

Nanostructures

Dimensions <1000 nm (1micron)

- Gratings
- HOEs
- Quantum wells
- Quantum wires
- Quantum dots
- Photonic crystals

Why Nanostructures

- **Improved performance of lasers**
 - Higher quantum efficiency
 - Narrower linewidth
 - Greater range of wavelengths
 - Improved thermal stability
- **Improved performance of detectors**
 - Higher quantum efficiency
 - Greater bandwidth
- **Improved performance of modulators**
 - Higher modulation index
- **Greater device density on chip**

Increasing Device Density

- **Electronic device density is reaching a fundamental limit**
- **Conventional optical waveguides based on total internal reflection (TIR) also have a fundamental limit**
- **Photonic crystals guide light by the distributed Bragg reflection (DBR) mechanism because of their periodic nature**