

Playing Off Each Other

Both Roadrunner and the brain quickly and efficiently process huge amounts of information. There are striking similarities—and differences—in how they do so. For example, each of Roadrunner's microprocessors performs about one billion operations per second, whereas a neuron performs about a thousand operations per second. However, Roadrunner—even though it is a "green" supercomputer—consumes about 2.341 megawatts of power, enough to run two thousand homes. (The imposing stack of Roadrunner's giant cooling towers, which dissipate the huge amounts of heat generated by the supercomputer's thousands of superfast chips, is a distinctive feature near the Los Alamos building that Roadrunner calls home.) However, because the neurons in the brain operate much more slowly than do a supercomputer's microprocessors and because the brain is far more parallel than a supercomputer is, the brain uses only 20 to 30 watts! As research programs such as the Synthetic Visual Cognition Project help us learn how cortical circuits work, we may one day be able to build hardware that can do what the brain does with much less power than existing supercomputers need—or that can operate much faster than existing brains do! Meanwhile, PetANNet and PetaVision are proof that the computational limitations of supercomputers are no longer major obstacles to studying the brain as an integrated system.