Geckos Walk On Walls Because Of Electrostatic Attraction Caused By Dust Nanoparticles

Geckos are shown to walk on walls because of electrostatic attraction caused by EM radiation produced at the instant toe-hairs in their feet detach nanoparticles from the wall surfaces

Jan. 8, 2009 - *PRLog* -- Since Aristotle, how geckos are able to climb up and down walls and run across ceilings has captured the interest of mankind. The earliest report of research directed to the gecko's secret was recorded in 1872. Recently, considerable research has identified the mechanism that holds the gecko to walls and ceilings to be the van der Waals (vdW) force.

The vdW force was originally formulated to describe the attractive force that holds atoms together in a gas, the gas atoms separated by a few angstroms. But the attraction of the gecko differs in that their toes cover a large area compared to that of the atom, and therefore it is unlikely that all atoms on the gecko’s toes contact those in the wall surface within a few angstroms.

In the alternative, perhaps Nature had a different mechanism in mind for holding the gecko to the wall and ceilings. For time immemorial, nanoparticles (NPs) have been ubiquitous and have attached to all surfaces on earth. Nature by providing the gecko with toe-hairs to detach millions of NPs from surfaces is shown to produce electromagnetic (EM) radiation that by the photoelectric effect charges the gecko toe-hairs negative and surface positive to allow the gecko to walk on walls and ceilings by electrostatic attraction. See www.nanoqed.net at link "Gecko's"

The physics may be understood by simple quantum mechanics (QM). Since attached NPs are a physical extension of the walls and ceilings which are macroscopic, the atoms in these surfaces including those in the attached dust NPs are not under EM confinement that by QM are allowed to have full thermal kT energy which is EM. Here, k is Boltzmann’s constant and T absolute temperature.

But the gecko by stepping on these surfaces detaches dust NPs with his toe-hairs. The atoms of the dust NPs in the detached state differ from those in the attached state in that they are under EM confinement at vacuum ultraviolet (VUV) levels that by QM are restricted to vanishing kT energy. Hence, the full kT energy remaining in the dust NPs from the attached state is now in excess of that allowed by QM, but how may this excess kT energy be conserved?

Usually, EM thermal kT energy is conserved by an increase in temperature. But the specific heat of dust NP atoms may also be shown to vanish at VUV levels, and therefore the excess kT energy cannot be conserved by an increase in temperature. Another way is to treat the dust NP as an EM confinement for the excess kT energy to adjust to the optical boundary conditions of the spherical NP. Since NPs have EM confinement frequencies at VUV levels, and since the lowest frequency allowed in the NPs is the EM confinement frequency, the low frequency EM thermal kT energy is frequency up-converted to VUV levels by quantum electrodynamics (QED).

Conservation then proceeds by the NPs emitting a burst of VUV radiation that Einstein’s photoelectric effect charges the walls and ceiling positive while the liberated electrons charge the toe-hairs negative. A 100 nm NP produces a charge of about 5 fC which in an electric field of 3 million volts / meter produces an attractive force of about 15 nN. For the gecko weight of 70 grams, the necessary electrostatic force is 0.7 N which requires about 45 million NPs which is common on dust coated surfaces on earth.

The gecko is therefore held to the walls and ceiling by electrostatic attraction caused by dust NPs. Apparently, Nature’s intent for the gecko’s toe-hairs was a nano-brush to detach NPs from walls and

ceilings..

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About QED induced EM radiation: Classically, thermal EM radiation conserves heat by an increase in temperature. But at the nanoscale, temperature increases are forbidden by quantum mechanics. QED radiation explains how heat is conserved by the emission of nonthermal EM radiation.

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