Science Newsletter

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Contents

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Introduction:

There are 3 main elements in the Science Newsletter is composed. In the first part, we provide articles about central issues for each discipline in this university, and they are provided with one subject for a time. In the second part, we select articles from the top journals in the whole science research, and most of them are from Nature and Science. In the third part, we post information about calling papers for international conferences. Hopefully, some of the information in this manuscript may be useful for those who are dedicating to scientific career. Besides, the journals are also posted on the website of our library, and they are available to be accessed any time at http://lib.jsut.edu.cn/2018/1015/c5474a113860/page.htm. If there are any questions or suggestions, please send e-mails to 2019560078@jsut.edu.cn in no hesitate.

Ⅰ Topics

The key word of this month is **Environmental science.**
We list several articles which are related to the top concerned topics of computer science researches. The articles are classified in 5 categories, and they are: **Environmental illness, Ecology, Scientific publication, Ecosystem** and **Biological science disciplines**. Also, the listed articles are all arranged in a descending sort of impact factor in order to make it convenient to read. There are also links to both official site and full text for each article.

ENVIRONMENTAL ILLNESS

International Organization (impact factor: 5.754) 1 区

Deflective Cooperation: Social Pressure and Forum Management in Cold War Conventional Arms Control

Giovanni Mantilla

Abstract:

Why do states create weak international institutions? Frustrated with proliferating but disappointing international environmental institutions, scholars increasingly bemoan agreements which, rather than solving problems, appear to exist “for show.” This article

offers an explanation of this phenomenon. I theorize a dynamic of deflective cooperation to explain the creation of compromise face-saving institutions. I argue that when international social pressure to create an institution clashes with enduring disagreements among states about the merits of creating it, states may adopt cooperative arrangements that are ill-designed to produce their purported practical effects. Rather than negotiation failures or empty gestures, I contend that face-saving institutions represent interstate efforts to manage intractable disagreement through suboptimal institutionalized cooperation. I formulate this argument inductively through a new multi-archival study of conventional weapons regulation during the Cold War, which resulted in the oft-maligned 1980 UN Convention on Certain Conventional Weapons. A careful reconsideration of the negotiation process extends and nuances existing IR theorizing and retrieves its historical significance as a critical juncture and complex product of contesting diplomatic practices.

Source: http://www.kingbook.com.cn/xz.htm

Science Of The Total Environment (impact factor: 10.753) 1 区

Social cost of mining-related lead (Pb) pollution in Kabwe, Zambia, and potential remediation measures

Daichi Yamada，et. al

Abstract:

Lead (Pb) pollution has been one of the major environmental problems of worldwide significance. It is a latent factor for several fatal illnesses, whereas the exposure to lead in early childhood causes a lifetime IQ loss. The social cost is the concept to aggregate various adverse effects in a single monetary unit, which is useful in describing the pollution problem and provides foundation for the design of interventions. However, the assessment of the social cost is scarce for developing countries. In this study, we focus on the lead pollution problem of a former mining town, Kabwe, Zambia, where mining wastes abandoned near residential areas has caused a critical pollution problem. We first investigated the social cost of lead pollution that future generations born in 2025–2049 would incur in their lifetime. As the channels of the social cost, we considered the lost income from the IQ loss and the lost lives from lead-related mortality. The results showed that the social cost would amount to 224–593 million USD (discounted to the present value). Our results can be considered conservative, lower bound estimates because we focused only on well-identified effects of lead, but the social cost was still substantial. Then we examined several engineering remediation measures. The results showed that the social cost can be reduced (the benefits of remediations) more than the costs of implementing remediation measures. This study is the first to investigate the social cost of mining-related lead pollution problem in developing countries. Our interdisciplinary approach utilises the micro-level economic, health and pollution data and integrates the techniques in economics, toxicology and

engineering.

Source: http://www.kingbook.com.cn/xz.htm

PEDIATRICS (impact factor: 9.703) 2 区

Drinking Water From Private Wells and Risks to Children

Alan D. Woolf, et. al

Abstract:
Drinking water for >23 million US households is obtained from private wells. These wells can become contaminated by chemicals, naturally occurring toxic substances, or pathogenic organisms that can cause illness in children. Although the US Environmental Protection Agency and most states offer some guidance for the construction, maintenance, and testing of private wells, most states only regulate the construction of new private water wells. With few exceptions, well owners are responsible for their own wells after the initial construction. Children may also drink well water at childcare or when traveling. This policy statement provides recommendations for the inspection, testing, and remediation of private wells to provide safe drinking water for children.

Source: http://www.kingbook.com.cn/xz.htm

ECOLOGY

Trends in Ecology & Evolution (impact factor: 20.589) 1 区

Championing inclusive terminology in ecology and evolution

Susan J. Cheng, et. al

Abstract:
Amid a growing disciplinary commitment to inclusion in ecology and evolutionary biology (EEB), it is critical to consider how the use of scientific language can harm members of our research community. Here, we outline a path for identifying and revising harmful terminology to foster inclusion in EEB.

Source: http://www.kingbook.com.cn/xz.htm

Proceedings Of The National Academy Of Sciences Of The United States Of America (impact factor: 12.779) 1 区

Intentional release of native species undermines ecological stability

Akira Terui, Hirokazu Urabe, Masayuki Senzaki, Bungo Nishizawa

Abstract:

The massive release of captive-bred native species ("intentional release") is a pervasive method to enhance wild populations of commercial and recreational species. However, such external inputs may disrupt the sensitive species interactions that allow competing species to coexist, potentially compromising long-term community stability. Here, we use theory and long-term data of stream fish communities to show that intentional release destabilizes community dynamics with limited demographic benefit to the enhanced species. Our theory predicted that intentional release intensifies interspecific competition, facilitating the competitive exclusion of unenhanced species that otherwise stably coexist. In parallel, the excessive input of captive-bred individuals suppressed the natural recruitment of the enhanced species via intensified within-species competition. Consequently, the ecological community with the intentional release is predicted to show reduced community density with unstable temporal dynamics. Consistent with this prediction, stream fish communities showed greater temporal fluctuations and fewer taxonomic richness in rivers with the intensive release of hatchery salmon—a major fishery resource worldwide. Our findings alarm that the current overreliance on intentional release may accelerate global biodiversity loss with undesired consequences for the provisioning of ecosystem services.

Source: http://www.kingbook.com.cn/xz.htm

Global Change Biology (impact factor: 13.211) 1 区

Disentangling the drivers of continental mammalian endemism

Benjamin R. Shipley, Jenny L. McGuire

Abstract:

Endemic species and species with small ranges are ecologically and evolutionarily distinct and are vulnerable to extinction. Determining which abiotic and biotic factors structure patterns of endemism on continents can advance our understanding of global biogeographic processes, but spatial patterns of mammalian endemism have not yet been effectively predicted and reconstructed. Using novel null model techniques, we reconstruct trends in mammalian endemism and describe the isolated and combined effects of physiographic, ecological, and evolutionary factors on endemism. We calculated weighted endemism for global continental ecoregions and compared the spatial distribution of endemism to niche-based, geographic null models of endemism. These null models distribute species randomly across continents, simulating their range sizes from their degree of climatic specialization. They isolate the effects of physiography (topography and climate) and species richness on endemism. We then ran linear and structural models to determine how topography and historical climate

stability influence endemism. The highest rates of mammalian endemism were found in topographically rough, climatically stable ecoregions with many species. The null model that isolated physiography did not closely approximate the observed distribution of endemism (r2 = .09), whereas the null model that incorporated both physiography and species richness did (r2 = .59). The linear models demonstrate that topography and climatic stability both influenced endemism values, but that average climatic niche breadth was not highly correlated with endemism. Climate stability and topography both influence weighted endemism in mammals, but the spatial distribution of mammalian endemism is driven by a combination of physiography and species richness. Despite its relationship to individual range size, average climate niche breadth has only a weak influence on endemism. The results highlight the importance of historical biogeographic processes (e.g. centers of speciation) and geography in driving endemism patterns, and disentangle the mechanisms structuring species ranges worldwide.

Source: http://www.kingbook.com.cn/xz.htm

Critical Reviews in Food Science and Nutrition (impact factor: 11.208) 1 区

Family Myrtaceae: The treasure hidden in the complex/diverse composition

Fatema R. Saber, et. al

Abstract:
Myrtaceae is one of the most important plants families, being regarded as the eighth largest flowering plant family. It includes many genera of utmost ecological and economical importance distributed all over the world. This review aimed to report the latest studies on this family focusing on certain widely used plants including Eucalyptus sp., Eugenia sp. (Eugenia uniflora, Eugenia sulcata), Syzygium sp. (Syzygium aromaticum and Syzygium cumini), Psidium sp., Pimenta dioica, Myrtus sp. (Myrtus communis), Myrciaria sp. and Melaleuca alternifolia. The extraction of bioactive compounds has been evolving through the optimization of conventional methods and the use of emerging technologies. Supercritical CO2 was applied for essential oils and ultrasound for polyphenols leading to extracts and essential oils rich in bioactive compounds. Advances in the field of encapsulation and delivery systems showed promising results in the production of stable essential oils nanoemulsions and liposomes and the production of plant extracts in the form of nanoparticles. Moreover, a significant increase in the number of patents was noticed especially the application of Myrtaceae extracts in the pharrmacuetucal field. The applications of ceratin plants (Pimenta dioica, Melaleuca alternifolia, Syzygium aromaticum essential oils or Myrciaria cauliflora peel extract) in food area (either as a free or encapsulated form) also showed interesting results in limiting microbial spoilage of fresh meat and fish,

slowing oxidative degradation in meat products, and inhibiting aflatoxin production in maize. Despite the massive literature on Myrtaceae plants, advances are still necessary to optimize the extraction with environmentally friendly technologies and carry out risk assessment studies should be accomplished to harness the full potential in food, industrial and pharmaceutical applications.

Source: http://www.kingbook.com.cn/xz.htm

SCIENTIFIC PUBLICATION

Angewandte Chemie-International Edition (impact factor: 16.823) 1 区

The COVID19‐NMR Consortium: A Public Report on the Impact of this New Global Collaboration

Elke Duchardt‐Ferner, et. al

Abstract:
The outbreak of COVID-19 in December 2019 required the formation of international consortia for a coordinated scientific effort to understand and combat the virus. In this Viewpoint Article, we discuss how the NMR community has gathered to investigate the genome and proteome of SARS-CoV-2 and tested them for binding to low-molecular-weight binders. External factors including extended lockdowns due to the global pandemic character of the viral infection triggered the transition from locally focused collaborative research conducted within individual research groups to digital exchange formats for immediate discussion of unpublished results and data analysis, sample sharing, and coordinated research between more than 50 groups from 18 countries simultaneously. We discuss key lessons that might pertain after the end of the pandemic and challenges that we need to address.

Source: http://www.kingbook.com.cn/xz.htm

Comprehensive Reviews in Food Science and Food Safety (impact factor: 15.786) 1 区

Advances in immunoassay‐based strategies for mycotoxin detection in food: From single‐mode immunosensors to dual‐mode immunosensors

Mengting Chen, et. al

Abstract:
Mycotoxin contamination in foods and other goods has become a broad issue owing to serious toxicity, tremendous threat to public safety, and terrible loss of resources.

Herein, it is necessary to develop simple, sensitive, inexpensive, and rapid platforms for the detection of mycotoxins. Currently, the limitation of instrumental and chemical methods cannot be massively applied in practice. Immunoassays are considered one of the best candidates for toxin detection due to their simplicity, rapidness, and cost-effectiveness. Especially, the field of dual-mode immunosensors and corresponding assays is rapidly developing as an advanced and intersected technology. So, this review summarized the types and detection principles of single-mode immunosensors including optical and electrical immunosensors in recent years, then focused on developing dual-mode immunosensors including integrated immunosensors and combined immunosensors to detect mycotoxins, as well as the combination of dual-mode immunosensors with a portable device for point-of-care test. The remaining challenges were discussed with the aim of stimulating future development of dual-mode immunosensors to accelerate the transformation of scientific laboratory technologies into easy-to-operate and rapid detection platforms.

Source: http://www.kingbook.com.cn/xz.htm

Annual Review of Clinical Psychology (impact factor: 22.098) 1 区

What Four Decades of Meta-Analysis Have Taught Us About Youth Psychotherapy and the Science of Research Synthesis

John R Weisz, et. al

Abstract:

Intervention scientists have published more than 600 randomized controlled trials (RCTs) of youth psychotherapies. Four decades of meta-analyses have been used to synthesize the RCT findings and identify scientifically and clinically significant patterns. These meta-analyses have limitations, noted herein, but they have advanced our understanding of youth psychotherapy, revealing (a) mental health problems for which our interventions are more and less successful (e.g., anxiety and depression, respectively); (b) the benefits of single-session interventions, interventions delivered remotely, and interventions tested in low- and middle-income countries; (c) the association of societal sexism and racism with reduced treatment benefit in majority-girl and majority-Black groups; and, importantly, (d) the finding that average youth treatment benefit has not increased across five decades of research, suggesting that new strategies may be needed. Opportunities for the future include boosting relevance to policy and practice and using meta-analysis to identify mechanisms of change and guide personalization of treatment.

Source: http://www.kingbook.com.cn/xz.htm

Annual Review of Physical Chemistry (impact factor: 12.703)1 区

Remembering the Work of Phillip L. Geissler: A Coda to His Scientific Trajectory

Gregory R Bowman, et. al

Abstract

Phillip L. Geissler made important contributions to the statistical mechanics of biological polymers, heterogeneous materials, and chemical dynamics in aqueous environments. He devised analytical and computational methods that revealed the underlying organization of complex systems at the frontiers of biology, chemistry, and materials science. In this retrospective we celebrate his work at these frontiers.

Source: http://www.kingbook.com.cn/xz.htm

ECOSYSTEM

Nature Communications (impact factor: 17.694) 1 ☒

Globally invariant metabolism but density-diversity mismatch in springtails

Anton M. Potapov, et. al

Abstract

Soil life supports the functioning and biodiversity of terrestrial ecosystems. Springtails (Collembola) are among the most abundant soil arthropods regulating soil fertility and flow of energy through above- and belowground food webs. However, the global distribution of springtail diversity and density, and how these relate to energy fluxes remains unknown. Here, using a global dataset representing 2470 sites, we estimate the total soil springtail biomass at 27.5 megatons carbon, which is threefold higher than wild terrestrial vertebrates, and record peak densities up to 2 million individuals per square meter in the tundra. Despite a 20-fold biomass difference between the tundra and the tropics, springtail energy use (community metabolism) remains similar across the latitudinal gradient, owing to the changes in temperature with latitude. Neither springtail density nor community metabolism is predicted by local species richness, which is high in the tropics, but comparably high in some temperate forests and even tundra. Changes in springtail activity may emerge from latitudinal gradients in temperature, predation and resource limitation in soil communities. Contrasting relationships of biomass, diversity and activity of springtail communities with temperature suggest that climate warming will alter fundamental soil biodiversity metrics in different directions, potentially restructuring terrestrial food webs and affecting soil functioning.

Source: http://www.kingbook.com.cn/xz.htm

Journal of Hazardous Materials (impact factor: 14.224) 1 ☒

Visible-light-driven photocatalytic degradation of tetracycline hydrochloride by Z-scheme Ag3PO4/1T@2H-MoS2 heterojunction: Degradation mechanism, toxicity assessment, and potential applications

Xiuyi Hua, et. al

Abstract

Residual antibiotics in wastewater threaten living organisms and the ecosystem, while the photocatalytic process is recognized as one of the most eco-friendly and promising technologies for the treatment of antibiotic wastewater. In this study, a novel Z-scheme Ag3PO4/1T@2H-MoS2 heterojunction was synthesized, characterized, and used for the visible-light-driven photocatalytic degradation of tetracycline hydrochloride (TCH). It was found that Ag3PO4/1T@2H-MoS2 dosage and coexisting anions had significant effects on the degradation efficiency, which could reach up to 98.9 % within 10 min under the optimal condition. Combing experiments and theoretical calculations, the degradation pathway and mechanism were thoroughly investigated. The excellent photocatalytic property of Ag3PO4/1T@2H-MoS2 was achieved attributed to the Z-scheme heterojunction structure, which remarkably inhibited the recombination of photoinduced electrons and holes. The potential toxicity and mutagenicity for TCH and generated intermediates were evaluated, which revealed the ecological toxicity of antibiotic wastewater was reduced effectively during the photocatalytic degradation process.

Source: http://www.kingbook.com.cn/xz.htm

Science Of The Total Environment (impact factor: 10.753) 1 ☒

Microplastics in Antarctic krill (Euphausia superba) from Antarctic region

Wenbin Zhu, et. al

Abstract

Pollution of microplastics (MPs) has become a potential threat to Antarctic marine ecosystems. However, the occurrence of MPs in Antarctic krill (Euphausia superba), a keystone species in Antarctic ecosystems, remains unclear. In this study, the abundance and characteristics of MPs were examined in Antarctic krill samples (n = 437) collected from two Antarctic regions. MPs were extracted using an alkali digestion method and analyzed using Fourier-transform infrared spectroscopy. The mean abundance of MPs in Antarctic krill samples from the South Shetland Islands (n = 355) and the South Orkney Islands (n = 82) were 0.29 ± 0.14 and 0.20 ± 0.083 items/individual, respectively. >90 % of MPs found in Antarctic krill were < 150 μm in size. Fibers

represented 77 % and 87 % of the MPs in Antarctic krill samples from the South Shetland Islands and the South Orkney Islands, respectively. Black, blue, and red were the predominant colors of MPs in Antarctic krill, accounting for 32 %, 22 %, and 21 % of the total MPs, respectively. Seven polymer compositions were identified for the MPs in Antarctic krill, with the predominance of polyethylene (37 % of total MPs), followed by polypropylene (22 %) and polyester (21 %). To our knowledge, this is the first study to investigate the occurrence of MPs in Antarctic krill samples. The results of this study are important for evaluating the risks of MP exposure in Antarctic krill.

Source: http://www.kingbook.com.cn/xz.htm

BIOLOGICAL SCIENCE DISCIPLINES

Cellular & Molecular Biology Letters (impact factor: 8.702) 1 ☒

3D genomics and its applications in precision medicine

Mengjie Chen, et. al

Abstract

Three-dimensional (3D) genomics is an emerging discipline that studies the three-dimensional structure of chromatin and the three-dimensional and functions of genomes. It mainly studies the three-dimensional conformation and functional regulation of intranuclear genomes, such as DNA replication, DNA recombination, genome folding, gene expression regulation, transcription factor regulation mechanism, and the maintenance of three-dimensional conformation of genomes. Self-chromosomal conformation capture (3C) technology has been developed, and 3D genomics and related fields have developed rapidly. In addition, chromatin interaction analysis techniques developed by 3C technologies, such as paired-end tag sequencing (ChIA-PET) and whole-genome chromosome conformation capture (Hi-C), enable scientists to further study the relationship between chromatin conformation and gene regulation in different species. Thus, the spatial conformation of plant, animal, and microbial genomes, transcriptional regulation mechanisms, interaction patterns of chromosomes, and the formation mechanism of spatiotemporal specificity of genomes are revealed. With the help of new experimental technologies, the identification of key genes and signal pathways related to life activities and diseases is sustaining the rapid development of life science, agriculture, and medicine. In this paper, the concept and development of 3D genomics and its application in agricultural science, life science, and medicine are introduced, which provides a theoretical basis for the study of biological life processes.

Source: http://www.kingbook.com.cn/xz.htm

Quarterly Review Of Biology (impact factor: 6.75) 2 ☒

Is Biological Control of Weeds Conservation's Blind Spot?

Guillermo Cabrera Walsh, et. al

Abstract:

Invasive alien species are among the most important threats to biodiversity, with invasive plants ranking among the highest. Classical weed biological control—or biocontrol—reunites exotic plants with host-specific natural enemies from their native range with the aim of controlling the invasive plant. We reviewed the attention classical weed biocontrol has received from scientific publications for the last 30 years, classified according to the area of academia and applied sciences, as well as the region of the world. Biological control journals were excluded from the analyses to avoid bias. This process allowed us to evaluate the support classical weed biocontrol has among the scientific community. We also recorded the number of weed biocontrol agents released from 1900 to date, where they were collected, and where they were released as a way to analyze the evolution of classical weed biocontrol policies in different parts of the world. Classical weed biocontrol releases peaked between 1990 and 1999, but have declined since, probably due to funding issues, increases in regulations, and bad publicity. Researchers in theoretical ecology appear to be more skeptical toward weed biocontrol than scientists in applied and experimental biology. Our synthesis also suggests that despite resistance to classical weed biocontrol in some quarters of the scientific community, the general scientific perception of the discipline has been consistently favorable. This means that the general scientific perception of classical weed biocontrol contradicts its level of current application. The five main objections against classical weed biocontrol—direct nontarget effects, indirect and hidden nontarget effects, evolution of host shifts in biocontrol agents, dispersion to unwanted areas, and disagreements on its level of success in the field—are summarized and analyzed in terms of their relevance and probability of occurrence. We also describe the way classical weed biocontrol practitioners deal with them at present to ensure safety and sustainability. Our analysis suggests the potential of classical weed biocontrol is undervalued in some areas of science and management due to objections that are plausible in theory, although their likelihood is very low and on-ground evidence scant.

Source: http://www.kingbook.com.cn/xz.htm

Microbial Biotechnology (impact factor: 6.575) 2 ☒

Scientific novelty beyond the experiment

John E. Hallsworth, et. al

Abstract:
Practical experiments drive important scientific discoveries in biology, but theory-based research studies also contribute novel—sometimes paradigm-changing—findings. Here, we appraise the roles of theory-based approaches focusing on the experiment-dominated wet-biology research areas of microbial growth and survival, cell physiology, host–pathogen interactions, and competitive or symbiotic interactions. Additional examples relate to analyses of genome-sequence data, climate change and planetary health, habitability, and astrobiology. We assess the importance of thought at each step of the research process; the roles of natural philosophy, and inconsistencies in logic and language, as drivers of scientific progress; the value of thought experiments; the use and limitations of artificial intelligence technologies, including their potential for interdisciplinary and transdisciplinary research; and other instances when theory is the most-direct and most-scientifically robust route to scientific novelty including the development of techniques for practical experimentation or fieldwork. We highlight the intrinsic need for human engagement in scientific innovation, an issue pertinent to the ongoing controversy over papers authored using/authored by artificial intelligence (such as the large language model/chatbot ChatGPT). Other issues discussed are the way in which aspects of language can bias thinking towards the spatial rather than the temporal (and how this biased thinking can lead to skewed scientific terminology); receptivity to research that is non-mainstream; and the importance of theory-based science in education and epistemology. Whereas we briefly highlight classic works (those by Oakes Ames, Francis H.C. Crick and James D. Watson, Charles R. Darwin, Albert Einstein, James E. Lovelock, Lynn Margulis, Gilbert Ryle, Erwin R.J.A. Schrödinger, Alan M. Turing, and others), the focus is on microbiology studies that are more-recent, discussing these in the context of the scientific process and the types of scientific novelty that they represent. These include several studies carried out during the 2020 to 2022 lockdowns of the COVID-19 pandemic when access to research laboratories was disallowed (or limited). We interviewed the authors of some of the featured microbiology-related papers and—although we ourselves are involved in laboratory experiments and practical fieldwork—also drew from our own research experiences showing that such studies can not only produce new scientific findings but can also transcend barriers between disciplines, act counter to scientific reductionism, integrate biological data across different timescales and levels of complexity, and circumvent constraints imposed by practical techniques. In relation to urgent research needs, we believe that climate change and other global challenges may require approaches beyond the experiment.

Source: http://www.kingbook.com.cn/xz.htm

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Ⅱ Concentration

PHYSICS

Probing site-resolved correlations in a spin system of ultracold molecules

Lysander Christakis, et al.

Abstract

Synthetic quantum systems with interacting constituents play an important role in quantum information processing and in explaining fundamental phenomena in many-body physics. Following impressive advances in cooling and trapping techniques, ensembles of ultracold polar molecules have emerged as a promising platform that combines several advantageous properties[1,2,3,4,5,6,7,8,9,10,11]. These include a large set of internal states with long coherence times[12,13,14,15,16,17] and long-range, anisotropic interactions. These features could enable the exploration of intriguing phases of correlated quantum matter, such as topological superfluids[18], quantum spin liquids[19], fractional Chern insulators[20] and quantum magnets[21,22]. Probing correlations in these phases is crucial to understanding their properties, necessitating the development of new experimental techniques. Here we use quantum gas microscopy23 to measure the site-resolved dynamics of quantum correlations of polar 23Na87Rb molecules confined in a two-dimensional optical lattice. By using two rotational states of the molecules, we realize a spin-1/2 system with dipolar interactions between particles, producing a quantum spin-exchange model[21,22,24,25]. We study the evolution of correlations during the thermalization process of an out-of-equilibrium spin system for both spatially isotropic and anisotropic interactions. Furthermore, we examine the correlation dynamics of a spin-anisotropic Heisenberg model engineered from the native spin-exchange model by using periodic microwave pulses[26,27,28]. These experiments push the frontier of probing and controlling interacting systems of ultracold molecules, with prospects for exploring new regimes of quantum matter and characterizing entangled states that are useful for quantum computation[29,30] and metrology[31].

Full text: https://www.nature.com/articles/s41586-022-05558-4

Photonic flatband resonances for free-electron radiation

Yi Yang, et al.

Abstract

Flatbands have become a cornerstone of contemporary condensed-matter physics and photonics. In electronics, flatbands entail comparable energy bandwidth and Coulomb interaction, leading to correlated phenomena such as the fractional quantum Hall effect and recently those in magic-angle systems. In photonics, they enable properties including slow light[1] and lasing[2]. Notably, flatbands support supercollimation—diffractionless wavepacket propagation—in both systems[3,4]. Despite these intense parallel efforts, flatbands have never been shown to affect the core interaction between free electrons and photons. Their interaction, pivotal for free-electron lasers[5], microscopy and spectroscopy[6,7], and particle accelerators[8,9], is, in fact, limited by a dimensionality mismatch between localized electrons and extended photons. Here we reveal theoretically that photonic flatbands can overcome this mismatch and thus remarkably boost their interaction. We design flatband resonances in a silicon-on-insulator photonic crystal slab to control and enhance the associated free-electron radiation by tuning their trajectory and velocity. We observe signatures of flatband enhancement, recording a two-order increase from the conventional diffraction-enabled Smith–Purcell radiation. The enhancement enables polarization shaping of free-electron radiation and characterization of photonic bands through electron-beam measurements. Our results support the use of flatbands as test beds for strong light–electron interaction, particularly relevant for efficient and compact free-electron light sources and accelerators.

Full text: https://www.nature.com/articles/s41586-022-05387-5

Attosecond field emission

H. Y. Kim, et al.

Abstract

Field emission of electrons underlies great advances in science and technology, ranging from signal processing at ever higher frequencies[1] to imaging of the atomic-scale structure of matter[2] with picometre resolution. The advancing of electron microscopy techniques to enable the complete visualization of matter on the native spatial (picometre) and temporal (attosecond) scales of electron dynamics calls for techniques that can confine and examine the field emission on sub-femtosecond time intervals. Intense laser pulses have paved the way to this end[3,4] by demonstrating femtosecond confinement[5,6] and sub-optical cycle control[7,8] of the optical field emission[9] from nanostructured metals. Yet the measurement of attosecond electron pulses has remained elusive. We used intense, sub-cycle light transients to induce optical field emission of electron pulses from tungsten nanotips and a weak replica of the same transient to directly investigate the emission dynamics in real time. Access to the temporal properties of the electron pulses rescattering off the tip surface, including the duration

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τ = (53 as ± 5 as) and chirp, and the direct exploration of nanoscale near fields open new prospects for research and applications at the interface of attosecond physics and nano-optics.

Full text: https://www.nature.com/articles/s41586-022-05577-1

MATERIALS

Vertical full-colour micro-LEDs via 2D materials-based layer transfer

Jiho Shin, Hyunseok Kim, Suresh Sundaram, et al.

Abstract

Micro-LEDs (μLEDs) have been explored for augmented and virtual reality display applications that require extremely high pixels per inch and luminance[1,2]. However, conventional manufacturing processes based on the lateral assembly of red, green and blue (RGB) μLEDs have limitations in enhancing pixel density[3,4,5,6]. Recent demonstrations of vertical μLED displays have attempted to address this issue by stacking freestanding RGB LED membranes and fabricating top-down[7,8,9,10,11,12,13,14], but minimization of the lateral dimensions of stacked μLEDs has been difficult. Here we report full-colour, vertically stacked μLEDs that achieve, to our knowledge, the highest array density (5,100 pixels per inch) and the smallest size (4 μm) reported to date. This is enabled by a two-dimensional materials-based layer transfer technique[15,16,17,18] that allows the growth of RGB LEDs of near-submicron thickness on two-dimensional material-coated substrates via remote or van der Waals epitaxy, mechanical release and stacking of LEDs, followed by top-down fabrication. The smallest-ever stack height of around 9 μm is the key enabler for record high μLED array density. We also demonstrate vertical integration of blue μLEDs with silicon membrane transistors for active matrix operation. These results establish routes to creating full-colour μLED displays for augmented and virtual reality, while also offering a generalizable platform for broader classes of three-dimensional integrated devices.

Full text: https://www.nature.com/articles/s41586-022-05612-1

Ultrathin quantum light source with van der Waals NbOCl2 crystal

Qiangbing Guo, Xiao-Zhuo Qi, Lishu Zhang, et al.

Abstract

Interlayer electronic coupling in two-dimensional materials enables tunable and emergent properties by stacking engineering. However, it also results in significant evolution of electronic structures and attenuation of excitonic effects in two-dimensional semiconductors as exemplified by quickly degrading excitonic photoluminescence and optical nonlinearities in transition metal dichalcogenides when monolayers are stacked into van der Waals structures. Here we report a van der Waals crystal, niobium oxide dichloride (NbOCl2), featuring vanishing interlayer electronic coupling and monolayer-like excitonic behaviour in the bulk form, along with a scalable second-harmonic generation intensity of up to three orders higher than that in monolayer WS2. Notably, the strong second-order nonlinearity enables correlated parametric photon pair generation, through a spontaneous parametric down-conversion (SPDC) process, in flakes as thin as about 46 nm. To our knowledge, this is the first SPDC source unambiguously demonstrated in two-dimensional layered materials, and the thinnest SPDC source ever reported. Our work opens an avenue towards developing van der Waals material-based ultracompact on-chip SPDC sources as well as high-performance photon modulators in both classical and quantum optical technologies[1,2,3,4].

Full text: https://www.nature.com/articles/s41586-022-05393-7

A wearable cardiac ultrasound imager

Hongjie Hu, Hao Huang, Mohan Li, et al.

Abstract

Continuous imaging of cardiac functions is highly desirable for the assessment of long-term cardiovascular health, detection of acute cardiac dysfunction and clinical management of critically ill or surgical patients[1,2,3,4]. However, conventional non-invasive approaches to image the cardiac function cannot provide continuous measurements owing to device bulkiness[5,6,7,8,9,10,11], and existing wearable cardiac devices can only capture signals on the skin[12,13,14,15,16]. Here we report a wearable ultrasonic device for continuous, real-time and direct cardiac function assessment. We introduce innovations in device design and material fabrication that improve the mechanical coupling between the device and human skin, allowing the left ventricle to be examined from different views during motion. We also develop a deep learning model that automatically extracts the left ventricular volume from the continuous image recording, yielding waveforms of key cardiac performance indices such as stroke volume, cardiac output and ejection fraction. This technology enables dynamic wearable monitoring of cardiac performance with substantially improved accuracy in various environments.

Full text: https://www.nature.com/articles/s41586-022-05498-z

CHEMISTRY

Control of stereogenic oxygen in a helically chiral oxonium ion

Owen Smith, Mihai V. Popescu, Madeleine J. Hindson, et al.

Abstract

The control of tetrahedral carbon stereocentres remains a focus of modern synthetic chemistry and is enabled by their configurational stability. By contrast, trisubstituted nitrogen[1], phosphorus[2] and sulfur compounds[3] undergo pyramidal inversion, a fundamental and well-recognized stereochemical phenomenon that is widely exploited[4]. However, the stereochemistry of oxonium ions—compounds bearing three substituents on a positively charged oxygen atom—is poorly developed and there are few applications of oxonium ions in synthesis beyond their existence as reactive intermediates[5,6]. There are no examples of configurationally stable oxonium ions in which the oxygen atom is the sole stereogenic centre, probably owing to the low barrier to oxygen pyramidal inversion[7] and the perception that all oxonium ions are highly reactive. Here we describe the design, synthesis and characterization of a helically chiral triaryloxonium ion in which inversion of the oxygen lone pair is prevented through geometric restriction to enable it to function as a determinant of configuration. A combined synthesis and quantum calculation approach delineates design principles that enable configurationally stable and room-temperature isolable salts to be generated. We show that the barrier to inversion is greater than 110 kJ mol^{-1} and outline processes for resolution. This constitutes, to our knowledge, the only example of a chiral non-racemic and configurationally stable molecule in which the oxygen atom is the sole stereogenic centre.

Full text: https://www.nature.com/articles/s41586-023-05719-z

Complete integration of carbene-transfer chemistry into biosynthesis

Jing Huang, Andrew Quest, Pablo Cruz-Morales, et al.

Abstract

Biosynthesis is an environmentally benign and renewable approach that can be used to produce a broad range of natural and, in some cases, new-to-nature products. However, biology lacks many of the reactions that are available to synthetic chemists, resulting in a narrower scope of accessible products when using biosynthesis rather than synthetic chemistry. A prime example of such chemistry is carbene-transfer reactions[1]. Although it was recently shown that carbene-transfer reactions can be performed in a

cell and used for biosynthesis[2,3], carbene donors and unnatural cofactors needed to be added exogenously and transported into cells to effect the desired reactions, precluding cost-effective scale-up of the biosynthesis process with these reactions. Here we report the access to a diazo ester carbene precursor by cellular metabolism and a microbial platform for introducing unnatural carbene-transfer reactions into biosynthesis. The α-diazoester azaserine was produced by expressing a biosynthetic gene cluster in Streptomyces albus. The intracellularly produced azaserine was used as a carbene donor to cyclopropanate another intracellularly produced molecule—styrene. The reaction was catalysed by engineered P450 mutants containing a native cofactor with excellent diastereoselectivity and a moderate yield. Our study establishes a scalable, microbial platform for conducting intracellular abiological carbene-transfer reactions to functionalize a range of natural and new-to-nature products and expands the scope of organic products that can be produced by cellular metabolism.

Full text: https://www.nature.com/articles/s41586-023-06027-2

The electron–proton bottleneck of photosynthetic oxygen evolution

Paul Greife, Matthias Schönborn, Matteo Capone, et al.

Abstract

Photosynthesis fuels life on Earth by storing solar energy in chemical form. Today's oxygen-rich atmosphere has resulted from the splitting of water at the protein-bound manganese cluster of photosystem II during photosynthesis. Formation of molecular oxygen starts from a state with four accumulated electron holes, the S_4 state—which was postulated half a century ago[1] and remains largely uncharacterized. Here we resolve this key stage of photosynthetic O_2 formation and its crucial mechanistic role. We tracked 230,000 excitation cycles of dark-adapted photosystems with microsecond infrared spectroscopy. Combining these results with computational chemistry reveals that a crucial proton vacancy is initally created through gated sidechain deprotonation. Subsequently, a reactive oxygen radical is formed in a single-electron, multi-proton transfer event. This is the slowest step in photosynthetic O_2 formation, with a moderate energetic barrier and marked entropic slowdown. We identify the S_4 state as the oxygen-radical state; its formation is followed by fast O–O bonding and O_2 release. In conjunction with previous breakthroughs in experimental and computational investigations, a compelling atomistic picture of photosynthetic O_2 formation emerges. Our results provide insights into a biological process that is likely to have occurred unchanged for the past three billion years, which we expect to support the knowledge-based design of artificial water-splitting systems.

Full text: https://www.nature.com/articles/s41586-023-06008-5

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FinnGen provides genetic insights from a well-phenotyped isolated population

Mitja I. Kurki, Juha Karjalainen, Priit Palta, et al.

Abstract

Population isolates such as those in Finland benefit genetic research because deleterious alleles are often concentrated on a small number of low-frequency variants (0.1% ⩽ minor allele frequency < 5%). These variants survived the founding bottleneck rather than being distributed over a large number of ultrarare variants. Although this effect is well established in Mendelian genetics, its value in common disease genetics is less explored1,2. FinnGen aims to study the genome and national health register data of 500,000 Finnish individuals. Given the relatively high median age of participants (63 years) and the substantial fraction of hospital-based recruitment, FinnGen is enriched for disease end points. Here we analyse data from 224,737 participants from FinnGen and study 15 diseases that have previously been investigated in large genome-wide association studies (GWASs). We also include meta-analyses of biobank data from Estonia and the United Kingdom. We identified 30 new associations, primarily low-frequency variants, enriched in the Finnish population. A GWAS of 1,932 diseases also identified 2,733 genome-wide significant associations (893 phenome-wide significant (PWS), P < 2.6 × 10–11) at 2,496 (771 PWS) independent loci with 807 (247 PWS) end points. Among these, fine-mapping implicated 148 (73 PWS) coding variants associated with 83 (42 PWS) end points. Moreover, 91 (47 PWS) had an allele frequency of <5% in non-Finnish European individuals, of which 62 (32 PWS) were enriched by more than twofold in Finland. These findings demonstrate the power of bottlenecked populations to find entry points into the biology of common diseases through low-frequency, high impact variants.

Full text: https://www.nature.com/articles/s41586-022-05473-8

Single-cell spatial immune landscapes of primary and metastatic brain tumours

Elham Karimi, Miranda W. Yu, Sarah M. Maritan, et al.

Abstract

Single-cell technologies have enabled the characterization of the tumour microenvironment at unprecedented depth and have revealed vast cellular diversity among tumour cells and their niche. Anti-tumour immunity relies on cell–cell

relationships within the tumour microenvironment[1,2], yet many single-cell studies lack spatial context and rely on dissociated tissues[3]. Here we applied imaging mass cytometry to characterize the immunological landscape of 139 high-grade glioma and 46 brain metastasis tumours from patients. Single-cell analysis of more than 1.1 million cells across 389 high-dimensional histopathology images enabled the spatial resolution of immune lineages and activation states, revealing differences in immune landscapes between primary tumours and brain metastases from diverse solid cancers. These analyses revealed cellular neighbourhoods associated with survival in patients with glioblastoma, which we leveraged to identify a unique population of myeloperoxidase (MPO)-positive macrophages associated with long-term survival. Our findings provide insight into the biology of primary and metastatic brain tumours, reinforcing the value of integrating spatial resolution to single-cell datasets to dissect the microenvironmental contexture of cancer.

Full text: https://www.nature.com/articles/s41586-022-05680-3

Programmable protein delivery with a bacterial contractile injection system

Joseph Kreitz, Mirco J. Friedrich, Akash Guru, et al.

Abstract

Endosymbiotic bacteria have evolved intricate delivery systems that enable these organisms to interface with host biology. One example, the extracellular contractile injection systems (eCISs), are syringe-like macromolecular complexes that inject protein payloads into eukaryotic cells by driving a spike through the cellular membrane. Recently, eCISs have been found to target mouse cells[1,2,3], raising the possibility that these systems could be harnessed for therapeutic protein delivery. However, whether eCISs can function in human cells remains unknown, and the mechanism by which these systems recognize target cells is poorly understood. Here we show that target selection by the Photorhabdus virulence cassette (PVC)—an eCIS from the entomopathogenic bacterium Photorhabdus asymbiotica—is mediated by specific recognition of a target receptor by a distal binding element of the PVC tail fibre. Furthermore, using in silico structure-guided engineering of the tail fibre, we show that PVCs can be reprogrammed to target organisms not natively targeted by these systems—including human cells and mice—with efficiencies approaching 100%. Finally, we show that PVCs can load diverse protein payloads, including Cas9, base editors and toxins, and can functionally deliver them into human cells. Our results demonstrate that PVCs are programmable protein delivery devices with possible applications in gene therapy, cancer therapy and biocontrol.

Full text: https://www.nature.com/articles/s41586-023-05870-7

Ⅲ Calling for papers

CONFCDS 2023

Submission deadline:	**July 7, 2023**
Conference date:	**July 14-15, 2023**
Full name:	**The 5th International Conference on Computing and Data Science**
Location:	**Macau, SAR**
Website:	https://www.confcds.org/

The 5th International Conference on Computing and Data Science (CONF-CDS 2023) is a leading conference on computing technology, machine learning, computer science, and data science. CONF-CDS is open to international participants. It provides an excellent opportunity for scholars interested in computing and data science to share their findings and achievements, thus promoting communication and cooperation. This conference is supported by faculty members from the University of California, Los Angeles, University of Melbourne, Harvard University, and National University of Singapore.

The goal of this conference is to bring together researchers and practitioners from academia and industry to highlight the importance of computing technologies and data science as well as establish new collaborations in these areas. The conference looks for significant contributions to computing, data mining, and data science in theoretical and practical aspects.

Topics

Computing

- Scientific Computing
- Computer Modeling
- Cloud Computing
- Parallel Computing
- Mobile Computing
- Simulation
- Computational Optimization
- Distributed Computing
- High Performance Computing
- Soft Computing Theory and Applications

Machine Learning

- Artificial Intelligence Tools & Applications

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- Hybrid Intelligent Systems
- Natural Language Processing
- Computer Vision
- Image Processing
- Heuristic and AI Planning Strategies and Tools
- Computational Theories of Learning
- Intelligent System Architectures
- Neural Networks and Applications
- Pervasive Computing and Ambient Intelligence
- Reasoning and Evolution
- Semantic Web Techniques and Technologies
- Web Intelligence Applications and Search

Data Science

- Data Mining
- Big Data
- Databases
- Data Management
- Data Analytics
- Social Network Analysis
- Time Series Analysis
- Forecasting
- Data Security

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NMOCT 2023

Submission deadline:	**May 31, 2023**
Conference date:	**Oct 21-22, 2023**
Full name:	**9th International Conference on Networks, Mobile Communications and Telematics**
Location:	**Sydney, Australia**
Website:	https://csty2023.org/nmoct/index

9th International Conference on Networks, Mobile Communications and Telematics (NMOCT 2023) is a forum for presenting new advances and research results in the fields of Network, Mobile communications and Telematics. The aim of the conference is to provide a platform to the researchers and practitioners from both academia as well as industry to meet and share cutting-edge development in the field.

Authors are solicited to contribute to the conference by submitting articles that illustrate research results, projects, surveying works and industrial experiences that describe significant advances in the following areas, but are not limited to.

Topics:

- Mobile Communications and Telematics
- Mobile Network Management and Service Infrastructure
- Mobile Computing
- Integrated Mobile Marketing Communications
- Efficacy of Mobile Communications
- Mobile Communication Applications
- Critical Success Factors for Mobile Communication Diffusion
- Metric Mobile Business Enterprise
- Mobile Communication Security Issues and Requirements
- Mobile and Handheld Devices in the Education
- Telematics
- Tele-Learning
- Privacy and Security in Mobile Computing and Wireless Systems
- Cross-Cultural Mobile Communication Issues
- Integration and Interworking of Wired and Wireless Networks
- Location Management for Mobile Communications
- Distributed Systems Aspects of Mobile Computing
- Next Generation Internet
- Next Generation Web Architectures
- Network Operations and Management
- Adhoc and Sensor Networks
- Internet and Web Applications

- Ubiquitous Networks
- Wireless Multimedia Systems
- Wireless Communications
- Heterogeneous Wireless Networks
- Operating System and Middleware Support for Mobile Computing
- Interaction and Integration in Mobile Communications
- Business Models for Mobile Communications
- E-Commerce & E-Governance
- Nomadic and Portable Communication
- Wireless Information Assurance
- Mobile Multimedia Architecture and Network Management
- Mobile Multimedia Network Traffic Engineering & Optimization
- Mobile Multimedia Infrastructure Developments
- Mobile Multimedia Markets & Business Models
- Personalization, Privacy and Security in Mobile Multimedia
- Mobile Computing Software Architectures
- Network & Communications
- Network Protocols & Wireless Networks
- Network Architectures
- High Speed Networks
- Routing, Switching and Addressing Techniques
- Measurement and Performance Analysis
- Peer To Peer and Overlay Networks
- Qos and Resource Management
- Network Based Applications
- Network Security
- Self-Organizing Networks and Networked Systems
- Mobile & Broadband Wireless Internet
- Recent Trends & Developments in Computer Networks

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CITS 2023

Submission deadline:	**May 22, 2023**
Conference date:	**Jul 10, 2023**
Full name:	**The 2023 International Conference on Computer, Information and Telecommunication Systems**
Location:	**Genoa, Italy**
Website:	http://atc.udg.edu/CITS2023/

The 2023 International Conference on Computer, Information, and Telecommunication Systems (CITS 2023), is an international forum for scientists, engineers, and practitioners to present their latest research and development results in all areas of Computer, Information, and Telecommunication Systems. The conference will feature tutorials, technical paper presentations, workshops and distinguished keynote speeches.

Topics

The conference will feature 6 tracks:

- Computer Systems Track
- Information Technology Track
- Web Technologies Track
- Networking Systems Track
- Telecommunications Systems Track
- Security Systems Track

All full paper submissions will be peer reviewed and evaluated based on originality, technical and/or research content/depth, correctness, relevance to conference, contributions, and readability. All accepted papers will be submitted to IEEE Xplore digital library covered by Scopus and EI Compendex. Selected extended versions of accepted papers will be published in special issue(s)/Section(s) of International Journal of Communication Systems (SCI indexed) and Security and Privacy Journal (EI indexed).

MITA 2023

Submission deadline:	**May 31, 2023**
Conference date:	**Jul 11-14, 2023**
Full name:	**The 19th International Conference on Multimedia Information Technology and Applications**
Location:	**Ostrava**
Website:	http://icmita.org/

The 19th International Conference on Multimedia Information Technology and Applications MITA 2023, July 11 - July 14,Ostrava, Czech Republic, is organized and sponsored by the Korea Multimedia Society (KMMS), VSB - Technical University of Ostrava (VSB TUO), Ostrava, Czech Republic.

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Topics

- Multimedia Systems
- Embedded Systems
- Multimedia Databases
- Multimedia Information Security
- Multimedia in e-Learning and u-Learning
- Graphic Design and 3D Animation
- Internet Technology and Social Media
- Cryptocurrencies & Blockchain Technology

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- Radar and Navigation Systems
- Human-Computer Interaction
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