The Electrifying Game of Nature

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Abstract: Generally speaking, when we identify some form of rotation of a whole system inside a given volume we also observe a total energy in that volume greater than the total energy in the same volume while the same system is not rotating. So there is an energy associated with rotation and we know that supplemental energy can increase gravitational effects, as well as the intertial effects, of the heterogeneous entity occupying the given volume. All these observations are consistent with the equivalence of mass and energy, and with the equivalence of gravitational mass and inertial mass.
That can lead to imagine "foundamental rotation forms of a field" producing the gravity associable with the mass-energy of elementary particles. This brief essay suggests one simple metaphor to focalize the concept.

Once upon a time there were many little windmills, lying on a toyshop shelf. It was nearly Christmas, so some of them would have ended up in a "without epoch" scene of the Nativity.
Of course these windmills are fake... The four blades are placed as a symmetrical cross on the hub, and this cross is free to rotate; there's no millstone connected to the hub!

I did a thought experiment inspired (for unknown reasons) by those windmills and Christmas tree balls.

Numerating the blades (of one of those windmills) counterclockwise from 1 to 4 let's imagine fixing a copper shell to the end of blade 1... as if it were a Christmas tree ball penetrated by the blade of the small windmill. It is one of the many ways in which the concept of equilibrium can be represented... in its main variations.
The shell tends to reach (perhaps after some oscillations) the position closest to the "center of the Earth", bringing blade 1 with it; so partially rotating (and making oscillate) all the blades and ending up to maintain the predictable position of stable equilibrium.
To have an example of unstable equilibrium it is sufficient to keep the shell in the position furthest from that of stable equilibrium, that is at the top, and then leave it... The equilibrium is now unstable because in this position a "minimum perturbation" is enough to cause all the movement necessary to achieve the stable one again.
Another interesting form of equilibrium is that of the so-called "neutral equilibrium"... A shell identical to that fixed in blade 1 is fixed to the end of blade 3... Whatever the position in which the blades are guided, it will be maintained.
In my opinion the concept of neutral equilibrium is more abstract than the other two... because in practice its representation is made possible by the circumstance that, as in this case, the imperfect identity of the shells (or their fixings, or any other detail) is masked by an inevitable friction that tends to be "symmetrical"... This kind of friction, moreover, also justifies the almost random final position of the blades after they have been temporarily given a "random rotation". This randomness of the final position is evidence of neutral equilibrium, too. And, from this point of view, nothing changes if the copper shells are electrostatically charged at a negative fixed amount the one in blade 1 and at a positive same amount the one in blade 3. If the blades are made of insulating material each shell will hold its charge... regardless of rotation and final positioning.

On the other hand, the condition of neutral equilibrium is lost if in the vicinity of this windmill we place another identical one (with charged shells) in such a way that all the blades lie on the same plane in which the Earth's center of gravity lies.
So-called Coulomb forces will tend to make the shells with opposite charge reciprocally approach and to make those with equal charge reciprocally push away. As known, the magnitude of these forces is inversely proportional to the square of the distance between the involved objects... Since in this case the moduli of all interacting electric charges are the same fixed amount, one can imagine the dynamics of the system simply by taking into account distances and constraints.

Let's imagine, for example, that those two little windmills are bound to maintain a fixed distance... The shells will be able to approach or move away only by causing rotational motions of the blades.
It is easy to predict that, at the end of any temporarily given rotation, all the shells will be aligned at the same height as the hubs... Seen from left to right we can find the shell in blade 1 of the first windmill, then the one in blade 3, then the one in blade 1 of the second windmill and, finally, the shell in blade 3 of the latter; or we can find the sequence 3 1 of the first windmill and 3 1 of the second one. Indeed, in the system consisting of the pair of windmills, 2 conditions of stable equilibrium are discerned... One that keeps the shell in blade 3 as close as possible to the left of the shell in blade 1 of the second windmill and the other that keeps the shell in blade 1 as close as possible to the left of the shell in blade 3 of the second windmill. In both cases the tendency to reach a condition of stable equilibrium will end up representing a force of attraction between the two windmills, which can be thought applied to the hubs... and presumably dominant even in some phases of combined rotation.

If we now prepare a straight section of track for toy electric trains, with two freight wagons free to run on it, and we put one windmill on each wagon reproducing the geometry of the previous case, we expect the two wagons to approach.

And what would we think if the swirling windmills were so small that they were not "visible" but so numerous that all together they could be "weighed"? I would think that some law of nature makes them concentrate in an ever smaller volume, something comparable to the law of gravitation.
In other words... If in nature there is the possibility that two electrically neutral bodies (in electrostatic terms each "windmill" is always neutral) approach "spontaneously" due to "residual effect of Coulomb forces" then, up to proof of inadmissibility, we can admit that in the "electrifying game of nature" gravity represents a chaotic complex of electromagnetic interactions, whose statistics end up justifying relatively simple macroscopic effects.

But why should the thought experiment with the little windmills suggest gravity and not, for example, magnetism?
If we mathematically analyze the resultant force that makes the windmills placed above the wagons approach we discover that it is not analogous to the one in the Newton's law of gravitation... but, unlike the one in magnetic phenomena, it is always attractive.

As for all metaphors also the one of the swirling windmills has a limited significance... Beyond "the limits" the electrostatically charged shells should be figured on as "dematerialized entities", at a sub-particle scale, "rotating" at very very high frequencies; and with "constraints" very different than the ones in the thought experiment... so producing different "macroscopic effects", possibly motions analogous to gravitation, too.

Well, this is the point in my imagination where I see Mr. Roger Babson's eyes abandon this reading with a smiling light!