# ADDENDUM TO AS2-01

"Care is needed because physicists are human and they make mistakes. Everyone makes mistakes, and it is particularly easy in theoretical research. The researcher is setting off on a journey in the dark along an uncharted road. If he gets lost, he has no one to put him back on the right track until someone else comes down the road, goes back, finds a better road and bothers to come back again to collect the lost soul."

H. Aspden, "Modern Aether Science", p. 87

Several readers have drawn our attention to the fact that our calculation of the work performed against gravity by the electroscopic leaf at any one instant, appears to be double that calculated from classical physics, or from Carnot's or Dr. Aspden's formula.

The accepted formula for the equivalence of 'positional' and 'kinetic' energies for the pendulum postulates that mgh = 0.5mv^2. Assuming an analogy between the pendulum and our electroscope - with a leaf length of 2.3 cm, a total leaf mass of 0.000939 gm, a deflection arrested at 70°, and a height of fall of ca 1.5 cm - we obtain mgh=1.39erg.

However, such a straight comparison assumes that the electroscopic leaf will act essentially as if all of its weight were concentrated at the tip. R. Spaandonk has tried to reason this with us - much to his dissatisfaction, we suspect – suggesting that the value should be halved to 0.7 erg, given that the mass of the leaf is homogeneously distributed throughout its mince volume.

We should equally note that Dr. Aspden's formula, as relayed to the authors in a private communication, applied solely to a paired-leaf electroscope: "The formula for significant angular deflection is mgl(1-cosø) but that represents energy. (...) If your figure involves pulsing (...) then the electroscope arms would need to flap up and down through the vertical distance (1-cosø)l (...)." Hence, Dr. Aspden's formula did not need to be halved, since it already referred to the deflection of two leaves, each with its center of mass assumed to lie half-way through their length.

So then, given that our standard electroscope is single-leaved, why did we not half our values?

First stands the fact that the leaf has a material structure that only permits it to bend in one plane, unlike the pendulum suspension; second that, precisely in this plane, and at high angles of deflection, it behaves just like a pendulum, typically developing a kink in the middle, so that the tip is the most distant from the stem - or from the twin leaf, if one employs a double-leaf electroscope. Dr. Aspden addressed these two observations best in a recent message to the authors - "You can clarify the factor-of-two problem by noting that the gravitational energy formula presented applies strictly to the two-leaf electroscope with rigid leaves that pivot, but is a good approximation for the single leaf version because the leaf is not rigid and is not mounted on a pivot. It bends, cantilever-style, and a cantilever with an end load is displaced along its length in proportion to the cube of distance. Accordingly, the work done against gravity, with weight distributed along the leaf, has to be estimated at a higher value than applies for the two-rigid-leaf case, depending, of course, upon how the angle of deflection is measured. A factor-of-2 seems a fair estimate."

Thirdly, in the context of aetherometric theory, it is suggested that beyond the equal division of trapped charge between the leaf and the stem, the free electrons in the conduction band (or the 'holes' in the valence bands, for a positively charged electroscope) tend to distribute themselves in the leaf and stem in such a way that, as they lose kinetic energy, they tend to get nearer to the lower edges of stem and leaf - from which they eventually fall off. In other words, there is a gravitational gradient acting both along the leaf and the stem and affecting the linear distribution of the charges or 'holes'. This suggests that if it is trapped massbound charges that serve as seat for the antigravitokinetic regeneration that arrests the discharge (when the positional energy of fall is fully counteracted by a kinetic energy of rise supplied from the medium), then the local seat of the counteracting action lies towards the tip of the leaf, not the middle, very much as if the center of mass of the foil resided near the edge. The suggested distribution of the trapped charges is schematically shown in **Fig. 1.**

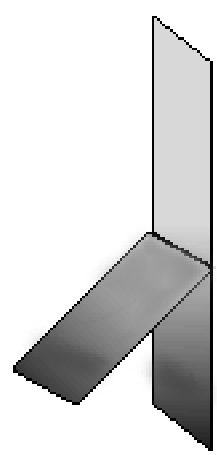

Figure 1

In a sense, then, the leaf tends to be bottom-heavy with charges, and as these charges tend to locate superficially - and are distributed almost essentially as a function of the surface rather than the volume - the analogy with the pendulum is reinforced, as the seat of the action counteracting gravity is displaced distally.

The authors have also carried out experiments with electroscopic leaves whose mass was concentrated at the tip of the arm. For this purpose, a gold leaf - precisely identical in all dimensions and weight to the leaves employed in our standard electroscopes - was sandwiched between fine rice paper and carefully cut parallel to its length, under a dissecting microscope, to leave a 'suspension strip' that was one-eighth of the leaf width.

As shown in **Fig. 2**, the single cut left an 'L' structure.

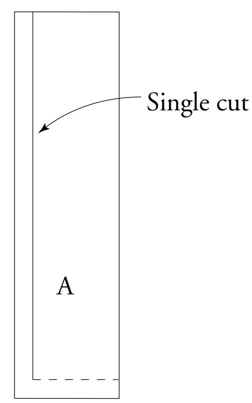


Figure 2

The remaining leaf surface A was then folded in successive halves - as shown in **Fig. 3** - until this 'L' structure was formed, and finally the 'leg' of the 'L' was folded by the same method.

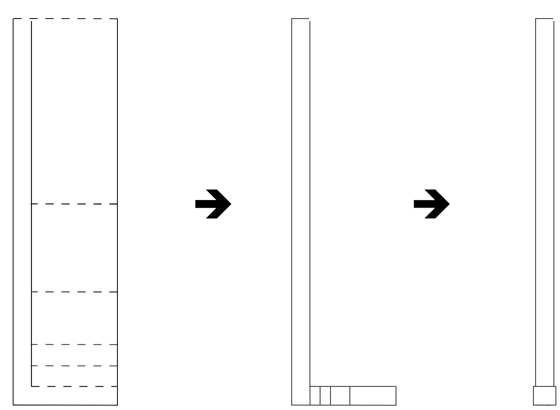

Figure 3

As a result, we obtained essentially a pendulum analog having the same mass as the electroscopic leaf, but with nearly 90% of its mass concentrated near the tip, while retaining perfectly continuous conductivity with the electroscopic stem. We weight-pressed the fashioned pendulum and then tacked the outer leaf fold to the suspension strip with a micro-drop of cyanoacrylate.

We mounted this 'leaf pendulum' in an electroscope, at the same stem height as the normal leaf in one of our standard electroscopes, and we used the latter as a control. Both electroscopes were tested with a single wire connection to a grounded dual-polarity power supply, while the cases were wired together and grounded to earth or to the center tap of the supply. The results completely conformed to the classical expectation, within the proportional curve of the electroscopic deflection, for any chosen voltage and independently of polarity. For example, at 900 VDC, the standard electroscope presented a 36° deflection, while the identical test electroscope with the 'fashioned gold pendulum' presented exactly half of that deflection, 18°.

This would appear to clinch the case. But not for these authors, since it is far from clear whether this experiment can be construed as an adequate control on the behaviour of the original leaf. First, the 'fashioned pendulum' does not present the same bending as the normal leaf, but the very opposite curvature, opposite also to the curvature of a gravitational pendulum at high angles of deflection. Secondly, the cantelever-like action of the joint is now nearly completely minimized. And thirdly, the 'fashioned pendulum' structure interferes with both the distribution of charges on the leaf and their antigravitokinetic action. Instead of a distribution that is predominantly superficial, we now have one that is concentrated in the pendulum mass. Yet, as illustrated in **Fig. 4** for a simple triple folding of a surface, the charges tend to distribute themselves on the surface of the inner folds, even when the pendulum is weight-pressed and rehammered, rather than on the outer surface of the pendulum mass.

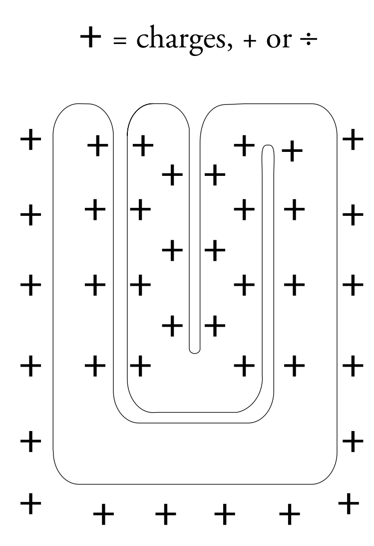


Figure 4

This is easy to observe and demonstrate: if the last fold is not tacked with glue to the suspension strip of the 'fashioned pendulum', then as soon as the electroscope is charged, the 'fashioned pendulum' mass immediately begins unfolding or inflating its folds, the mass-folds functioning as so many micro-electroscopes engaged in electrostatic repulsion. This is stark evidence that the 'fashioned pendulum' structure interferes with both the electrostatic and the antigravitokinetic interaction. If the latter is mediated by the former and seated in the trapped charges, then the effective and substantial decrease in active leaf area and the presence of electrically repelling folds within the pendulum mass will affect the entire distribution of the trapped charges, as well as the vectorial targets of their expenditure of kinetic energy, whether electric or 'borrowed' from 'latent heat'. Fewer charges will be available over a nearly tenfold smaller surface to repel the leaf from the stem or sustain the deflecting mass, and one might argue that it is this that effectively accounts for the observed halving of the deflection.

We are therefore obliged to stick to our original model of the analogy of the electrically repelling leaf with the free-swinging (nonelectrified) gravitational pendulum. Although we see no fundamental objection in principle to the halving of our proposed values, we do see plenty of physical observations and considerations that suggest they should not be halved. As this is an ongoing research problem, this addendum will remain open to further additions.

We thank Dr. H. Aspden for his support, insights and advice, and Mr.s C. Bell and R. Spaandonk, for their interest and suggestions.