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LOCAL MAGIC NUCLEI: PROPERTIES AND STRUCTURE

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A new kind of atomic nuclei, local magic nuclei (l.m.n.), have been discovered recently [1]. We present in this report a current state of relevant research.
L.m.n. have the same observable features as traditional magic nuclei, i.e. elevated energies of the first 2+ excitations, increased nucleon separation energies, and so on. However, unlike the traditional magic nuclei, l.m.n. do not have magic isotopes or isotones, and, in addition, they manifest at non-conventional magic numbers. They are described not by 'magic numbers' but by 'miraculous pairs', such as (N, Z) and similar, where the underline denotes a number that loses its magicity in another pair. Examples of observed pairs are (N, Z) = (32, 20), (40, 28), (56, 40), (64, 50), (82, 64) etc.
L.m.n. arise due to the compact (like a hole) gaps inside the traditional shells. This conclusion follows from our studies of the one-nucleon stripping and pick-up reactions. As we suppose this shell evolution is due to nucleon-nucleon interactions, and the proton-neutron tensor force makes a decisive contribution. On this basis, we have constructed the diagrams of the nucleon orbit energies, which successfully describe above processes. These diagrams predict new magic numbers as well.
As a result, we obtain the two-dimensional (N, Z) shell scheme, which develops the traditional Goeppert-Mayer – Jensen scheme.

1. Igor Boboshin // Preprint of Skobeltsyn Institute of Nuclear Physics, Lomonosov Moscow State University, http://www.sinp.msu.ru/en/preprint/25701.

The speaker is a student or young scientist

No

Section

1. Nuclear structure: theory and experiment

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