Editorial Note on the Hidden Mysteries behind Atom

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Editorial Note

Received date: 15/03/2021
Accepted date: 22/03/2021
Published date: 25/03/2021

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Keywords: Atom, Proton, Neutron

EDITORIAL NOTE

Nobody knows exactly what happens within an atom. In an atom's outer shell, electrons whiz through "orbitals."
After that, there's a lot of empty space. There's a tiny nucleus, a dense knot of protons and neutrons that gives the atom much of its mass — right in the middle of that vacuum.
The strong force brings certain protons and neutrons together in a cluster.
Still, no one knows how those protons and neutrons (together known as nucleons) behave inside an atom. Outside an atom, protons and neutrons have definite sizes and shapes. Each of them is made up of three smaller particles called quarks, and the interactions between those quarks are so intense that no external force should be able to deform them, not even the powerful forces between particles in Each of them is made up of three smaller particles called quarks, and the interactions between those quarks are so intense that no external force should be able to deform them, not even the powerful forces between particles in a nucleus. But for decades, researchers have known that the theory is in some way wrong.
Reports suggest that, inside a nucleus, protons and neutrons appear much larger than they should be. Physicists have developed two competing theories that try to explain that weird mismatch, and the proponents of each are quite certain the other is incorrect. protons and neutrons inside heavy nuclei act as if they are much larger than when they are outside the nuclei. Researchers call this phenomenon the EMC effect, after the European Muon Collaboration — the group that accidentally discovered it. It violates existing theories of nuclear physics. quarks, the subatomic particles that make up nucleons, strongly interact within a given proton or neutron, quarks in different protons and neutrons can't interact much with each other. The strong force inside a nucleon is so strong it eclipses the strong force holding nucleons to other nucleons. Recent experiments have shown that at any given time, about 20 percent of the nucleons in a nucleus are in fact outside their orbitals. Instead, they're paired off with other nucleons, interacting in "short range correlations." Under those circumstances, the interactions between the nucleons are much higher-energy than usual. This is because quarks penetrate the walls of their individual nucleons and begin to interact directly, and quark-quark interactions are much more powerful than nucleon-nucleon interactions. The walls separating quarks within individual protons or neutrons are broken down by these interactions.