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Electrons Moving in a Magnetic Field Exhibit Strange Quantum Behavior

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<http://www.riken.jp/engn/>

The dynamic behavior of electrons in magnetic fields is crucial for understanding physical processes, such as the quantum Hall effect, which are important in many areas of solid state physics, including electrical conductivity. Yet, there is much that remains unknown about exactly how electrons behave in a magnetic field.

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biology

For Legume Plants, a New Route from Shoot to Root

A new study shows that legume plants regulate their symbiotic relationship with soil bacteria by using cytokinins—signaling molecules—that are transmitted through the plant structure from leaves into the roots to control the number of bacteria-holding nodules in the roots.

This collaborative study was conducted by researchers from the National Institute for Basic Biology, the Graduate University for Advanced Studies (SOKENDAI), and the RIKEN Center for Sustainable Resource Science in Japan.


medicine

Broken Signals Lead to Neurodegeneration

Researchers from the RIKEN Brain Science Institute in Japan, in collaboration with Juntendo University and the Japan Science and Technology Agency, have discovered that a cell receptor widely involved in intracellular calcium signaling—the IP3R receptor—can be locked into a closed state by enzyme action, and that this locking may potentially play a role in the reduction of neuron signaling seen in neurodegenerative diseases such as Huntington's and Alzheimer's disease.


biology

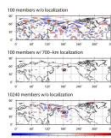
Researchers Switch Emotion Linked to Memory

Recalling an emotional experience, even years later, can bring back the same intense feelings. Researchers from the RIKEN-MIT Center for Neural Circuit Genetics revealed the brain pathway that links external events to the internal emotional state, forming one memory by engaging different brain areas. The study published in the journal Nature, also demonstrates that the positive or negative emotional valence of memory can be reversed during later memory recall.


physics

Breaking Benzene

Aromatic compounds are found widely in natural resources such as petroleum and biomass, and breaking the carbon-carbon bonds in these compounds plays an important role in the production of fuels and valuable chemicals from natural resources. However, aromatic carbon-carbon bonds are very stable and difficult to break. In the chemical industry, the cleavage of these bonds requires the use of solid catalysts at high temperatures, usually giving rise to a mixture of products, and the mechanisms are still poorly understood. ...


technology

K Computer Runs Largest Ever Ensemble Simulation of Global Weather

Ensemble forecasting is a key part of weather forecasting today. Computers typically run multiple simulations, called ensembles, using slightly different initial conditions or assumptions, and then analyze them together to try to improve forecasts. Now, using Japan's flagship 10-petaFLOPS K computer, researchers from the RIKEN Advanced Institute for Computational Science (AICS) have succeeded in running 10,240 parallel simulations of global weather, the largest number ever performed, using data assimilation to reduce the range of uncertainties. ...

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