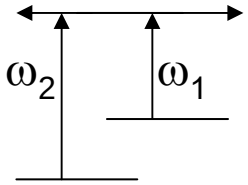
Research Interests of Moshe Shapiro

Coherent control – theory

Bichromatic control of a superposition state:

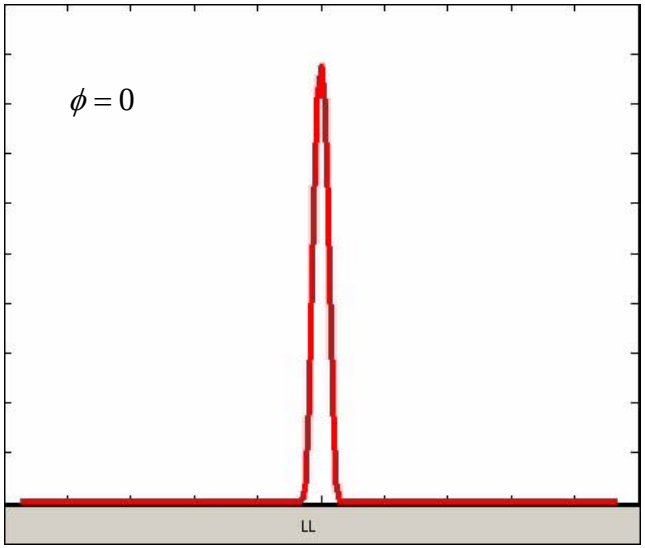


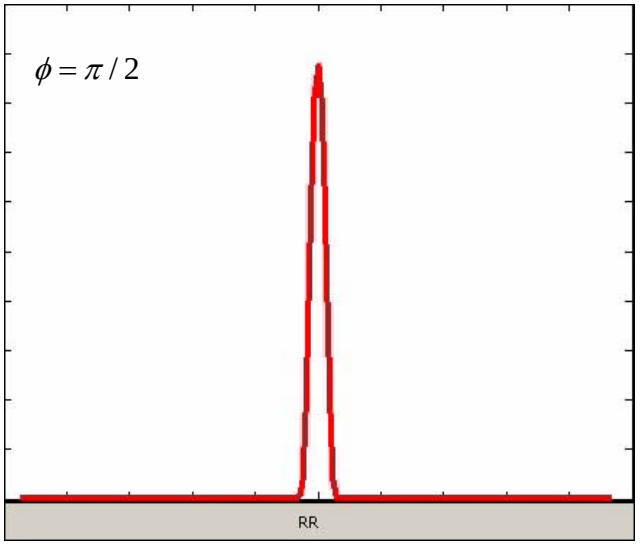
The control of electronic branching in the
$CH_3 + I^* \leftarrow CH_3I \rightarrow CH_3 + I$, reaction

Elliptic polarization control of differential cross-sections

1 photon vs. 3 photon interference

1 photon vs. 2 photon interference
Symmetry breaking and differential control:
creation of DC photo-current in semi-conductors
with *no bias voltage*.





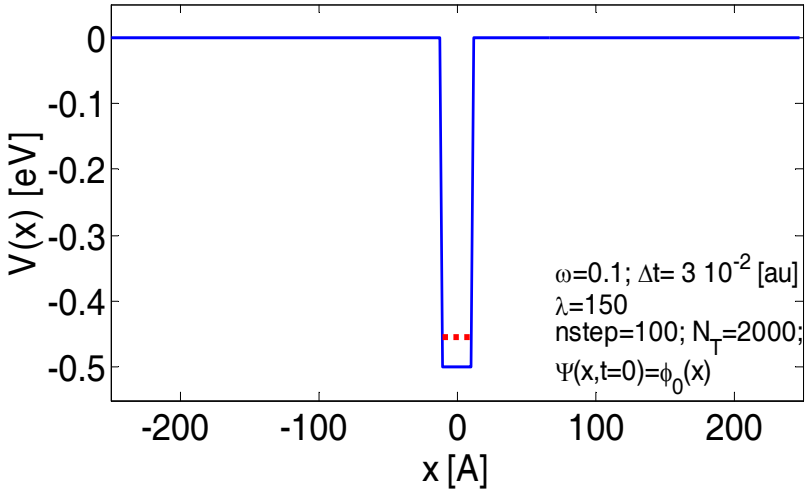
$$\dot{\psi} = -iH\psi$$

$$H = -\frac{\hbar^2}{2m}\frac{d^2}{dx^2} + V(x) + U(x,t)$$

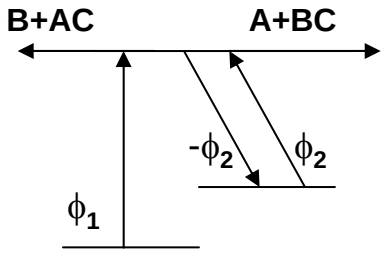
$$V(x) = \begin{cases} 0 & |x|>0.1 \text{ nm} \\ -0.5 \text{ eV} & |x|<0.1 \text{ nm} \end{cases}$$

$$U(x,t) = x\left[\sin(\omega t) + \sin(2\omega t + \varphi)\right] f(t)$$

$$f(t) = e^{-(t/\lambda)^2}$$



Interference Control with Incoherent light



Coherent Control of refractive indices

Enantiomeric purification of chiral racemic mixtures by coherent control techniques

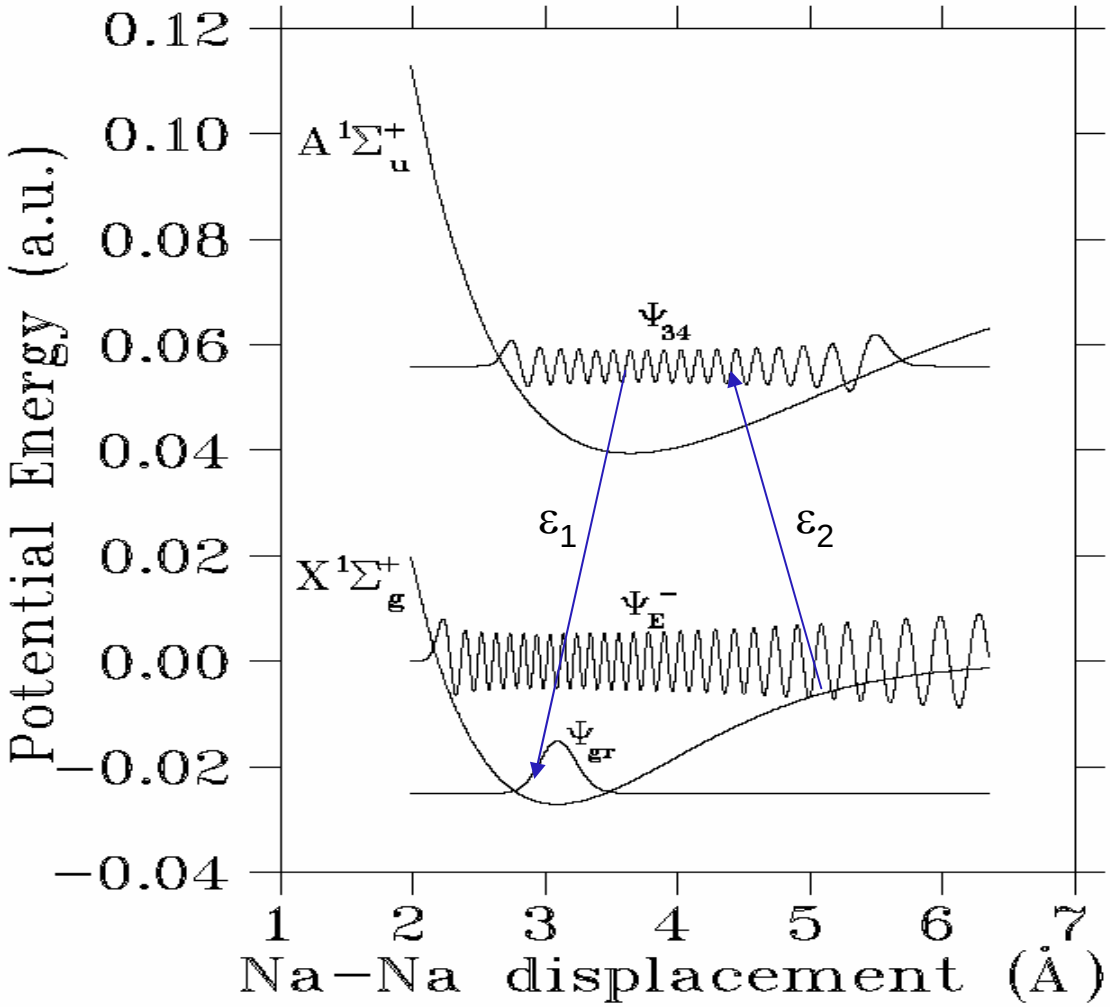
Optically controlled nanoscale deposition on surfaces

Coherent Suppression of spontaneous emission using overlapping resonances

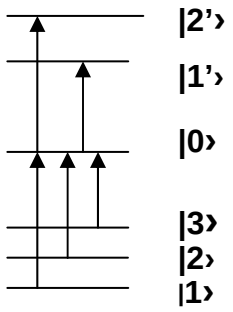
Coherent control with non-classical light

Tubular Image States

Photoassociation of ultracold atoms to form ultracold molecules via coherent Raman processes (The molecular BEC)



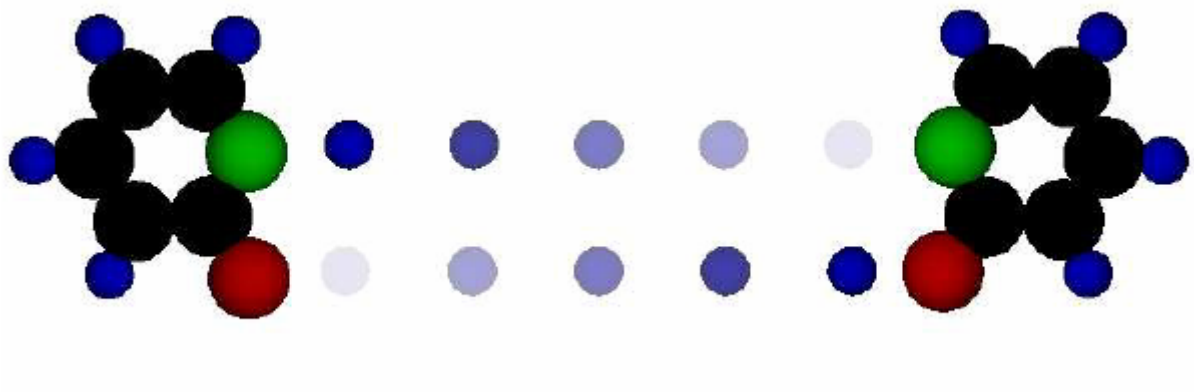
An exact analytical solution of the non-degenerate and degenerate quantum control problem



Experimental demonstration of phase locking between two 2-photon processes in 2-photon vs. 2-photon coherent control

Control of radiationless transitions by interference between overlapping resonances

Automatic optical repair of mutations caused by dihydrogenic tunneling between two nucleotides



Quantum computation using electrons trapped in an array of quadrupoles of carbon nanotubes