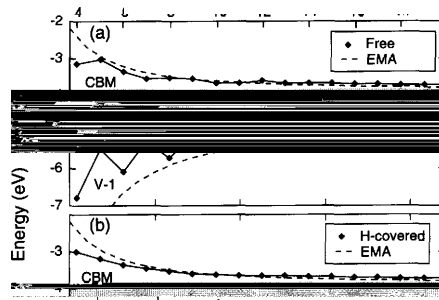


Electronic-Structure Theory of Semiconductor Quantum Dots

Alex Zunger

**The “Standard Model” of the
Electronic Structure of Dots**

Progress made in the growth of “free-
standing” (e.g., colloidal) quantum

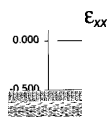


GaAs)

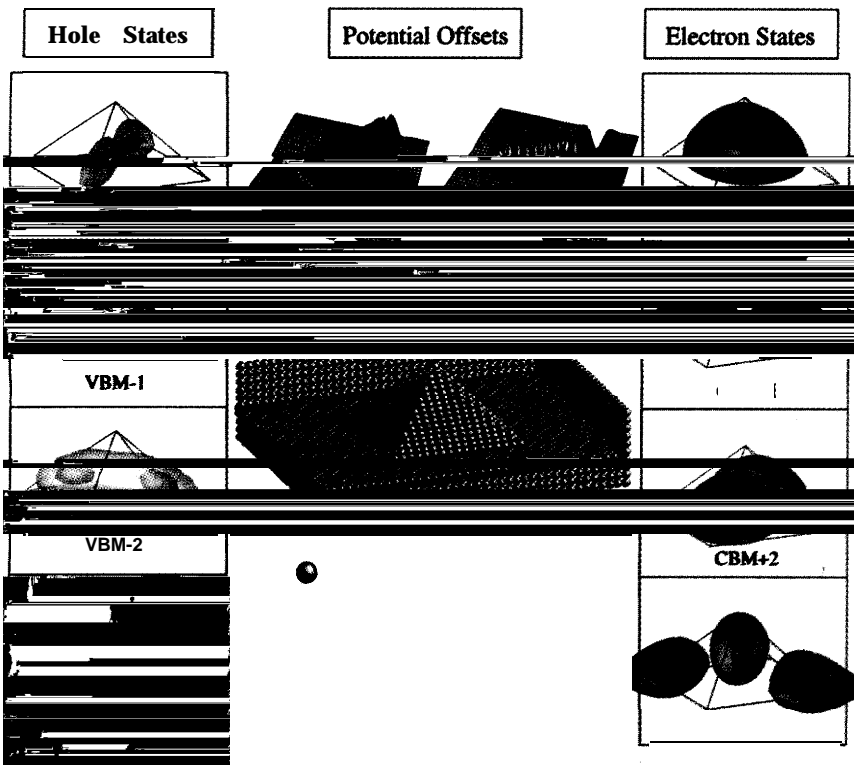
field.²⁰

-7 l

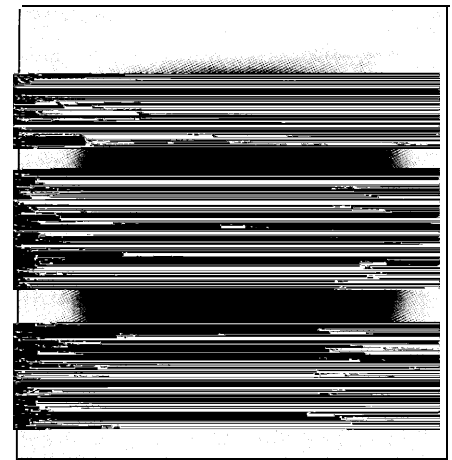
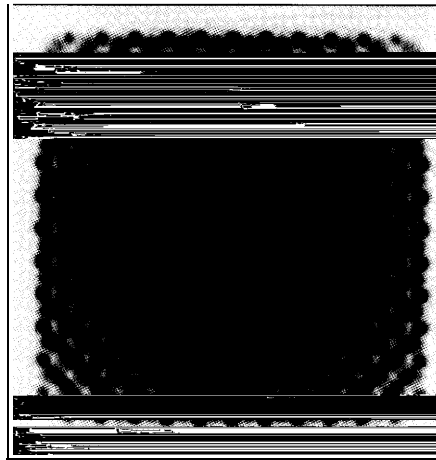
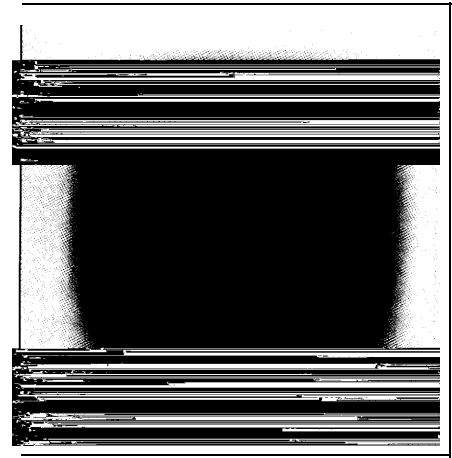
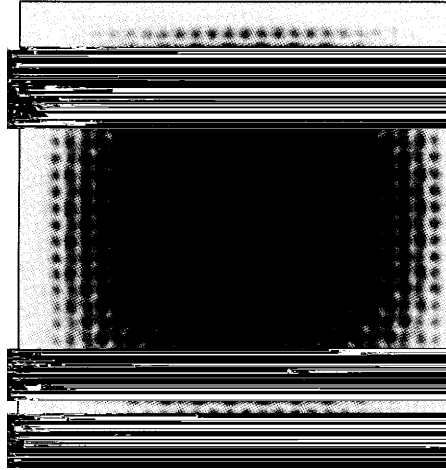
$$\mathcal{E}_x(\omega) = \mathcal{E}_x(\omega) + i\eta$$



Λ



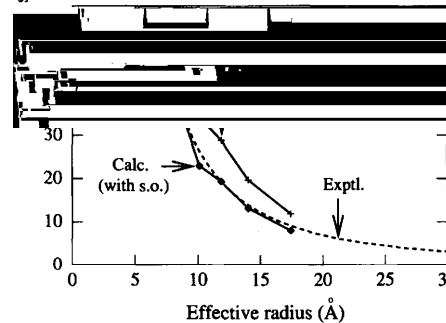
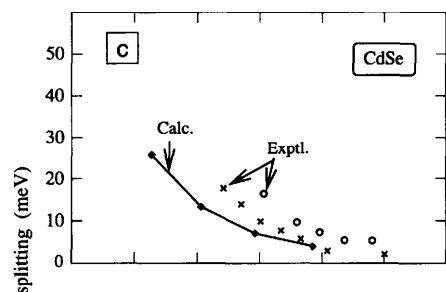
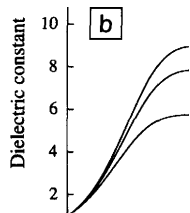
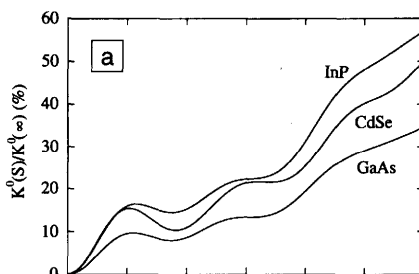
wave functions, transition probabilities,
etc. On a massively parallel CRAY



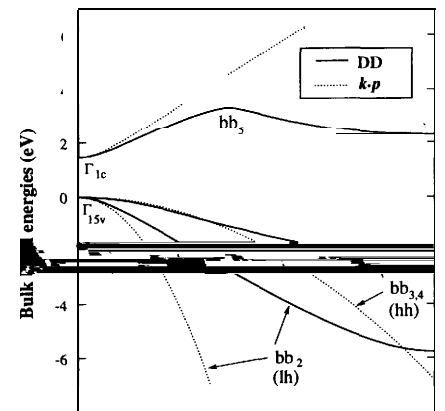
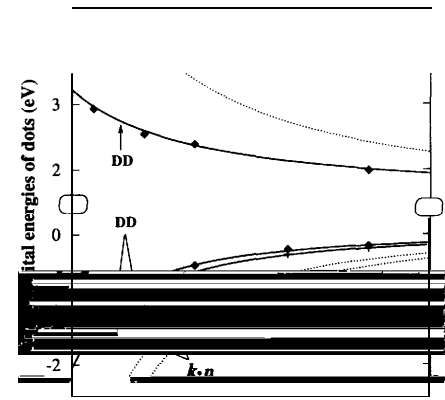
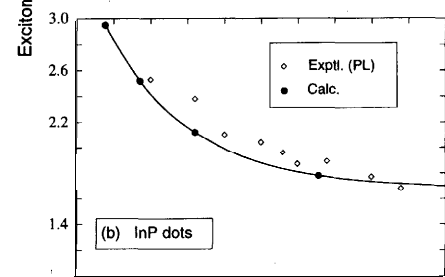
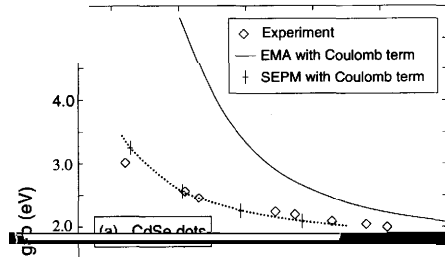
$$\langle \Phi_{ij} | \mathcal{H} | \Phi_{kl} \rangle = (\epsilon_{j,c} - \epsilon_{i,v}) \delta_{i,k} \delta_{j,l} - J_{ij,kl} - K_{ij,kl} \quad (5)$$

$$\iint \frac{\psi_{i,v}^*(\mathbf{x}_1)\psi_{i,c}^*(\mathbf{x}_2)\psi_{k,v}(\mathbf{x}_1)\psi_{j,c}(\mathbf{x}_2)}{\epsilon(\mathbf{r}_1,\mathbf{r}_2)|\mathbf{r}_1-\mathbf{r}_2|} d\mathbf{x}_1 d\mathbf{x}_2$$

$$\iint \frac{\psi_{i,v}^*(\mathbf{x}_1)\psi_{i,c}^*(\mathbf{x}_2)\psi_{j,c}(\mathbf{x}_1)\psi_{k,v}(\mathbf{x}_2)}{\epsilon(\mathbf{r}_1,\mathbf{r}_2)|\mathbf{r}_1-\mathbf{r}_2|} d\mathbf{x}_1 d\mathbf{x}_2.$$



$$\left(\frac{a_x}{R}\right)^3 E_x$$



gies versus size is consistently too large
in $k \cdot p$.
A recent

finem

