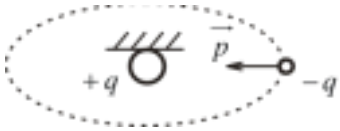
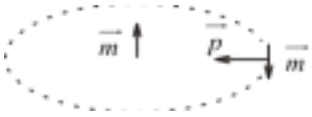
NOVELTIES IN SHORT

Phenomena represented here (Stable Magnetic Planetary System (SMPS) [1– 4, 6, 17], Magnetic Potential Well (MPW) [4 – 6, 12 – 25, 27], and Speed-Independent Electromechanical Energy Conversion (SIEEC) [8, 26]) are tested fundamental of many new clean technologies.

Background of SMPS: In physics (see, e.g., [9], § 14, p. 49), two material points interacting with potential energy $^{n}U = -1/R$ where R is distance between points and $n = const$ can be stably moving on a stationary circular orbit if $n < 2$. Graphically, properties of planetary systems with different nature of the force between them are shown in Figs. 1- 3.

 $U \sim -1/R$	 $U \sim -1/R$	 $^{3}U \sim -1/R$
Fig. 1. Gravitational planetary system is **stable because n =1 < 2**	Fig. 2. Electrical planetary system is **stable because n =1 < 2**	Fig. 3. Magnetic planetary system is **unstable because n =3 > 2** [10])

As first shown by us [1- 4, 6, 17], stable SMPSs **are possible**. The top size of orbit R of any stable magnetic planetary system is restricted from above and comparable with the size of a magnet of the magnetic planetary system. The originality of the planetary systems with magnetic interaction is that they can be stable but any stable magnetic planetary system is always "close-packed" or restricted from above the size of the stable orbit [4, 17]. Many applications based on the SMPS have been developed: space stations providing artificial gravity and magnetic shielding against cosmic radiation for long staying human in outer space, compressors, turbo expanders, bearingless blood pumps, mixers etc providing non-contact rotation and torque transfer (the portable working model can be demonstrated).

Background of the MPW: In Fig. 4, P is magnetic force, x is spacing between two magnets, U is magnetic potential energy, x_0 is the MPW-position as point of the magnetic potential energy U minimum and zero magnetic force P between two distant magnets. Other curves represent

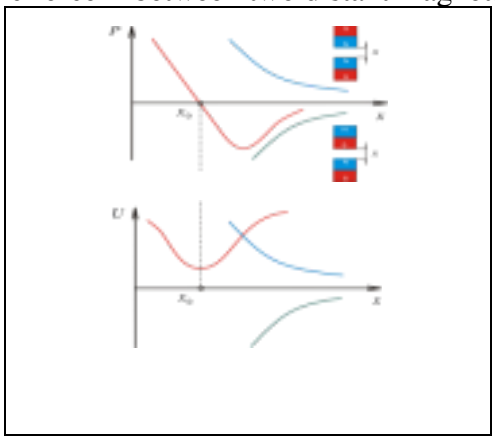


Fig. 4. MPW- presentation

"classic" two-magnet force and magnetic potential energy versus distance between two magnets. Prima facie, MPW-interaction demonstrates variance with physics. Really, MPW denies classic imagination about **monotonicity** of the pair magnetic interaction because in physics footing exists: only two-nucleus potential energy has a local minimum as a function of two-nucleus distance, whereas potential energies of gravity and electromagnetic interactions are monotonic functions of the distance.

The MPW-phenomenon substantiated in [4 – 6, 27] is the basis of a new magnetic levitation [12 – 25, 27] distinguished by: 1) operates at rest and/or movements of a levitated body with no contact; 2) no control to operate; 3) no power supply for various masses of levitated bodies; 4) the highest level of magnetic force and stiffness allowing non-contact operation at extremely high speeds (hundred times and more compared to known maglev transport and magnetic bearing solutions using normal conductor electromagnets, permanent magnets and bulk superconductors); 5) largest range of operation gaps (from microns in small devices to meters in large scale applications).

Background of the SIEEC: From 1831, electricity is generated on the basis of the Faraday's experiment (see, e.g., [11], p. 285, Fig. 248) requiring the time-varying magnetic flux through a closed electrical circuit where electric current is to be induced. Such electromechanical energy conversion crucially depends on the relative speed between field winding and armature of electrical machinery. The new conversion completely turns mechanical energy into electrical one, and back, at **constant in the time** magnetic flux through the circuit [8, 26], and the completeness of the electromechanical energy conversion does not depend on the relative speed between the field winding and armature. The SIEEC can be used to generate electricity from any slow primary mechanical energy, e.g generation **(without dams)** from rising/ebbing ocean tides potential of which is sufficient to satisfy the world's energy needs during million years. Another sample: the SIEEC using energy from California's shore ocean waves enables replacement of all fuel-based power stations and heat-engine cars operating for California. Technologies based on the SIEEC are simply doable right now and do not require additional time and expenses to justify contrary to, e.g., nuclear fusion (app. $20 billion from the first research and to the International Thermonuclear Experimental Reactor which is constructed now). Efficiency of the SIEEC is no less than 95% that **excludes** heating of the Earth similarly as existing coal-oil-gas and nuclear electricity generation and transport requiring heat machines with efficiency no higher than 50%, and/or solar with efficiency 10%.

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More in details see book "Novelties in Magnetism and Clean Energy", Amazon Press, 2019
(https://www.amazon.com/NOVELTIES-MAGNETISM-CLEAN-ENERGY-Kozorezebook/dp/B07W7TJ9R5)