

# 白眉研究ピックアップ

## Cultural differences in inconsistent brand image evaluation: The influence of dialectical thinking.

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Researchers in the brand management theory often emphasize consistency. For example, one of the brand management gurus, Kevin Lane Keller (2013) says "without question, the most important consideration in reinforcing brands is *consistency*" (p. 480, italic added). Indeed, past research highlights the benefit of brand consistency, such as developing and reinforcing brand equity and nurturing a loyal customer base. However, phenomena in the Japanese market suggest that consistency may not always be necessary. For example, Universal Studios Japan has dramatically changed its brand image and brand personality since its opening in 2001; still, the sales and number of visitors are constantly growing. Furthermore, changes in logos and product packages are commonly observed in Japan, whereas they are less preferred in the U.S.

Recent findings in cultural psychology have identified that there are cultural differences in attitudes

toward consistency (Spencer-Rodgers et al., 2010). In Western cultures, an important characteristic of its folk epistemology is its focus on "linear" thinking and belief that inconsistencies need to be resolved. On the other hand, in East Asian cultures, a set of folk beliefs that view the nature and objects as constantly changing and inherently contradictory is prevalent ("dialectical" thinking). These cultural differences in thinking styles may affect various consumer behaviors including brand evaluations. I propose that Japanese may be more tolerant toward brand image inconsistency.

Based on the above discussion, my research focuses on the empirical examination of cultural differences in (in)consistent brand image evaluations. The findings of this research aim to propose a new theory in brand management that incorporates Asian perspectives.

(すずき さとこ)

## Strong electron correlation in molecular electronic-structure theory.

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I'm working on molecular electronic-structure calculations and high performance computing implementations. In electronic structure calculations, we calculate how electrons behave in molecules according to the fundamental equations of quantum mechanics, predicting chemical reaction and the required energy, for example. The spectacular dream of solving problems of chemistry on a computer is may seem like a pipe dream, but thanks to the rapid evolution of computer technology and the development of the electronic-structure theories, the dream is coming true even with a computer on your lap.

There still remain challenges to analyze strongly correlated systems. In condensed matter physics, 'strong electron correlation' is a critically important concept that brings about many remarkable phenomena such as superconductivity. By contrast, it has been overlooked in chemistry until recently because most organic molecules are well described by the mean-field picture, and molecular orbital theory has enjoyed great success over decades. But now, the importance of strong correlation effects in chemical reactions has begun to be understood due to the connection with the exceptional catalytic ability of transition metal atoms in metalloenzymes. The biggest obstacle in studying strong correlation arises from non-trivial exponential complexity of

strongly interacting electrons, which is similar to the difficulty in solving the Hubbard-model and is called the 'multireference' problem in quantum chemistry. To solve this remaining problem in quantum chemistry, we utilized the density-matrix renormalization group (DMRG) theory, which can efficiently compress the exponentially growing complexity of the wavefunction by encoding the special entanglement structure that is present in low-lying physical quantum states.

In the study of the  $\text{Mn}_4\text{CaO}_5$  cluster in photosystem II, we compute the near-exact many-electron wavefunctions of the  $\text{Mn}_4\text{CaO}_5$  cluster with more than  $10^{18}$  quantum degrees of freedom by the *ab initio* DMRG method. This is the first treatment of multi-nuclear transition metal complexes beyond the mean-field picture of density functional theory. Our calculation revealed many electronic properties, such as oxidation states and spin states of the manganese atoms, which are directly associated with the mechanism of the catalytic water-splitting reaction. We also revealed rich information contained in the wavefunctions on the catalytic ability of the cluster through an analysis for quantum entropy along the catalytic cycle. The results have brought us, although only slightly, one step closer towards understanding "*how multi-nuclear complexes exhibit exceptional catalytic ability in metalloenzymes?*"

(くらしげ ゆうき)