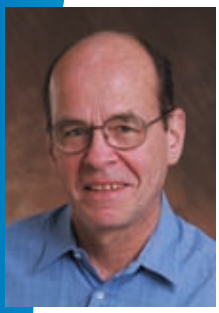
MRS Materials Research Society SINGAPORE

NUS National University of Singapore

# Public Lectures *by* Nobel Laureates



## K. Barry SHARPLESS

*Nobel Laureate in Chemistry*
*The Scripps Research Institute (TSRI), La Jolla, California, USA*

## Chemistry and the "Kiss Principle"

## Claude COHEN-TANNOUDJI

*Nobel Laureate in Physics*
*Collège de France and Laboratoire Kastler Brossel, France*

## Atoms and Photons

**Date**
2 July 2007

**Time**
6.00-8.00pm

**Venue**
University Cultural Centre, NUS

**Free Admission**

**These lectures are organised in conjuction with the International Conference on Materials for Advanced Technologies, 1 - 6 July 2007, under the A*STAR - BMRC Distinguished Visitor Program.**

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**Guests are to be seated by 5.45pm**

# Chemistry and the "Kiss Principle"

**K. Barry SHARPLESS**

*Nobel Laureate in Chemistry*
*The Scripps Research Institute (TSRI), La Jolla, California, USA*

**Abstracts:**

My lecture will consider the chemists' love affair with reactivity. In particular, I will discuss how much more 'new reactivity' we think we need and how, by seeing the known in new light, we might find creating new properties and functions much easier than we had ever imagined possible. As an example, chemical orthogonality can enable us to create "Trojan Horse" molecules using Nature's own biochemical tools without Her ever noticing.

# Atoms and Photons

**Claude COHEN-TANNOUDJI,**

*Nobel Laureate in Physics*
*Collège de France and Laboratoire Kastler Brossel, France*

**Abstracts:**

Einstein was the first physicist to introduce the idea that the radiation field is quantized and consists of quanta, called now photons, having an energy hn and a linear momentum hn / c. He extended also the new statistics introduced by Bose for a gas of photons to a perfect gas of atoms, predicting in this way a new spectacular phenomenon, Bose-Einstein condensation.

We will review in this paper a few modern extensions of these ideas. First, multiphoton ionization, where an atom is ionized, not by the absorption of a single photon, as in the first description of the photoelectric effect given by Einstein in 1905, but by the absorption of several photons. We will then show how resonant exchanges of linear momentum between atoms and photons can give rise to huge radiative forces exerted by laser beams on atoms, allowing one to cool these atoms to extremely low temperatures. One of the most spectacular applications of the ultracold atoms obtained by these methods is the observation of Bose-Einstein condensation in ultracold atomic gases. New fascinating perspectives opened by these gaseous condensates will be briefly discussed.