

Overtime Activists Take On Corporate Titans: Toyota, McDonald’s and Japan’s Work Hour Controversy

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This paper describes lawsuits involving Toyota and McDonald’s Japan, bringing to light seven common strategies Japanese firms use to extract uncompensated “service” overtime and linking them with violations of labour laws and damage to worker health. These cases highlight the role of civil society groups in supporting plaintiffs and in keeping issues and their broader social consequences before the public. However, the cases also show the limits of activist pressure. Judges issued clear decisions favouring the plaintiffs. But even as the outcomes became front-page news, employers countered by attempting to re-legitimize the very overtime practices that had caused worker injury.

This paper won the 8th William L. Holland Prize. It can be viewed free at http://pacificaffairs.ubc.ca/pdfs/weathers_north.pdf

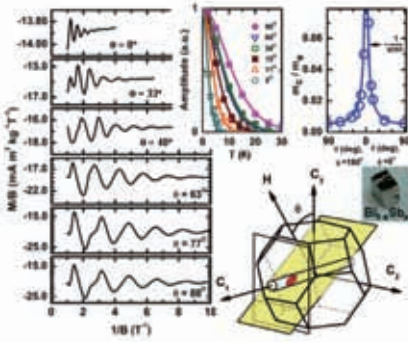
Pacific Affairs, 82 (4), 615-636 (2009/2010)

Science

Quantum Oscillations in a Topological Insulator Bi_{1-x}Sb_x

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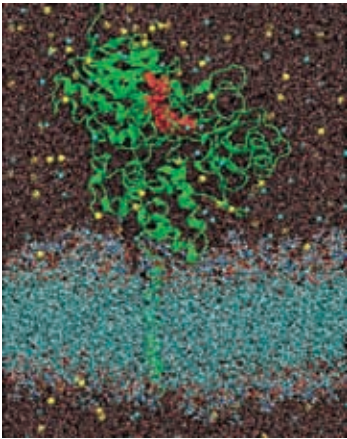
“Topological insulator” is insulating in the bulk but always has a metallic surface containing dissipationless spin currents. This new state of matter was discovered in 2008 and is currently attracting a lot of attention. We have grown high-quality single crystals of the first known topological insulator, Bi_{1-x}Sb_x, and observed the quantum oscillations originating from the peculiar surface states of this class of materials for the first time. Intriguingly, the amplitude of the quantum oscillations was found to be orders of magnitude larger than what is normally expected for surface electrons, pointing to new physics in this exotic system.



Physical Review B, 80, 085303 (2009)

Membrane Attachment Facilitates Ligand Access to the Active Site in Monoamine Oxidase A

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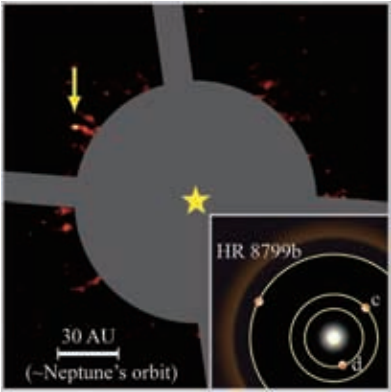


Dynamics of rat Monoamine oxidase, a membrane enzyme, was analyzed by performing multiple independent molecular dynamics (MD) simulations of membrane-bound and membrane-free forms to clarify the relationship between the mechanics of the enzyme and its function, emphasizing on the significance of membrane attachment. Monoamine oxidases are responsible for the catalytic breakdown of extra- and intracellular neurotransmitters and are targets for the development of central nervous system drugs. From analysis of the MD trajectories, the presence of the lipid environment was suggested to assist in decoupling the interdomain motions, consistent with the observed reduction in the enzyme activity under membrane-free conditions.

Biochemistry, 48, 5864-5873 (2009)

Science

Do planetary systems like our own exist in the Universe? Characterizing extra-solar planetary systems is one of the most important research topics in contemporary astronomy. Today, more than 400 planets are known to exist, but most of them were found in indirect ways. An epoch-making result, reported in 2008 by Marois et al., is the success of taking direct pictures of three Jupiter-like planets orbiting the star HR 8799. Following the discovery, the images of HR 8799 that had been obtained with the Japanese Subaru telescope in 2002 were closely analyzed by an optimized method for extracting planets, successfully revealing the outermost one, HR 8799b. Its positions from 2002 to 2008 are consistent with a planet having a circular orbit.

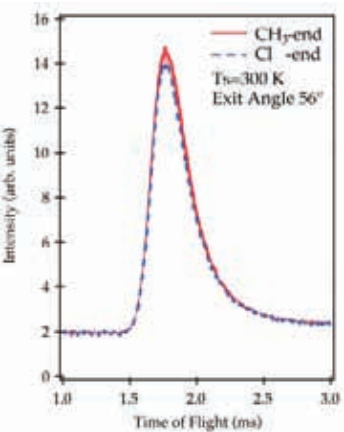


H-Band Image of a Planetary Companion Around HR 8799 in 2002

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The Astrophysical Journal, 696, L1-L5 (2009)

We report results of a study on steric effects appearing in the scattering of an oriented CH₃Cl molecular beam from highly-oriented pyrolytic graphite (HOPG) surface at 300 K. Data presented here show that the scattered CH₃Cl beam intensity measured at a fixed scattering angle depends clearly on the initial molecular orientation toward the HOPG surface. The scattered-CH₃Cl-beam intensity for the CH₃-end collision is larger than that for the Cl-end collision, suggesting that strong anisotropy of the interaction potential between CH₃Cl and HOPG induces the molecular-orientation-dependent energy dissipation during transient trapping into the physisorption well.



Steric Effects in the Scattering of Oriented CH₃Cl Molecular Beam from a Graphite Surface: Weak Interaction of Physisorption

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The Journal of Physical Chemistry A, 113, 14749-14754 (2009)

Theorem. For every $k \geq 10$ and j is even, we have

$$\dim_{\mathbb{C}} S_{k,j}(\mathrm{Sp}(2, \mathbb{Z})) - \dim_{\mathbb{C}} S_{k-5,j}(\mathrm{Sp}(2, \mathbb{Z}), \mathrm{sgn}) = \dim_{\mathbb{C}} V_{k,j}.$$

The Witt operator W from $S_{k,j}(\mathrm{Sp}(2, \mathbb{Z}))$ to $V_{k,j}$ is surjective for $k \geq 10$.

Siegel modular forms are typical arithmetic objects in number theory. Here we considered dimensions of Siegel modular forms of low weight of degree two. Combining the standard restriction operator with explicit trace formulas for higher weight, or theta representability for degree one, we obtain the images of Siegel

modular forms on boundaries of the Satake compactification, and also surjectivity under the diagonal restriction to the simple direct sum of tensors of modular forms of degree one. These give new evaluations of dimensions from below for low weights on which no general theory had been known at all.

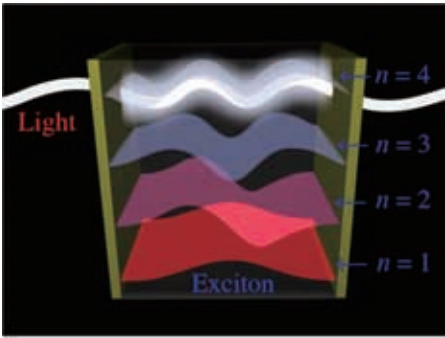
▲Reprinted from *Contemporary Mathematics*, 493, 2009, 189-209, Siegel Modular Forms of Small Weight and the Witt Operator, Ibukiyama, T. et al, with permission from American Mathematical Society.

Siegel Modular Forms of Small Weight and the Witt Operator

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Contemporary Mathematics, 493, 189-209 (2009)

In physics, light wave and electronic excitation (exciton) wave have been described in hierarchically different regimes, i.e., macroscopic (classical) and microscopic (quantum mechanical) regimes. Hence, no spatial interplay between these waves appears. However, here we report the observation of a new class of light-matter coupling in ultrahigh-quality semiconductor thin films, wherein these two waves form a harmonized wave-wave coupling over a range of multiple wavelengths shown in the figure ($n=4$). This unconventional coupling significantly enhances the light-matter interaction, e.g., providing extremely fast optical response time



less than 100 fs, four orders of magnitude faster than that in conventional materials.

Observation of Superradiance by Nonlocal Wave Coupling of Light and Excitons in CuCl Thin Films

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Physical Review Letters, 103, 257401(2009)