Tiny lasers light up future electronics

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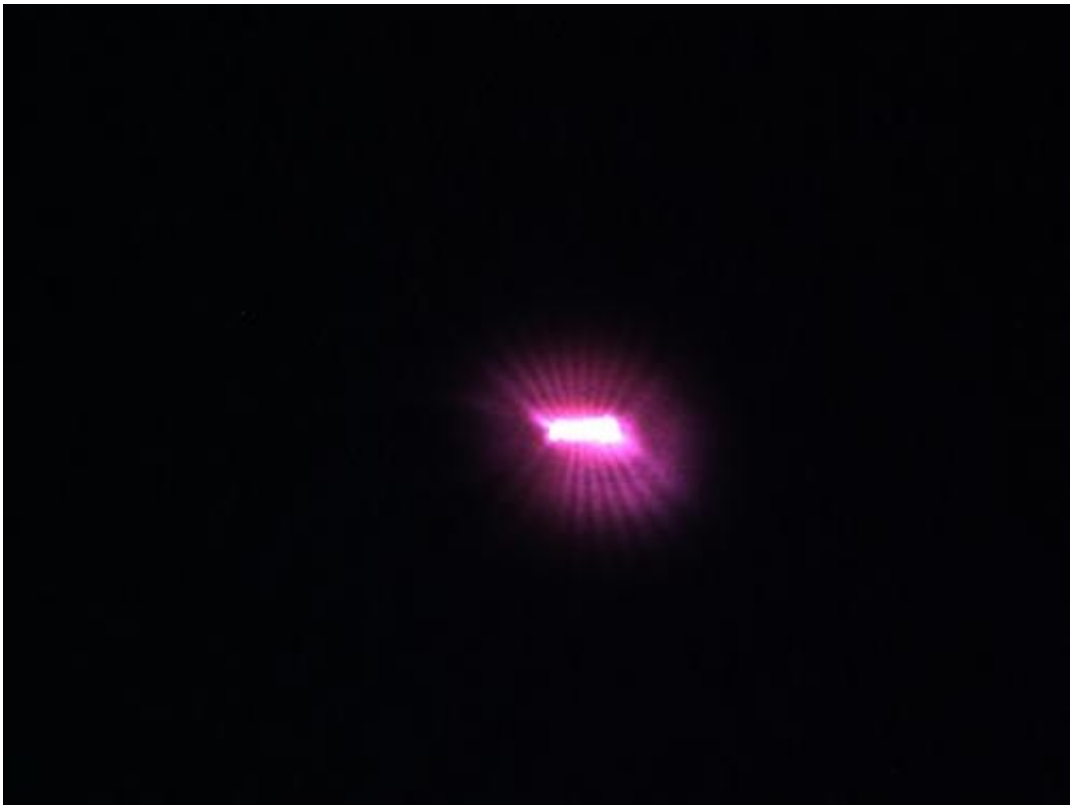


Pattern of light emitted from a nanowire laser.

(Phys.org) —Faster, smaller electronics are one step closer with researchers from The Australian National University successfully making the first room temperature lasers from gallium arsenide nanowires.

"The wires and lasers will lead to much faster, much lighter computers

because light travels faster than electrons, allowing us to process data much faster," explains Mr Dhruv Saxena from the Research School of Physics & Engineering.

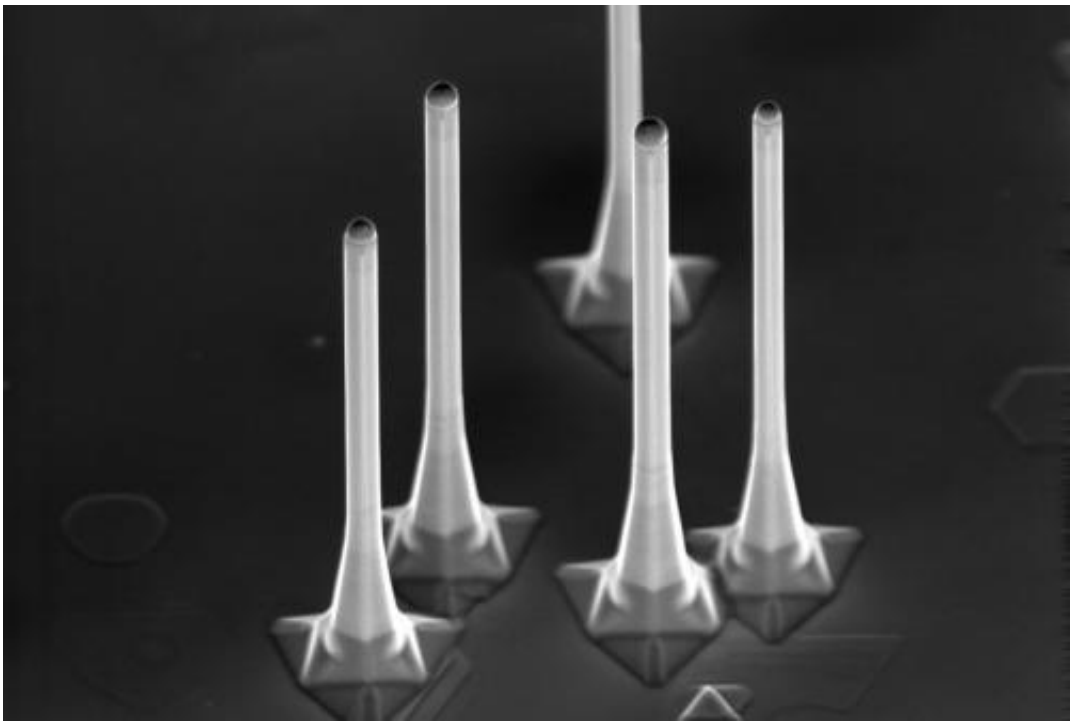
"The lasers in use at the moment often require a lot of processing steps to produce a nice cavity and mirrors in order to emit laser light," explains Saxena, who went on to explain these older lasers also are much bulkier.

Saxena authored a paper in *Nature Photonics* explaining how to make smaller lasers using gallium arsenide nanowires – solid wires only several billionths of a metre in diameter.

These wires get 'grown' in the lab, says Dr Sudha Mokkapati, an ANU-based ARC Super Science Fellow who co-authored the paper with Saxena.

"We have a substrate covered in gold particles which act as catalysts, or seeds."

"We provide gases containing gallium and arsenic and raise the temperature of the substrate up to 750°C. At these temperatures the elements react and nanowires start growing."



Nanowires standing on substrate.

"It's crystal growth," adds Saxena. "The substrate provides the direction of the growth, so they grow straight up, standing vertically on the substrate instead of growing in random directions."

"The shape of the nanowire confines light along its axis. The ends of the nanowire are like tiny mirrors that bounce light back and forth along the wire and the gallium arsenide amplifies it. After a certain threshold, we get laser light," says Dr Mokkapati.

Now that gallium arsenide nanowire lasers have been shown to work at room temperature, Saxena hopes this research will lead to cheaper, faster and lighter computers.

"We hope our lasers could be used in photonic circuits on a chip that

enable computing using light," concludes Professor Chennupati Jagadish, who leads this research.

More information: Optically pumped room-temperature GaAs nanowire lasers, DOI: 10.1038/nphoton.2013.303

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