Scientists develop atom-scale switch

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U.S. Energy Department scientists performing basic research have discovered a carbon nanotube-based system that functions as an atom-scale switch.

The researchers at the Oak Ridge National Laboratory say their approach is to perform first-principles calculations on positioning a molecule inside a carbon nanotube to affect the electronic current flowing across it.

The result is an electrical gate at the molecular level: In one position, the molecular gate is open, allowing current to pass, while in another position the gate is closed, blocking the current. In a silicon chip, the gate is a silicon oxide barrier within the structure of the chip.

In the ORNL model, the gate is a short molecule -- encapsulated inside the carbon nanotube that is about one nanometer in size, or three orders of magnitude smaller than a silicon chip.

The research is to appear in the Feb 2 issue of the journal *Physical Review Letters*.