

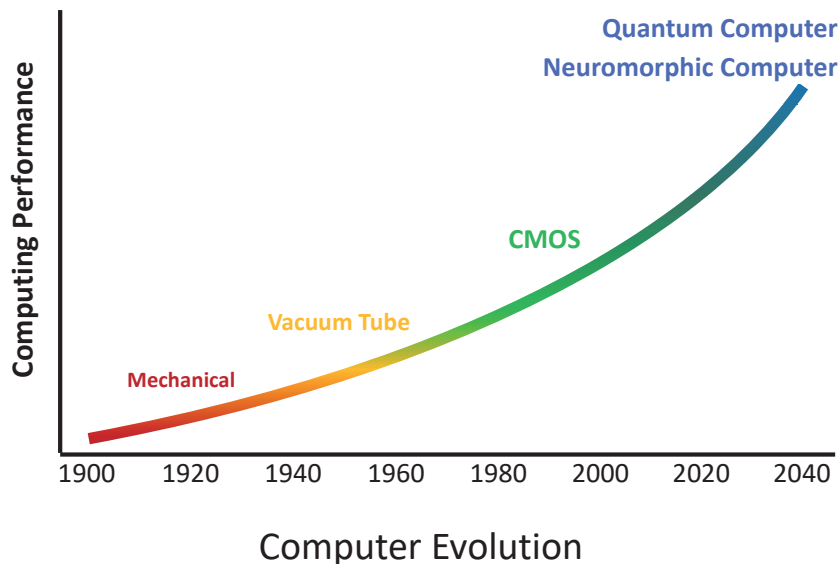


## Photonics for Future Computing

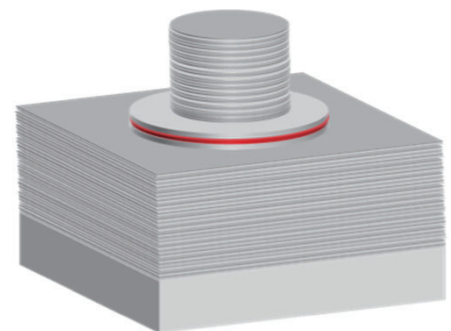
Laboratory for Future Interdisciplinary Research of Science and Technology (FIRST)  
Quantum Nanoelectronics Research Center

- **Data Link for Cryogenic Computing**
- **Single Photon Source for Quantum Computer**
- **Integrated Photonics for Neuromorphic Computing**

Computers have been evolving in the 20<sup>th</sup> century, starting with mechanical computers and then vacuum tube, and kept growing with CMOS transistors since 1960s. After 2000, CMOS computers increase the performance with CMOS scaling and high-level integration of energy-efficient transistors. Now as CMOS scaling is reaching to physical limit, performance improvement of CMOS computers have started slowing down. For continuous computer evolution, new approaches such as quantum computers and neuromorphic computers have emerged and their research and developments have been accelerated.



Photonics is crucial for future computers, such as cryogenic computing as an energy-efficient option for evolving CMOS computers, and next-generation computers, i.e. quantum and neuromorphic computers. Our research focuses on surface-emitting vertical microcavity including surface-emitting lasers, and integrated photonics including photonic crystals.



Vertical-Cavity Single Photon Source