This Month's Stiff: Charles Augustin De Coulomb

Entered Mortal Coil: 14 June 1736

Assumed Room Temperature: 23 August 1806

Coulomb

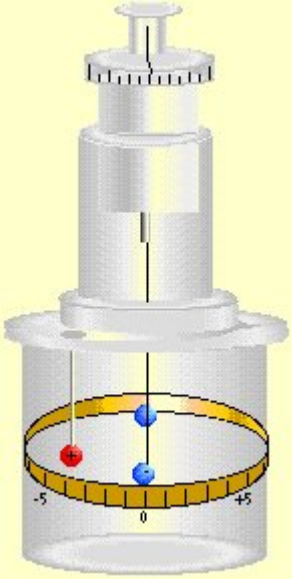
I remember my high school electronics vocational arts classes quite well. The instructor described capacitance. One of the people he mentioned during his lecture was Mr. Coulomb. Funny names stick out in my memory, as I am sure they do for other people. Unlike many other electrical pioneers, Charles achieved a respectable measure of renown in other fields quite unrelated to electricity. His work in that particular field seems almost like an afterthought in the latter years of his life.

Young Charles grew up in Angouleme in France. His parents were well established; his mother's family had quite a respectful fortune amassed. Upon reaching young adulthood, Charles was enrolled in College Mazarin, where he received a good, solid, classical education. Coulomb later undertook more advanced studies at Montpellier and subsequently joined the Society of Sciences there at the age of 20. Yet further education was undertaken in Paris around 1758. In 1761 he was commissioned as a lieutenant in the engineering corps.

Coulomb's professional life would revolve around the field of engineering for the remainder of his life, and he became a much sought after consultant in later years. Charles single-handedly wrote the book on the mechanics of friction, and he was also responsible for the construction of military fortifications and other related projects. A seminal work was undertaken in 1773, “*Sur une*

application des règles, de maximis et minimis à quelque problèmes de statique, relatifs à l'architecture" (roughly translated - ... to determine, as far as a combination of mathematics and physics will permit, the influence of friction and cohesion in some problems of statics), in which he used the calculus of variations in solving engineering problems. The man was simply brilliant.

Taken singly, any one of the aforementioned achievements would have put Charles in the history books. However, between 1785 and 1791, Coulomb submitted several treatises to the French Academy of Sciences which dealt with the behavior of electrical charges and magnetism. In particular, he quantified the laws that dealt with attraction and repulsion of like and dislike electrical charges by using a clever device called a torsion balance.



Coulomb's Torsion Balance

The balance worked by measuring the very minute forces by twisting a thread as the electrically charged pith balls were brought close together. The relative twist was noted on the graduated scale at the top of the cylinder. Coulomb noted that the electrostatic force was acting as a product of the relative charges divided by the distance between the balls. In other words, an inverse square relationship was noted. Coulomb's formula for electrostatic attraction or repulsion is as follows:

$$F = -k\frac{q_a q_b}{r^2}$$

Where *F* = force

K = constant (always negative in value)

qa and *qb* are the relative charges

r = distance between the charges

Notice that the formula is quite similar to that given for gravitational attraction, as derived by Newton. The constant K in Coulomb's formula is several orders of magnitude greater than that for Newton's formula. At short distances, electrostatic attraction or repulsion is much stronger than the force of gravity. Also note that gravity is always attractive in nature.

$$F = -G\frac{M_a M_b}{r^2}$$

Where *F* = force

G = gravitational constant

Ma and *Mb* are the relative masses

r = distance between the masses

For Coulomb's work, the unit of electrical charge, ***the Coulomb*** (what else would it be?) was named after him. A Coulomb is approximately 6.24 x 10^{18} electrons. One ampere of electrical current is defined as one coulomb of electrons passing a given point in one second. Simple, isn't it?

Here endeth the lesson. You are dismissed.

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