

# The activation of the inner lever of an astrophysical body by the radial spreading of infrared luminosity

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## Abstract

Well-established physical principles indicate that a powerful three-dimensional lever exists in every large astrophysical body. In order for earth's lever to produce its observed acceleration towards the sun, calculations indicate that its night side surface pressure has to be at most 43 Pa greater than its night side surface pressure. Since the solar-driven atmospheric tides can vary as much as 260 Pa, they are likely candidates that could serve to sufficiently activate earth's inner lever. Experiments indicate that the radial spreading of infrared luminosity produces an attractive gravitational force. With these results, a straightforward interpretation of the Tully Fisher relation and the notion of the inner lever, a gravity theory has been developed that is based on the radial spreading of infrared luminosity.

## A. The innate, inherent and essential property of mass?

In the last half century both Newton's and Einstein's gravitational theories have experienced serious difficulties accounting for gravitational phenomena found beyond the solar system [1]. For these theories to remain valid it must be assumed that 95% of the universe is filled with two kinds of substances about which only their gravitational influence is known. It is possible that these difficulties could be due the unsound foundation upon which these two theories have been built. In a letter to Richard Bentley, Newton wrote [2],

“It is inconceivable that inanimate brute matter should, without the mediation of something else which is not material, operate upon and effect other matter without mutual contact as it must be if gravitation...be essential and inherent in it. And this is one reason why I desired you not to ascribe innate gravity to me. That gravity should be innate, inherent, and essential to matter so that one body may act upon another at a distance through a vacuum, without the mediation of anything else...is to me is so great an absurdity.... Gravity must be caused by an agent...but whether this agent be material or immaterial I have left to the consideration of my readers.”

There are those that believe that this problem of how mass is able to attract other mass has been dealt with by Einstein's modification of Newton's theory. However, some are not so sure. P.J. Brancazio [3] writes: “Einstein has not explained gravitation any more than Newton did; he has simply reinterpreted it in terms of different unexplained concepts.” To further amplify this point he quotes G.G. McVittie as remarking: “To say instead that gravitation is a manifestation of the curvature of four dimensional geometrical manifolds is to account for a mystery by means of an enigma.”

Along these lines, it is interesting to point out that Ptolemaic astronomy, which finally had to

be abandoned and has had a life even longer than Newtonian gravity theory, was also based on a foundation that could not be further interpreted or understood. With Newton's theory one can ask, "What innate, essential and inherent property of mass would give it the ability to attract other mass?" Similarly, with the theory upon which Ptolemaic astronomy was based one could ask, "What innate, essential and inherent property of the earth would give it the ability to make all heavenly objects revolve around it in a 24-hour period?" Since no simple answer is forthcoming from either question, a case can be made that both theories are based on a sterile ad hoc formalism.

Fortunately, mass is accompanied by something else that has qualities upon which a new<sup>1</sup> theory of gravitation can be built. This something else is the *radial spreading of infrared luminosity*. It is as ubiquitous as mass and, unlike it, it is capable of transmitting itself through a vacuum. Furthermore, in many cases it varies inversely as the square of the distance in the same way that force varies inversely as the square of the distance from a central mass in Newtonian gravity theory. In addition, since it is measured in units of power, its effects on mass can be further interpreted in terms of force, acceleration and distance using familiar physical concepts.

A possible drawback with luminosity, however, is that the results of the light pressure studies have indicated that it produces a repulsive rather than an attractive force [5]. These studies tend to employ a laser or a collimated beam. In experiments described in this paper where the radial spreading of infrared luminosity has been employed the resulting force turns out to be attractive i.e. pointing towards the heat source. Figs. 1 and 2 describe experiments where the force produced points

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<sup>1</sup> As an indication of the disenchantment with the present state of affairs and the hope for a possible way out Stacy McGaugh writes, "Current cosmology ( $\Lambda$ CDM) invokes not one but two aethers (dark matter and dark energy); let us be careful not to fall into the same conceptual trap that led classical physicists to infer that Maxwell's theory *required* aether. It is at least conceivable that there could be a theory which captures the successes of cosmology without the excess baggage [4]."

towards a literal heat source. Figs. 2 and 3 describe experiments where the force produced points towards a virtual one. Since an increase in weight was observed with all four experiments, a hot air buoyancy effect can be ruled out as a cause for the force change.

Another possible disadvantage with luminosity is that the amount of it coming from a source like the sun may be insufficient to account for the force needed to make the planets orbit the sun. For instance, given that the earth has a mass  $m_{\oplus}$  and a centripetal acceleration  $\Delta g_{\oplus}$ , the energy required to move it a distance of  $x = (1/2)\Delta g_{\oplus}t^2$  towards the sun in one second would be

$$m_{\oplus}\Delta g_{\oplus}x \approx 10^{20} \text{ J.} \quad (1)$$

However, the total amount of energy that the earth receives from the sun in one second is only  $\sim 10^{17}$  J. If infrared radiation mediates the gravitational force, then the amount of energy available from sunlight would only be  $\sim 10^{16}$  J.

## B. The inner lever

Fortunately, this apparent lack of energy can be dealt with by considering the possible role that earth's central pressure might play in producing the force that could accelerate the earth towards the sun. If  $g_s$  denotes earth's surface gravity,  $\rho$  its average density and  $r$  its radius, a rough estimate [6] of the pressure at the center of the earth is given by

$$P_c = g_s \rho r. \quad (2)$$

If infrared luminosity from sunlight produces an attractive force as the results of experiments described in Figs. 1-4 indicate, earth's dayside surface gravity would be reduced. If we assume this reduction is equal to earth's centripetal acceleration towards the sun i.e.  $\Delta g_{\oplus} = (0.0006)g_s$  or 0.06% of earth's surface gravity, then the pressure at the center of the earth from the weight from any column that originates on the dayside surface of the earth would be

$$P_c = (g_s - \Delta g_{\oplus}) \rho r. \quad (3)$$

The force from the weight of all the dayside columns projected on the flat part of earth's night side hemisphere would be given by multiplying (3) by earth's cross<sup>2</sup> sectional area  $\pi r^2$

$$F_{day} = (g_s - \Delta g_{\oplus}) \rho r (\pi r^2). \quad (4)$$

Similarly, the force from the weight of all the columns from the night side surface of the earth on the flat part of the dayside hemisphere would be given by

$$F_{night} = g_s \rho r (\pi r^2). \quad (5)$$

When these two are subtracted, we have a powerful net force capable of accelerating the  $10^{24}$  kg earth towards the sun

$$F_{net} = \Delta g_s \rho \pi r^3. \quad (6)$$

Since the force that accelerates the earth towards the sun is  $m_{\oplus} \Delta g_{\oplus}$  where  $m_{\oplus} = \rho (4/3) \pi r^3$ , (6) is a factor of  $4/3$  shy of  $m_{\oplus} \Delta g_{\oplus}$ . Furthermore, since  $\Delta g_{\oplus} = G m_{\odot} / r_{AU}^2$ , (6) is a factor of  $4/3$  shy of the theoretical force given by Newton's Law of Universal Gravitation that is supposedly due an inherent property of the sun's mass that can travel through a vacuum and operate on the earth as though all its mass were concentrated at its center

$$F_{net} \frac{4}{3} = \frac{G m_{\odot} m_{\oplus}}{r_{AU}^2} \quad (7)$$

Because earth's density increases with depth, its actual central pressure [8] is three orders of magnitude greater than that given by (2). This implies that the difference  $\Delta g$  between the surface gravities of earth's dayside and night side hemispheres could be as much as three orders of magnitude less than  $\Delta g_{\oplus}$  and still produce the required acceleration force of  $m_{\oplus} \Delta g_{\oplus}$ .

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<sup>2</sup> Jay M. Pasachoff in his textbook uses this cross sectional area  $\pi r^2$  in a similar problem [7].

Although it underestimates the actual pressure by quite a large amount, (2) provides a rationale for how more accurate and useful equations might be developed in the future. For instance, (2) and the equations developed from it provide a way to determine how much of a difference would have to occur between the night side and dayside surface pressure in order for earth to produce the required  $m_{\oplus}\Delta g_{\oplus}$ . Taking (6) and multiplying it by  $4/3$  gives

$$F_{net} \frac{4}{3} = \Delta g_{\oplus} \rho \pi r^3 \frac{4}{3}. \quad (8)$$

By changing the volume density to the surface density with the expression  $\rho = \sigma \Delta r$  where  $\sigma$  is the surface density and  $\Delta r$  is of unit length, the above becomes

$$F_{net} \frac{4}{3} = \left( \Delta g_{\oplus} \sigma \frac{4}{3} \right) \Delta r \pi r^3. \quad (9)$$

The term in parenthesis equals 43 Pa. This fact indicates that the earth's night side surface pressure needs to be at most 43 Pa greater than its dayside surface pressure in order for the earth to produce the centripetal force of  $m_{\oplus}\Delta g_s$ . Since the thermal tides, especially those around the equator [9], can vary as much as 260 Pa, they could very well likely serve as the catalyst that could appropriately activate earth's inner lever. Since the pressure at the center of the earth is three orders of magnitude greater than that estimated by (2), the actual surface pressure difference between the dayside and night side hemispheres would probably be three orders of magnitude less than 43 Pa. This is fortunate because the timing of the minimum and maximum of the thermal tides and their extent over the surface of the earth is less than ideal.

### C. The mechanics of the gravitational force at the molecular level

If a solid sphere has an infrared heat source at its center and is placed in a cold environs, the heat conducting radially through it will energize the vibratory mode of all the sphere's molecules. We are confident of this because the fundamental frequency of the vibratory mode of every molecule lies

in the infrared part of the spectrum [10]. We are almost equally as confident<sup>3</sup> that the heat leaving the central source will also *align* the vibratory modes so that their direction of vibration will be collinear with the sphere's radii. With these conditions, the geometry of the sphere constrains how the vibrating atoms will transfer momentum in the inner and outer directions along the sphere's radii. Because the area of a sphere increases as  $r^2$ , more molecules will always be above a particular molecule in the outward direction than below it in the inward direction. This will make it much more easier for the vibrating atoms to transfer momentum in the inward direction than in the outward direction. This inward transfer of momentum will be accumulative such that the center of the sphere will receive the greatest transfer of momentum making it the most rigid part of the sphere. This in turn will cause the aligned vibrating atoms near the center to not only have difficulty transferring momentum in the outward direction but also in the inward direction. This will leave the vibrating atoms in the outer parts of the sphere the most free to transfer momentum in the inward direction. These constraining conditions should then all combine to produce the observed gravitational gradient where  $g$  increases linearly with  $r$  or  $g(r) = -kr$ .

A similar scenario can be developed when infrared luminosity of one star first enters the surface of a neighboring star or planet. Since the shape of the entering luminosity will be that of a spherical cone, the aligned vibratory modes of the atoms on the surface of the neighboring star or planet will have a much easier time transferring momentum towards luminosity-emanating star's center. This is because that within the spherical cone that penetrates its neighbor there will always be more molecules in the outward direction than in the inward direction. This in turn will create the condition whereby the surface gravity of the dayside hemisphere of the neighboring star or planet will be less than the surface gravity of its night side hemisphere. This difference in turn will activate the powerful inner lever of the star or planet and produce a force capable of accelerating that star or planet

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<sup>3</sup> This assumption has been made in the introductory textbook explanation of how sound travels at the molecular level [11].

towards the luminosity-emanating star.

It should also be mentioned that the vibratory modes do not necessarily have to be energized by infrared radiation alone. They could also be energized by lower harmonics of the fundamental frequency of the vibratory mode of a particular molecule. Thus, it is entirely possible that low frequency sounds produced by atmospheric turbulence and tidal variations could play an important role in maintaining and creating the radially aligned vibratory modes of atoms inside an astrophysical body.

## D. The Tully-Fisher relation and gravity beyond the solar system

If the infrared radiation from a heat source at the center of a spherical shell produces a gravitational force in the mass of that shell, the following equation should hold

$$Lt = mgh. \tag{10}$$

$L$  is the infrared luminosity emanating from the source that is absorbed by the shell that becomes gravitational potential energy,  $t$  is the time during which the absorption of this luminosity takes place and  $m$  is the mass of the shell. The variable  $g$  is the force per unit mass that is produced by the unbalanced transfer of momentum of the atoms whose direction of vibration is collinear with the radii of the shell. The symbol  $h$  represents the distance  $h = 1/2gt^2$  that a portion of the mass would move in time  $t$ . As an aid to further understanding (10) can be rewritten as

$$g = \sqrt{\frac{2L}{mt}} \tag{11}$$

or

$$g = \sqrt{\frac{2F}{\sigma t}}. \tag{12}$$

In the latter,  $F$  is the luminosity per unit area absorbed by the shell where  $F = L/4\pi r^2$  and  $\sigma$  is the mass per unit area where  $\sigma = m/4\pi r^2$ .

Since  $g = V^2/r$ , (10) can also be rearranged to give

$$L = (\sigma 2\pi t)V^4. \quad (13)$$

If the expression in the parenthesis were constant, it would be equivalent to one form of the Tully-Fisher relation.

$$L \propto V^4. \quad (14)$$

Since (13) and (14) reveal a possible causal link between luminosity and orbital velocity, as do more unequivocally the experiments shown Figs. 1-4, Renzo Sancisi's remarks about this possible causal link between rotation curves and a galaxy's luminosity is worth reviewing. He writes [12]:

“There is a striking correspondence between the shape of the rotation curves and the shape of the radial distribution of luminosity in spiral galaxies...the correspondence between rotation curve and the distribution of light is close and detailed.... The rule suggested here can be seen perhaps as a Tully-Fisher kind of relation, between the distributions of light and the run of rotational velocities.... The unavoidable conclusion from the observed correspondence between the shapes of the rotation curves and those of the luminosity profiles is that the gravitational potential is strongly correlated with the distribution of luminous matter....”

In addition to a “Tully-Fisher kind of relation” that could possibly serve to catalyze the internal lever of a galaxy's stars, the phenomenon of light bending can also be used to provide further insight into a galaxy's higher-than-expected rotation curve. The geometry of spiral galaxy is ideal for bending the light that leaves a galaxy at low angles to its plane and making that bended light land in the far outer reaches of the galaxy. Since this light leaves from stars that reside not only in the bulge but also in the inner and middle parts of a galaxy, the amount of bended light that lands in the far outer

reaches of a galaxy could be constant for a goodly portion of the outer part of the galaxy. A constant amount of light as a function of radius in the outer reaches of a galaxy is just what is needed to produce a flat rotation curve if it is in deed true that infrared radiation gravitationally attracts mass.

If the radial spreading of infrared luminosity can explain, the flat the rotation curves of galaxies, could not the same spreading luminosity be used to account for the gravitational binding between galaxies as they fly apart from one another? The recent observation that the universe is accelerating [13] provides support for this possibility. It just so happens that the universe began to dim just prior to when it started to accelerate. Roughly speaking, the mean light output of the universe began dimming at around  $z = 1.0$  [14]. A recent estimate indicates that the expansion rate of the universe changed from decelerating to accelerating at  $z_t = 0.75 \pm 0.13$  [15]. Thus with less infrared luminosity spreading between galaxies there would be less activation of the inner lever of a galaxy's stars which would in turn decrease the gravitational binding between galaxies. With less gravitational binding the many galaxies that rotate around one another would then tend to fly off in a direction tangential to their center of mass creating the conditions or appearance of an accelerating universe.

## E. Conclusion

It should be apparent that having the correct foundation is critical for long-range viability of a theory. By Newton's own admission, his Law of Universal Gravitation was built on a questionable foundation. Thus as a probable consequence his theory and Einstein's modification of it has led to the need for the dark matter and dark energy which at the very least seem surrealistic or otherworldly. On the other hand, if the extraordinary amount of time is taken to develop a new theory that has been built

up on a more sound foundation, simple, “close<sup>4</sup> to experience” solutions are effortlessly forthcoming to problems that seem intractable with an old trusted theory that has been built on a shaky foundation.

## References

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<sup>4</sup> Einstein has written, “On the other hand it must be conceded that a theory has an important advantage if its basic concepts and fundamental hypotheses are ‘close to experience’ and greater confidence in such a

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theory is certainly justified.” [16].

### Solid aluminum foil cone 1000 W from below

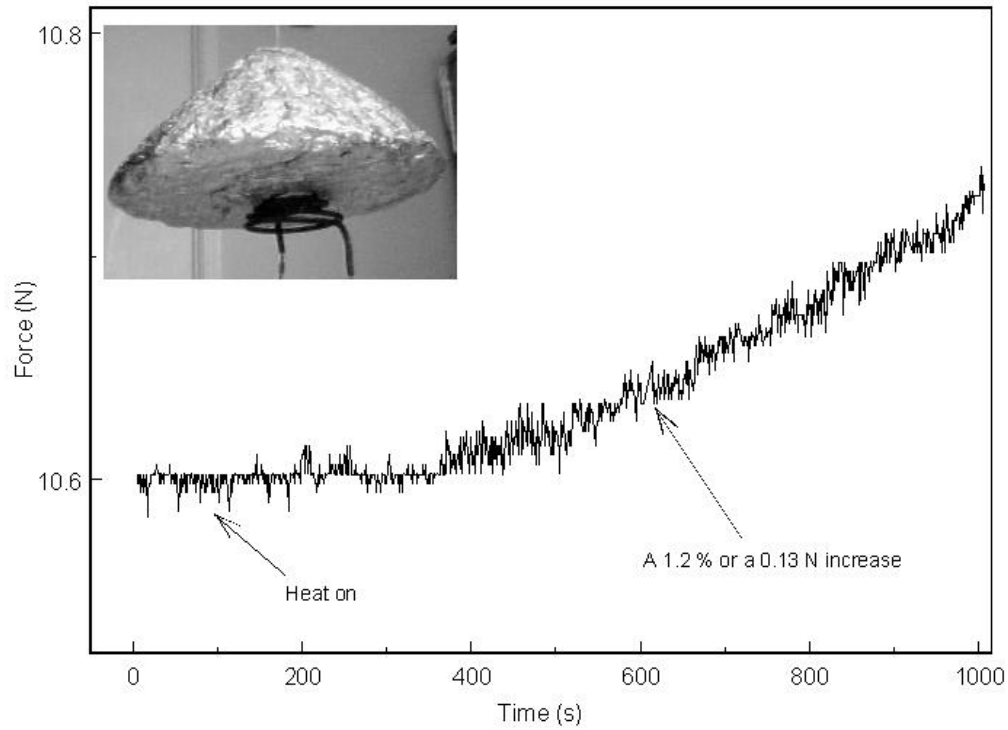


Figure 1 1000 W of heat was applied from below to a solid cone made of tightly packed aluminum foil for 1000 s. A 1.2% or a 0.13 N increase in weight was observed. This force change is unambiguously attractive i.e. the direction of the force is toward the literal source of infrared luminosity.

### Hollow copper hemisphere 2250 W from below for 320 s

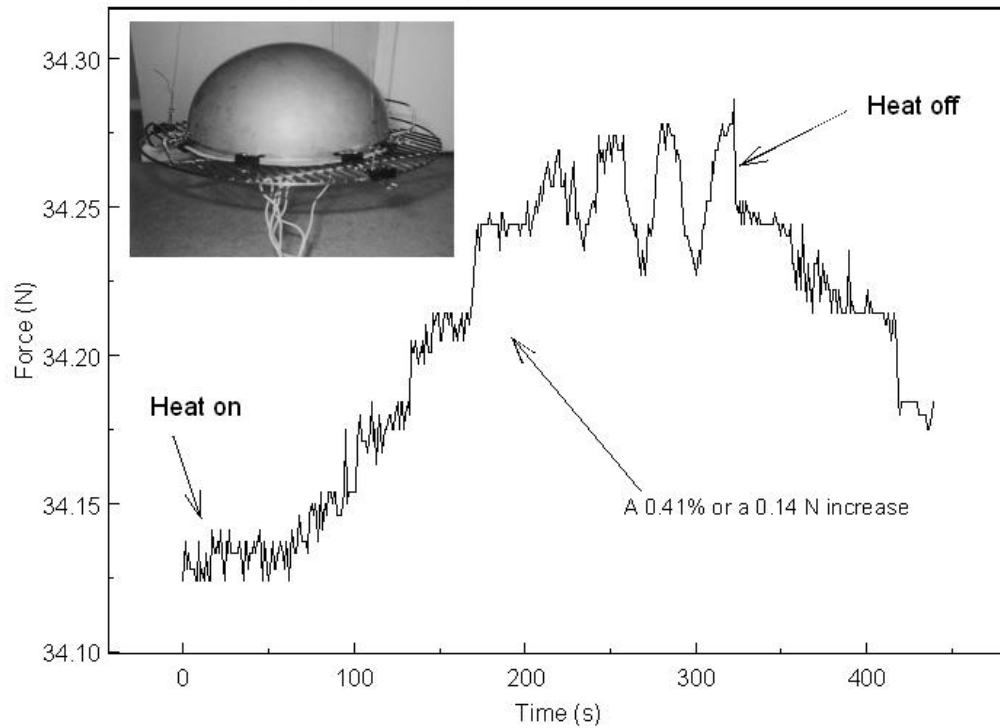


Figure 2. In the picture is a hollow copper hemisphere. Underneath resting at the center of the grille are three heating elements (not shown) capable of delivering 2250 W of infrared radiation. After the heat was turned on for 320 seconds a 0.41% or a 0.14 N increase in weight was observed. This is another unambiguous case demonstrating that infrared luminosity is attractive.

Stainless steel colander 1000 W above and 500 W below

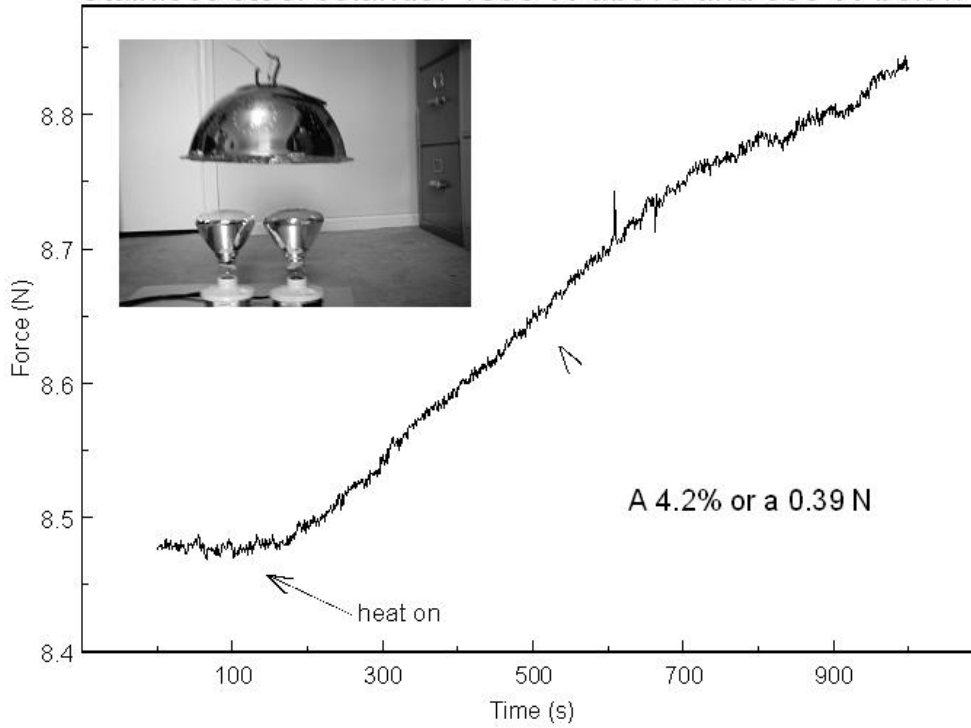


Figure 3. Heat was applied to a stainless steel colander with a 1000 W heat element from above and from two 250 W heat lamps from below. Insulation was placed inside the colander to insure that most of the heat would radiate away in the upward direction. With a 1000 s application of heat a 4.2% or a 0.39 N increase in weight was observed. The observed force points in the direction of a virtual heat source.

### Aluminum colander 1000 W insulation inside

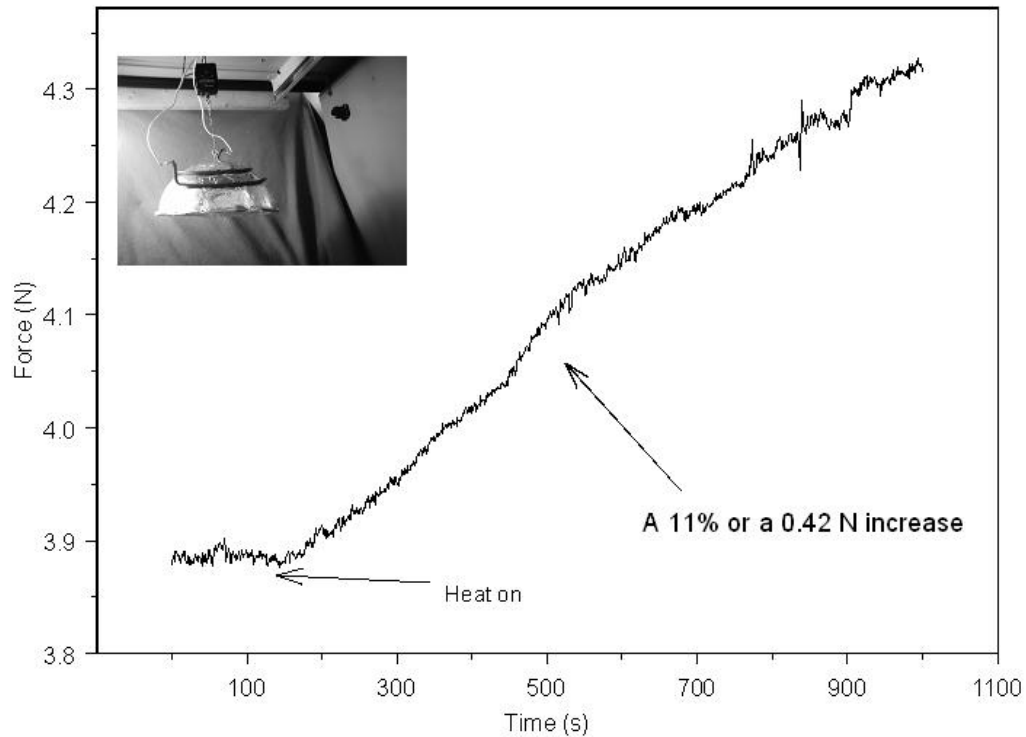


Figure 4. Heat from a 1000 W heating element on the outside of a convex-up aluminum colander was applied for 1000 s producing a 11% or a 0.42 N increase in weight. Insulation was placed inside to insure that most of the heat would spread radially upward. Without this insulation, experiments have indicated that very little weight change will be developed. The colander was placed underneath a desk, which apparently is more conducive to force change than in a more open spot. The observed force is in direction of virtual heat source.