**Proton’s Mass ‘Predicted’**

**STARTING FROM A THEORETICAL DESCRIPTION OF ITS INNARDS,** physicists precisely calculated the mass of the proton and other particles made of quarks and gluons. The numbers aren’t new, experimenters have been able to weigh the proton for nearly a century. But the new results show that physicists can at last make accurate calculations of the ultracomplex strong force that binds quarks.

In simplest terms, the proton comprises three quarks with gluons zipping between them to convey the strong force. Thanks to the uncertainties of quantum mechanics, however, myriad gluons and quark-antiquark pairs flit into and out of existence within a proton in a frenzy that’s nearly impossible to analyze but that produces 95% of the particle’s mass.

To simplify matters, theorists from France, Germany, and Hungary took an approach known as “lattice quantum chromodynamics.” They modeled continuous space and time as a four-dimensional array of points—the lattice—and confined the quarks to the points and the gluons to the links between them. Using supercomputers, they reckoned the masses of...
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