Nanophotonic Computational Design

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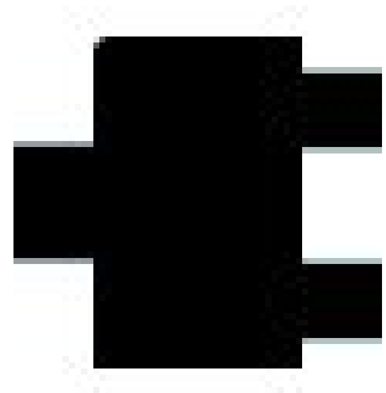
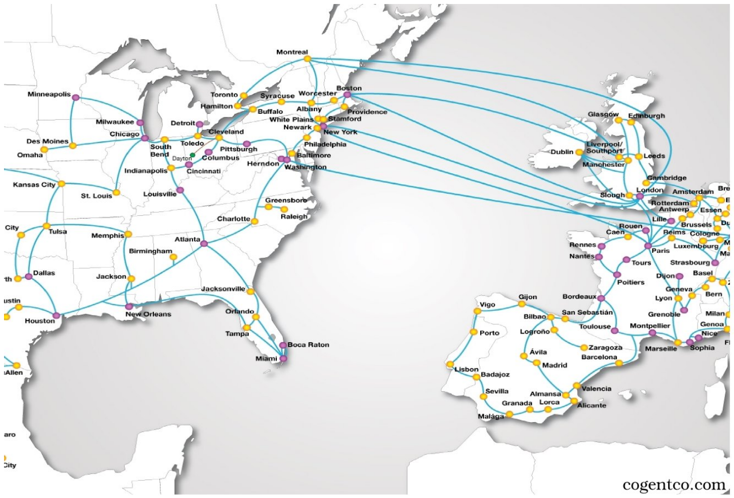
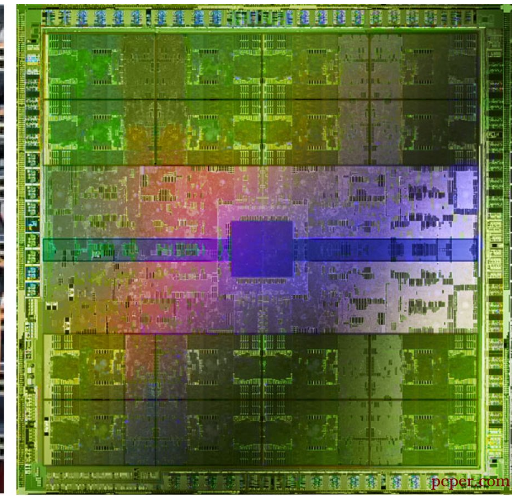
Takeaway: Taught a computer to design nanophotonic devices



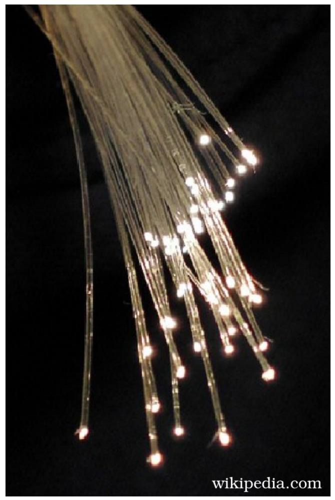
Part 1: Motivation

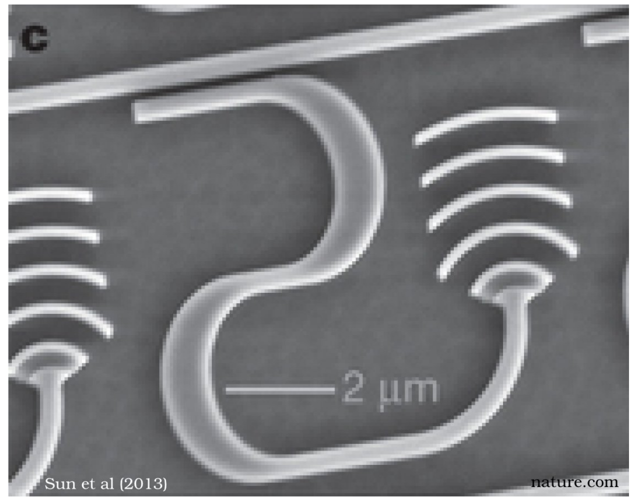




- As information grows, optical networks needed
  - across continents
  - within a datacenter
  - between chips and on-chip

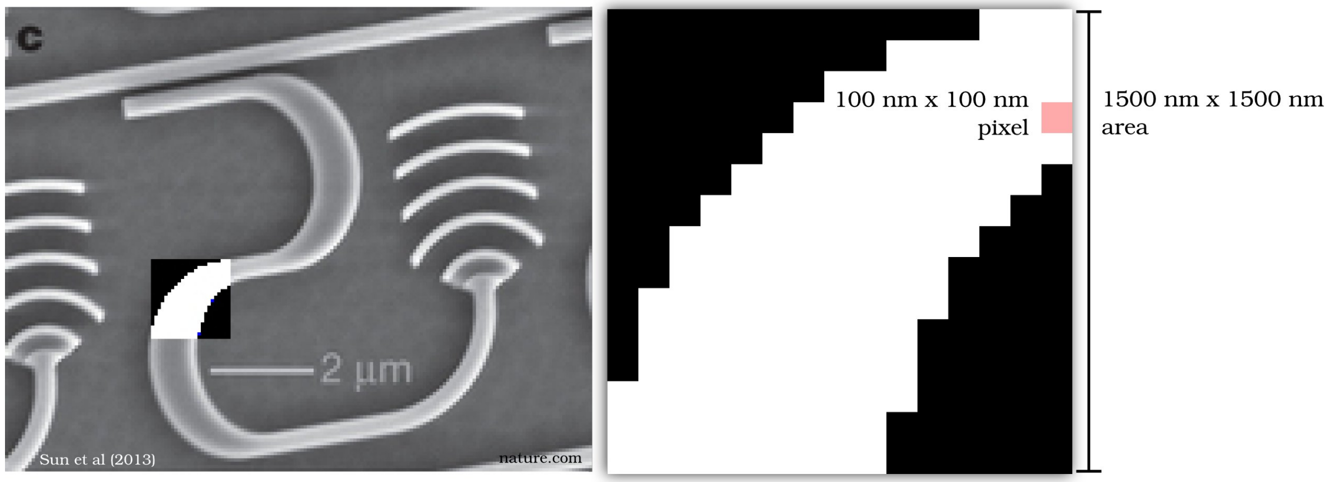
- An on-chip optical network is a fundamentally new optical communications technology: *the integrated optical circuit*





- Miniaturization drives
  - component price down
  - functionality up
  - design complexity (way) up

- Increasing design complexity requires additional degrees of freedom
- Fortunately, we have a virtually unlimited amount



- Include/exclude per pixel gives us $2^{(15^2)} = 2^{225}$ possibilities, uncountable

- Only feasible solution: Humans describe, Computers design

```
device mux2
    in: {freq1, freq2}
    out1 <= freq1
    out2 <= freq2
```

Part 2: Theory