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Memristor Circuitry via Material Implication ANNA WRIGHT, NADINE GERGEL-HACKETT, Department of Chemistry and Physics, Mary Baldwin University — Memristors are novel nanoelectronic devices that have advantages over traditional computer circuitry (eg., they are nonvolatile, two-terminal, and low power) and thus have potential circuit applications for both digital logic and memory. In this work, we used a simple memristor model that was designed to replicate the real-world electrical characteristics of previously fabricated and tested memristor devices. This model was developed and constructed with basic circuit elements using a free and widely available circuit simulator, LT Spice. We updated this model to more realistically simulate memristor behavior and then theoretically demonstrated that the model can be used to build memristor-based material implication gates (IMPLY gates). The development of these IMPLY gates is a critical step in the realization of memristor-based digital logic because they can be combined to act in place of any of the basic traditional logic gates (AND, NAND, etc), and thus enable efficient entirely memristor-based computing.

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