CTG

Capacitance Theory of Gravity

MORTON F. SPEARS

Library of Congress Catalog Card Number: 91-90526
ISBN: 0-9629933-0-1

Printed in the United States of America

Published by Morton F. Spears

Prepared by Quill Publications, Inc.

Cover Design: Stephen A. Taranto

Truth is eternal
until a new truth replaces it.

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ABSTRACT

A theory is presented which contends that voltage-gradient fields due to voltage drops through capacitive circuits in either free-space or "artificial" space intercept separate pole particles of plus and minus bi-poles to form diminutive forces. The summation of myriads of these reciprocal forces acting through any materials and media is gravity.

Simple replicable experiments are described which demonstrate qualitatively how gravity works in accordance with the theory. Precise mathematical expressions are developed that result in attractive forces, falling-off with the square-of-the-distance, with the exact magnitude of forces (to six numerical places) established by the Newtonian GM_1M_2/r^2 empirical expression, when the conditions are such that Newtonian gravity applies. The theory, however, also predicts and explains variations from Newtonian gravity.

Major idiosyncrasies of gravity, such as non-shieldability, absence of polarization, gravity-acceleration mass equivalence, curved space and others, are discussed within the framework of the new theory.

An effective radius approach is developed in the text which visualizes constant values for energy, mass, charge, potential difference and capacitance to the background, for a charged particle immersed in various media.

AUTHOR'S PROLOGUE AND ACKNOWLEDGEMENTS

This publication embodies an entirely new approach to explaining gravity. It is called the Capacitance Theory of Gravity, although it started out to be the Circuit Theory of Gravity. Its name was changed at the suggestion of Professor Keith Johnson of MIT because, as he pointed out, mass is essentially analagous to capacitance in the new theory. In either case, the three capital letters CTG serve as an abbreviated macro name which applies to all aspects of the theory.

What does the CTG approach to gravity do that others do not, and what, if any, are the predictive capabilities of the new theory?

First, CTG is an extremely simple and logical concept, quite easily understood by anyone familiar with electrical charge force relations.

Second, it predicts what gravity will do from the grand scale of cosmic proportions down to the miniature scale of sub-atomic proportions. The characteristics of gravity can be qualitatively shown by experiments, and quantitatively expressed by mathematical relations which agree with Newtonian gravity relations to six places of accuracy when the relations are applicable. Deviations from Newtonian gravity are also predictable. For example, very slight gravity force variations from $1/r^2$ square-of-the-distance attenuation are predictable when a body leaves the surface of the earth or enters the earth.

I am not so naive or arrogant as to believe that I am the only one who has thought of gravity in terms of electromagnetic fields and forces originating from polarized positive and negative charges within the atom. Einstein, Maxwell, Lorentz and others all considered such approaches, then discarded them in favor of other pursuits more in line with the particular endeavors each had at the time. Benjamin Franklin was probably the first to consider that "left-over" electricity (charges) might cause gravity. The idea is very appealing, since so many characteristics of the charge and gravity forces are similar—the square-of-the-distance fall-off being the most notable. But no one until now has been able to put forth a consistent logical explanation for all the idiosyncrasies of gravity in terms of charge forces, or, for that matter, in any terms. For example, a big thrust to include Einstein's general relativity and gravity under the quantum mechanics banner has so far been unsuccessful.

When coming forward with any new theory, there are naturally many skeptics. Why not? Who wants to embrace, or even waste time with, an unsubstantiated hypothesis that is probably flawed? When one does take the time to try and understand what the promoter means, it often turns out to be completely erroneous, or worse, the work of a crank.

Here are some of the reactions to my first written material:

> "Einstein tried your theory; he couldn't make it work. Do you think you're smarter than Einstein?"
>
> "If I were to read your stuff, I know I'd find all kinds of things wrong. I simply don't have the time to waste on it."
>
> "I don't believe charge has anything to do with gravity; therefore, I'm not going to read your material."
>
> "The fact that the mathematics and equations substantiate your theory is a 'tragic coincidence'."

After some physicists (and other scientists and engineers as well) were persuaded to observe my gravity experiments and then to listen to my explanations, the reactions were more like:

> "Well, I can't find anything wrong with what you've said or shown me; but there must be (something wrong). Otherwise somebody would have come up with your ideas long before now."

> "I can't find anything wrong, but maybe 'so-and-so' can. Why don't you contact him?"

Actually, I did receive very helpful advice from a number of people near the beginning of my deliberations. Most particularly, I would like to thank R. Adler, J. Brooks, D. Edmonds, K. Johnson, K. Lane, B. McMillan, P. Rowe, J. Spears, L. Tesfatsion, R. Weiss, J. A. Wheeler, and R. Woodward for their comments. The fact that they helped does not infer in any way that any of the above really believe, or disbelieve, my theory—only that their suggestions and criticisms were of great assistance to me, leading toward the present formulations you are about to read.

I also wish to thank John Carter and Steve Hathaway of Spears Associates, Inc. for the wonderous ways they made all my experiments work, and Larry Burke, Joe Blais, and Jack Bryan for proofing and checking the technical contents. Last, but certainly not least, I would like to thank Jan Bemis, Marianne McCluskey, Leona Gould, Jacqueline Coyne and especially Maureen Gillis, for their seemingly tireless efforts to type and retype countless revisions.

CHAPTER 1

HOW GRAVITY WORKS

The basic principle of gravity in accordance with the CTG theory is illustrated in Figure 1.1 by means of six simple progressive sketches involving capacitance and charge-force analogies.

Sketch [1] shows two plates of a vacuum-spaced capacitor connected to a DC voltage supply. Neglecting fringe effects, the two plates, P1 and P2, will mutually attract each other with a force $F = CV^2/2d$ or $F = \epsilon_0 AV^2/2d^2$, where F is the force in newtons between the plates, C is the capacitance $\epsilon_0 A/d$ in farads, V is the potential difference between the plates in volts, A is the area of each plate facing the other plate in square meters, d is the distance between the plates in meters, and ϵ_0 is the permittivity of the space between the plates in farads/meter.

Sketch [2] shows the same capacitor, except that a dielectric medium with permittivity $K\epsilon_0$ has replaced the original ϵ_0 space between the plates. With constant voltage applied, the capacitance and the force between the plates increases or decreases linearly with the new K multiplier which is called the "dielectric constant" of the medium. The new capacitance is $K\epsilon_0 A/d$, and the new force is $K\epsilon_0 AV^2/2d^2$.

Sketch [3] shows a capacitor in a background of ϵ_0 space with a U-shaped dielectric of $K\epsilon_0$ forming a circuit path between two electrically polarized plates. There are also other circuit paths through the medium of ϵ_0 between P1 and P2; but the force of interest from each plate to the $K\epsilon_0$ medium and vice versa is almost perpendicular to the plane of the plate, and works between the plate and the $K\epsilon_0$ dielectric medium. In a background of ϵ_0 space, if K is greater than 1, the plates are attracted to the U-shaped medium and vice versa; if K is less than 1, the plates are repelled from the U-shaped medium.

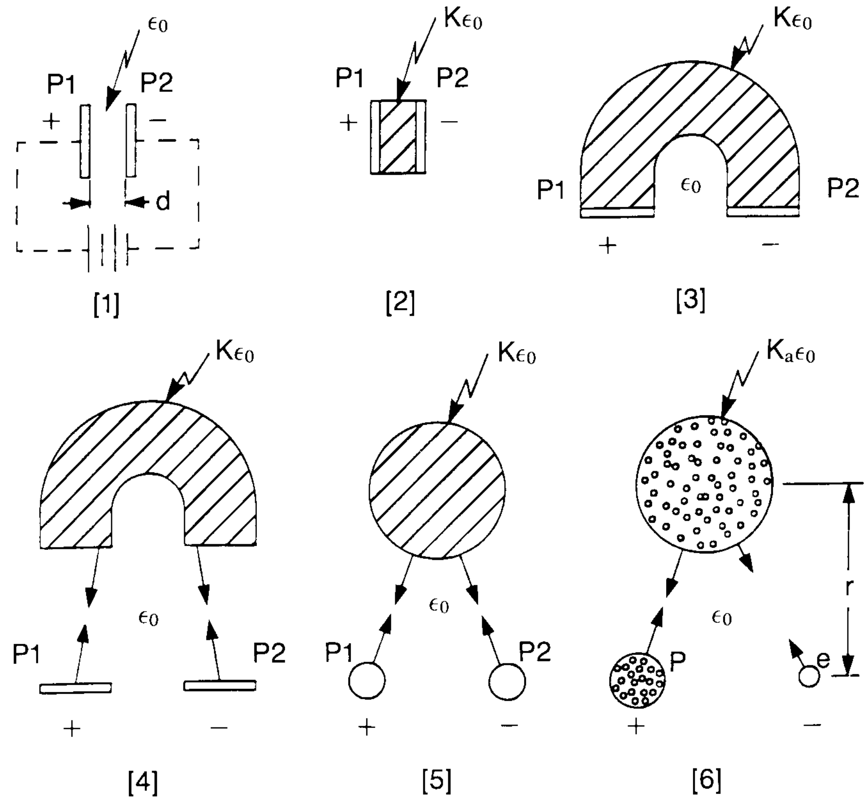


FIGURE 1.1. SIX PROGRESSIVE STEPS TO ILLUSTRATE HOW GRAVITY WORKS

Since all media normally encountered in nature have K values which are positive and greater than 1, the K in the sketches of Figure 1.1 may be assumed as greater than 1, which simplifies any charge-gravity analogies.

The electrical fields and forces get a bit more complicated with the progression of sketches in Figure 1.1. Since the interim steps are not of prime importance, only qualitative force relations are described for now. In Section IV, quantitative comparisons of charge and gravity forces will be made.

Sketch [4] shows the $K\epsilon_0$ dielectric medium removed from direct contact with the plates P1 and P2. The circuit involving the plates and $K\epsilon_0$ medium has a path through two dielectric media of ϵ_0 and $K\epsilon_0$ permittivities. The attractive forces between the $K\epsilon_0$ dielectric and the plates P1 and P2 are designated by arrows.

Sketch [5] shows a spherical particle of $K\epsilon_0$ material with two identical spherical small particle capacitor electrodes replacing the plates P1 and P2 in Sketches [1] through [4]. The resulting attractive forces are designated by arrows.

Sketch [6] shows an "artificial" (particle filled) dielectric $K_a\epsilon_0$ attracted over a great distance r by two unequally-sized closely-spaced polarized particles p and e (the particle p is shown also as an "artificial" dielectric). "Artificial" dielectrics will be discussed in greater detail later in this paper. Forces are represented by equal magnitude and opposite sense attractive force arrows between the medium $K_a\epsilon_0$ and the particle p. Also, there are shorter-length equal and opposite attractive force arrows between the medium $K_a\epsilon_0$ and the particle e. When p is a proton and e is an electron, and any known material is substituted for $K_a\epsilon_0$, forces between the particles as illustrated in Sketch [6] exist. Such forces act like *gravity* forces. Basically, this is how gravity works.

To understand fully the workings and ramifications of the CTG theory, however, substantially more explanation than the charge-gravity force analogy just presented is required. "Artificial" dielectrics, the intensity and nature of gravity fields and the impedance presented to them, the reason gravity is difficult to attenuate or shield, the relation of gravity to general relativity and curved space, the equivalence of mass for gravity and acceleration, and many more characteristics are delineated and explained in sections that follow.

Also, experimental results which support the CTG theory are described, and precise quantitative calculations for gravity are derived. When applicable, Newtonian gravity agrees with CTG gravity magnitudes to six places in their respective force expressions; but CTG permits non-complex calculations of gravity forces from cosmic proportions to miniscule sub-atomic proportions in various media backgrounds.

CHAPTER 2

SIMULATED GRAVITY DEMONSTRATIONS AND MEDIUM EFFECTS

In this section the results from a number of easily replicable experiments are reported which lead to logical conclusions. These experiments extend the concepts presented in the sketches of Figure 1.1 and demonstrate the nature of small forces produced electrically by bi-polar sources in various media.

Sketches [1] through [5] in Figure 1.1 are not theoretical "thought experiments," but rather are illustrations of what actually happens with easily duplicated set-ups using simple apparatus. The transition from Sketch [5] to the sub-atomic realm of the thought experiment in Sketch [6], however, requires a good understanding of what is happening in Sketch [5]. This section is therefore devoted to describing force actions which occur in experiments with Sketch [5] types of configurations in various medium backgrounds. In this process, some new terms and entities are introduced such as (volume) "impedivity" and "artificial" properties of media and materials. Also introduced is the concept of electrical circuits in vacuum space (or any background medium) with "field impedances" associated with the gradients of electrical potential in the medium circuits.

Bi-Pole Force Experiments

Referring to Figure 2.1, imagine the top view of an electrically insulated tank, 30 centimeters in diameter, which contains a liquid about 5 centimeters deep. Inserted are two cylindrical fixed electrode copper poles, P1 and P2, each 1 centimeter in diameter, which are centered in the tank with about 3 centimeters center-to-center separation. The electrode poles can be electrically energized as shown with either (nearly) constant direct current DC or with (nearly) constant alternating current AC.

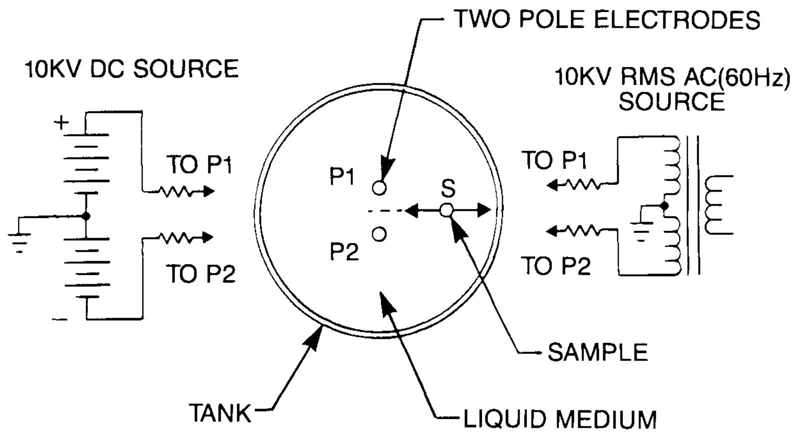


FIGURE 2.1. TANK ARRANGEMENT FOR FORCE TESTS (TOP VIEW)

Whenever DC energization is applied between P1 and P2, there are polarization effects over the circuit paths that have to be taken into account. Instead of obtaining steady and repeatable results with the Figure 2.1 arrangement, any dielectric media in the tank and dielectric substances at S become electrically charged over time and the force actions of interest are altered. If an experimenter is willing to put up with this, he can observe the initial action after energy turn-on and forget what happens later. However, a way to counteract this charging is to reverse the polarity of the DC energization source by swapping the leads to P1 and P2, from once every few seconds to many times per second. An even better way to counteract this charging is to use an alternating power supply source supplying, for example, 60 hertz AC rather than DC, which automatically eliminates a build-up of charge displacement and provides a continuous action to be measured or observed at one's leisure.

Since DC and low frequency AC results are identical in most instances, the 60 hertz source is preferred and used whenever feasible. DC is used only when some major difference between DC and AC application is emphasized. AC energization is a good analogy because, in the "real" world configurations that the simulated gravity experiments are attempting to duplicate, the poles equivalent to P1 and P2 are small particle bi-pole pairs rotating about randomly oriented axes; and there are vast numbers of them to insure no residual DC polarization in their space circuits.

When a floating or suspended piece of substance S is placed in the Figure 2.1 tank liquid, preferably along the perpendicular bisector line running between P1 and P2, what happens? With either DC or low frequency (60 Hz) AC applied to P1 and P2, and the tank liquid chosen as distilled water with a volume resistivity of about 400,000 ohm-centimeters, any particle S material with a volume resistivity appreciably less than 400,000 ohm-centimeters is pulled along the centerline bisector toward the P1,P2 electrodes; and, conversely, any particle S material with a volume resistivity appreciably greater than 400,000 ohm-centimeters is pushed away from the electrodes. Note in this example that the relative volume resistivity of S with respect to the volume resistivity of its background medium is the governing parameter deciding the direction of the force, not the relative permittivity or dielectric constant. Proof that volume resistivity determines the force direction in distilled water can be demonstrated with either DC or 60 Hz AC by using for S a piece of lead-zirconium-titanate ceramic (PZT-5H) with a dielectric constant of 3100 and a volume resistivity of 10^{13} ohm-centimeters, which promptly repels away from P1,P2. The dielectric constant 3100 of PZT-5H is considerably greater than the dielectric constant 80 of distilled water; yet repulsion occurs rather than attraction, demonstrating conclusively that volume resistivity, in this instance, governs. This result seems to be somewhat different from both the simplified analogies used in Section I and the way capacitive forces are usually presented, but further experiments demonstrate clearly what is happening.

Next, instead of distilled water in the tank, substitute Wesson light vegetable oil as the liquid medium. It has a dielectric constant of about 3 and a volume resistivity of about 5×10^8 ohm-centimeters. With steady-state DC energization as before, objects at S with lesser volume resistivity than the new medium are pulled to P1,P2; objects with greater volume resistivity are repulsed by P1,P2. With 60 Hz AC energization, although the same directions of forces generally occur, a PZT-5H piece at S with a greater volume resistivity than the oil is attracted to P1,P2. This reversal to attraction occurs because the volume "impedivity" at 60 Hz for PZT-5H is less than the surrounding oil medium. Actually, in all the tests, it is the relative volume "impedivity", that determines the attraction or repulsion of S to P1,P2.

"Impedivity" is defined in this report as a medium property which is applicable to any portion of space. It is represented by the symbol "z_v" and includes all the impedance components of a material or medium, not just the resistance component. While the capacitance property (permittivity ϵ) is important, the inductance property (permeability μ) has no significant contribution to most analyses in this paper. Also, the volume resistivity, ρ, of vacuum space is assumed infinite for CTG purposes.

In Figure 2.2 the significant electric current impedance components of a one centimeter cube of various materials or media are shown. The circuit assumed is composed of two parallel plate terminals on opposite sides of the medium cube which is immersed in a background of infinite impedivity. By noting the relative impedivity of any material S to any background medium, attraction or repulsion between S and the DC or AC bi-polar electrodes P1,P2 is predictable. Lower impedivities for S than the background impedivity result in attraction; higher impedivities than the background result in repulsion.

Although it may seem a bit confusing at first, the volume resistivity and volume impedivity parameters of a material or medium in ohm-meters, or ohm-centimeters, are used here purposely rather than the inverse volume conductivities and volume admittivities even though the latter terminology fits in better with permittivities and permeabilities; that is, mhos/meter along with farads/meter and henrys/meter. But "ohms" are used and understood more universely than "mhos", and, for convenient analogies to follow, "ohms" instead of "mhos" and "darafs" instead of "farads", are more useful units to explain gradient voltage drops along field lines.

For steady DC fields as used in the measurements for Figure 2.2, the volume "impedivity" of PZT-5H material is determined solely by the volume resistivity; but for AC fields the capacitive reactance which shunts the resistance in a given volume may be important. At 60Hz AC, a piece of PZT-5H at S in distilled water has not only a greater volume resistivity than the medium around it, but also a greater capacitive reactance volume impedivity than the surrounding distilled water, and is consequently repelled by P1,P2. But in oil, a piece of PZT-5H due to its capacitance reactance has a 60 Hz impedivity less than the surrounding medium, and

MEDIUM	CIRCUIT	IMPEDIVITY Z_v (OHM-CM) DC	60Hz
COPPER	R = 1.6×10^{-6} ohms	1.6×10^{-6}	1.6×10^{-6}
IRON	R = 10×10^{-6} ohms	10^{-5}	10^{-5}
SEAWATER K ≅ 80	C = 7.08pf; R = 25ohms	25	25
DISTILLED WATER K ≅ 80	C = 7.08pf; R = 4×10^{5} ohms	4×10^{5}	4×10^{5}
WESSON OIL K ≅ 3	C = 0.266pf; R = 5×10^{8} ohms	5×10^{8}	5×10^{8}
PZT–5H K ≅ 3100	C = 274pf; R = 10^{13} ohms	10^{13}	$-j9.7 \times 10^{6}$
TEFLON K ≅ 2	C = 0.177pf; R = 10^{16} ohms	10^{16}	$-j1.5 \times 10^{10}$
POLYSTYRENE K ≅ 2.6	C = 0.230pf; R = 10^{19} ohms	10^{19}	$-j1.2 \times 10^{10}$
VACUUM SPACE K = 1	C = 0.0885pf; R = ∞ ohms	∞	$-j3.0 \times 10^{10}$

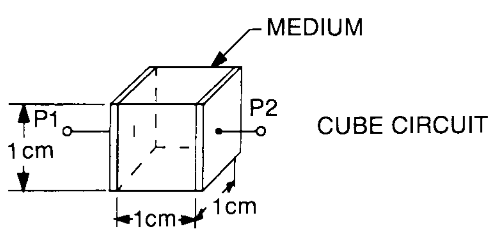


FIGURE 2.2. REPRESENTATIVE IMPEDIVITIES (OHM-CENTIMETERS)

is attracted to P1,P2. Then, for particles in any medium, the relative volume impedivities govern the force action.

Figure 2.3 forcefully illustrates the attraction-versus-repulsion phenomenon with ceramic PZT-5H at S in first distilled water (Figure

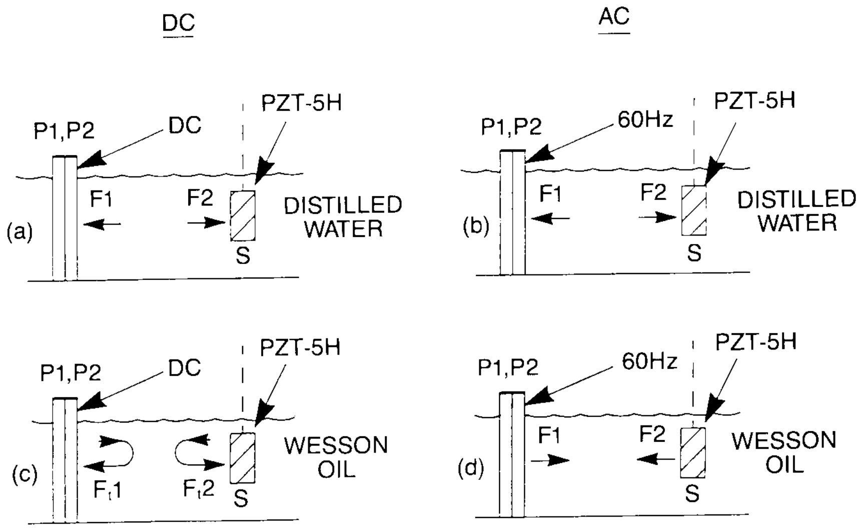


FIGURE 2.3. BI-POLAR FORCES WITH PZT-5H CERAMIC PIECE SUSPENDED IN WATER OR OIL (SIDE VIEW)

2.3(a) and (b)) and then in Wesson oil (Figure 2.3(c) and (d)). In distilled water, the impedivity of PZT-5H is higher than the background water impedivity with either DC or AC (60 Hz) energization applied to P1,P2; and S is consequently repulsed from P1,P2. In Wesson oil, however, the relative impedivity of PZT-5H to its background is higher for DC but lower for AC, resulting in repulsion with steady-state DC and attraction with AC. Because of the transient DC charging time involved, momentary attraction occurs when DC is first switched on with PZT-5H at S; but with time the force reverses to a steady-state repulsion as depicted in Figure 2.3(c).

Next it is shown in Figure 2.4 that objects with relatively high impedivity at S (closed-end cylinder polystyrene plastic pieces) can be lowered in overall impedivity by center-filling or impregnating them with relatively low impedivity substances, changing them from objects being repulsed to objects being attracted to P1,P2 in Wesson oil. Substituting a vacuum space background instead of Wesson oil, the attraction as shown in Figure 2.4(d) exemplifies for CTG purposes exactly how any object consisting of a portion of vacuum space filled with electrons, protons, and neutrons is attracted to the individual bi-poles in distant objects.

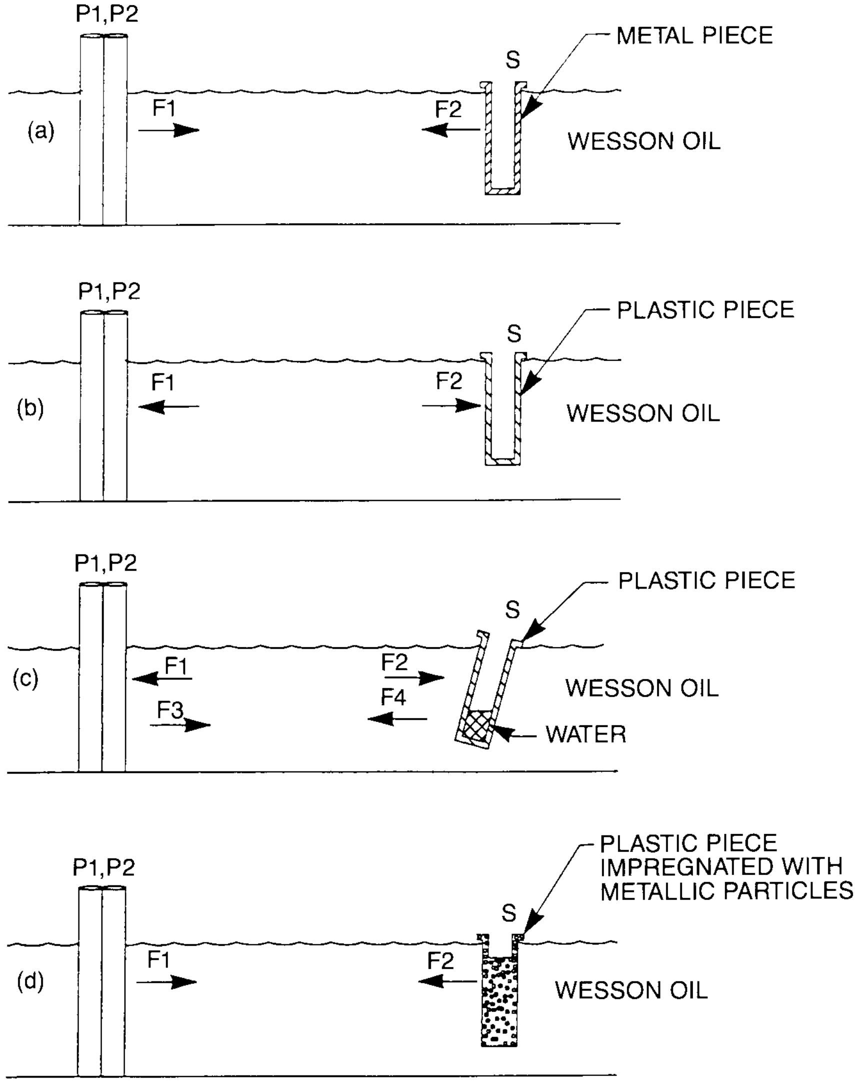


FIGURE 2.4. BI-POLAR FORCES WITH VARIOUS FLOATING OBJECTS IN OIL (SIDE VIEW)

Referring to the set-up in Figure 2.1, what happens when a single electrically energized P1,P2 is drastically reduced in size to two different size spherical poles positioned very close together? Do the bi-pole forces to remote objects stop? If so, what new law governs the miraculous extinction? The answer is that the forces are drastically reduced to miniscule strengths, but not eliminated. If a batch of digital watch batteries were dropped into high impedivity oil, for example, they would still pull toward each other and to all other low impedivity objects in the oil; but the forces at polar potential differences in the order of 1-2 volts for the batteries would be insignificant with respect to the 10,000 volt polar potential difference forces just illustrated in Figures 2.3 and 2.4. The illustrated forces, themselves, are only a few micro-newtons in strength. Furthermore, the exposed areas of the battery pole pieces are much smaller than the exposed areas for P1,P2 in the experiments, which further reduces any force magnitudes. Batteries in free-space also attract to all other objects by the same rules of relative impedivity, but the forces, like those in oil, are too weak to be readily detected.

Field Impedance and Impedivity

Next, imagine ultra-miniscule charged poles floating in vacuum space – say negatively charged electrons and positively charged protons. Singly, each produces charge fields and forces which are tremendous with respect to those produced from a closely spaced bi-pole electron-proton pair (as in hydrogen). When separated as single entities, only the charge forces which are produced by each charge entity are significant, but other electrons and protons in closely-spaced pairs still react with the entity to produce either slight mutually attractive or repulsive forces, dependent upon the relative impedivity of the single entity to the surrounding vacuum medium. Since all substances that have been encountered so far by mankind are attracted to bi-polar steady state sources in a vacuum surrounding, it follows that at least some of the component particles making up the substances can be assumed to have impedivities less than a similar volume of vacuum. By visualization and by logic, each charged single continuous particle, for example, should present very low resistivity to a transfer of charge across itself.

In reference to our everyday world, then, an electron can be assumed to be a tiny negatively charged metal ball, or simply a spark (arc), either of which has low impedivity. But in vacuum space, what value is there in considering the presence of a low impedivity particle when no electrons flow along a steady state electric field line to form a current? As will be explained, bi-pole fields are present nevertheless, and low impedivity bodies form short-circuits to those fields. The nature of miniscule bipole electric fields and how they work in our universe is the main essence of gravity that transmits across vast spaces an enormous summation of tiny forces to move little grains of dust, big mountains, planets, and even entire galaxies.

The "impedance" associated with a spatial electric field is a somewhat different concept than the concept of an impedance associated with a dQ/dt current field, but the effects with respect to potential gradients (voltage drops) are identical. Imagine a rod of resistive material energized by a constant DC current as in Figure 2.5(a). The electric field is the change of potential per unit length in volts/meter units and is determined by the current in units of amperes multiplied by the ohms/meter along the axis of the rod. But the current traveling lengthwise along the rod (as distinct from the current source) is really a gradient vector field in units of volts/ohm.

Similarly, imagine as in Figure 2.5(b), that a rod of dielectric material (with infinite resistivity) is energized by a constant Q source. The electric field is in volts/meter, but the Q (field) dispersed through the dielectric rod is the volts/daraf along the rod. "Darafs" are the units for elastance S, hence the inverse of "farads" which are the units for capacitance C. The total voltage from end-to-end in (b) is the volts/daraf times the darafs between the end terminals, just as for the rod resistance in (a) the total voltage is the volts/ohm times the ohms between the end terminals. The (current field) impedance of the rod in (a) is the end-to-end ohms; the (charge field) impedance of the rod in (b) is the end-to-end darafs. "Field impedance" is thus defined here as a medium property which causes a voltage drop along a field line. Thus, for a field f, the voltage drop is $V = fZ_f$. Then:

$$V = f_I Z_I = IR, \text{ for resistive circuits} \tag{2.1}$$
$$V = f_Q Z_Q = QS, \text{ for capacitive circuits} \tag{2.2}$$

The impedance term, Z_I, is composed entirely of resistance R for (2.1), and Z_Q is composed entirely of elastance S for (2.2). For steady state fields, (2.1) is simply ohms law, and (2.2) is a rearrangement of the fundamental charge-volts-capacitance relation, $Q = VC$.

All miniscule DC charge sources have charge field circuits through vacuum space with field impedances. The fields may encounter objects with lower-than-vacuum field impedivity, changing the overall field impedance or field impedances over a given range. The charge field impedivity of pure vacuum space is $1/\epsilon_0$, or 1.12941×10^{11} daraf-meters. For very weak fields, the impedivity of all other media is $1/K_a\epsilon_0$, where K_a is the artificial dielectric constant of the medium. For miniscule charge fields, there are no resistive energy losses, and all objects and materials appear as portions of vacuum space impregnated with tiny widely separated shorting (zero resistivity or infinite permittivity) particles. These particles cause a greater-than-one artificial dielectric constant in any given volume by shortening the daraf paths through that volume.

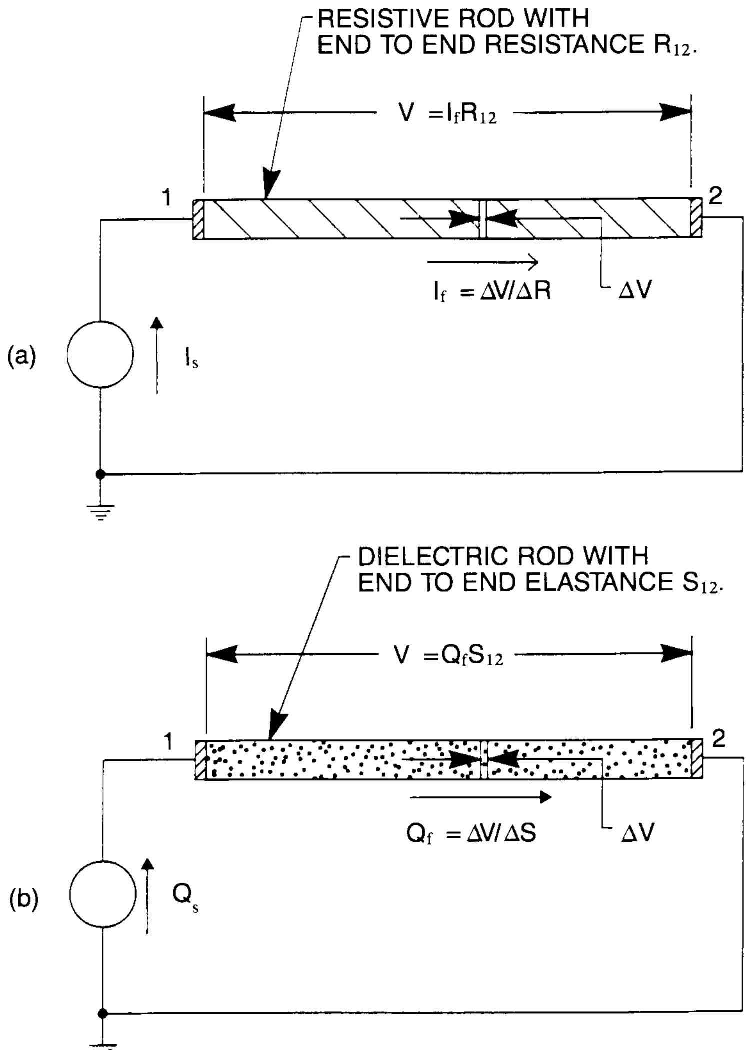


FIGURE 2.5. CURRENT FIELD I_f THROUGH RESISTANCE R AND CHARGE FIELD Q_f THROUGH ELASTANCE S.

Artificial Dielectric, Artificial Permittivity, and Artificial Dielectric Constant Defined

Generally, an *artificial dielectric* is any dielectric medium that has had its permittivity altered to a new *artificial permittivity* by the dispersement of particles throughout its volume. An artificial dielectric has an *artificial dielectric constant* relating its permittivity to that of vacuum space by the expression:

$$K_a = \epsilon_a/\epsilon_0 \qquad (2.3)$$

By this same reasoning, there are also other artificial electromagnetic properties of materials, such as artificial conductivity and artificial permeability. For most CTG applications, however, only capacitive circuits are used, and thus only a concept of artificial permittivity is required.

For CTG, an artificial dielectric is defined as any portion of vacuum space that has a permittivity established by the dispersement of relatively smaller particles throughout the portion's volume. When the particles are field-short-circuiting relative to vacuum space, the artificial dielectric constant is greater than 1.0. Conversely, if such particles happen to be open-circuiting relative to vacuum space, the artificial dielectric constant is then less than 1.0. Having K_a values greater than 1.0 in the CTG concept is a near universal occurrence; having K_a, less than 1.0 is a rare,

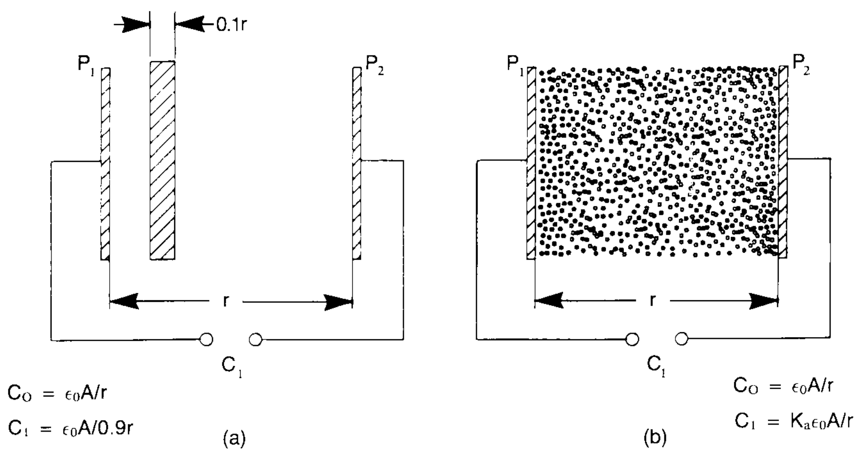


FIGURE 2.6. CAPACITANCE AFTER INSERTION OF METAL PLATE OR METAL PARTICLES IN A CAPACITOR SPACE. THE ARTIFICIAL DIELECTRIC CONSTANT IS: $K_a = C_1/C_0 = 1/0.9 \approx 1.11$

if not a totally absent, occurrence. However, K_a comparison ratios of one medium to another, which can be 1.0, greater than 1.0, or less than 1.0, are useful to predict the actions of forces in different media.

To better understand a volume of medium as an "artificial dielectric" having an "artificial dielectric constant," assume a capacitor with ϵ_0 vacuum space between two metal plates, and neglect all fringe effects. Place in the volume between the plates another parallel metal plate of the same plate cross-sectional area but with a thickness of 0.1 times the capacitor spacing r, as illustrated in Figure 2.6(a). It doesn't matter where in the capacitor volume the added metal piece is placed, left or right. The new capacitance C_1 with the metal piece inserted is 11% greater than the original capacitance C_0 due to the shorter field path through the vacuum medium.

Next, divide the entire metal insert into tiny little particles and disperse these particles somewhat homogeneously throughout the capacitor volume, as in Figure 2.6(b). This capacitance C_1 is also about 11% greater than C_0.

Strictly speaking, ϵ_0 has not changed in either sketch (a) or (b), but the field travels over a lower field impedivity path from P_1 to P_2 in both illustrations. What has measurably changed in (b) is the plate-to-plate, particle-to-particle, and particle-to-space capacitances. These capacitances have increased by a factor K_a, designated the *artificial dielectric constant*, calculated as follows:

$$K_a = \frac{\text{(Total Space Volume of Capacitor)}}{\text{(Total Space Volume of Capacitor - Volume of Metal Particles)}} \tag{2.4a}$$

Using the symbol Υ for any capacitor space volume,

$$K_a = \Upsilon_T/(\Upsilon_T - \Upsilon_P). \tag{2.4b}$$

For the particular examples shown in Figure 2.6,

$$K_a = \Upsilon_T/(\Upsilon_T - 0.1\Upsilon_T) \approx 1.11. \tag{2.4c}$$

Now one must identify the environment in which a force field acts, as demonstrated by the experiments in the tank. For the tank forces, the impedivity in the surrounding space and of the objects acted on are of vital importance. Consider a miniscule balanced bi-polar charge source consisting of a single electron and proton existing in free vacuum space as in the bi-pole force example. The magnitude of the balanced field is so small that, through any medium or material objects in the field, attached electrons or other ions are not freed for conduction and all charged particles maintain their charge-force relations without any significant effect attributable to the electron-proton bi-pole. The plus-minus bi-pole generated force magnitudes turn out to be in an order of only some 10^{-38} to 10^{-40} times the charge force magnitudes generated by individual free electrons or protons.

But what is the impedivity of vacuum space for a tiny bi-polar generated field? Without field-caused conduction, the resistivity is infinite and only the artificial permittivity (or inversely, the artificial elastivity) of any space determines the field voltage-gradients. Hence, tiny force fields work through perfect vacuum space with an artificial dielectric constant of exactly 1.000, or through particle-filled vacuum space with impedivity (or artificial elastivity) determined by the number, size, and impedivity of the particles in a given volume of the space through which the field passes.

Artificial Permittivity and Density Equivalence

For any portion of vacuum space containing dispersed short-circuiting particles, the artificial permittivity for that portion increases with the number and size of the particles in the portion volume —that is, with the mass density for that given volume of space. In the CTG concept, the artificial permittivity is, in the electrical sense, the same thing that mass density is in the physical sense. Both determine the pull of gravity and have a direct relation which can be tabled or graphed. The *artificial dielectric constant* of a medium establishes the artificial permittivity relative to *vacuum* permittivity just as the *specific gravity* of a medium establishes the density of a medium relative to *water* density. In Appendix C, Table C.1, the specific gravities and densities of various common substances are related to their artificial dielectric constants and artificial permittivities.

In this section, qualitative charge force demonstrations and explanations have been used to strengthen the concept of bi-polar gravity forces working always on apparent dielectrics, as illustrated in Section I, Figure 1.1. The next two sections will be more specific, leading to the remarkable quantitative results of CTG with respect to actual gravity actions. It will be shown that, in those circumstances when empirical Newtonian gravity ($F_g = -GM_1M_2/r^2$) can be used reliably, CTG predicts identical force results solely by theoretical calculations. Moreover, CTG also predicts deviations from Newtonian and curved-space gravity, at least as understood in the present state-of-the-art. For example, in References [5] and [6], deviations from expected gravity forces inside and outside of the earth are observed. These deviations are predicted by CTG; and the cause, as well as the effect, can be fully understood using the CTG concept.

CHAPTER 3

BASIC THEORY AND ORIGIN

The Particles

For CTG, the electron has been chosen as the basic quantum particle. The charge, mass, energy and effective size are known (or readily determined) quantities. Although smaller particles may exist, a smaller breakdown is not required and adds nothing to the concept of the theory to follow.

What are the important properties of the electron? It has a negative charge of $Q_e = -1.60219 \times 10^{-19}$ coulombs, a mass of $M_e = 9.10953 \times 10^{-31}$ kilograms, and an energy, courtesy of Einstein, of $M_e c^2 = Q_e^2/C_e$ joules, where c^2 is the square of the velocity of light $(2.99792 \times 10^8$ meters/sec$)^2$ and C_e is the self-capacitance of the electron to space in farads. Solving for $C_e = Q_e^2/M_e c^2$, one finds that C_e equals 3.13539×10^{-25} farads. In general, the capacitance C of a particle to space is a function of the *effective* radius of the particle by the relation, $C = 4\pi\epsilon R$, where ϵ is the permittivity of the surrounding space background and R is the *effective* radius. In vacuum free-space, the permittivity ϵ_0 is 8.85419×10^{-12}

farads/meter. Thus, solving for the electron *effective* radius R_e in free-space, one finds:

$$R_e = C_e/4\pi\epsilon_0 = 2.81795 \times 10^{-15} \text{ meters.} \qquad (3.1)$$

Why is R_e called the *effective* radius here rather than just the radius? The *effective* radius is that radius culminating in both the real capacitance to space and the real rest energy of the electron particle. By this designation, the particle is not required to be spherical, nor to be visualized with a metal-like consistency. It can be considered as a solid, liquid, gas, or plasma with exactly the same end results for CTG. The conception of an effective radius is therefore very useful, and should eliminate visualization difficulties pertaining to the exact nature of the electron. One controversy, for example, involves the visualization of the electron as a plasma-like cloud rather than a finite particle.

Early physicists called the effective radius (3.1), the *classical* electron radius. In any event, the precise value, 2.81795×10^{-15} meters, is very important to CTG, as correct gravity force magnitudes are determined from this value to the same level of precision. Any other radius assumed for the electron leads to erroneous gravity solutions.

In addition to the negatively charged electron, the equal-but-opposite positively charged form of the electron (positron) and the neutral charge form of the electron (neutrino) also exist. Insofar as CTG is concerned, the electron, positron, and neutrino are the *only* three particles that are required, and *everything* filling "empty-space" consists of combinations of these in one way or another.

One step up from the quantum order of particles, there are three significant sub-atomic building-blocks for everything in nature — the electron, the proton and the neutron. In the least complicated visualization for CTG, these particles are made up solely of quantum electrons and positrons, although uncharged neutrinos may be present with no effect on gravity.

The visualization of protons and neutrons containing internal up-quarks (+2/3 positron charge equivalents) and down-quarks (−1/3 positron charge equivalents) is not required for CTG. The overall particle properties are of more importance; that is, the overall charge value of the particle relative to space and the total capacitance value of the particle relative to space. One assumption, however, is that both plus and minus charges exist within both the proton and the neutron.

While it is true that materials, molecules, atoms, and sub-atomic entities can be successively bombarded to produce myriads of different particles and wave energy emissions, none of these enhance the understanding of gravity generation. In this sense, such bombardments can be compared to hitting a brand new automobile with various size stones thrown with different velocities. Every time there is a collision, new broken pieces with all kinds of materials, shapes, sizes, and weights result. Yet none of these pieces add anything significant for judging how the automobile operated before the bombardment, because that was more easily determined before the break-up.

Figure 3.1 illustrates how particles might be constructed to meet CTG requirements. The words "might be" are used purposely, since there are a great number of assumptions that result in identical overall characteristics for the three building-block entities.

In Figure 3.1, all particles are assumed spherical. The electron consists of the one basic quantum particle. The proton consists of all positrons and electrons within its silhouette forming many bi-pole pairs, with one extra positron effecting the overall positive 1.60219×10^{-19} coulombs charge. The neutron consists of even more bi-pole pairs of electrons and positrons, perfectly balanced in numbers to effect a neutral zero charge. Neutrinos in protons or neutrons are not an essential concept in the CTG approach to determine gravity forces unless they are assumed to have non-zero mass (or capacitance-to-space with a self-permittivity either greater or less than ϵ_0). Without neutrinos, the proper capacitances to space are obtained anyway by assuming the plus-minus charges have a proximity or "clustering" factor which reduces the total capacitance to less than N times the capacitance of each particle, where N is the total integer number of identical sized particles. By this visualization, the proton or neutron is not limited by the mass ratio as to the number of quantum or smaller particles actually making up the whole entity. This is similar to measuring the capacitance-to-space of one metal ball, and then several more identical balls in parallel. If the balls are all far-spaced relative to their radii, the capacitance is N times the capacitance of one ball. When the balls are moved closer together, this total capacitance is reduced and the ratio of the total capacitance to the capacitance of a single ball does not have to be an integer number.

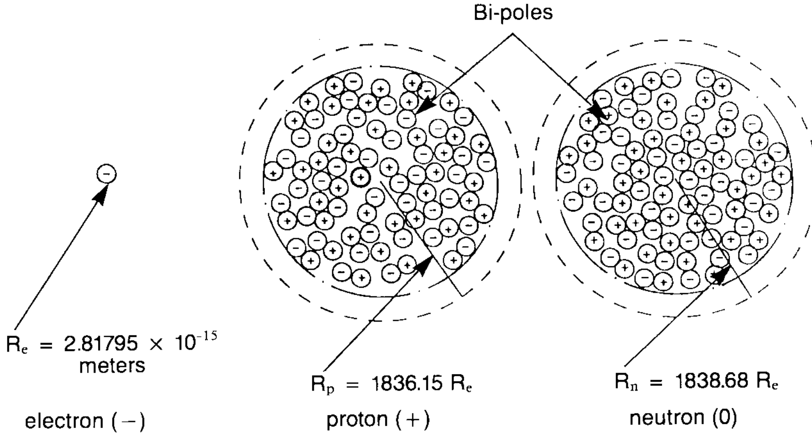


FIGURE 3.1. BUILDING-BLOCK PARTICLE MODELS WITH EFFECTIVE RADII AND NET CHARGES

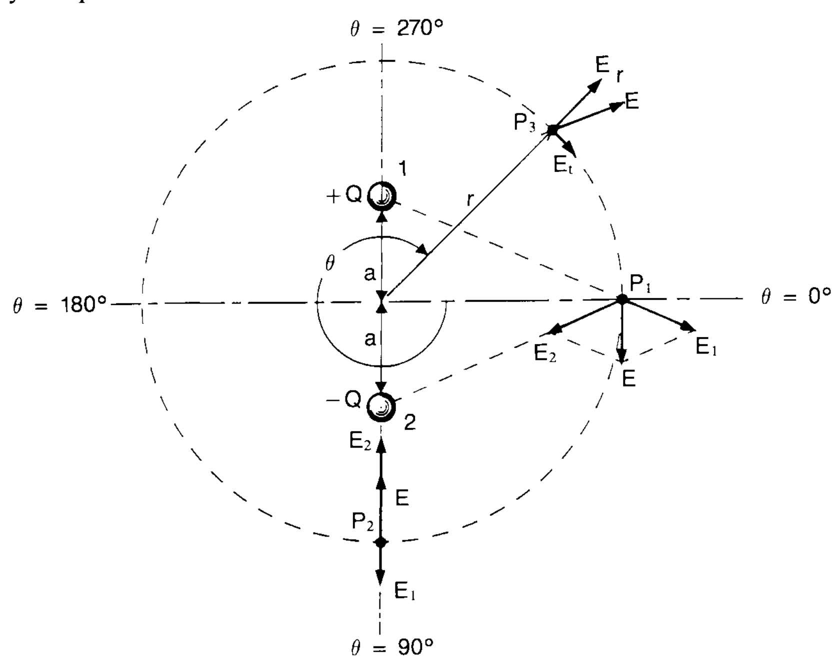
Given the preceding assumptions, the nice spherical field-shorting particle depictions are easy to visualize. That is why they are illustrated this way in Figure 3.1. However, other assumptions work just as well. For example, one might assume for the proton and neutron many different-sized odd-shaped, tiny charged and uncharged particles filling an odd-shaped volume around the center of gravity of the entity. So long as the positive and negative charged particles balance out (with one positive charge left over for the proton), and the sum of the self-capacitances-to-space of all the particles add to 1836.15 C_e for the proton and 1838.68 C_e for the neutron, everything will come out right for CTG. (The numbers 1836.15 and 1838.68 are the measured proton/electron and neutron/electron mass ratios, respectively, as delineated in Reference [1].) Since CTG ultimately depends upon the *capacitance* of particles to derive theoretical gravitational forces in the same way that the Newtonian theory depends upon the *mass* of particles to derive empirical gravitational forces, the self-capacitance ratios of the building-block particles have to be equal to the measured mass ratios. Thus, for the proton, the capacitance is $C_p = 1836.15\ C_e$, and the effective radius of the proton is $R_p = 1836.15\ R_e$. Similarly, for the neutron, the capacitance is $C_n = 1838.68\ C_e$, and the neutron effective radius is $R_n = 1838.68\ R_e$.

Once again, it should be emphasized that the *effective* radii shown in Figure 3.1 are not the radii for any purpose other than establishing the capacitance of each building block particle to space and to other particles. The ratio of the effective radius of a particle to the effective radius of an electron, however, is also the ratio of the masses and energies. The effective radius approach does not limit the actual number of quantum or other small particles making up the proton or neutron to 1837 or 1839 since there may be a "clustering" reduction of overall capacitance which could account for considerably more quantum particles.

The Fields

The reader may have noticed in this presentation that the term "bi-pole" has been used consistently rather than "dipole" even through the latter is more commonly used for a two pole electrical energy source. This is done purposely to emphasize the difference between electric E-field patterns and charge Q-field patterns around two oppositely charged poles.

Figure 3.2 is a representation of the electric field vectors produced by a dipole.



$E = E_t + jE_r$ WHEN $r >> a$:

$E \cong (aQ/2\pi\epsilon_0 r^3)\,(\mathrm{COS}\ \theta - j2\mathrm{SIN}\ \theta)$

CONVENTION USED: CLOCKWISE E_t IS POSITIVE,

OUTWARD E_r IS POSITIVE, AND CLOCKWISE θ IS POSITIVE

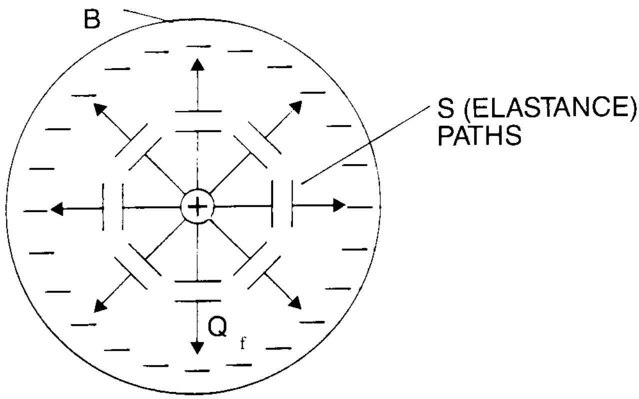
FIGURE 3.2. DIPOLE ELECTRIC FIELD

The volts/meter field pattern is not omnidirectional around the dipole center point, and the strength of the E-field at great distances falls off as the cube of the distance. Also, at great distances, the resultant field E at a position P is all tangential (E_t) when $\theta = 0°$ (and 180°), all radial (E_r) when $\theta = 90°$ (and 270°), and a vector summation of both E_t and E_r components at any position. The tangential electric field pattern is omnidirectional only in the plane perpendicular to the dipole aa axis and is a cosine (often called a "figure-8") pattern in the other two orthogonal planes. The radial electric field, on the other hand, is absent in the dipole bisecting plane perpendicular to aa, and forms sine "figure-8" patterns in the other two orthogonal planes. These dipole fields are not characteristic of gravity fields which must radiate omnidirectionally as radial vectors falling off in magnitude with the square of the distance.

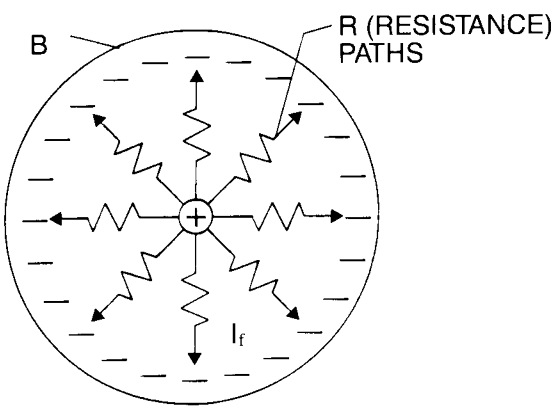
To understand other actions of a closely-spaced two pole arrangement (bi-pole), first refer back to Figure 2.5(b) to interpret what is meant by a Q-field. A Q-field is a vector field of charge similar to a vector (flow) field of current. Voltage gradients form in geometrical space along the volts/daraf vector Q-field lines just as volts/ohm fields form voltage gradients along current I-field lines. The field lines, similar to magnetic field lines, must start at one pole and end on another one of opposite polarity.

Each vector Q-field line follows a path of least impedivity to the field to get from a positive charge (pole) to a negative charge (pole), just like a current flow (field) follows the path of least impedivity to get from a positive pole to a negative pole. In both cases, the direction of the field vector is determined by convention, going from positive (plus sign) pole to negative (minus sign) pole. There are complete loop circuits for Q-fields, just as there are for electric current (fields) and magnetic fields.

Figure 3.3 compares the (stationary charges) Q-field to the (moving charges) I-field. To better visualize a Q-field, consider that a current



(a) FREE-SPACE



(b) OCEAN

FIGURE 3.3. Q_f CIRCUITS IN FREE-SPACE BACKGROUND AND I_f CIRCUITS IN RESISTIVE MEDIUM BACKGROUND FROM SINGLE-POLE CHARGE AND CURRENT SOURCES

is flowing through a medium with electrons streaming through. Suddenly, the resistivity of the path is made so great (infinite, for example) that no more current flow occurs. The pattern of charges is exactly the same as it was at the instant of cut-off, and stays that way without allowing new electrons to flow in or old ones to flow out of the medium. Energy is trapped in the field path, no power source is required to maintain it, and the same field lines (vectors) are still there. The cessation of flow is equivalent to what happens when fields and resultant forces are so miniscule that no electrons are moved as continuous electric current from particle to particle through a medium; hence, the elastance in the path, rather than the resistance, determines the voltage gradients.

Figure 3.3 shows Q-field and I-field flux lines heading outward omnidirectionally from a single particle pole into the medium surrounding it. A positive constant charge source is used to initiate the radial Q-field lines in free-space, and a positive constant current source is used to initiate the radial I-field lines in the ocean. By convention, a reversal of polarity of the source poles would reverse the direction of the vector field lines to point inward; but the background B would always stay oppositely polarized from the source.

In free-space, any minute volume of space or particle filling that space encounters a radial field vector from the charge source. If the (space) particle short-circuits the background medium, the impedivity of the source to the background is slightly lowered and a very small opposite polarity ΔV voltage decrease occurs at the pole source. This is the same action as if an opposite-charge object were at the position of the (space) particle. Consequently, the pole is attracted to the (space) particle and vice-versa. If, on the other hand, the (space) particle is open-circuiting (that is, has an impedivity higher than the background medium), the impedivity of the source to the background is slightly raised, producing a ΔV voltage increase in the same polarity as the source pole. To the source in the latter case, the (space) particle now appears to be one with a slight charge of the same polarity as the source pole, and the (space) particle and source pole mutually repel each other. Simple experiments can be set up both electrically and magnetically to demonstrate this principle.

In Figure 3.4(a), a shallow insulated round tank filled with distilled water has a perimeter metal rim and a small cylindrical metal pole at the center. A high voltage is applied between the pole P (+) and the rim B (−) which represents a background reference "ground." Similarly, in Figure 3.4(b) a deep half-cup-core magnet has its center post pole P as "north" N and its rim (background B) as "south" S. For electric fields in distilled

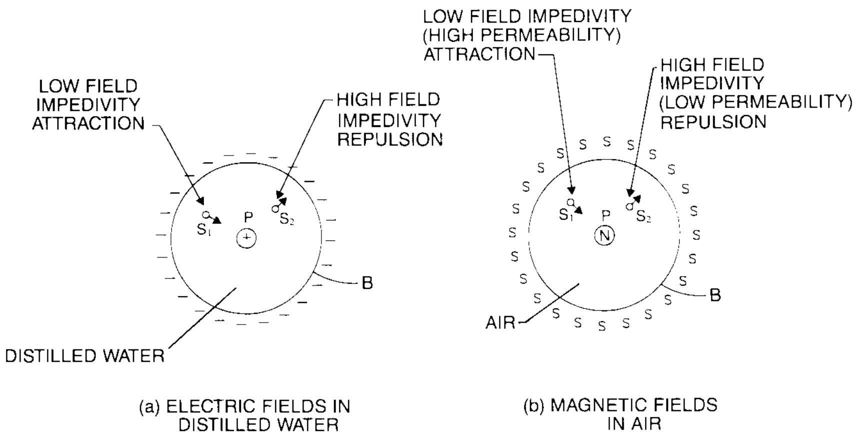


FIGURE 3.4. SINGLE POLE OMNIDIRECTIONAL FORCES

water, any substance S with less impedivity to the field than the tank background medium is attracted to P; any substance S with greater impedivity to the field than the tank background medium is repelled from P. For the equivalent with magnetic fields, any source S material of greater permeability (less impedivity to the field) than the background space (air) is attracted to P; any source material of less permeability (greater field impedivity) than air (say, bismuth) is repelled away from P. For an electrostatic field in vacuum free-space, any material of less impedivity (greater permittivity) than free-space is attracted to a single pole charge. Conversely, if there were any substance of lesser permittivity than the free-space background (which so far has not been recorded), it would be repelled by the single pole P. The electric and magnetic pole polarities, "plus" and "minus" or "north" and "south", can be reversed and still attain identical results in a Figure 3.4 configuration.

While the effects of the single electric pole configuration of Figure 3.4 might appear promising as a means to explain gravity, it is by no means the whole or even correct answer; and magnetic forces, presumably, cannot be the basis of gravity since they work only on magnetic materials. The main trouble with a single pole electric field visualization of gravity is that there are always relatively huge charge forces that can readily be shown to swamp any slight gravity forces. But what if the electric field forces could all be cancelled? That is where the bi-pole conception shines, for that is exactly what happens!

Literally, there are trillions upon trillions upon trillions of *dipole* sources from proton-electron pairs (and neutrons) dispersed throughout the universe. These dipoles have no particular orientation and may be rotating with random axis orientations. At positions in space, the sums of all of the electrostatic E-fields from all of these dipoles balance out to form a quiescent background of zero, since even a single randomly rotating dipole at any position balances to zero E-field integrated over a long-enough time period. If the E-fields did not cancel, there would be tremendous forces greater than gravity continually impinging upon us.

But the Q-fields from a closely spaced *bi-pole* are not cancelled; they continuously form the same field circuit path between the two poles (bi-pole) and a distant object, no matter what orientation or rotation either the bi-pole or the object experiences. Figure 3.5 represents the omnidirec-

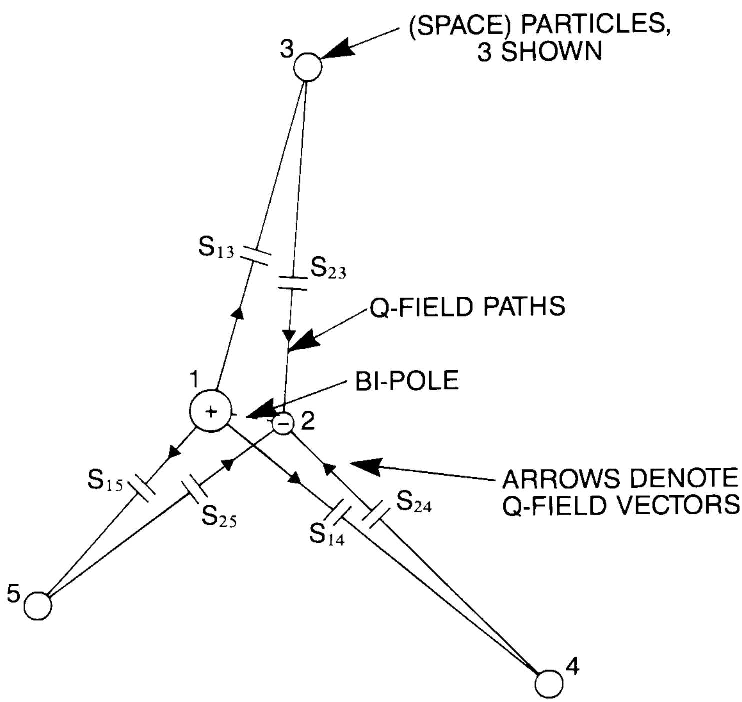


FIGURE 3.5. Q-FIELD PATHS FROM A BI-POLE TO (SPACE) PARTICLES

tional Q-field circuit pattern from a central bi-pole to several miniscule volumes of space or particles randomly disposed in the open space around the two poles. In a homogeneous medium, at any given great distance from the bi-pole center, the field strengths in the circuit paths are identical in all directions. With respect to gravity, the exact effective sizes as well as the charges, of the two particles of the bi-pole must be taken into account before one can quantify precisely the circuit parameters and resultant forces.

The Circuits

Electrical capacitance has a geometrical property that establishes the ratio of an object's net charge to a resultant potential difference between that object and another one, or from the object to "background space."

Every object, including the earth, has a capacitance to the background space all around us. For engineers and physicists, however, the earth is usually used as a reference, so one is likely to think of the earth "ground" as the basic electrical tie-point to which everything else can be related. For the case of free or far-apart small objects, there is no significant error in this kind of assumption; the earth has such a great capacitance relative to background space that either the earth "ground" or the background space "ground" means essentially the same thing, and either designation can be used interchangeably.

The electrical capacitance of the entire earth to our background is about 7.9×10^{-4} farads; the capacitance of an average adult male human to ground, on the other hand, is only about 60×10^{-12} farads, or about 60 picofarads (pf). For one example, this characteristic human capacitance to ground permits a "touch" switch circuit to activate electric lights or other devices at the touch of a finger on a sensitive portion of the circuit. For every capacitance C to the background, a radius R of a perfect metal sphere with the same capacitance can be determined from the expression: $R = C/4\pi\epsilon$. In free-space where $\epsilon = \epsilon_0 \approx 8.85 \times 10^{12}$ farads/meter, the human male thus has, with respect to an equivalent sphere size, an *effective* radius of about 0.54 meters.

Using Figure 3.6 as an illustration, imagine an average man named Tom with a capacitance to space of 60 pf, having a smaller wife named Anne with a capacitance to space of 40 pf. They have *effective* radii of 0.54 meters and 0.36 meters, respectively. If they are far enough apart, say a few meters or more, and one measures the capacitance between Tom and Anne, it will be found that the measured capacitance is about 24

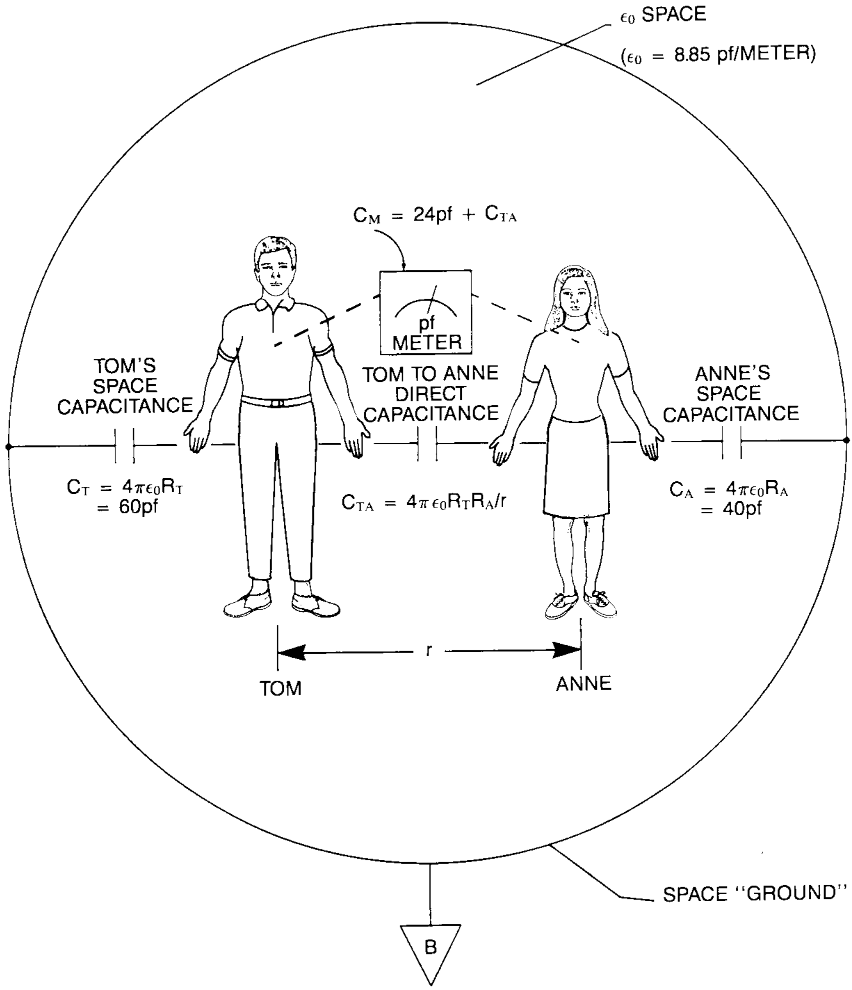


FIGURE 3.6. TOM AND ANNE LINKAGE CIRCUIT

picofarads, or the value of the two space capacitances in series. This holds true even when Anne is home in Iowa and Tom is traveling in Japan. In other words, this measured capacitance does not vary with the distance between them so long as that distance is much greater than their effective radii. Even when Tom and Anne are far apart, however, there is also a *direct* capacitance between them which varies inversely with distance but is so small in relation to the two capacitances to space that it is unmeasurable. For example, if Tom and Anne are 100 meters apart, their interlinking direct capacitance is only about 2×10^{-13} farads, or about 0.2 pf. At a separation of 1000 meters, the direct capacitance drops to about 0.02 pf; at 10,000 meters, 0.002 pf, and so on. These are all small capacitances with respect to the 24 pf series space capacitance separating Tom and Anne. The image that one generally thinks about for a two-plate capacitor has completely shifted around – the "fringe-effect" capacitance, which one is usually told to neglect, is now the large dominate *space* capacitance, and the object-to-object (plate-to-plate) *direct* capacitance, which is usually the one of greater interest, is small and seemingly insignificant. But both kinds of capacitance are equally important for correctly analyzing gravity circuits.

Instead of Tom and Anne, imagine small particles with the same sort of capacitances to space and interlinking direct capacitances. Their specific capacitances to space and to each other are governed by the same physical laws as for Tom and Anne. In Appendix B, the expressions are derived for particle capacitances to space and capacitances between two and three particles in terms of the effective radii of the particles. Figure 3.7 represents a pattern of three particles dispersed in space. Since the three particles are designated as Particle 1, Particle 2, and Particle 3, their *space* capacitances are designated C_1, C_2, and C_3, respectively. The *direct* capacitance between two particles, as between Particle 1 and Particle 2, is designated C_{12}.

In Figure 3.8 a schematic diagram of a two-particle circuit is shown. Suppose Particle 1 has a positive charge Q_1 associated with it and one wants to determine the resulting voltage between Particle 2 and ground. By using the Q-field concept applied to the capacitance circuit, the voltage at Particle 2 is:

$$V_2 = Q_1/[C_1 + C_{12}C_2/(C_{12} + C_2)] \times [C_{12}/(C_{12} + C_2)] \qquad (3.2)$$

If C_{12} is very small in relation to C_1 and C_2, the expression (3.2) simplifies to:

$$V_2 \approx Q_1C_{12}/C_1C_2 \qquad (3.3)$$

Substituting $4\pi\epsilon_0R_1$ for C_1, $4\pi\epsilon_0R_1R_2/r$ for C_{12}, and $4\pi\epsilon_0R_2$ for C_2, the expression (3.3) becomes:

$$V_2 = Q_1/4\pi\epsilon_0 r \qquad (3.4)$$

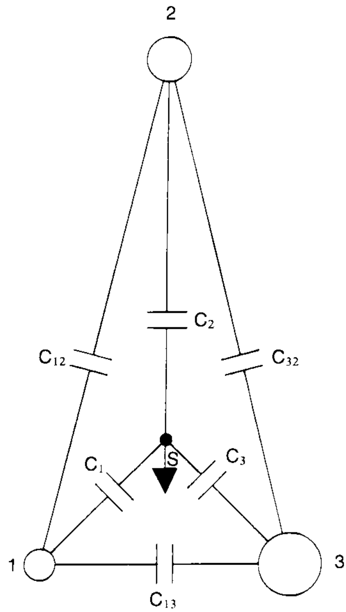
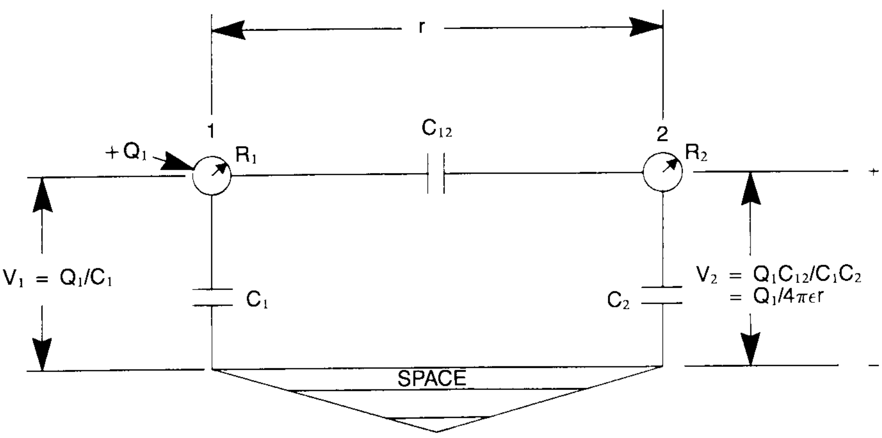


FIGURE 3.7. THREE SUB-ATOMIC PARTICLES IN SPACE LINKED BY CAPACITANCE



$$C_1 = 4\pi\epsilon R_1$$

$$C_2 = 4\pi\epsilon R_2$$

$$C_{12} = 4\pi\epsilon R_1 R_2/r$$

$$r >> R_1 \text{ or } R_2$$

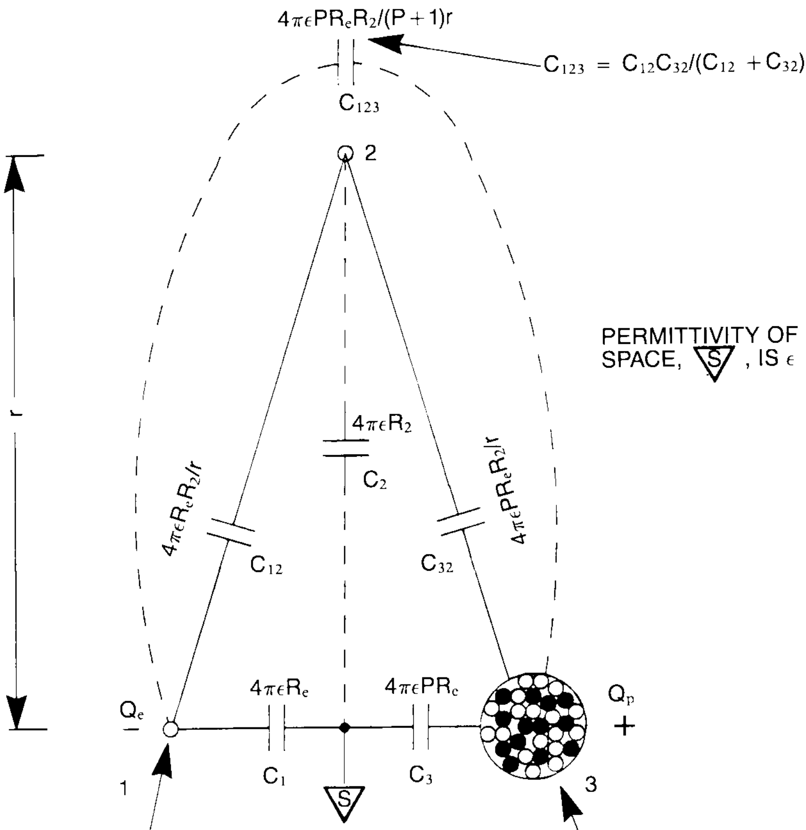
FIGURE 3.8. A TWO-PARTICLE Q-FIELD CIRCUIT

Equation (3.4) is the same as the universal formula for the scalar voltage (to ground) at any point in space produced from a distant point charge, which is based on the inverse-of-the-distance reduction in voltage magnitude rather than any capacitive circuits. The identical expressions serve as a positive check of the Q-field approach and corroborate that the effective radius expressions for C_1, C_{12} and C_2 are correct.

Figure 3.7 contains a general schematic diagram of three particles capacitively linked in space. When two of the particles represent a closely-spaced electron-proton bi-pole pair, and the third represents a basic quantum (electron-size) particle intercepted in space, the interlinking capacitive circuit is represented by the diagram shown in Figure 3.9.

The capacitance C_{13} is not carried over from Figure 3.7 to Figure 3.9 because C_{13} does not enter into the calculations of gravity forces. The charge and capacitance values Q_e, C_e, Q_p and C_p are assumed for the electron and proton in orbital relation within the atom. Since the potential induced at Position 2 relative to background space is zero, the charge induced at Position 2 is also zero. Except for determining the effective radius $R_2 = C_2/4\pi\epsilon$, the value of C_2 is superfluous in the circuit which is indicated by the use of dotted lines for C_2. The *indirect* capacitance between two particles by way of a third particle, as between Particle 1 and Particle 3 via Particle 2, is a series capacitance, $C_{123} = C_{12}C_{32}/(C_{12} + C_{32})$. Also, the term ϵ used for permittivity is not necessarily the free-space permittivity ϵ_0 since the circuit may be immersed in a medium other than free-space.

From the fundamental circuit of Figure 3.9, all the forces of gravity can be calculated. First, one finds the forces produced by a single bi-pole and particle combination, and then simply adds the total number of bi-poles and particle combinations at both positions of two mutually attracting bodies to find the multiplier to get the total force. However, when any circuit passes through a medium of permittivity different from ϵ_0, or through more than one permittivity background, each circuit path characteristic has to be taken into account to obtain precise results.



ENERGY, $U_e = M_e c^2 = Q_e^2/C_e$

CAPACITANCE, $C_e = Q_e^2/M_e c^2 = 4\pi\epsilon R_e$

EFFECTIVE RADIUS, $R_e = Q_e^2/4\pi\epsilon M_e c^2$

Q IS CHARGE

M IS MASS

c IS THE VELOCITY OF LIGHT

$Q_p = -Q_e$

$M_p = 1836.15\ M_e$

$C_p = 1836.15\ C_e$

$R_p = 1836.15\ R_e$

LET 1836.15 EQUAL P

EFFECTIVE RADIUS, $R_p = PR_e$

FIGURE 3.9. CIRCUIT LINKAGE OF ELECTRON-PROTON PAIR WITH REMOTE PARTICLE

The Forces

Particles, fields and circuits have been presented as consisting of real or artificial capacitance for at least one component in their energy (mass) and interdependent field circuit linkages. When the inverse of capacitance, or elastance in units of darafs, is imagined as the path over which a steady state Q-field travels, close analogies to the E-field and I-field result, where those fields travel over paths of distance (meters) and resistance (ohms), respectively. A more detailed explanation for the equivalence of elastance and distance paths is given in Appendix D.

A Q-field Q_f produces a voltage drop through capacitive space which is a voltage gradient field V/S, where V is voltage and S is elastance. The V/S voltage gradient vector is then in units of volts per daraf which, by definition, is also in units of coulombs.

A new theoretical force $F_g = QQ_f$ is introduced in terms of an intercepted Q multiplied by the Q-field voltage gradient V/S. The new force F_g is then in units of coulomb-volts per daraf, which here will be called *gravits* because, as will be shown, it defines the magnitude of a gravity force in precise quantitative terms.

The well-known charge force $F_c = QE_f$ is in terms of intercepted Q multiplied by the E-field voltage gradient V/r, where r is in units of meters. The charge force F_c is then in units of coulomb-volts per meter, or *newtons*.

Evidence that a *gravit* is a viable force equivalent in magnitude to a *newton*, is demonstrated by the following argument. As a charged particle Q_1 moves through space toward a second oppositely charged particle Q_2 along a straight-line path r measured in units of meters, it also moves through space along a straight-line path S measured in units of darafs.

Thus, in terms of movement of a particle experiencing a force:

$$F_c \times \Delta r = Q_1 \Delta V / \Delta r \times \Delta r = Q_1 \Delta V \tag{3.5}$$

$$F_g \times \Delta S = Q_1 \Delta V / \Delta S \times \Delta S = Q_1 \Delta V \tag{3.6}$$

In either case, $Q_1 \Delta V$ represents an energy change, or work performed by moving a particle an increment through space. Equation (3.5) represents work done by a charge force; equation (3.6) represents work done by a gravity force.

When two charged capacitive bodies are separated by a straight-line distance r, they are separated by an elastance of $S = r/4\pi\epsilon_0 R_1 R_2$, where R_1 and R_2 are *effective* radii of the bodies. For ease in presentation, let B denote $4\pi\epsilon_0 R_1 R_2$ in units of farad-meters, so that $S = r/B$ darafs. Then,

$$F_c = QE_f$$
$$= QV/r \text{ newtons} \qquad (3.7)$$

and

$$F_g = QQ_f$$
$$= BQV/r \text{ gravits.} \qquad (3.8)$$

Also,

$$|F_g| = |B| \, QV/r \text{ newtons,} \qquad (3.9)$$

where $|F_g|$ and $|B|$ are the magnitude values of F_g and B.

Therefore, forces in units of *gravits* are equal in magnitude to forces in units of *newtons* since (3.8) and (3.9) are equal in magnitude. As a consequence, all forces will be designated in this text in units of *newtons*, which is the universally accepted term for the strength of a force. To differentiate between *gravits* and "pure" *newtons*, however, vertical slash lines either before and after the F_g symbol or before and after the newton unit designator will be used when applicable to denote *gravits* with magnitude equivalence to *newtons*.

CHAPTER 4

QUALITATIVE AND QUANTITATIVE GRAVITY

Qualitative Gravity

The sketches from an easily assembled charge force experiment shown in Figure 4.1 are excellent simulations of how gravity works. A bi-pole pair of electrodes energized at high voltage in the bottom of a plastic jar tank are insulated by oil separation and act through a layer of teflon and oil on an object of substance S. In Figure 4.1(a), the force pulls S downward through the oil if S is a metal coated ball "short-circuiting" the oil; in Figure 4.1(b), the force pushes S upward through the oil if S is a polystyrene ball "open-circuiting" the oil. Since the demonstrations have to contend with real gravity in addition to the artificial simulated gravity, one must be careful to select electrically low impedance objects that normally just float in the oil and high impedance objects that normally just sink in the oil in order to display the synthetic gravity-like forces working counter to real gravity.

Comparing the actions of Figure 4.1 to similar gravity actions, every one of the earth's proton-electron and neutron bi-pole electrode pairs are energized by appreciable pole-to-pole voltages, insulated by vacuum,

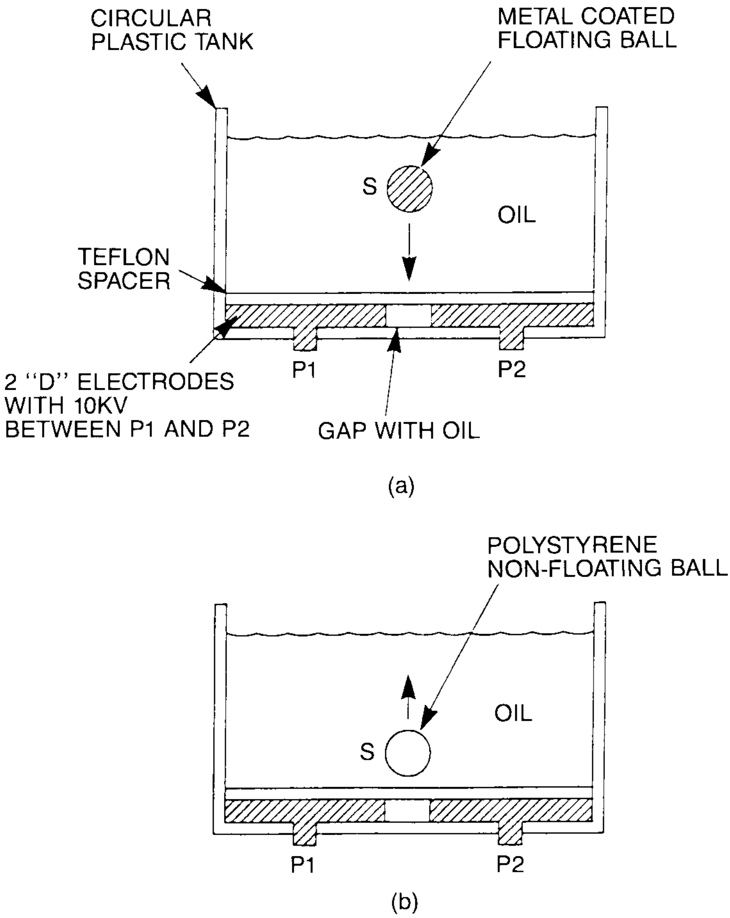


FIGURE 4.1. SIMULATED GRAVITY DEMONSTRATIONS

and act through the earth and air on any substance in the air. They pull down through the air all substances "short-circuiting" the air, such substances as portions of metal, rock, wax, water and almost everything else; they push up through the air all substances "open-circuiting" the air, such substances as balloons filled with hydrogen, helium, or even hot air. In physics, this pulling and pushing is generally explained in another manner. Air is certainly pulled downward by gravity, but so are balloons filled with hydrogen, helium, or hot air – the air around a balloon is pulled down just a bit harder. By Archimedes Principle (of displacement) a less dense balloon has to "float" upward through the denser air. The same thing is happening in Figure 4.1(b) – both the oil and the polystyrene ball are pulled downward by the bi-pole, but the oil is pulled down just a little bit harder. In the simulated gravity experiments, the impedivities of the S objects and oil are not determined by densities, but are determined solely by the bi-pole's (electric current field) ability to displace electrons in the substances. In the case of real gravity, where extremely weak bi-pole fields are involved, the impedivities of objects are determined by their artificial permittivities, or by their numbers of quantum particles per volume, or by their densities — all three parameters being just different ways of expressing the inverse of impedivity to a bi-pole Q-field.

From the actual experiments, a series of "thought" experiments can be deduced which could be readily performed except for the great difficulty to hold the parameters within the tolerances required. A closer analogy to earth gravity working on an object in the air is one in which the teflon disk in Figure 4.1 is thickened and impregnated with carbon until its impedivity is 0.2% lower than the oil above it, say to exactly 499 megohm-centimeters while the oil is fixed at exactly 500 megohm-centimeters. Then the oil is equated to air and the teflon to the average earth material which has an artificial elasticity (inverse of permittivity) about 0.998 times the elasticity of air (or vacuum). The strength and direction of the "thought" experimental forces are governed by the relative resistive impedances (resistivity); gravity forces are governed by relative artificial elasticity impedances in the same manner.

In the tank, a floating plastic ball S with an initial resistivity of 500 megohm-centimeters, but impregnated with tiny metal particles until it has a lower artificial resistivity of say, 495 megohm-centimeters, will pull down in the tank toward the tank's energized bi-pole; in vacuum space, a small portion impregnated with electrons, protons and neutrons until it is fashioned into a heavy rock with a higher artificial permittivity than the space around it (a lower artificial elasticity) will pull with gravity down toward the earth's bi-poles. Back in the tank, a non-floating plastic ball S impregnated with metal particles has an initial resistivity of about 500 megohms-centimeters until some of the metal particles are removed to make a new artificial resistivity just higher than the oil, say 501 megohm-centimeters. Then the plastic ball rises away from the tank bi-pole. For the analogy with gravity, a balloon filled with all the electrons, protons, and neutrons of air will not rise, but if the number of the electrons, protons, and neutrons are lessened, as when the medium is helium with an artificial permittivity slightly less than air (greater artificial elasticity), then the balloon rises away from the earth's bi-poles.

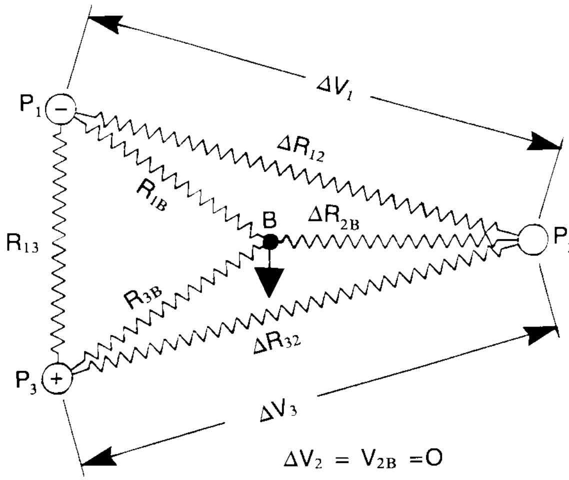
The tank experiments of Figure 4.1 are based on charge forces and are only qualitative demonstrations of how gravity works. It is time to move on to quantitative solutions for real gravity interactions.

Quantitative Gravity

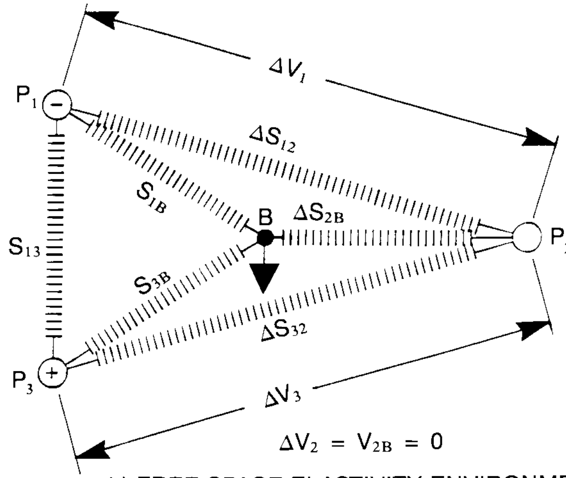
Quantitative gravity is based upon the fields of sub-atomic bi-poles (proton-electron pairs and plus-minus pairs in neutrons) intercepting "short-circuiting" particles in capacitive space. To determine the quantitative force of a bi-pole acting on a low-impedivity object in space, several approaches are possible. The problem might be attacked as Einstein did by using the curvature of space (the curvature of the field paths in space close to an object) as a purely geometric cause of gravity. The curvature approach to gravity is not satisfying to many scientists because it doesn't explain what energy "curves" the space. Further, it involves complex mathematics, not only difficult to understand, but perhaps impossible with today's tools to duplicate by practicable experiments. A much simpler approach, much like the one championed by Coulomb, is preferred for the Capacitance Theory of Gravity.

When an energized electric bi-pole causes a force on a distant small particle, what can be observed at each end of the reaction? At the bi-pole end, any "short-circuiting" out in space, no matter how small the size of the shorting particle, results in a lower field-impedance between the two poles of the bi-pole. Over the field impedance path, including the particle that lowers the impedance, there is a voltage change ΔV which would not exist without the particle being there. Since the single particle in space remains at zero potential to the background, a voltage change ΔV shows up at each pole of the bi-pole. This tends to lower the pole voltage-to-space magnitude regardless of the pole polarity. At the negatively charged pole, for example, the ΔV is plus polarity; at the positively charged pole, the ΔV is minus polarity. An experiment duplicating this effect is shown in Figure 4.2. Circuits for a bi-pole in resistive water and for a bi-pole in elastive vacuum space are shown.

This opposite polarity voltage change ΔV occurring at a plus or minus pole is identical to the effect that is the basis of Coulombs Law, where a $+Q_1$, point-charge at Position 1 in space intercepts a $-Q_2/4\pi\epsilon_0 r$ voltage change ΔV of opposite polarity due to a distant point-charge $-Q_2$; or a $-Q_1$ point-charge at Position 1 in space intercepts a $+Q_2/4\pi\epsilon r$ voltage change ΔV of opposite polarity due to a distant point-charge $+Q_2$. In either instance, the field E_f is the voltage-change ΔV divided by the distance between the charges, and results in an attractive charge force $-QE_f$ on Q_1, which is $F = -Q_1Q_2/4\pi\epsilon_0 R^2$ directed towards the Q_2 charge.



a) OCEAN RESISTIVITY ENVIRONMENT



b) FREE-SPACE ELASTIVITY ENVIRONMENT

FIGURE 4.2. CIRCUITS FOR DETERMINING ΔV VOLTAGE CHANGES AT A BI-POLE DUE TO A DISTANT PARTICLE

Conversely, if the same bi-pole and distant particle configuration is assumed except that an "open-circuiting" particle is substituted for the "short-circuiting" one, the resultant voltage change ΔV at each pole has the same polarity as that pole. This is similar to what happens by Coulomb's Law when there is a charged particle of the same polarity at a distance r, and an opposing vector force results.

In vacuum space, if one assumes only "short-circuiting" particles, the forces on particles are always attractive. Since no substances have ever been identified with higher impedivity (lower permittivity and/or higher resistivity) than vacuum space, only attractive gravity forces have been observed.

At the particle end of the reaction nothing can really be observed except for a vector force towards the distant bi-pole, either attracting (if the particle is "short-circuiting") or repulsing (if the particle is "open-circuiting"). When the particle is "short-circuiting," as assumed for gravity, it forms one pole of a capacitor with each separate pole of the distant bi-pole, and there is a ΔV voltage across each capacitor. The ΔV potentials, and even the capacitors themselves, are not there without the particle's existence. Each capacitor's Q-field between the appropriate poles is then derived from the ΔV voltage divided by the ΔS elastance caused by the particle's existence. The fields are then multiplied by "half-Q's" of the separate poles of the bi-pole to determine the two separate attractive forces, which, with vector addition, determines the total attractive force between the bi-pole and the particle. The "half-Q" is used in a particle capacitor force determination when one pole is grounded, just as a charge force is determined for an ordinary capacitor when one plate is grounded. Even though one pole (plate) has full Q and the other has zero Q (relative to space), one half the charge Q is assigned to each plate, determining a force $F_c = 1/2\ QE_f$, or $F_c = 1/2\ Q(V_1\text{-}V_2)/r_{12}$.

Similarly, for gravity between one pole particle of a bi-pole and a second distant particle:

$$F_g = 1/2\ Q\Delta(V_1\text{-}V_2)/\Delta S_{12}$$

$$= 1/2\ QV_{12}/S_{12} \qquad (4.1)$$

$$= 1/2\ Q_1V_{12}C_{12} \qquad (4.2)$$

In Figure 3.9, the negative charge of the electron is $Q_1 = -1.60219 \times 10^{-19}$ coulombs, the positive charge of the proton is $Q_3 = 1.60219 \times 10^{-19}$ coulombs, and the particle charge at Position 2 is assigned a zero value.

The Position 2 charge, even when other than zero, always balances out the radial E-field forces to zero between itself and a randomly rotating electron-proton pair. Thus all E fields are neglected for Q-field gravity calculations. Starting with a quantum force, assume that the shorting particle at Position 2 is the smallest possible size, the same as that of a quantum electron (or positron, or neutrino). Using the space circuit shown, it is not difficult to solve for the ΔV at the electron, ΔV_e, and for the ΔV at the proton, ΔV_p. Assuming a great separation distance r:

$$\Delta V_e = Q_p C_{123}/C_1 C_3 \tag{4.3}$$

$$\Delta V_p = -Q_e C_{123}/C_1 C_3 \tag{4.4}$$

The voltage charge ΔV_e is positive because the voltage charge Q_p is positive; ΔV_p is negative because $-Q_e$ is negative, where Q represents a charge in units of positive coulombs.

Substituting $4\pi\epsilon P R_e R_2/(P + 1)r$ for C_{123}, $4\pi\epsilon R_e$ for C_1, and $4\pi\epsilon P R_e$ for C_3:

$$\Delta V_e = Q_p/4\pi\epsilon(P + 1)r, \tag{4.5}$$

$$\Delta V_p = -Q_e/4\pi\epsilon(P + 1)r, \tag{4.6}$$

where P is the effective radius ratio R_p/R_e. The negative $-Q_e$ intercepts a positive $Q_p/4\pi\epsilon(P + 1)r$ voltage change ΔV_e at Position 1 and the positive Q_p intercepts a negative $-Q_e/4\pi\epsilon(P + 1)r$ voltage change ΔV_p at Position 3, both ΔV's due to the particle at Position 2.

Using the particle capacitor force Equation (4.2) to find the force at Position 1 due to Particle 2, one finds:

$$F_{g1} = -Q_e Q_p R_e R_2/2(P + 1)r^2, \tag{4.7}$$

and the force at Position 3 due to Particle 2 is:

$$F_{g3} = -Q_e Q_p P R_e R_2/2(P + 1)r^2. \tag{4.8}$$

In the rationalized MKS system of units, the general formula for gravity between any two small particles (both in free space) then becomes:

$$F_g = -Q_eQ_pR_1R_2/2(P + 1)r^2 \ |\text{newtons}|, \qquad (4.9)$$

and the minus sign denotes attraction. Substituting the charge values of $-Q_e$ and Q_p, and the proton-to-electron P ratio of 1836.15, the magnitude of the gravity force is:

$$F_g = -(1.60219 \times 10^{-19})^2R_1R_2/2(1836.15 + 1)r^2$$

$$= -6.98640 \times 10^{-42}R_1R_2/r^2 \ |\text{newtons}|. \qquad (4.10)$$

When the magnitude of the CTG force of (4.10) is checked with Newton's $-GM_1M_2/r^2$ force between two electrons (each with the classical 2.81795 $\times$ 10^{-15} meters effective radius) using one meter separation:

$$F_g = 5.54779 \times 10^{-71} \text{ newtons by CTG;}$$

$$F_g = 5.53716 \times 10^{-71} \text{ newtons by Newton.}$$

The fact that a completely theoretical CTG gravity force, determined by electric circuits in space, agrees to a little better than 99.8% with Newton's empirical gravity, seems remarkable enough; but, what is even more remarkable in the calculations to come is that CTG gravity, after required modification for one end of the force reaction being within the earth (as gravity is usually experienced), then agrees with Newtonian gravity to six numerical places. Here lies the great beauty of the effective radius concept.

In an earlier explanation of capacitance gravity in Reference [2], gravity was first determined between any two particles in free-space, then between two particles with one inside and the other outside the earth (which replicates the configuration for Newton's empirical determination). The slight reduction in gravity force due to a particle being within the earth's silhouette was explained in terms of a slight energy (mass) reduction rationalized from Einstein's $M = E/c^2$, where the energy per particle E is $Q^2/4\pi\epsilon R$. Since the artificial permittivity ϵ_E within the earth is 1.00192 (earth's average artificial dielectric constant) times the free-space ϵ_0, the energy, and therefore the mass, of a particle within the earth is reduced by multiplying the free-space mass by ϵ_0/ϵ_E when it has the earth's medium all around it. After the modification for one of the particles being within the earth, the capacitance gravity expression and the Newton gravity expression resulted in force strength calculations identical to six places.

But can the energy (or mass) of a particle really decrease just because of the medium around it – and, if so, where does the loss go? The conservation laws have not been broken up to now, and it would be nice to keep them intact. The answer comes automatically with the effective radius approach. With it, a particle's charge Q_p, energy E_p, mass M_p, self-capacitance C_p, and potential Q_p/C_p relative to the background, are all maintained inside or outside the earth, in free-space, or in any other medium. Relating to a single particle P, the reasoning proceeds mathematically as follows:

$$E_p = M_p c^2 = Q^2{}_p/4\pi\epsilon R_p = \text{Constant Value;}$$

$$R_p = Q_p^2/4\pi\epsilon M_p c^2$$

Then:

$$R_p = (Q_p^2/4\pi M_p c^2)/\epsilon\,. \tag{4.11}$$

Thus, when all the other parameters of a particle are constant, the effective radius R_p is an inverse function of the permittivity ϵ in the space around the particle; and the self-capacitance, $C_p = 4\pi\epsilon R_p$, and the potential, $V_p = Q_p/C_p$, are constant values.

The CTG formula for gravity force between two electrons, when one is inside the earth and the other is outside the earth, then becomes:

$$F_g = -[6.98640 \times 10^{-42}]\,(R_e\epsilon_0/\epsilon_E)(R_e)/r^2 \tag{4.12}$$

At 1 meter r separation, and $R_e = 2.81795 \times 10^{-15}$ meters, the CTG force magnitude is:

$$|F_g| = -[6.98640 \times 10^{-42}][.998084 \times (2.81795 \times 10^{-15})^2]$$

$$= 5.53716 \times 10^{-71} \text{ newtons by CTG.} \tag{4.13}$$

At 1 meter r separation, and $M_e = 9.109534 \times 10^{-31}$ kilograms, the Newton force is:

$$
\begin{aligned}
F_g &= -GM_eM_e/r^2 \\
&= -[6.6726 \times 10^{-11}]\,(9.109534 \times 10^{-31})^2 \\
&= 5.53716 \times 10^{-71} \text{ newtons by Newton.} \qquad (4.14)
\end{aligned}
$$

Note the exact magnitude agreement of (4.13) and (4.14)!

To obtain gravity forces between any two objects of any size, the CTG force reaction between two electrons is the basic quantum force: but this magnitude must be multiplied by the number of quantum particles at each end of the reaction in order to ascertain the correct total gravity force. In addition to single entity electrons, one uses 1836.15 electron equivalents for each proton, 1838.68 electron equivalents for each neutron, and the total of all entities at each position to obtain the total gravity force. Thus the total force is:

$$F_{gT} = (-[6.9864 \times x\, 10^{-42}] \times N_1R'_{e1} \times N_2R'_{e2})/r^2 \text{ newtons,} \quad (4.15)$$

where N_1 is the total equivalent number of electrons at one position, N_2 is the total equivalent number of electrons at a second position, and R'_{e1} and R'_{e2} are the effective radii of electron-sized particles in their respective background media.

Obviously, it is much easier to use Newton's formula in most situations. Nevertheless, when the gravity force is not just associated with the earth, or when the force fields travel a significant distance through more than one medium, the CTG approach is more adaptable and more precise. Furthermore, the Newton approach is strictly empirical; and when there are deviations, it is often important to understand what is actually happening in terms of a non-complex force law, much like Coulomb's Law for electrostatic forces.

A summary of applicable charge field and force expressions compared to gravity expressions is shown in Table 4.1.

RELATED CHARGE AND GRAVITY EXPRESSIONS
TABLE 4.1

1. *General charge force expression:* $F_c = QE_f$	*General gravity force expression:* $F_g = QQ_f$
2. *Expanded:* $F_c = QV/r$	*Expanded:* $F_g = QV/S$
3. *Between two capacitor plates:* $F_c = QV/2r$	*Between two capacitor particles:* $F_g = QV/2S$ $S = r/4\pi\epsilon R_1R_2$
4. *Voltage at a Great Distance r from a point charge Q, at another point in space:* $V = Q/4\pi\epsilon_0 r$	*Voltage at a great distance r from a small charged particle, at another small particle in space:* $V_2 = Q_1C_{12}/C_1C_2 = Q_1/4\pi\epsilon_0 r$
5. *Average voltage and electric field at a great distance r from a randomly rotating dipole:* $V = 0$ $E_f = 0$	*Opposite polarity voltage and charge field at each monopole of a randomly rotating bi-pole caused by a quantum "short-circuiting "particle at a great distance r:* $\Delta V = Q/(P + 1)4\pi\epsilon r$ $Q_f = QR_1R_2/(P + 1)r^2$
6. *Force between a rotating dipole and a particle separated by a great distance r:* $F_c = 0$	*Force between each monopole particle and a "short-circuiting" particle separated by a great distance r in free-space:* $F_g = QV/2S = -Q_eQ_pR_1R_2/2(P + 1)r^2$
7. *Force between a rotating dipole in the earth and a particle separated by a great distance r:* $F_c = 0$	*Force between each monopole particle in the earth and a "short-circuiting" particle in free space, or vice versa, separated by a great distance r:* $F_g = -Q_eQ_p(R_1/K_{aE})(R_2)/2(P + 1)r^2$

NOTES: R represents the Effective Radius of a Particle.
Proton to Electron Mass Ratio, $P = R_p/R_e = 1836.15$.
Earth Artificial Dielectric Constant, $K_{aE} = 1.00192$.

CHAPTER 5

SOME IDIOSYNCRASIES OF GRAVITY

This section includes a discussion of several distinct and unique characteristics of gravity that distinguish it from other forces. These idiosyncrasies are explained in relation to the CTG Theory, which is reinforced rather than diminished by "real world" happenings.

Shielding and Attenuation of Gravity

Whenever gravity forces are compared to either electrostatic or magnetic forces, the preclusion of gravity from being either type is bolstered by the conclusion that gravity fields, unlike electromagnetic fields, cannot be shielded or attenuated (other than by the square-of-the-distance fall-off). On the face of it, this argument appears sound enough; but if one considers that gravity originates from equally charged plus and minus pairs of poles separated only by a distance of some 10^{-10} meters or less, there is not much field from these to do very much at any position in space. The force fields from such bi-poles, for example, are not able to change the positions of electrons, or charged ions of any type, held in fixed relations to other charged entities. The additive bi-pole forces resulting on all the particles within a body work simply like a single force on all of the particles as if they were glued together. Although the individual particles within bodies are actually widely separated with respect to their radii, no significant relative charge displacement occurs, and there is no significant charge alignment to cancel or alter minute bi-pole charge fields. Without charges moving to alignment within a body of separated particles, there is no measurable shielding or field attenuation, and a bi-pole field travels freely through the "open-space" of the body's medium.

All solids, liquids, and gases look like open space to diminutive bi-pole fields except for the tiny little widely-spaced specks of matter floating in them. The specks are held in relation to each other by *mighty* charge forces, which are not significantly affected by the *tiny* fields passing through. Thus gravity fields pass through with *very* minor attenuation. The earth, for example, as shown in Appendix C, is equivalent to a free-space sphere with an artificial dielectric constant of about 1.00192. Some other substances listed in Table C.1 with artificial dielectric constants are:

Hydrogen:	1.000000031
Air:	1.00000045
Water:	1.000347
Iron:	1.00273
Uranium 238:	1.00654

None of these substances significantly attenuate or shield gravity fields, but all will slightly "curve" space by bending the (daraf) paths of Q-fields that pass near or through a substantial body made from any of them (see below).

Curved Space and General Relativity

What is curved when "space" is curved? Seemingly, it is hard to imagine nothingness being curved. Rather one can think of a curvature distortion of the least impedance field energy path. For gravity (which is less complicated than light or other AC electro-magnetic fields), the daraf circuit path is all that has to be considered.

Any body placed in space distorts (curves) the electrical fields in its vicinity if its field impedivity, compared to that of the space around it, is either greater or less than the surrounding space impedivity. If the impedivity is relatively greater, fields are curved away from the body; if the impedivity is relatively less (the property of all known bodies in free-space with the possible exception of neutrinos), the fields are curved toward and through the body. If the body has the same impedivity as the space around it, no change in the field occurs and the surrounding space is still flat. Figure 5.1(a) shows exaggerated field curvatures for greater, equal, and lesser impedivity spheres compared to the background impedivity. Figure 5.1(b) shows a single field path for light distorted by the "shorting" impedivity (gravity) of the earth.

When the impedivities are in terms of "artificial elastivities" of all know substances inside or on our planet earth, the relative impedivities to those of free-space have ratios in the range of only 1.000 to 0.993. The earth as a whole, for example, has an average impedivity of 0.998084 times the impedivity of space. With these slight impedivity differences between bodies and space, the daraf path curvatures of bi-pole gravity fields near bodies of any selected substance are very small even when the bodies are massive.

A precise analysis of curvature effects, although beyond the scope of this presentation, is possible by CTG. These should agree with Einstein's general relativity conclusions for gravity fields and forces based upon the geometric properties of curved space.

Curved space alone, however, cannot generate gravity forces. There has to be an energy acting in the curved space. In CTG, the energy is supplied from balanced plus and minus bi-pole charges.

No Polarization by Gravity

With CTG, one looks from a distance at either a great number of randomly spinning equal plus and minus charged closely-spaced bi-poles, or at no charge. Therefore, the local medium, and any media in between, are not polarized. Positively or negatively charged particles acting alone face no net charge, and thus no net large charge force.

The Principle of Equivalence and Gravity

The purpose of the material that follows is to demonstrate that CTG accounts for the principle of equivalence.

It has been well established that, under the influence of gravity, all objects, heavy and light, large and small, and made of any material, fall in a friction-free environment with the same measurable rate of increase of velocity, or acceleration. Sir Isaac Newton is supposed to have first wondered about this phenomenon when he observed an apple falling from

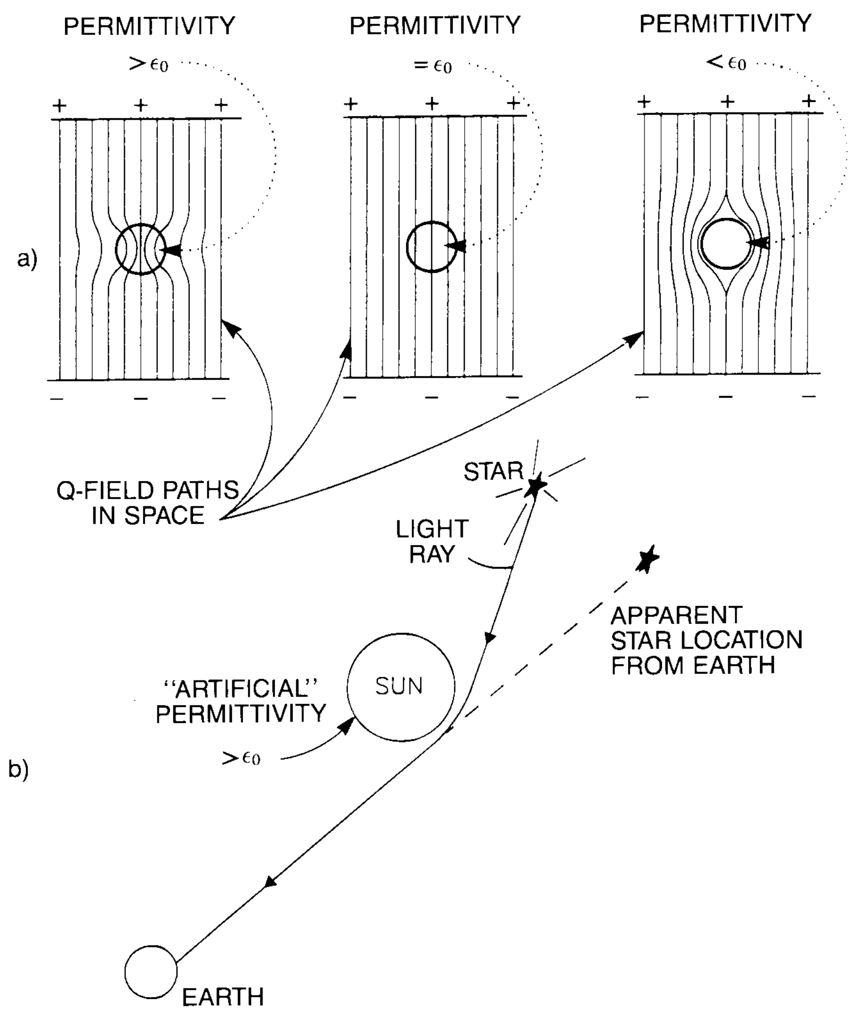


FIGURE 5.1. EXAGGERATED CURVATURE OF FIELD PATHS NEAR BODIES

a tree, leading to his famous theories and classical physical laws. To justify that objects with greatly different applied forces (weights) all fall simultaneously from a drop position to the ground, the idea of equivalency of mass for both an earth's attraction and a resistance to the attraction came about.

The Newton gravity law says that the force F_g on a mass M_1 near the earth is GM_E/r^2 times M_1, where M_E is the mass of the earth, r is the exact distance to the effective center of the earth, and G is an arbitrary constant found empirically over time by many, many measurements. The force on the mass M_1 points along r to the center of (gravity of) the earth.

The Newton acceleration law says that the force F_a on a mass M_1 is M_1 times the acceleration, or $F_a = M_1a$, where a is the rate of velocity change dv/dt. An implied force F_a runs counter to F_g in the opposite direction, pointing outward from the center of the earth along r, keeping intact Newton's law stating that for every force action there is an equal and opposite reaction.

From the above, it is easy to see that a force F acting on any object can be determined if the mass M is known and the object is allowed to move with an acceleration a. When objects are decelerated, any force slowing down the object can also be determined by reversing the sign to a negative acceleration $-a$, which also reverses the direction of the force F to $-F$.

All this can be a little confusing when one asks: what is the reference frame for acceleration, or what is an object accelerating toward or away from? Some say the "real" reference frame is the total gravity field plot; others cite distant galaxy configurations. For purposes here, the reference frame is fixed with the reader.

Einstein, to emphasize the mass equivalence, equates the experienced loss of gravity in a free-falling elevator to turning off gravity itself; that is, for the frame of reference in the elevator, there is no way of telling whether one is in a non-gravity environment or in a downward accelerating closed chamber. From this, it is deduced that the gravity and accelerating masses just counterbalance and are equal.

From the CTG point of view, the observer in the elevator cannot tell the difference, but an observer watching the elevator fall down the chute surely can. He sees the elevator picking up speed (relative to the stationary ground) as it drops, and he quickly knows that the elevator and its contents are under the influence of a force which, to the observer, does not appear to be cancelled to zero net force. The accelerating elevator must still have a force applied, otherwise it would continue to fall at the same velocity.

By Einstein's monumental discoveries, all mass is equivalent to energy and vice-versa, related by the famous $E = Mc^2$, where E is the energy, M is the mass, and c is the velocity of light. Also, all mass is composed of tiny quantum particles. Any particle "at rest" must have an electric charge associated with it in order to have energy and, therefore, mass. The electron, for example, has a total energy of Q_e^2/C_e, where Q_e is the charge that it carries in coulombs, and C_e is its capacitance in farads to space. This equates by Einstein's formula $E = Mc^2$ to an electron mass of about 9.1×10^{-31} kilograms.

The proton and neutron particles are each composed of many finer particles, with a number of them carrying plus or minus charges. The proton has an extra plus charge equivalent to a positron, and the neutron has a balance of plus and minus charges. Since the charged particles in a proton or neutron body are only somewhat confined with vacuum space between them, some of the total radiated charge field in the form of bi-pole radiation "gets out" to cause force actions; but some is retained within the body as inter-capacitance energy.

The resultant total proton mass equivalent showing externally is then established as 1836.15 times the electron mass, and the resultant neutron mass equivalent showing externally is 1838.68 times the electron mass. In other words, the proton looks like a conglomerate of 1838.15 electron masses of plus and minus charges, and the neutron looks like a conglomerate of 1838.68 electron masses of balanced plus and minus charges.

Vacuum space for steady-state fields emanating from Q charges has conductivity (assumed zero), permittivity (about 8.85×10^{-12} farads/meter) and permeability (about $4\pi \times 10^{-7}$ henrys/meter). When pulling an object through space, one is pulling all of its particle masses and charges through this space. Before one begins to pull, assume that a charge within the object is either at rest or moving at constant velocity. At rest, there is no net force on the charge due to its surrounding space. At constant velocity, any charge moving through space is an electric current that has no counter-forces due to the inductance of space, and continues to move unhindered just like a steady DC current through a loss-less laboratory inductor. A magnetic field surrounding the charge path is built-up while attaining the charge flow, but remains constant with constant current. However, if one tries to accelerate (or decelerate) the movement of charge (increase or decrease the magnetic field by changing the rate of current flow) there is an immediate counter force to the current change, and a counter potential gradient (EMF) acts to counteract the new change of current, either in the inductance of space or in an inductance in the laboratory.

Even when quantum charged particles are equally plus and minus polarity within a larger body, they are widely enough separated from each other that each acts independently and identically to determine acceleration or deceleration.

Notice that acceleration mass and gravity mass staying in the same ratio is equivalent to what the observer sees watching the elevator fall — each quantum charged particle, falling in parallel so-to-speak, is resisted exactly the same by a force opposing gravity. The total force for gravity depends upon the summation of each mass particle (proportional to Q^2), and the restricting force limiting acceleration depends upon the summation of each charge (proportional to particle Q). The force of each type on each charged particle multiplied by the number of particles gives both the gravity and limiting acceleration total forces. Although both gravity and acceleration forces vary linearly with mass, they do not net to zero, as believed by the inhabitant inside the falling elevator. Instead, difference "left-over" forces are perceived by watching the elevator accelerate downward from a fixed position. These forces pull both the elevator and its objects inside toward the earth at the same "left-over" acceleration per particle. Without friction or a limit to the falling distance available, the elevator's velocity (and the velocity of all its individual particles) would finally approach the limiting speed of light in a period of time determined by the permittivity-permeability time-constants over the path of the elevator in space.

This, in essence, is the substance of an equivalence theory, within the framework of the CTG approach.

Gravity Bends Light. Signals Propegate Slower in the Vicinity of Large Bodies. Clocks Run Slower in a Strong Gravitational Field.

Large bodies bend the impedance paths for light and gravity by changing the effective ϵ, σ or μ in the vicinity of themselves with high relative-to-free-space volume permittivity, conductivity or permeability. Light velocity is reduced when the *effective* ϵ and/or μ is higher than the free-space background medium ϵ_0 or μ_0. At light high frequencies (also at 0 frequency gravity), the ϵ increase (curving daraf space) has a lowering effect on field impedance, and this occurs, if only ever-so slightly, near any substance with an artificial or real permittivity greater than the permittivity of the free-space background. If light is assumed at the same constant speed near the earth as out in space, then time measurements indicate a time slow-down that agrees with the actual slower light velocity.

A Spinning Body Causes a Change in Gravity

Any object with artificial permittivity, when spun fast enough in a background medium, will lower the impedance path through its body (and very slightly through any volume close to its body) with respect to the normal impedance surrounding it. This is equivalent to raising the energizing frequency by the rotation, which will then permit energy to travel more easily through a lower reactive impedance. As demonstrated in Section II, lower relative impedance causes attraction to balanced charged bi-poles.

Gravity and Black Holes

There is a widespread belief that a large accumulation of astral mass forced into a compact volume generates so much gravity that it sucks back in all existing signals (including light), thus leaving a "black hole". Some believe also that intense gravity will squeeze a star eight times the mass of the sun into a diameter of about 20 kilometers.

In the bi-pole theory of gravity, how a "black hole" looks relative to its background is what mainly counts. An absolute short circuit (infinite permittivity or infinite conductivity) is as far as one can go — there are not likely to be negative field impedances. Therefore, a "black hole" can generate only so much gravity per volume as an absolute short circuit would imply.

Furthermore, by CTG, the crushing together of constant-energy particles inside a body would store more capacitive energy between the closely spaced bi-poles and reduce the energy available to outside space. Thus the centermost particles would produce less gravity, and prevent a large celestial body from contracting down to the extreme nuclear density postulated for a black hole. With too much compression, one might speculate that all the pluses and minuses would get together and form "nothing".

Much of the black hole concept is in direct opposition to CTG. If black holes are *proved* right, some aspects of CTG will have to be reconsidered.

Gravity Propagation Through More than One Medium

When the earth's gravity attracts anything outside the earth silhouette, the gravity wave must "travel" through at least two distinct media. From the point-of-view of an originating energized bi-pole at the center of the earth, the Q-field has travelled some 6.4 million meters through the earth's "artificial" permittivity, and then travels the rest of the way outward through the "artificial" permittivity of the earth's atmosphere, or for longer trips, outward through the "real" permittivity of free-space. Both the bi-pole and object acted on stay entirely within their own respective backgrounds, but the Q-field travels over a non-linear daraf path which distorts ever-so-slightly the square-of-the-distance fall-off of force intensity. Actually the fields encounter a lower impedance path per distance through the earth than outside the earth. This is not to imply that the earth is uniform; there are continual slight distortions from the center outward. Furthermore, bi-poles nearer the circumference have different permittivity field paths to objects outside the earth than do the ones near the center. Even the paths from relatively less separated bi-poles, wherever they are situated, vary. But if one neglects the nonhomogeneous effects, and averages the earth as having a uniform artificial dielectric constant K_{aE} of 1.00192 (as found in Appendix C), and approximates the earth's atmosphere permittivity as almost the same as free space, one can predict approximately what happens to the gravity force on a single particle (and to the sum of all the forces on all of an object's particles) as an object moves outward — first within the earth, then just outside of the earth, and finally out into space. To accomplish this, use Figure 3.9 in this text and a plagiarized part of Reference [4] which follows:

For an electron, from Einstein's well-established mass-energy equation of $E = Mc^2 = Q^2/C = Q^2/4\pi\epsilon R$ the:

$$\text{Electron Effective Radius, } R_e = Q_e^2/4\pi\epsilon M_e c^2 \tag{5.1}$$

To find the gravity force F_{g12} between the electron at Position 1 and the single far-spaced electron at Position 2, use the general formula:

$$F_{g12} = 1/2\ Q_e \Delta V_1/S_{12} = 1/2\ Q_e \Delta V_1 C_{12}, \tag{5.2}$$

where:

$$\Delta V_1 = Q_p C_{123}/C_1 C_3 = Q_p/(P+1)4\pi\epsilon r \tag{5.3}$$

and is the change in potential at Position 1 due to the field from the Proton at Position 3 as transmitted through the particle at Position 2 along the capacitive path C_{123}.

$$C_{12} = 4\pi\epsilon R_1 R_2/r = 4\pi\epsilon R_e R_e/r \tag{5.4}$$

and is the direct capacitance between particles at Positions 1 and 2. Then, combining (5.2) through (5.4),

$$\begin{aligned} F_{g12} &= (1/2\ Q_e)(Q_p/(P+1)4\pi\epsilon r)(4\pi\epsilon R_e R_e/r) \qquad (5.5) \\ &= Q_e Q_p R_e R_e/2(P+1)r^2 \end{aligned}$$

In free space: $\epsilon_0 = 8.85419 \times 10^{-12}$ farads/meter,
In the earth: $\epsilon_E = 1.00192\ \epsilon_0 = 8.87119 \times 10^{-12}$ farads/meter [Appendix C]

Then, from equation (5.1), the *effective* radii of the electron in free space and in earth-space are:

$$R_e \text{ (free space)} = 2.81795 \times 10^{-15} \text{ meters}$$

$$R_e' \text{ (earth space)} = 2.81255 \times 10^{-15} \text{ meters}$$

Consider the determination of a gravity force for the condition under which Newton's empirical classical formula was derived; that is, a particle totally within the earth pulling on a particle at the earth's surface just outside the earth. Suppose both particles are electrons, and the particles are separated by a distance of 100 meters.

Gravity force as calculated by the CTG formula:

$$\begin{aligned} F_{g12} &= Q_e Q_p R_e' R_e/2(P+1)r^2 \\ &= \frac{-(1.60219 \times 10^{-19})^2\ (2.81255 \times 10^{-15})(2.81795 \times 10^{-15})}{2(1837.15) \times (100)^2} \\ &= -5.53716 \times 10^{-75}\ |\text{newtons}| \qquad (5.6) \end{aligned}$$

Gravity force as calculated by the Newton formula:

$$\begin{aligned} F_{g12} &= -G\ M_e M_e/r^2 \\ &= -(6.6726 \times 10^{-11})\ (9.10953 \times 10^{-31})^2/(100)^2 \\ &= -5.53716 \times 10^{-75} \text{ newtons,} \qquad (5.7) \end{aligned}$$

Note that (5.6) and (5.7) are in exact magnitude agreement!

If a proton is placed at Position 2, for either Newton or CTG, the gravity force between the electron and the proton would calculate out to be exactly 1836.15 times as great as that between electrons, since mass and effective radius increase one for one in their respective formulas. Also, if the force is calculated between an electron at Position 2 and the proton at Position 3, an identical 1836.15 multiple of greater force results than between two electrons.

Using the Newton gravity configuration (particle inside earth to particle just outside earth) as a standard reference, one can now use CTG to determine what happens to gravity when all the interactive particles are otherwise disposed. For example, suppose that all of the particles are inside the earth silhouette. Then, within the earth:

$$f_{g12} = Q_e Q_p R_e' R_e' / 2(P+1)r^2 \tag{5.8}$$

For two electrons spaced 100 meters apart, the gravity force is

$$F_{g12} = 5.52655 \times 10^{-75} \ |\text{newtons}|,$$

or about 0.2% less than in the Newton configuration.

What about the gravity force when all the particles are in free space? The electron-to-electron gravity at 100 meters is then:

$$\begin{aligned} F_{g12} &= Q_e Q_p R_e R_e / 2(P+1)r^2 \qquad (5.9) \\ &= 5.54779 \times 10^{-75} \ |\text{newtons}|, \end{aligned}$$

or about 0.2% greater than in the Newton configuration.

What happens when the electron-proton pair supplying the energy for gravity remains in the earth but the particle being acted on moves outward radially from the earth's surface? In this case one must consider carefully the effect of the path over which the force acts. There are two *effective* permittivies involved - that of earth space and that of free space. If the average permittivity is reduced between the two particles, the intercapacitance C_{12} and the induced voltage ΔV_1 are both reduced. This can be understood from Figure 5.2, which shows why changes in capacitance occur in formulas (5.3) and (5.4). C_1, C_2 and C_3 remain fixed as particle capacitances to space within their respective permittivies; but C_{12} and

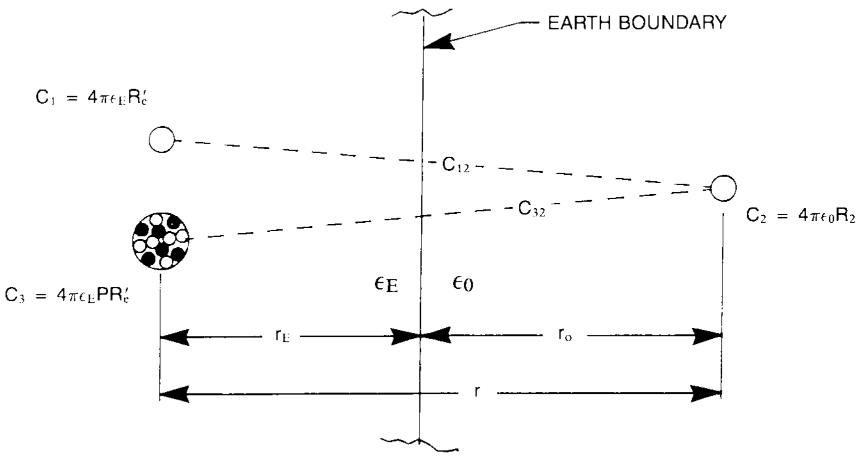


FIGURE 5.2. GRAVITY WORKING THROUGH TWO MEDIA, EARTH AND FREE SPACE

C_{123} use the series capacitance paths which must encompass two permittivities, and they change with the average permittivity as determined by the length of the path in each permittivity.

The new and more complete formula for gravity between two electrons in two different media then becomes:

$$F_{g12} = Q_e Q_p R_e' R_e (\epsilon_A/\epsilon_E)^2 / 2(P+1)r^2, \qquad (5.10)$$

where

$$\epsilon_A = r/(r_E/\epsilon_E + r_0/\epsilon_0), \qquad (5.11)$$

r_E = length of path in the earth;

r_0 = length of path in free space.

For a single electron to electron interaction, the solution is not too difficult. However, when one considers integrating the effect of a large number of proton-electron pairs, and other plus-minus pairs in neutrons and so on, acting within the earth over many different distances with different ϵ_A values on one or more particles outside the earth, the precise total force solution becomes difficult indeed.

Consider what has been determined about gravity forces so far:

1) The gravity force acting totally within the earth (just how far in from the surface is "within" has not been determined) is about 1920 parts per million less than the predicted Newton standard force.

2) The force of gravity between a proton-electron pair within the earth and a particle very far away from the earth (where $\epsilon_A \simeq \epsilon_0$) is about 3844 parts per million less than the predicted Newton standard force.

3) The gravity between single small particles when both are in free space is 1920 parts per million greater than the predicted Newton standard force.

The generalized plot in Figure 5.3 depicts the determinations 1) through 3), with an approximate shape of the deviation curve of gravity with respect to the Newton standard for gravity versus the distance r from the center of the earth.

Finally, with a very enlarged scale for distance over that in Figure 5.3, (at Point B on the earth's surface), one can imagine what happens when gravity is checked by a sensitive precise gravitometer as an object is "weighed" going radially into the earth or radially away from the earth. Remember, in these instances, an enormous number of paths of interactions between earth plus-minus pairs and each of the many particles in the object being weighed occur. See Figure 5.4.

Gravity forces totally within a uniform earth are reduced without exception between all particles by approximately 0.192%, assuming the object being weighed is far enough within the earth so that all the body's particles are effectively in ϵ_E surroundings. Of course the earth's material is not all uniform, and the plot in Figure 5.4 is idealized.

As the object being weighed close to the earth moves away from the earth's surface, however, most of the total gravity force is caused by the nearest plus-minus pairs within the earth. Consequently, $(\epsilon_A/\epsilon_E)^2$ begins to drop off at the beginning much more rapidly than the asymptotic curve which approaches a -0.384% reduction. As more and more of the earth's plus-minus pairs come into play at greater and greater ranges, the shape of the negative gravity deviation flattens off in its final approach to its asymptotic -0.384% value.

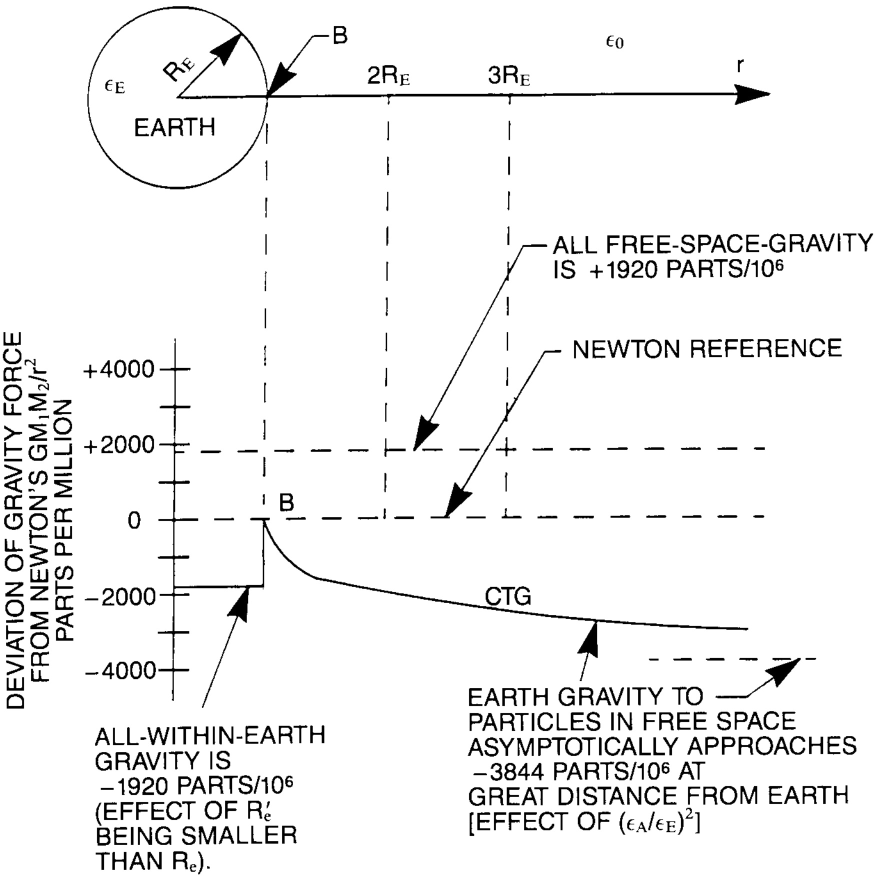


FIGURE 5.3. DEVIATION OF ESTIMATED CTG GRAVITY VS. DISTANCE FROM THE CENTER OF THE EARTH (ROUNDED FOR APPROXIMATION SIMPLICITY)

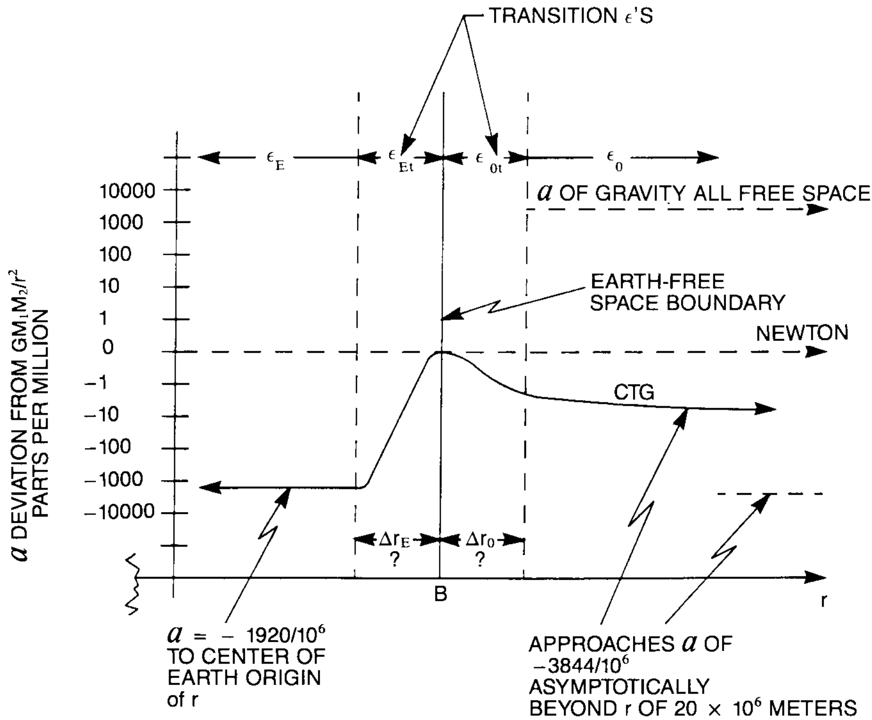


FIGURE 5.4. EXPANSION OF DISTANCE SCALE AROUND POINT B TO SHOW APPROXIMATE GRAVITY CHANGE AT EARTH'S SURFACE

Without having performed the complicated force integrations involving $(\epsilon_A/\epsilon_E)^2$ and $1/r^2$ for every path interaction, only a rough "guesstimate" of gravity variation is shown in Figure 5.4. Intuitively, one might guess values for Δr_E and Δr_0 as less than 100 meters.

Also, there is a very small effect upon the gravity forces due to the internal ϵ of the object being weighed and to other even smaller changes very near to the object being weighed. Since these are all lower order effects, they are not included in these rough CTG predictions.

What will affect experimental measurements quite appreciably, showing some differences from these and later improved predicted magnitudes of gravity forces, is the non-roundness of the world and the local earth density variations near any measurement site.

CHAPTER 6

CONCLUSIONS

Generally, one picks up a technical report and, after reading the title and abstract, next scans the Conclusions to determine if there is sufficient merit to wade through the rest of the contents. Given enough time and interest in the subject matter, and if the conclusions agree with the general concepts of one's own ideas, the rest of the report has some chance of being perused. But, let one presented idea strike a discordant note, and the tendency is to cast aside the whole report as if it were so much garbage. Without that spark of interest required to carry forward a new concept, any new ideas, like the pages that contain them, will uselessly wither away to dust on dingy shelves of forgotten archives, perhaps only some day to be resurrected in a new form by a luminary in a new era.

The purpose of these conclusions, then, is primarily to provide enough information to interest a prospective reader in the main text. The reasonings and experiments that brought about the specific conclusions to follow can then be understood and properly evaluated. For example, even though a prospective reader "knows" certain ideas are "crazy" because "charged particles do not cause gravity", he (or she) should read on to see *why* this "half-baked" author thinks the way he does. After all, this author has communicated and worked with a number of reputable engineers and physicists who have not been able to explain away CTG, even though some of them were employed as consultants to specifically do so.

1) The basic and most important conclusion of this presentation is that Gravity stems from rotating electrically charged bi-poles which act upon other rotating bi-poles to effect mutually attracting forces. The range of force intensities can be quantized down to a single pole (of a bi-pole) acting on another single particle (usually one pole of another bi-pole), up to and beyond clusters of galaxies acting on each other.
2) Gravity forces are due to clusters-of-particles in bodies with "artificial" permittivities greater than the space around them causing voltage gradient fields between themselves and distant separate poles of bi-poles. These fields act omnidirectionally though the elastive (inverse of capacitive) circuits in space, intercepting separate charge-poles to generate gravity forces.
3) In ordinary matter or space, all E-fields are cancelled at great distances from myriads of rotating bi-poles comprised of proton-electron pairs and positron-electron pairs in neutrons. Then, only Q-fields (or voltage gradients due to elastance path voltage-drops) are left to cause forces, which are gravity forces.
4) Qualitative demonstrations simulating gravity by resistance-voltage-drop gradients intersecting bi-poles are presented in Section II through IV, and they depict quite clearly how true gravity works.
5) Quantitative mathematical formulas derived strictly from electric circuits in space (in Sections III and IV) predict gravity forces precisely. These formulas, developed by using the daraf elastance circuit paths between separated bi-poles in space, determine free-space gravity, Newton gravity, and variations from Newton gravity under altered conditions within the earth or out-into-space. These determined forces correctly have a minus sign (denoting attraction only), a force strength that falls off as the square of the distance between objects, and a magnitude designation with precision to six numerical places. It is hard to imagine that such a series of results could be just a coincidence of nature (as suggested by one physicist critic).

6) An *effective radius* hypothesis is developed in this report which is useful, not only for the calculations of precise gravity force magnitudes as shown, but for an assumption of constant mass, energy, charge, voltage and capacitance to space for individual particles.

7) Predicted variations from Newton reference gravity are presented in Section V when two or more objects acted on by gravity are in different permittivity backgrounds, and when the paths between two or more objects encounter changes in permittivity. Predictions of changes in gravity into the earth or out into space away from the earth's surface are shown, with results in qualitative agreement, at least, with results in References [5] and [6].

8) Some idiosyncrasies of gravity, including its non-shieldable properties, the curving of space, the gravity-acceleration mass equivalance principle, and others are all predictable by CTG electrical circuit analogies, as described in Section V.

APPENDIX A

CONSTANTS, SYMBOLS AND UNITS

A glossary of constants used in this text follows:

Parameter Constant	*Symbol*	*Value*	*Reference*
Elementary Electron Charge	Q_e	-1.60219×10^{-19} coulombs	1
Balanced Proton Charge	Q_p	1.60219×10^{-19} coulombs	1
Mass of Electron	M_e	9.10953×10^{-31} kilograms	1
Proton/Electron Mass Ratio	P	1836.15	1
Neutron/Electron Mass Ratio	N	1838.68	1
Permittivity of Vacuum Space	ϵ_0	8.85419×10^{-12} farads/meter	1
Permittivity of Earth Space	ϵ_E	8.87119×10^{-12} farads/meter	Appx. C
Speed of Light in Vacuum	c	2.99792×10^{8} meters/sec	1
Gravitational Constant	G	6.6726×10^{-11} $m^3/(s^2 \times kg)$	1
Mass of Earth	M_E	5.98×10^{24} kilograms	1
Radius of Sphere (same volume as Earth)	R_E	6.37122×10^{6} meters	8

Other symbols and units are:

C = capacitance, farads

S = elastance (1/C), darafs

M = mass, kilograms

E = Mc^2 energy, joules

Q = charge, coulombs

Q_f = charge field, volts/daraf

I = current, amperes

I_f = current field, volts/ohm

V = potential, volts

E_f = electric field, volts/meter

F_c = charge force, coulomb-volts/meter

F_g = gravity force, coulomb-volts/daraf

R = effective radius of a particle, meters (with appropriate subscript e, p, or n for electron, proton or neutron, for example).

K = a dimensionless constant (or ratio), usually a dielectric constant

Δ = change increment of symbol that follows

ϵ = permittivity, farads/meter

μ = permeability, henrys/meter

σ = conductivity, mhos/meter

Υ = volume, $(\text{meters})^3$

E = dipole electric field vector, volts/meter (Figure 3.2)

R = resistance, ohms

p = resistivity, ohm-meters

Z = impedance, ohms

z_V = impedivity, ohm-meters

r = distance, meters

APPENDIX B

OPEN-SPACE AND EARTH-SPACE CAPACITANCES

Two capacitances are used extensively in this report: (1) the capacitance to free, or open, space of a particle which is $4\pi\epsilon_0 R$, and (2) the "direct" capacitance C_{12} between two "far-spaced" particles which is $4\pi\epsilon_0 R_1 R_2/r$, where R, R_1 and R_2 represent the "effective" radii of particles and r is the spacing between the two centers (of charge).

The word "direct" used for capacitance between two particles means that the body capacitances *to space* (which, in series, shunt the direct capacitance) are not included in C_{12}. The word "far-spaced" used for particle separation means that r is very much greater than both R_1 and R_2 by many orders of magnitude.

The "effective" radius of a single particle as defined in this paper is that radius equivalent to a perfect sphere radius which establishes the particle's capacitance to space or to another body. For a single sub-atomic particle like the electron, the capacitance to space can be determined from Einstein's mass-energy relationship of $M_e c^2 = Q^2/C$, where M_e is the electron mass, c^2 is the velocity of light squared, and Q^2/C is the total energy of an electron in terms of charge Q and capacitance C to space. Then the effective radius R_e for the electron in free space is $C/4\pi\epsilon_0$, or $Q^2/4\pi\epsilon_0 M_e c^2$, or 2.81795×10^{-15} meters.

Actually, the particle capacitance to space is the capacitance between a particle body with effective spherical radius R_1 and another concentric sphere around the first one with a radius R_2 assumed to be infinity. In Figure B.1, the capacitance to space is derived from the fundamental relationship:

$C = \epsilon_0 A/r$, and:
C_s is the capacitance to space, farads
ϵ_0 is the permittivity of free space, 8.85419×10^{-12} farads/meter,
A is the geometric mean surface area of the two concentric spheres,

$$(4\pi R_1^2 \times 4\pi R_2^2)^{1/2}, \text{ or } 4\pi R_1 R_2, \text{ (meters)}^2.$$

r is the radial distance between the sphere surfaces, meters.

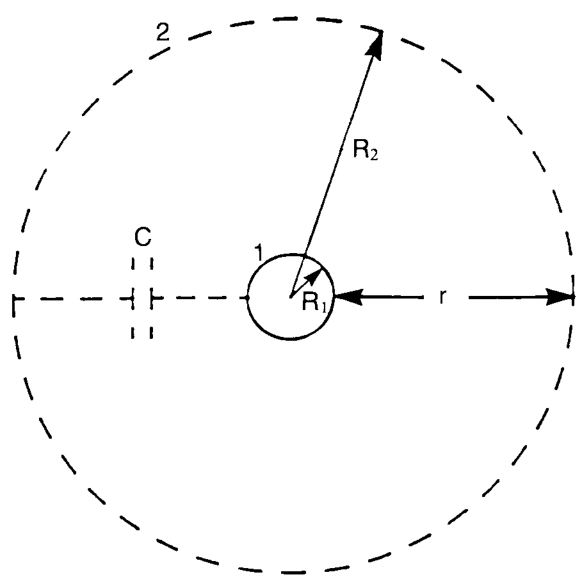


FIGURE B.1.

When R_2 is very large compared to R_1, or has the value of infinity, then r is very large, or infinity, and:

$$C_s = (\epsilon_0)(4\pi R_1 R_2)/(R_2 - R_1)$$
$$= 4\pi\epsilon_0 R_1 R_2/r$$
$$R_2/r \approx 1$$
$$C_s = 4\pi\epsilon_0 R_1$$

In Figure B.2, the direct capacitance between two far-spaced particles of effective radius R_1 and R_2 is also derived from the fundamental relationship $C = \epsilon_0 A/r$, where:

C_{12} is the direct capacitance between two particles, farads

ϵ_0 is the permittivity of free space, 8.85419×10^{-12} farads/meter

A is the geometric mean surface area of the two spheres, $4\pi R_1 R_2$, (meters)^2.

r is the distance between the effective sphere centers, meters.

Then:

$$C_{12} = (\epsilon_0)(4\pi R_1 R_2)/r$$
$$= 4\pi\epsilon_0 R_1 R_2/r$$

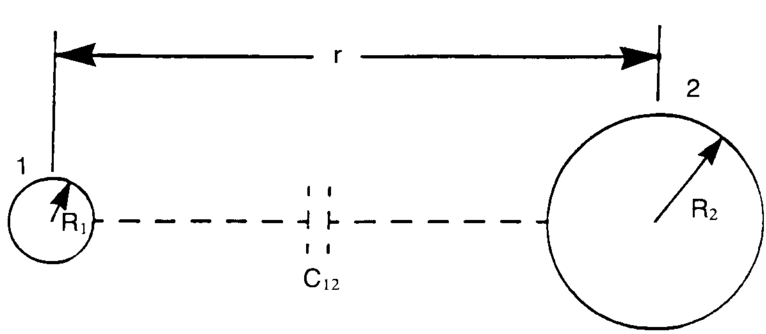


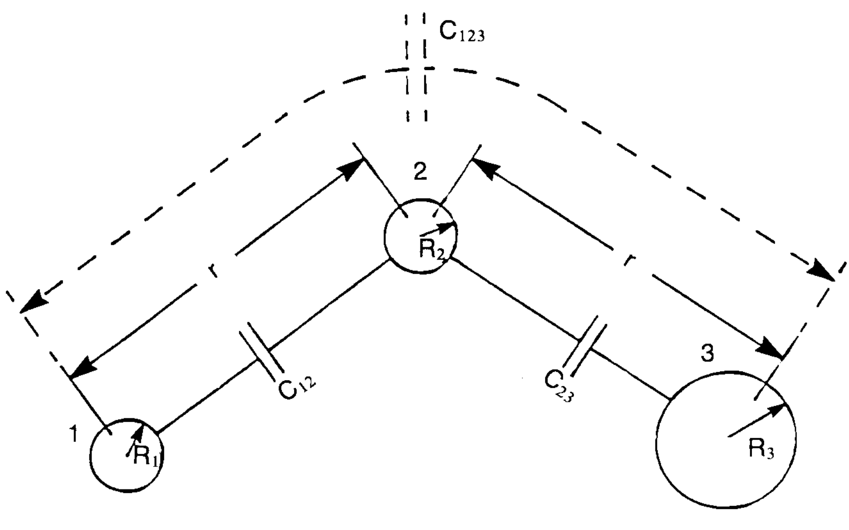
FIGURE B.2

For a three particle arrangement as shown in Figure B.3 and used for gravity computations, the capacitance from 1 to 3 via 2 is designated as the "indirect" series capacitance C_{123}, and:

$$C_{123} = C_{12}C_{23}/(C_{12} + C_{23}).$$

Let $R_3 = PR_1$, then:

$$C_{123} = [P/(P + 1)]4\pi\epsilon_0 R_1 R_2/r$$



LET $R_3 = PR_1$

FIGURE B.3

The earth for extremely minute Q_f fields looks like an open space (squashed) ball with a number of sub-microscopic, sub-atomic particles distributed throughout the volume of the ball. Each separate particle with an effective radius of its own contributes most of its capacitance to space, adding up to effect a total capacitance of the earth to real space outside the ball and to particles in other bodies.

These sub-atomic particles increase the apparent permittivity within the "earth-space" from ϵ_0 of free-space to a new ϵ_E (see Section V). The ratio of apparent ϵ_E/ϵ_0 has been designated an artificial dielectric constant K_a which is similar to a dielectric constant for charged insulators.

Then capacitances (per radius) of particles in "earth-space" rather than in free-space increase their values to the background and between particles, by the factor K_{aE}. The higher permittivity of the earth slightly affects the magnitude of gravity force fields and curves gravity field paths nearby.

See Appendix C for more detail about K_{aE}, and the derivation of its magnitude.

APPENDIX C

DETERMINATION OF EARTH PROPERTIES, K_{aE} and $1/K_{aE}$

In Sections IV and V, the theoretical gravity force acting close to, or within, the earth was shown to decrease with respect to open-space gravity because of increased artificial permittivity due to clusters of short-circuiting particles making up "earth-space." A gravity force between two objects is effected by the properties of the entire path over which the gravity (Q_f) field travels. For purposes of this report, a mean property of the earth will be assumed to apply to the entire field path for calculated gravity on earth.

If the entire path (or almost the entire path) of the Q-field is within the earth, as when an object to be acted on by the earth is next to the surface of the earth, then each particle-to-particle gravity force is reduced to $1/K_{aE}$ times the open-space gravity. K_{aE} is a dielectric constant defined as the mean ratio of artificial permittivity of earth-space to the permittivity of open-space.

In general, let the ratio of increased artificial permittivity of any medium to open-space permitivity be designated by K_a. Then the formula for K_a for a selected volume containing many particles is:

$K_a = \Upsilon_T/(\Upsilon_T - \Upsilon_P)$, where

Υ_T = Total Volume Selected

Υ_P = Volume of Particles in Υ_T.

Specific K_a values for particular volumes of material at various positions within a non-homogenious body such as the earth will vary with density of the surrounding medium, and for any given volume Υ':

$$K'_a = \Upsilon'/(\Upsilon' - \Upsilon'_p)$$

The "mean earth" artificial dielectric constant K_{aE} is determined by the total effective volume of the particles within the volume of the earth in the expression:

$K_{aE} = \Upsilon_E/(\Upsilon_E - \Upsilon_p)$, where

Υ_E = Total Volume of Earth

Υ_p = Total Volume of Particles in Υ_E.

The data and calculations that follow in paragraphs I, II, and III are intended to find as precisely as possible the best values for K_{aE} and $1/K_{aE}$.

I. *Earth Composition by Mass (Page 2624, Hndbk. of Chemistry and Physics, 30th Edition, 1947).*

Element	*Symbol*	%	Protons	Neutrons
Oxygen	0	46.43	8	8
Silicon	Si	27.77	14	14
Aluminum	Al	8.14	13	14
Iron	Fe	5.12	26	30
Calcium	Ca	3.63	20	20
Sodium	Na	2.85	11	12
Potassium	K	2.60	19	20
Magnesium	Mg	2.09	12	12
Titanium	Ti	0.63	22	26
All others		0.74	—	—
Total		100		

II. *Percentage of Particle Masses, Earth Composition:*

Element	*Proton-Electron Pairs*	*Neutrons*
0	23.205	23.225
Si	13.879	13.891
Al	3.918	4.222
Fe	2.376	2.744
Ca	1.814	1.816
Na	1.362	1.488
K	1.266	1.334
Mg	1.045	1.045
Ti	0.289	0.341
All Others	0.352	0.388
Totals	49.506%	50.494%

III. *Calculation of K_{aE}*

In the calculations to follow, all the basic values are taken from Reference 1 except for volumes of particles, which are *effective* volumes derived from $4\pi R^3/3$, where R is the particle's *effective* radius, as shown in the main text. For the proton-electron (p-e) pair, the sum of the proton volume plus electron volume is used.

Mass of Earth M_E	$= 5.98 \times 10^{24}$ KG
Total Proton-Electron Mass M_{Ep}	$= 2.96046 \times 10^{24}$ KG
Total Neutron Mass M_{En}	$= 3.01954 \times 10^{24}$ KG
Mass of Single p-e Pair M_{pe}	$= 1.67356 \times 10^{-27}$ KG
Mass of Single Neutron M_n	$= 1.67495 \times 10^{-27}$ KG
No. of p-e Pairs $N_{Epe} = M_{Ep}/M_{pe}$	$= 1.76896 \times 10^{51}$
No. of Neutrons $N_{En} = M_{En}/M_n$	$= 1.80276 \times 10^{51}$
Volume of Single p-e Pair Υ_{pe}	$= 5.80247 \times 10^{-34}$ (meters)^3
Volume of Single Neutron Υ_n	$= 5.82649 \times 10^{-34}$ (meters)^3

Total Vol. of p-e Pairs = $N_{Epe}\Upsilon_{pe}$	= 1.02643×10^{18} (meters)^3
Total Vol. of Neutrons = $N_{En}\Upsilon_n$	= 1.05038×10^{18} (meters)^3
Total Vol. of Space Particles Υ_P	= 2.07681×10^{18} (meters)^3
Vol. of Earth Υ_E (from below)	= 1.08332×10^{21} (meters)^3
Radius of Earth, R_E	= 6.371221×10^6 meters
$K_{aE} = \Upsilon_E/(\Upsilon_E - \Upsilon_P)$	= $1.08332 \times 10^{21}/1.08124 \times 10^{21} = 1.00192$
$1/K_{aE}$	= 0.998084

Referring to the above calculations, exact percentages of proton-electron pairs and neutrons is not critical. For example, if the earth were assumed to consist of all proton-electron pairs and no neutrons, $1/K_{aE}$ would change by only some 2 to 3 parts/million.

To find the values of artificial dielectric constants and artificial permittivities of any substance, the earth may be used as a reference. On a one-cubic-meter of volume basis:

$$K_{aE} = \Upsilon_{cm}/(\Upsilon_{cm} - \Upsilon_{pcm}), \text{ where:}$$

Υ_{cm} is 1 cubic meter, and Υ_{pcm} is the total effective volume of building-block particles within a representative cubic meter of the earth.

Thus, for the earth:

$$K_{aE} = 1/(1 - 1.91708 \text{ x } 10^{-3}) = 1.00192$$

A material X with x times the earth's specific gravity, or x times the earth's density, will have x times the number and volume of "short-circuiting" particles per cubic meter in the expression:

$$K_{aX} = 1/[1 - x(1.91708 \times 10^{-3})]$$

Then K_{aX} is the artificial dielectric constant of a substance X, and $K_{aX}\epsilon_0$ is the artificial permittivity of the same substance.

Table C.1 lists a number of common substances with representative specific gravities (to water) and densities related to equivalent artificial dielectric constants and artificial permittivities, determined by using the specific gravity or density ratios of the substances to earth.

TABLE C.1
SPECIFIC GRAVITIES AND DENSITIES RELATED TO ARTIFICIAL DIELECTRIC CONSTANTS AND ARTIFICIAL PERMITTIVITIES OF COMMON SUBSTANCES

Substance	*Specific Gravity*	*Density* Kg/m^3	K_a	$K_a\epsilon_0$, *farads/m*
Hydrogen (0°C, 760 mm)	8.98×10^{-5}	0.0898	1.0000000312	8.85419×10^{-12}
Air (0°C, 760 mm)	0.00129	1.29	1.000000448	8.85419×10^{-12}
Wood (Red Pine)	0.507	507	1.000176	8.85575×10^{-12}
Water (3.98°C)	1.000	1000	1.000347	8.85726×10^{-12}
Aluminum	2.70	2700	1.000939	8.86250×10^{-12}
Earth (Mean)	5.52	5520	1.00192	8.87119×10^{-12}
Iron (pure ore)	7.86	7860	1.00273	8.87836×10^{-12}
Lead	11.3	11343	1.00394	8.88908×10^{-12}
Uranium 238	18.7	18700	1.00654	8.91210×10^{-12}

APPENDIX D

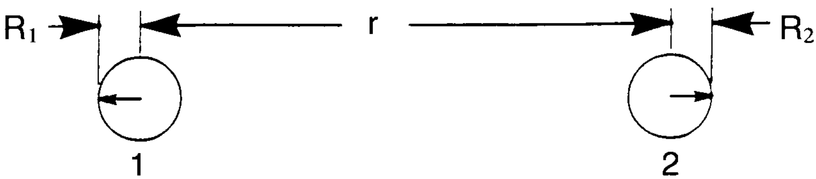
GRAVITY FORCES AND UNITS CLARIFICATION

To understand CTG, it is most important to grasp the concept of a Q-field which is a voltage gradient vector field much like the E-field.

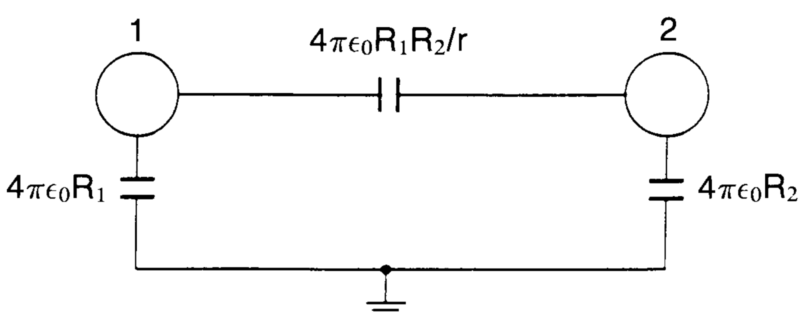
First, suppose there is a capacitor composed of two flat parallel metal plane plates facing each other, each with an area of about 1.13 square meters and separated by exactly one meter. *Neglecting fringe capacitances* (to space and to the edges and the backs of the plates), the capacitance in a vacuum (or air) will be about 10^{-11} farads between the plates. This corresponds to an elastance S of 10^{11} darafs (inverse of farads) and the darafs would increase or decrease linearly with plate spacing. One could now place a ruler measuring rod one meter long between the plates and mark it off in 100 centimeters or 100 giga-darafs. The two measurement parameters are interchangeable for all purposes within the "universe" between the plates of that particular capacitor. No units modifier is required, simply a dimensionless constant multiplier which is "one" (1) for centimeters and giga-darafs, or 1 daraf is equivalent to 10^{-11} meters. The E-field (E_f) in the capacitor space is designated by volts/meter; the Q-field (Q_f) in the same space is designated by volts/daraf (which is also in units of coulombs).

Since there is a capacitive force 1/2 QV/r (newtons), there is also a capacitive force 1/2 QV/S | newtons | , where Q is in coulombs; V, in volts; r, in meters; and S, in darafs. The latter force is only 10^{-11} times 1/2 QV/r, but still in units of newtons for magnitude designation. This is why the gravity force which is always some form of Q times the voltage gradient V/S seems to have a direct magnitude relation to the charge force, Q times the voltage gradient V/r, and can be expressed in newtons.

Next, instead of the capacitor plates, imagine two tiny metal balls in space, each with a radius R_1 or R_2 separated by a distance r.



If r is *very great* with respect to R_1 and R_2, most of the capacitance between the spheres will be composed of the two series capacitances to space, but the entire capacitance diagram will appear as:



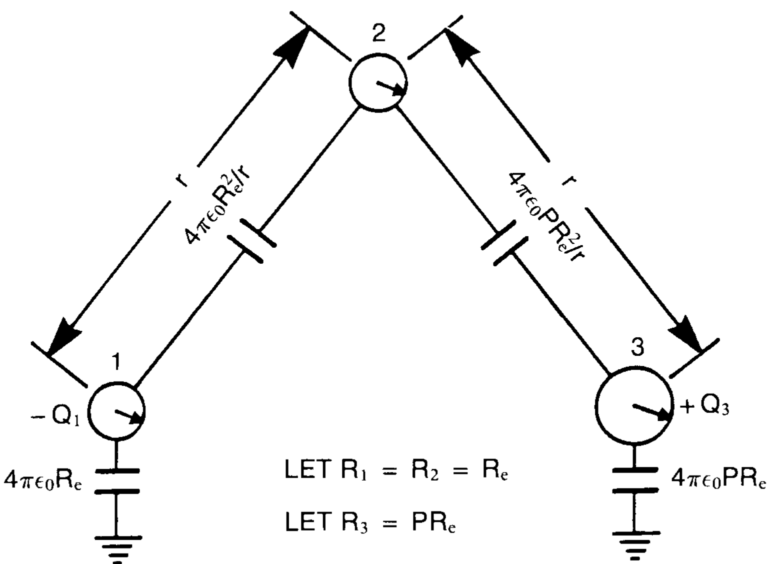
If a charge Q is placed on (1), the voltage at (2) is $Q/4\pi\epsilon_0 r$; or conversely, if a charge Q is placed on (2), the voltage at (1) is $Q/4\pi\epsilon_0 r$, which is obtainable by simple circuit analysis.

The E-field at (1) or (2) in volts/meter is simply $Q/4\pi\epsilon_0 r^2$. The Q-field at (1) or (2) in volts/daraf is $Q/4\pi\epsilon_0 rS$. But, $S = r/4\pi\epsilon_0 R_1 R_2$.

Therefore, the Q-field is $(4\pi\epsilon_0 R_1R_2)(Q/4\pi\epsilon_0 r^2)$. The gravity-type force QV/S then becomes $(4\pi\epsilon_0 R_1R_2)Q_1Q_2/4\pi\epsilon_0 r^2$, or $Q_1Q_2R_1R_2/r^2$ (which is the multiplier $4\pi\epsilon_0 R_1R_2$ times the charge force).

If the diminutive *classical electron radius* is used for R_1 and R_2, the gravity type force between electrons could never be observed in the presence of the relatively huge repelling charge force.

The gravity that we do observe is never in the two-particle situation as just illustrated, but rather in a three-particle configuration as follows:



Assume the three-particle illustration above is for hydrogen, (1) and (3), acting on a unit particle (electron size) of radius R_e at (2). The bi-pole arrangement of Q_1Q_3 is in random rotation (along with myriads of other rotating bi-poles) so that the electric field E_f is virtually zero at Particle 2. By circuit analysis, the voltage at (3) due to Q_1 via (2) is $Q_1/(P + 1)4\pi\epsilon_0 r$. The voltage at (1) due to Q_3 via (2), is $Q_3/(P + 1)4\pi\epsilon_0 r$. The 1/2 QV/S capacitance force between the spheres (1) and (2) is then $1/2\ Q_1Q_3/(P + 1)4\pi\epsilon_0 r(S_{12})$,and the Q_1Q_3 product will produce a minus sign denoting attraction.

The same type force between capacitor spheres (3) and (2) is 1/2 $Q_3Q_1P/(P + 1)4\pi\epsilon_0 r(S_{32})$. When r is very large with respect to the radii of the particles, the V/r fields are cancelled and only the V/S fields still exist. Then, simplifying the force equations, the general gravity force expression for the magnitude of the attractive force between any two subatomic particles holding charges becomes

$$|F_g| = Q^2R_1R_2/2(P + 1)r^2 \text{ newtons.}$$

To obtain the exact gravity force (in free-space) between an electron and a proton, as an example, just fill in the *classical electron radius* R_e for R_1, and $1836.15R_e$ for R_2. A slight 0.99804 modifier is required when "space" is altered within the earth by a slightly higher (artificial) permittivity than in free space. The neutron effective radius is 1838.68 R_e and is assumed to hold balanced charges to include it as a particle in gravity force calculations.

Since the formula is able to include all three "building-block" particles of nature, any force can be calculated between any number of building-block configurations by summing the individual inter-particle force reactions. This is the basic concept of CTG.

REFERENCES

[1] Resnick, Robert and Halliday, David; *Physics*. John Wiley and Sons, New York, Revised 1978.

[2] Spears, Morton F., *Gravity Simplified, Revision D.* Spears Associates, Inc., Norwood, MA. March 1989.

[3] Adair, Robert K., *The Great Design, Particle Fields and Creation.* Oxford University Press, New York, 1989.

[4] Spears, Morton F., *Prediction of the Earth's Gravity and Gradient with the Circuit Theory of Gravity.* Spears Associates, Inc., August 1989.

[5] Eckhardt, Jekeli, Lazarewicz, Romaides, and Sands; *Tower Gravity Experiment: Evidence for Non-Newtonian Gravity.* Physics Review Letters, Volume 6D, No. 25, 20 June 1988.

[6] Waters, Tom, *Gravity Under Siege.* Discover Magazine, April 1989.

[7] Feynman, Leighton, and Sands; *The Feynman Lectures on Physics.* Addison-Wesley Publishing Company, Reading, MA., Third Printing, July 1966.

[8] *Handbook of Chemistry and Physics, 30th Edition.* Chemical Rubber Publishing Company, 1947.

[9] Misner, Charles W., Thorne, Kip S., Wheeler, John Archibald; *Gravitation.* W. H. Freeman Company, New York, 1973.