to understand and implement these approaches, creating uncertainty regarding the selection of models suitable for their objectives. Moreover, the rapid and continuous evolution of complex AI model architectures, like Bidirectional Encoder Representations from Transformers (BERT), make it challenging for zoological researchers to stay current. As access to advanced computational tools and comprehensive zoological datasets expands, it may pave the way for broader adoption of these algorithms in mainstream research. Nevertheless, unfamiliarity with these techniques persists among many animal scientists, necessitating a foundational understanding of when, why, and how to employ these methods, as well as what type of data is suitable for their application.

History of AI in Animal Science

AI was first defined by Stanford Professor John McCarthy in 1955 as a 'the science and engineering of making intelligent machines.' The history of AI in animal science is like a roller coaster ride. From the early days when machine learning algorithms were first used to identify and interpret data from animals, through today's automation technology where robots are being developed that can mimic certain behaviours of animals, it has been an exciting journey. Here's a look at the historical perspective on AI's role in animal science or zoology:

1. AI development has enabled scientists to better understand how animals interact with each other and their environment.
2. Machine learning models have helped researchers analyse large sets of data quickly and accurately.
3. Automation technologies such as robotic arms allow for faster collection of samples and more accurate measurements.
4. Artificial neural networks improve predictive analytics by providing insights into behaviour patterns within species.
5. Natural language processing helps biologists create comprehensive databases of information about different species.

AI has revolutionized our understanding of the world around us and its effects on animal science have been profound. With continued advancements in AI technology, new opportunities to explore the unknown will continue to arise offering us unprecedented insight into this fascinating field.

Benefits of AI for Animal Science

AI technology offers immense potential for animal scientists to improve their work. Automated tracking and predictive analytics allow data analysis on an unprecedented scale, enabling greater insight into complex biological systems than ever before. This can lead to improved animal welfare through better resource optimization, as well as more informed decision making in conservation efforts. AI also helps to reduce the workload of

researchers by automating mundane tasks that would otherwise take a long time to complete. The use of AI in animal science is becoming increasingly widespread, with applications ranging from early detection of disease in livestock, to the development of autonomous robots that help monitor wildlife populations. By providing real-time insights into animal behaviour, AI can be used to inform policy decisions around species protection and habitat management. It's clear that AI has much to offer the field of animal science, potentially revolutionizing how we interact with our environment and making us better stewards of nature.

Potential Risks from Automation

As Artificial Intelligence (AI) technology continues to develop, many people are becoming concerned about the potential risks associated with automation. With machines potentially taking over jobs that were once done by humans, there is no doubt that we should be aware and cautious of the risks involved. The key concerns when it comes to AI are:

1. **Machine Malfunction:** Despite its advanced capabilities, automated systems are still prone to malfunctioning or not working as intended due to programming errors or a lack of data accuracy. This could lead to unintended consequences such as financial losses in certain industries or even physical harm if safety protocols aren't followed correctly.
2. **Data Accuracy:** Automation relies on data being accurate and up to date for it to function effectively and make decisions accurately. If there's incorrect information input into the system, then it won't be able to produce reliable results, which can have serious repercussions depending on the industry.
3. **Technology Failure:** Technology is always evolving but at any given point, something could go wrong during an update or upgrade process resulting in widespread disruption and unforeseen consequences for businesses relying heavily on AI technologies for their operations. These are just some of the potential issues related to automation that need to be taken seriously before rushing into implementing new technologies in workplaces and homes without considering all possible outcomes first. It's important for us all to stay vigilant and prepared for any eventuality so that we can minimize risk wherever possible and ensure maximum safety both physically and financially.

Challenges to the Adoption of AI

The potential risks from automation have been discussed, but the challenges to AI adoption remain. For animal scientists to retain their jobs in this age of machine learning complexities and technology investments, they must be aware of the ongoing hurdles that impede progress towards a fully automated future. Organizations may be hesitant to invest heavily into AI due to its lack of scalability and stability. Without proper guidance and maintenance, it is difficult for companies to ensure that an AI system can handle all the tasks required by an organization or specific job role. Moreover, certain roles within organizations might not require advanced levels of automation such as those held by animal scientists or zoologists who are experts at observing and understanding animals' behaviour. AI adoption comes with formidable roadblocks; however, these do not mean that automation cannot benefit animal scientists. By educating themselves on how best to use AI tools in conjunction with human expertise, animal scientists can

continue to confidently perform their duties while also taking advantage of new opportunities presented by technological advances.

New Job Opportunities for Animal Scientists

As technology advances, the question of whether Artificial Intelligence (AI) can replace zoologists or animal scientists remains. But what could this mean for career prospects? Could it lead to job creation or professional opportunities? The answer is a resounding yes! Professional opportunities are indeed available to animal scientists in the world of AI and robotics. With new technologies entering the market every day, there is boundless potential for career advancement and increased job prospects. This opens exciting possibilities for those looking to expand their knowledge base and create innovative solutions that benefit both animals and humans alike. With so many possible avenues open to them, animal scientists now have unprecedented access to an array of cutting-edge tools that could revolutionize not only their work but also how they approach research into animal welfare. The possibilities are truly limitless when it comes to using AI as a tool to improve our understanding of animals' needs from better diagnosis processes through to improved treatments for various conditions; all with the bonus of greater efficiency and accuracy than ever before. This presents incredible new opportunities for animal scientists across industries, allowing them to make meaningful contributions on a much larger scale than was previously possible. And with such vast potential, who knows what other innovations may yet be discovered?

Ethical Considerations for AI in Animal Science

AI is becoming a more prominent part of our lives and has the potential to replace some aspects of Animal Science work. As exciting as this may be, there are ethical considerations that need to be addressed to make sure AI is used responsibly in animal science research. In terms of AI ethics, it's important to consider how AI will affect animals and their habitat. Will machine learning algorithms identify behaviours or characteristics that could lead to discrimination against certain species? Also, what sort of regulations should be put into place with regards to using AI in animal science? These are all questions that need to be answered before implementing any type of AI-driven technology within the field of animal science. The use of AI can provide researchers with valuable insights they wouldn't otherwise have access to but must also be done so ethically. It's important to ensure proper evaluation of the impact on animals when designing new technologies for animal science research. Not only the benefits must be considered, but also potential harms if any arise from its implementation. If done right, the power of Artificial Intelligence can be harnessed for good while protecting both wild animals and those kept in captivity alike.

Potential Impact of AI on Research Quality and Outputs

The potential of Artificial Intelligence (AI) to revolutionize animal research is both tremendously exciting and deeply concerning. While some have highlighted the opportunities it offers in terms of increased accuracy, efficiency, and cost savings, there are also numerous questions that remain unanswered about its impact on research quality and outputs. Figuratively speaking, AI can be thought of as a double-edged sword when applied to zoology or animal science: On one hand, it could enable faster progress through automation; but on the other hand, it could lead to poorer results if not managed properly or used

ethically. Here are three points that must be considered when exploring how AI may shape the future of animal science or zoology:

1. AI has the potential to streamline data collection processes, reducing manual labour while providing more accurate information.
2. With advanced algorithms at their disposal, scientists can quickly uncover insights from complex datasets which were previously inaccessible using traditional methods.
3. However, caution should be taken when relying on technology alone; without proper oversight and ethical considerations, automated decision-making systems could introduce unforeseen risks into animal studies.

Ultimately, deciding whether AI will replace jobs held by Animal Scientists requires further exploration into areas such as regulatory frameworks for AI use in research and public opinion towards autonomous technologies involved in animal care. It's clear that modernizing various practices with innovative tools carries both benefits and challenges, only time will tell what role they play in future advances in this field.

Government Regulations

The emergence of AI technology has created a need for new government regulations. In the field of Zoology or Animal Science, this means that regulatory compliance must be ensured to protect animals from harm and unethical treatment in research studies or farming practices. As AI systems become increasingly sophisticated, it is important that governments develop legislation specifically tailored to regulate their use. AI specific laws will provide clarity on how data can be used while protecting animal welfare and ensuring ethical standards are adhered to. They should also cover issues such as liability and responsibility if things go wrong with an AI system, as well as outlining any other necessary safeguards. With these laws in place, companies would have greater confidence in investing in AI technologies, leading to more job opportunities for scientists working within the sector. It is clear then that there is a real need for governments across the globe to put appropriate measures into place regarding AI regulation and its application within Zoology or Animal Science. Regulations must not only ensure public safety but promote innovation to unlock the true potential of Artificial Intelligence technologies ultimately allowing us all to benefit from them.

Role of Human Expertise

The role of human expertise in the field of Animal science cannot be denied. AI and automation have certainly made great strides in advancing the understanding, but they cannot replace the deep knowledge a trained eye brings to this profession. For that reason, it is unlikely that AI will ever fully take over the job of a Zoologist or Animal Scientist. To understand why human experts are so important to this discipline, consider these points:

1. Human expertise enables us to recognize subtle nuances and patterns that machines may not detect due to their lack of experience or sensory capabilities.
2. The ability for humans to empathize with animals helps scientists better understand their behaviour and needs which can lead to more effective treatments or solutions.
3. Animal Scientists use their specialized skills acquired from years of study and hands-on training when making decisions about care plans, breeding programs, etc. Machines simply can't do this yet.

4. Having someone familiar with species on site ensures any changes implemented by AI technology don't cause harm or distress as there's always someone available who can check and intervene if needed.
5. Humans bring creativity and intuition into the equation qualities which are invaluable when navigating complex ethical issues related to animal welfare.

AI automation and machine learning technologies undeniably offer incredible potential for advancement in zoology or animal sciences, however none come close to replacing the value provided by experienced professionals whose expertise has been honed through practice and dedication over many years. As such, while scientific progress continues at a rapid pace, it seems likely that Human Experts will remain integral components of this field moving forward.

Outlook for Animal Scientists

Despite the potential for automation and AI to replace certain animal science jobs, it is still unlikely that robots will completely take over. Advances in technology have opened new opportunities for creative problem solving within the field of animal sciences. For example, using 3D printing and data analysis can help researchers create more accurate models which can then be used to study complex biological processes at an unprecedented level of detail. As such, technological advancements could lead to expansion instead of contraction when it comes to job security for professionals within this field.

Although AI and automation may reduce the amount of labour involved with certain tasks related to animal sciences, there is no need yet for current practitioners or aspiring students of this discipline to fear replacement by machines anytime soon. With increased access to resources and an eye towards innovation, there are plenty of reasons why the prospects look good for both established and budding animal scientists alike.

CONCLUSION

Artificial intelligence (AI) is making an impact on the field of Zoology or Animal Science. AI may not completely replace one's job as an animal scientist in the near future, but there is still a need to be prepared for this potential transition. With the right skills and knowledge, we can remain competitive in a rapidly changing industry. It's important to anticipate these changes and focus on developing new strategies or technologies to stay ahead of the curve. In addition to acquiring technical proficiency, animal scientists must also ensure their research results are free from bias when using AI driven methods. Finally, government incentives such as tax credits or grants could help companies invest more heavily in AI driven Animal Science research. This type of investment would create additional opportunities within the field while ensuring data security remains intact throughout any scientific process involving AI technology. As an animal scientist, it's up to you to keep track of developments related to AI and adjust accordingly so you can continue being successful within your profession well into the future.

"Any Error in this manuscript is silent testimony of the fact that it was a Human effort."

Dr. Wahied Khawar Balwan *is an Associate Professor at the Department of Zoology, Govt. Degree College Doda, Jammu & Kashmir at can be reached at wahied_kb@yahoo.co.in*

Poems on Science and Society

विज्ञान और हम

ध्रुव कुमार

विज्ञान का दीप जब जलता है,
समाज ज्ञान का सागर बनता है।
जब हाथ में हाथ संग आते हैं,
रातों को उज्जवल कर जाते हैं ।

नए आविष्कार गूँज रहे हैं ,
समाज अँधेरे में? पूछ रहे हैं ।
टेक्नोलॉजी से जब बढ़ती है समझ,
भविष्य बनते हैं और भी सहज ।

पर्यावरण का रखते हैं जब ध्यान,
प्रकृति का होता है सम्मान ।
विज्ञान से जब सेवा होगी ,
हर ओर समृद्धि फैली होगी ।

संवाद बनती जब सोच नई ,
समाज की होती बुद्धि सही ।
विज्ञान के हम साथ चलेंगे,
तो प्रगति के सूरज जलेंगे ।

ध्रुव कुमार *९ बी, एपीएस, दमाना, जम्मू*

Vigyan Setu

Dheeraj Singh

Through time and space, so vast and wide,
A bridge of wisdom, tall with pride.
Not made of stone, nor wood, nor steel,
But of knowledge, strong and real.
It spans the depths of dark unknown,
Where seeds of curiosity are sown.
From ancient scrolls to modern days,
Science lights our future ways.
A bridge of minds, a path so bright,
Guiding us from dark to light.
From Newton's laws to Einstein's dreams,
To galaxies and quantum beams.
With every step, we seek, we learn,
Through every page, the fires burn.
From tiny cells to cosmic flight,
Science turns the dark to light.
The atoms dance, the stars ignite,
The oceans rise, the birds take flight.
With every pulse, with every spark,
Science shines when all is dark.
Bridging past to future.

Dheeraj Singh *a student at APS, Damana, Jammu.*

Compassion Beyond Words:
The Call for Animal Welfare

Etisha Parmar

"A world so big, yet hearts so small,
Do they not deserve a life at all?
With quiet eyes, they beg and wait,
For love, for care, before it's too late."

Animals, just like humans, are entitled to love, care, and dignity. My experience with animal welfare started not as a deliberate endeavour but as a spontaneous reaction to suffering — feeding stray dogs, rescuing injured animals, and getting them medical care. As time went by, I came to understand that compassion towards animals is not merely about saving them in need but about building a society where they are respected and safeguarded.

The most unforgettable experience was the rescue of a wounded dog that had been struck by a car. Having no one around to assist me, I brought the dog home, washed his wounds, and got him to a doctor. To see him recover and wag his tail once again was an experience of sheer bliss, and it strengthened my conviction that every small act of kindness matters. I have also participated in vaccination campaigns for stray dogs, realizing that disease prevention such as rabies is not only good for animals but also for human society.

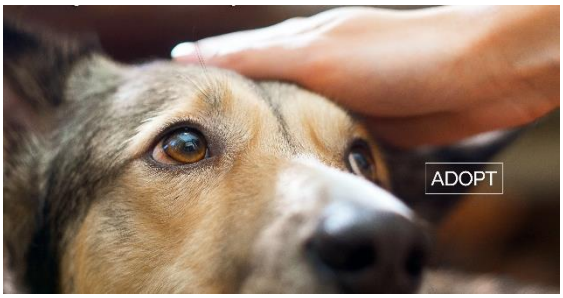
"They wander the streets, cold and bare,
Hoping someone will stop and care.
A little food, a gentle touch,
Is that really asking much?"

But animal welfare is not just individual acts; it's awareness. Most people are unaware that small things — giving food and water, promoting sterilization to keep strays in check, or reporting cruelty to animals — can have a tremendous impact. With what I do, I want to inspire others to view animals as not a nuisance but as inhabitants of our world who deserve to live without fear.

As I go on in this journey, I envision a future where the welfare of animals is everyone's concern, and not the sole passion of the few. With every little thing we do, with every little act of love, we draw closer to our goal.

"Let kindness grow, let voices rise,
To shield the weak, to open eyes.
For in their love, so pure, so true,
Lies a lesson for me and you."

Let us all be a voice for the voiceless and make the world safer for them.



***Etisha Parmar**, a Professional Social Worker, is presently working as a Counselor (MSW). She has experience with disaster management, climate change adaptation, and humanitarian response. She is also actively engaged in animal welfare activities, such as rescue operations, and vaccination drive for stray animals.*

Himalayan Pastoral Trust: Guardians of Kashmir's Rangelands and Pastoral Heritage

Mr Shahid S. Sulaiman

The pastoralist communities of the Himalayas, with their centuries-old traditions, are facing unprecedented challenges. Climate change is rapidly altering their landscapes, drying up the natural springs they depend on for survival.

At the same time, their rich ecological knowledge, that is passed down through generations, is at risk of being lost due to modern educational systems that do not integrate traditional wisdom.

Recognizing these urgent issues, the Himalayan Pastoral Trust (HPT) has launched two groundbreaking initiatives: the Alpine Pond Project, ensuring water security for migrating pastoralists, and the Grassland to Classroom Initiative, which bridges the gap between traditional knowledge and formal education. These programs aim to protect both the livelihoods and cultural identity of pastoral communities, ensuring a sustainable future.

The Alpine Pond Project: Securing Water for Pastoralists

Water scarcity in high-altitude pastures is an escalating crisis. During their seasonal migrations, pastoralists carry only the bare essentials, lacking the means to store even 100 Liters of water. They are entirely dependent on natural springs, which are becoming increasingly unreliable. When a spring dries up, families often struggle to find water even for their meal. This can force them to undertake long, arduous journeys in search of alternative sources, leading to distress migration and threatening their traditional way of life.

To address this crisis, HPT has launched the Alpine Pond Project, a transformative initiative designed to ensure water security for pastoral communities. Each alpine pond is engineered to collect and store rainwater, providing a reliable backup when springs run dry. These water bodies can sustain pastoralists and their livestock for up to 30 days, equivalent to surviving a long drought in the high-altitude pastures of the Himalayas. The project goes beyond just building ponds; it also includes community training programs that teach pastoralists how to manage water resources efficiently, ensuring the longevity of the initiative.

HPT has successfully constructed three alpine ponds and is

looking to complete five more by the end of this season. With water scarcity reaching critical levels, HPT has received distress calls from pastoral communities to construct 48 ponds in the grasslands. This initiative is not just about water security, it is a lifeline for sustaining livestock, preventing the collapse of pastoral livelihoods, and strengthens community resilience against climate change.

Grassland to Classroom: Educating the Next Generation

While securing water is crucial for pastoral survival, preserving their knowledge systems is just as important. Traditionally, pastoralists have relied on deep-rooted ecological wisdom, passed down orally from one generation to the next. However, the modern education system often fails to incorporate this indigenous knowledge, leaving pastoralist children disconnected from their heritage.

HPT's **Grassland to Classroom Initiative** aims to bridge this gap by integrating traditional wisdom into formal education. This initiative ensures that pastoralist children not only receive an education but also learn about their environment, sustainable herding practices, and cultural heritage. The key components of this initiative include:

- **Mobile Learning Centres**: Given the migratory lifestyle of pastoralists, these temporary schools move with the community, ensuring uninterrupted education.
- **Traditional Knowledge Workshops**: Elders and experienced herders conduct sessions on sustainable grazing, livestock care, and environmental stewardship.
- **Bilingual Curriculum**: Educational materials are developed in Gojri language, making learning more accessible.
- **Hands-on Field Learning**: Students engage in pasture mapping, identifying medicinal plants, and understanding seasonal migration patterns, providing them with practical knowledge they can apply in their daily lives.

By incorporating pastoral knowledge into mainstream education, HPT is creating a model that not only preserves traditional wisdom but also equips pastoral youth with skills that can help them navigate the challenges of the modern world. The initiative seeks to collaborate with local schools, policymakers, and researchers to formalize the inclusion of indigenous knowledge in education.

Building a Sustainable Future

The **Alpine Pond Project** and the **Grassland to Classroom Initiative** are not just about addressing immediate challenges; they represent a long-term vision for pastoral resilience. By ensuring water security and preserving traditional knowledge, these initiatives provide a sustainable framework for the future of Himalayan pastoralists.

However, these efforts require collective action. The Himalayan Pastoral Trust calls upon governments, NGOs, research institutions, and individuals to support these vital programs. **Investing in alpine pond construction** will secure water for migrating pastoralists, while **funding educational programs** will ensure that the

next generation remains deeply connected to their heritage.

In a world where climate change and modernization threaten indigenous ways of life, initiatives like these serve as beacons of hope. With the right support, pastoral communities can not only survive but thrive preserving their traditions while adapting to a rapidly changing world. By investing in these programs, we take a step toward safeguarding an ancient way of life, ensuring that Himalayan pastoralists continue to flourish for generations to come.

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