# A Roadmap for Quantum Light Emission from Carbon Nanotubes

## Scientific Achievement

A CINT User Team established design principles linking defect engineering to controlled quantum light emission in carbon nanotubes.

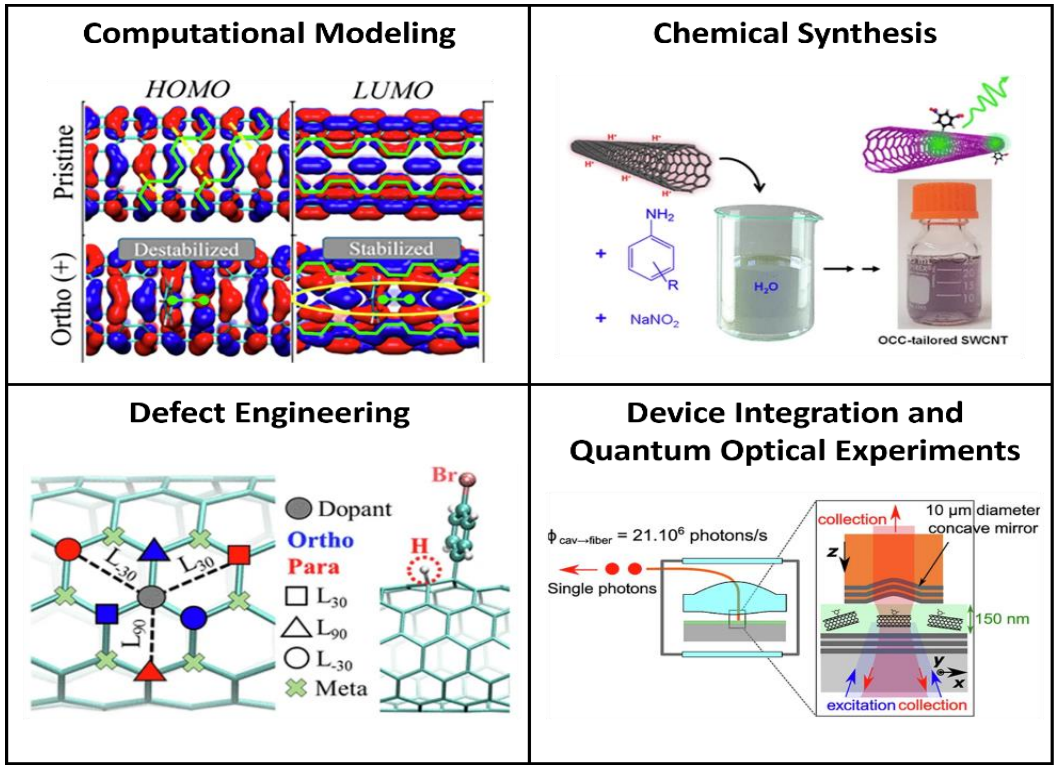


**Figure:** Defect engineering in carbon nanotubes enables localized excitons, whose properties are understood through computational modeling and validated by quantum optical measurements, establishing design principles for scalable quantum light sources.

## Significance and Impact

Defined promising research directions by integrating advances across computational modeling, chemical synthesis, defect engineering, device integration, and quantum optical experiments. This establishes a clear path toward practical quantum photonic devices.

## Research Details

- Identified key limitations in defect reproducibility, optical coherence and spectral stability, and device integration.
- Defined pathways toward scalable, room temperature quantum photonic platforms.

Work was performed, in part, at the Center for Integrated Nanotechnologies.

Chang, Y.-R.; Fortner, J.; Chandrasekaran, V.; Gifford, B. J.; Weight, B. M.; Doorn, S. K.; Htoon, H.; Kato, Y. K.; Tretiak, S.; Wang, Y. Quantum Defects in Carbon Nanotubes as Single-Photon Sources. *Communications Materials*. 2026.