

Fundamentals of a Theory of Aether – Part 4: The Mechanical Origin of the Electrostatic Force

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Abstract

This work is a further development of the theory that explains electrostatic attractions and repulsions by the molecular vibration of objects acting on one another through the liquid aether that fills the vacuum and the interatomic spaces of substances. The physical origin of the electric field is that of a to-and-fro motion of the aether. The 2000-year-old problem of a mechanical explanation of the laws of electrostatics is answered by the behavior of coupled oscillators. Light and radio waves are shown to be longitudinal waves consisting of to-and-fro motions of the aether along the direction of wave propagation, which makes them essentially electric waves. The 100-year-old problems of the photoelectric effect and of the wave-particle duality are solved by uncovering the direct link between voltage and frequency of vibration, by a new interpretation of de Broglie equation, and by advancing the new theory of light propagation in channels.

Keywords: aether, electrostatics, coupled oscillators, electric field, radio, wireless, electric wave, light, propagation in channels, matter waves, de Broglie, photoelectric effect, thermionic emission

I. Introduction

This work claims to solve the 2000-year-old problem of giving a mechanical explanation of the electrostatic force. It is part of a broader project aimed at finding mechanical explanations for all the interactions at-a-distance – gravitational, electrostatic, magnetic –, as well as for the propagation of light through the aether as a longitudinal wave. Explaining electrostatics mechanically has been known historically the most challenging of all the interactions at-a-distance, recognized as such by the scientists of the 19th century who were fully immersed in the experimentation and mathematical representation of the phenomena of electrostatics and magnetism, one of whom was William Thomson, Lord Kelvin.

Although he is remembered today as the inventor of the scale of the absolute temperature, William Thomson's main line of work was in the field of electromagnetism. He contributed to the successful transmission of electrical signals through the first transatlantic cable that linked Europe and America. William Thomson was contemporary with the likes of Stokes, Joule, Maxwell and Heaviside, whose works he followed and understood, as he did the works of Faraday and Green, who preceded him. He invented important instruments for the measurement of electrical quantities and was involved in the setting up of the electrical units of measure used today in electricity and magnetism [i1]. His positioning in the midst of the scientific activities, both experimental and theoretical, that took place in the second half of the 19th century and contributed to the development of electricity and magnetism makes his opinions and thoughts extremely important.

Relevant to the present work is William Thomson's recognition, in his 1889 address "Ether, Electricity, and Ponderable Matter", of the *necessity of a mechanical theory of electric and magnetic interactions* [i2] :

1. THE demand for something like a mechanical explanation of electrical phenomena is not new, but it is growing in intensity every year.

A remarkable thought of William Thomson is his hopelessness that he will ever be able to find a mechanical explanation of the electrostatic phenomena [3] :

Now, with reference to the electrostatic effect, the hopeless—I must not say "hopeless:" that is too large a word; we are never without hope in science—I was going to use another word, "despair"—well, I feel it desperately difficult; I feel the probability of my seeing the solution of it *is* hopeless.

[i1] British Association for the Advancement of Science, Reports of the Committee on electrical Standards, A record of the history of "absolute units" and of Lord Kelvin's work in connexion with these, Cambridge at the University Press, 1913

[i2] William THOMSON, Mathematical and Physical Papers, Vol iii, Cambridge University Press Warehouse, London, 1890, p484

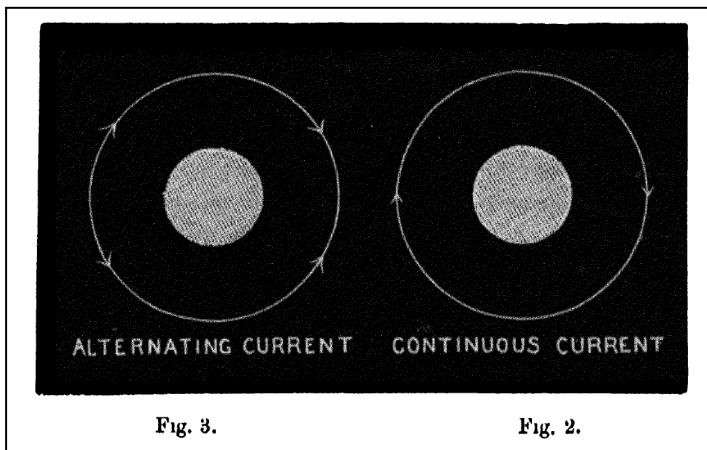
[i3] William THOMSON, Mathematical and Physical Papers, Vol iii, Cambridge University Press Warehouse, London, 1890, p498

... and again [i4] :

I have absolutely—not ignored, because I have spoken of it two or three times—but I have left out in the cold, the electrostatic part, the thing we knew first. Our first love was electrostatics. That is absolutely left out in the cold; we do not touch it. We do not get near to explaining the mutual force between two electrified bodies, in any of these illustrations or attempted explanations;

The “illustrations or attempted explanations” William Thomson was referring to in the above quote were mostly related to the magnetic effect of the electric current, for which a mechanical explanation has been presented in this series of works titled “Fundamentals of a Theory of Aether” [i5] and [i6]. Although the knowledge of fluid mechanics was relatively well-developed in William Thomson’s time, the fact that the nature of the electric current was not well understood prevented everyone from observing that an electric current in the nature of surface waves along a conductor would generate the required circulation of the aether surrounding the conductor, which aether circulation many thought constituted the magnetic field that the current produced. Perhaps the closest to this theory came the description of the propagation of electricity in a wire as similar to the propagation of sound through an elastic body or by the propagation of motion through a series of ivory balls [i7].

In connection with the magnetic effect of the electric current, it is interesting to mention here William Thomson’s strong belief that, in the interior of a current-carrying solenoid, the aether rotates continuously (or through a definite angle – he could not tell which of these two actually occurred),



the amount of rotation depending on the strength of the current [i8]. I must note before we look at this quote that I consider quite unreasonable William Thomson’s assumptions that the aether had rotational rigidity and that the electric fluid drags the aether :

“Imagine this (Fig. 2 or Fig. 3) to be the section of an ordinary helix or solenoid with a solid copper core. Imagine a continuous electric current (Fig. 2) or an alternating electric current (Fig. 3) of

[i4] William THOMSON, *Mathematical and Physical Papers*, Vol iii, Cambridge University Press Warehouse, London, 1890, p510

[i5] Ionel DINU, Lori GARDI, *Fundamentals of a Theory of Aether - Part 1*, ResearchGate, August, 2020

[i6] Ionel DINU, *Fundamentals of a Theory of Aether - Part 3*, ResearchGate, December, 2021

[i7] Aug. DE LA RIVE, *A Treatise on Electricity in Theory and Practice*, in three volumes, Vol. II, Longman Brown Green and Longmans, London, 1856, p196,199

[i8] William THOMSON, *Mathematical and Physical Papers*, Vol iii, Cambridge University Press Warehouse, London, 1890, p503,504

of electricity sent through the solenoid, shown in section by the outer circle. Whatever the current of electricity may be, I believe *this* is a reality : *it does pull the ether round* within the solenoid. I do not think this is a dream of electro-magnetic theory ; difficult as the idea is, I believe it to be a reality. Whatever ether is, we move through it - the earth moves through it.

[...]

Somehow or other, however it is, the ether is pulled round, the ether does get a turning motion in the interior of a solenoid ; somehow or other the electric current through the surrounding wire, does give a turning motion to ether in our supposed copper core and in the air between it and the wire through which the current is flowing.

[...]

And now, instead of an alternating current through the helix, take a constant current through it. What can it do ? One thing or the other it does : either a constant current through this helix drags the ether round and round inside, or it drags it round to a certain angle proportionate to the strength of the electric current, and brings it to static equilibrium so turned. It does either one or other of those things.”

I will end this rather historically-scented introduction with the prophesy William Thomson made at the end of his 1889 address on the topic of a mechanical theory of electricity and magnetism [i9], and with my comment that the present work might be the fulfillment of his prophesy :

“And here, I am afraid, I must end by saying that the difficulties are so great in the way of forming anything like a comprehensive theory, that we cannot even imagine a finger-post pointing to a way that can lead us towards the explanation. That is not putting it too strongly. I only say we cannot now imagine it. But this time next year, – this time ten years, – this time one hundred years, – probably it will be just *as* easy as we think it is to understand that glass of water, which seems now so plain and simple. I cannot doubt but that these things, which now seem to us so mysterious, will be no mysteries at all ; that the scales will fall from our eyes ; that we shall learn to look on things in a different way – when that which is now a difficulty will be the only common-sense and intelligible way of looking at the subject.

I ask you to pardon me for leading you up to so impotent a conclusion as that we really know nothing below the surface of this grand subject which constitutes the province of the Institution of Electrical Engineers.”

Is this year, the year 2024, the “this time one hundred years” William Thomson prophesied about in his 1889 address quoted above ? And is the present work, albeit coming 35 years later than prophesied, going to be the one showing how to “look on things in a different way”, “the only common-sense and intelligible way of looking at the subject” of electrostatics ?

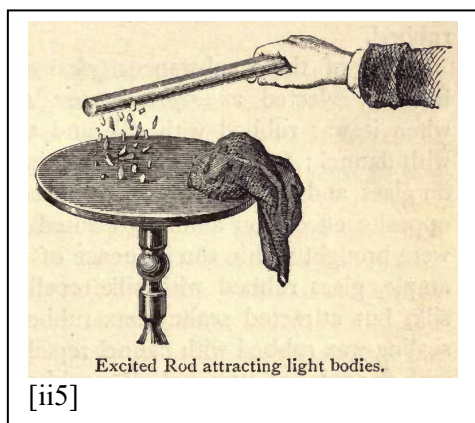
I can only hope that what follows will, in William Thomson’s words, make the “scales fall from our eyes”.

[i9] William THOMSON, Mathematical and Physical Papers, Vol iii, Cambridge University Press Warehouse, London, 1890, p510,511

II. The Effluvium and the 2000-year-old problem of explaining electrostatics mechanically

Have you ever wondered how scientists who observed and wrote about electrical phenomena since Plutarch almost 2000 years ago [ii1] have actually attempted to explain what they were seeing? They were all, without exceptions, discussing the *effluvium*, or emanation - a type of fluid the electrical object seemed to emit in all directions. For how else could the electrical object act on another object at a distance away from it?

Of course, this fluid was invisible, but the idea of effluvium was important because it was employed



[ii5]

to give a *mechanical* explanation of the attractions that were observed. Initially it was believed that the effluvium displaced the air around the charged object and that the air pressure imbalance thus created forced any nearby object towards the charged object. Later, when the same interactions were observed by Robert Boyle to take place in vacuum, it became clear that it was not the air but the aether that played a role in the observed interactions, since the aether was believed to remain in the space of Torricellian vacuum. Unsurprisingly, the author of the three laws of mechanics, *Isaac Newton*, attempted a *mechanical explanation of the electrostatic attraction* with the help of an elastic fluid emitted by the electrical object [ii1] [ii2] [ii3] [ii4].

As incredible as it may seem, more than one hundred years had to pass between the first scientific investigation of electricity by Gilbert in 1600 and that of *electrostatic repulsion* by Grey and Du Fay in 1733 [ii6]. Thus, it can be said that proper study of the electrostatic repulsion has been overlooked for about sixteen centuries, if we count since the time of Plutarch in the year 100 A.D. [ii1] when people attempted their first explanations of the electrostatic force. Benjamin Franklin, in spite of his extensive researches in electricity, was “perplexed” when he learned that electrostatic repulsion existed between two bodies resinously electrified [ii7]. Electrostatic repulsion was difficult to explain in a science whose name, electricity, entered the English language as “a power to attract straws or light bodies”.

The science of electricity has had a complicated development, and one of the reasons for this complication was Du Fay’s introduction of the idea of *existence of two kinds of electricity* [ii8] to explain *electrostatic repulsion*. It can be said that Du Fay’s introduction of the idea of existence of *two kinds of electricity* almost put an end to the whole effort of finding a mechanical explanation of

[ii1] Duane ROLLER, Duane H. D. ROLLER, *The Development of the Concept of Electric Charge*, Harvard University Press, Cambridge, 1954, p3

[ii2] John TYNDALL, *Lesson in Electricity*, D. Appleton and Company, New York, 1895, p3

[ii3] William Snow HARRIS, *Rudimentary Electricity*, 5th Ed., London, 1859, p36

[ii4] Park BENJAMIN, *The Age of Electricity, from Amber-Soul to Telephone*, Charles Scribner’s Sons, New York, 1901, p10

[ii5] Thomas P. TREGLOHAN, *Frictional Electricity*, Longmans Green and Co., London, 1886, p3

[ii6] Dionysius LARDNER, *The Cabinet Cyclopaedia, A Manual of Electricity, Magnetism, and Meteorology*, Vol. I, Longman, Brown, Green, and Longmans, John Taylor, London, 1841, p7,12-15

[ii7] Edmund Taylor WHITTAKER, *A history of the theories of aether and electricity : from the age of Descartes to the close of the nineteenth century*, Longmans Green and Co, London, 1910, p47

[ii8] Duane ROLLER, Duane H. D. ROLLER, *The Development of the Concept of Electric Charge*, Harvard University Press, Cambridge, 1954, p44–46

the electrostatic interactions because his view implied that the two kinds of electricity acted on one another at-a-distance. To make matters worse, the concept of effluvium seemed to give contradictory explanations in the case of electrostatic repulsion : for how to explain repulsion between two electrical objects if they both emit, and especially if they both *absorb*, effluvium ?

Effluvium is nevertheless an important concept to return to and reconsider, because it is a *healthy scientific concept*, being derived from a *healthy and legitimate way of scientific reasoning*, something that the experimenters of the past worked so much with in their effort to find a *mechanical explanation of electrostatic interactions*. And effluvium is relevant because it naturally led to the development of the theory advanced in this work - which theory, however, makes no use of effluvium at all. How is this possible ?

Firstly, effluvium is related to the fact that the electrostatic force is a short-range force, unlike the gravitational force which acts through the vast distances of the interplanetary space ; so, although both forces act through the aether, they are not similar because they do not act through the same mechanism. The gravitational force was identified in [ii9] as a buoyancy force in the aether, the aether pressure gradient necessary for its action being produced by the total radiation emitted by a star or a planet. The short-range feature of the electrostatic force is very well captured in the concept of effluvium because the effluvium, as something *emitted* by the charged object, cannot be expected to travel too far through the aether from the object that emitted it.

However, it is not reasonable to admit that the charged object emits effluvium continuously, because this would mean that a charged object is an infinite store of effluvium. It follows then that the effluvium emitted by a charged object must return back to the charged object that emitted it, which is what some investigators in the past actually believed it occurred. And if the effluvium is emitted, then returns back, then it is emitted again, then it returns back again and so on, we have a to-and-fro motion of effluvium that originates at the charged object. If that is the case then, *there is no need for an effluvium at all* since the same function can be assigned to the aether surrounding a charged object : taking a charged object as an object in molecular vibration immersed in aether, it can be seen that the aether will be pushed to-and-fro by the charged object, and this to-and-fro motion will act on another object placed at a distance. Thus, what we call an object with “electric charge” is in fact an object charged with energy of vibration. This naturally leads to the conclusion that what we call the “electric field” surrounding a “charged object” is in fact a to-and-fro motion of the aether produced by the vibrations of that object. We have seen in [ii10] that attractions and repulsions take place between vibrating objects immersed in a liquid, and we will see later how the laws of electrostatics can be explained by the coupling of the vibrating objects acting on one another through the aether.

[ii9] Ionel DINU, The Origin of Gravitation, The General Science Journal, January, 2007

[ii10] Ionel DINU, Fundaments of a Theory of Aether - Part 2, ResearchGate, August, 2021

III. The experimental background of the laws of electrostatics. How the electric charges were invented. A digression into the atomic structure

So what exactly are the electrostatic phenomena that any theory of electrostatics should be able to explain ?

The list of six electrostatic phenomena below [iii1] is the most comprehensive due to the inclusion of the last item, not commonly mentioned in the modern textbooks of physics :

- (i) attraction between a body positively charged and one negatively charged
- (ii) attraction between a body positively charged and one uncharged
- (iii) attraction between a body negatively charged and one uncharged
- (iv) repulsion between two positively charged bodies
- (v) repulsion between two negatively charged bodies
- (vi) attraction that may occur between two bodies that have charges of the same sign, but with the charge on one of them relatively weak.

Let us recall briefly how the artificial concepts of “electric charge” – “positive” and “negative” – have been *invented*. It is best to start with Benjamin Franklin’s theory that explained the charging of a glass rod by rubbing it with a piece of silk : he considered that, through rubbing, the glass rod gained some electric fluid from the piece of silk, which piece of silk was therefore considered to have lost some of its own electric fluid. Since glass gained the electric fluid, it contained more than the normal quantity of electric fluid it had before rubbing, and because of this *excess* of electric fluid it was called by Franklin “charged” “positive”. The silk, since it lost some of its electric fluid, had a *deficit* of electric fluid, and was called “charged” “negative”. *There were no two types of electricity* at this stage of development of the electrical science, there was only the electric fluid that was transferred from one object to another through rubbing, in a way very similar to water that can be transferred from one container to another. “Charge” meant simply “load” – a load of electric fluid in the case of glass and, by extension, a deficit of electric fluid in the case of silk.

The topic of electric fluid was discussed in a previous work of this series [iii2], where it was assigned the name **electrigen**, a place in the Periodic Table of Chemical Elements, the chemical symbol [E], and considered to have no “electric charge” of its own in the sense that “electric charge” is understood today. In fact, the quote below [iii3] clearly shows that the electric fluid *was considered an element also by Franklin himself* [iii4], so the idea of the electric fluid as a distinct chemical element should not appear so unusual to anyone today :

“This observation suggested to Franklin the same hypothesis that (unknown to him) had been propounded a few months previously by Watson : namely, that electricity is an element present in a certain proportion in all matter in its normal condition ; [...].” (underline added)

It is worth noting here Watson’s hypothesis mentioned in the above quote [iii5], according to which

[iii1] Duane ROLLER, Duane H. D. ROLLER, The Development of the Concept of Electric Charge, Harvard University Press, Cambridge, 1954, p89

[iii2] Ionel DINU, Lori GARDI, Fundamentals of a Theory of Aether - Part 1, ResearchGate, August, 2020

[iii3] Edmund Taylor WHITTAKER, A history of the theories of aether and electricity : from the age of Descartes to the close of the nineteenth century, Longmans Green and Co, London, 1910, p43

[iii4] Benjamin FRANKLIN, Experiments and observations on electricity, made at Philadelphia in America, London, 1751, p14

[iii5] Edmund Taylor WHITTAKER, A history of the theories of aether and electricity : from the age of Descartes to the close of the nineteenth century, Longmans Green and Co, London, 1910, p42-43

the *electric fluid existed* and was at *the origin of electrical effects* :

"I have shewn, that electricity is the effect of a very subtil and elastic fluid, occupying all bodies [...] ; and that every-where, in its natural state, it is of the same degree of density ; and that glass and other bodies, [...] have the power, by certain known operations, of taking this fluid from one body, and conveying it to another, in a quantity sufficient to be obvious to all our senses ; and that, under certain circumstances, it was possible to render the electricity in some bodies more rare than it naturally is, and, by communicating this to other bodies, to give them an additional quantity, and make their electricity more dense." (underline added)

Another stage in the development of the theory was due to Du Fay's *artificial invention of two types of electric charge* – “vitreous” and “resinous” – [iii6], made with the purpose of explaining the electrostatic repulsion that he was the first to study. It must be stated here that, although Du Fay claimed to “explain” the electrical phenomena he was observing by inventing *two types of electric charge*, his invention explained in fact nothing. The words “vitreous” and “resinous” were chosen by Du Fay because glass (“vitra” in Latin) and sealing-wax (which is made from “resin”, amber belonging to the same class of materials) were the main materials employed in rubbing and obtaining electrical attractions and repulsions : in very simple experiments glass repelled glass, wax repelled wax, whereas glass and wax attracted one another after being rubbed with certain materials. By extension then, all objects that repelled glass after being rubbed with other materials were considered to have glass-like or “vitreous” electricity ; the same procedure was applied to determine the wax-like or “resinous” electricity of other rubbed objects. However, this procedure was actually *inconsistent*, because glass can be made to attract glass if the two are rubbed with different materials, wax can be made to attract wax if the two are rubbed with different materials, and glass can be made to repel wax if the two are rubbed with certain different materials. Even rubbing two identical materials such as two glass plates will result in different electricities on each plate [iii7(a)], and the same is true for two pieces of resin [iii7(b)]. It can be seen that Du Fay's introduction of *two types of electricity* was questionable from the very beginning because **all that happened through rubbing was to create objects that attracted or repelled one another and this is all that a theory of electrostatics was, and still is, supposed to explain**. The *invention of two types of electricity* does not solve the problem of explaining why and how objects repel and attract. In fact, it can be seen at point (vi) in the list of electrostatic phenomena shown at the beginning of this section that there are gradations even among “electricities” of the same type, in that stronger and weaker electricities of the same type can actually attract one another, defeating the very purpose for which two types of electricity were invented.

In the third and last stage of the development of the theory of electricity, Franklin's conception of “positive” charge (or load) due to *excess* of electric fluid in glass was combined with Du Fay's conception of “vitreous” *type of electricity* for the same material, resulting in the ***invention of “positive charge” as a distinct physical entity, which is elevated to the status of a fundamental, irreducible, property of matter in today's physics***. The same happened with the invention of the “negative charge” : the combination of Franklin's “negative” charge due to *deficit* of electric fluid in wax and Du Fay's conception of “resinous” *type of electricity* for the same material resulted in the

[iii6] Duane ROLLER, Duane H. D. ROLLER, *The Development of the Concept of Electric Charge*, Harvard University Press, Cambridge, 1954, p44–46

[iii7] (a) Aug. DE LA RIVE, *A Treatise on Electricity in Theory and Practice*, in three volumes, Vol. II, Longman Brown Green and Longmans, London, 1856, p596 ; (b) Rev. Robert MURPHY, *Elementary Principles of the Theories of Electricity, Heat, and Molecular Actions*, Part I On Electricity, Cambridge, London, 1833, p29

invention of “negative charge” as a distinct physical entity in use today. The author of this strange mix of ideas was Robert Symmer, who did not base it on any experimental observations, nor could he have – he put it forward as a personal thought [iii8]. It was Augustin Coulomb who, for some reason, preferred it, promoted it, and tried to bring, unsuccessfully, experimental arguments in its favor.

The strangeness of the coexistence of two opposite types of charges in the same object, which are supposed to attract and cancel one another when the object is “neutral”, is felt by many people when they learn about it for the first time ; these mutually cancelling charges are then supposed to be separable by external forces and be transferred further on other objects through contact. We are asked to believe that they *exist inside the atom of an element*, attracting one another but not annihilating each other, creating tremendous problems for the understanding of the atom, but nevertheless forming the basis for the current model of atomic structure in which a “positive” central part – the atomic nucleus – is surrounded by a “negative” cloud – the electronic shells – inexplicably coexisting as fundamental and separate physical entities, leading to absurdities such as the planetary theory of the atom in which the electron accelerates in its circular motion around the nucleus without emitting radiation (although it is expected to), which absurdities are simply dismissed through Bohr *postulates* proclaiming that the physics happening within the atom is different from the physics happening without it, and thus creating a so-called class of “quantum phenomena” whose common property is to be weird and incomprehensible. Needless to say that I find this situation unacceptable.

It is amazing and ironic to see how some authors in the past described the relationship between the two types of electricity as being the same as “the two elements of common salt – chlorine and sodium – which, when united in certain proportion, produce a neutral salt, whose union is attended not by a destruction of either element, but by a balancing of their chemical activities” [iii9]. This looks like a circular argument, because here the union of chlorine and sodium is used to illustrate two electricities neutralizing each other in a chemically neutral substance, while today’s chemistry uses the doctrine of “positive” and “negative” electric charges to account precisely for the formation of the sodium chloride salt through ionic bonding.

The laws of electrostatics “like charges repel” and “unlike charges attract”, originally introduced by Du Fay for “vitreous” and “resinous” *types of electricity*, were not explained by Du Fay, he just found these attractions and repulsions to occur empirically, i.e. through his experimental observations. After Du Fay, people were forced to assign all electrical objects to one of these two types, “vitreous” or “resinous”, even if, as explained above, the same substance could be made to behave sometimes like a “vitreous” and sometimes like a “resinous” one. Moreover, since the mechanisms of these attractions and repulsions were not explained by Du Fay then, they remain unexplained now in the modern electrical science. No fundamental reason can be given why “positive” (or “vitreous”) charge should repel another “positive” (or “vitreous”) charge.

In an exceptionally well-written textbook on electricity and magnetism [iii10] published at the beginning of the last century, these issues have been correctly highlighted and mentioned to the students of electrostatics, showing that scientists and researchers were aware of these problems until very late in the development of this science. So careful were the authors with the terminology that,

[iii8] Duane ROLLER, Duane H. D. ROLLER, *The Development of the Concept of Electric Charge*, Harvard University Press, Cambridge, 1954, p56

[iii9] Frederick GUTHRIE, *Magnetism and Electricity*, William Collins Sons and Co., 1876, p17

[iii10] R. H. JUDE and John SATTERLY, *Senior Magnetism and Electricity*, London, University Tutorial Press, 1911, p93

instead of two types of “electricity”, they employed the term two types of “electrification”.

Coming towards modern era, we observe *the fallacy of positive and negative electricity* perpetuated and enhanced : J. J. Thomson, the discoverer of the electron [iii11], in spite of being well aware of the way in which, and the reason for which, the concepts of positive and negative electricity were developed [iii12], namely to explain electrostatic attractions and repulsions, makes the mistake of assigning to his corpuscule an absolute negative charge, and then tries to explain the action at a distance between electric charges by Faraday’s lines of force in the aether. J. J. Thomson’s explanation fails however, because he cannot explain how an electric charge produces these lines of force, why the lines have different directions for the two types of charge, why the lines are elastic and behave like rubber-bands and, most importantly, because J. J. Thomson makes the fatal mistake of assigning mass to the aether itself, and claiming that the lines of force drag the aether and that this causes the mass of charges and of all matter. The drag is not well explained, nor possible, as it is not clear why it occurs only when the charge accelerates and not also when the charge moves with uniform velocity. Moreover, in my opinion, assigning mass to the aether defeats one of the purposes the aether exists for, which is to *explain the origin of mass* of objects by a hydrodynamical effect due to the *acceleration* of objects in it ; the aether does not have intrinsic mass, it is *the cause and the origin of mass*, but a definite volume of aether *accelerating* through aether can display inertia, so this volume of aether acquires mass only when in, and because of, this state of accelerated motion through the aether.

Retuning to electrostatics, to state again what has been noted once above :

What happens in electrostatic phenomena at the fundamental level is that, through rubbing, mere contact, or other methods, objects are created that attract and repel one another, and this is all that a theory of electrostatics was, *and still is*, supposed to explain.

Since the introduction of *two types of electric charges* (“positive” and “negative”) by Du Fay does not solve the issue of explaining the attractions and repulsions observed in electrostatic phenomena, the present work takes the following approach :

Du Fay’s conjecture for the existence of two types of electricity is dismissed.
Only one substance is recognized : Franklin’s electric fluid, named in this series of works **electrigen**.
The electrostatic attractions and repulsions between electrical objects are explained by a two-stage process : (i) *the quantity of electrigen contained in the objects changes by its transfer through rubbing, contact, influence, or other methods* (ii) *this leads to changes in the natural frequency of vibrations of the electrigen in the objects*

It can be said that the theory proposed here is a revival and an expansion of a theory [iii13] [iii14],

[iii11] Isobel FALCONER, Corpuscles, Electrons and Cathode Rays: J.J. Thomson and the 'Discovery of the Electron' , BJHS, 1987, 20, p241-276

[iii12] J. J. THOMSON, Electricity and Matter, Charles Scribner’s Sons, New York, 1904, p2

[iii13] S. Tolver PRESTON, Physics of the Ether, London, New York, 1875, p30,31

[iii14] John ANGELL, Elements of Magnetism and Electricity, William Collins Sons and Co., 1877, p72 ; J H PEPPER, Cyclopaedic science simplified, Philadelphia, J. B. Lippincott CO., 1885, p242 ; J L HEILBRON, Robert Symmer and the Two Electricities, ISIS, 1976, p17

contemplated by the scientists of the 19th century, which they called “the molecular theory of electricity” or “electricity a mode of movement theory”.

In the theory proposed in this work the concept of *charge* is derived from Franklin’s original idea of deficiency or excess – i.e. less or more *load* – of electrigen in an object. As stated by Watson in the earlier quote, the electrical phenomena themselves are *caused by the electric fluid*, so the term **electrigen** applied to Franklin’s electric fluid is extremely appropriate, since it means “producer of electrical phenomena”, the naming being similar to that used for other elements of the Periodic Table such as **hydrogen** that means “water producer”, **oxygen** that means “acid producer”, **nitrogen** that means “nitrate producer”, a.s.o.

Moreover, electrigen causes electrical phenomena through its vibration, so *electric charge* will imply *electrigen causing attractions and repulsions by its state of vibration*, as only by vibrations can the aether be pushed to-and-fro and a charged object act on another at-a-distance. And, since the electrigen is just one of the chemical elements of the Periodic Table, the other elements of the Periodic Table may also be brought in a state of vibration and cause a to-and-fro motion of the aether around them to act on another element situated at-a-distance. In other words, a charged object will mean : an object that has electrigen in vibration in a normal quantity, in excess or deficit and, in the case of a complete absence of electrigen in an object, charge will imply that it is *other chemical elements in the object that vibrate* and act on the aether with periodic motion.

The problem of attractions and repulsions between charged objects becomes thus one of interactions between objects in molecular vibration made up of different chemical elements in different proportions, including the chemical element electrigen [E]. Electrigen exists in all substances, being the glue that bonds the atoms of elements together chemically in molecules, or physically in liquids and solids, and covers the isolated atom of an element like a film of a certain thickness.

Since the word *atom* was mentioned above, a little digression on this topic is in order here. In the theory advanced in this work, what is currently called “atom of an element” is considered to be in reality made up of *two chemical elements* :

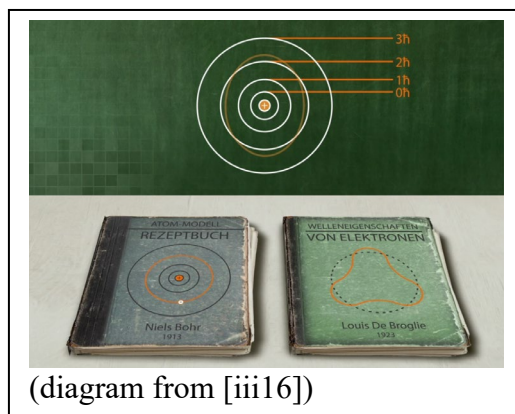
- the nucleus is the real atom of the chemical element, but without a “positive charge” ; the nucleus behaves as if it was charged “positively”, i.e. it produces attractions and repulsions, only when brought in a state of vibration.
- the electronic shells surrounding the nucleus are in fact a layer of electrigen covering the nucleus; there is no attraction between the two, as it is assumed in the current theory of atomic structure where the “positive nucleus” attracts the “negative electrons” ; the electrigen simply covers the nucleus and clings to it due to external aether pressure exerted on the electrigen.

It is not the aim of this work to advance a new theory of atomic structure but, as mentioned in [iii15], the atomic model based on Bohr’s ad-hoc postulates is highly problematic, inconsistent, and relies on the fundamental electrostatic structure derived from DuFay-Symmer-Coulomb’s unnecessary doctrine of the existence of “positive” and “negative” electric charges.

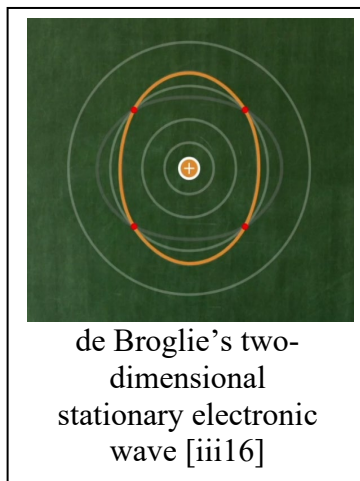
The alternative to this doctrine is the *two chemical elements theory of atom* outlined above, which is more promising since waves of electrigen on the surface of the atom, or just surface waves on the atom itself, can lead to *explaining the atomic line emission spectra in a mechanical way*, which was the original approach scientists took when studying atomic spectra during the *acoustic period*

[iii15] Ionel DINU, Fundamentals of a Theory of Aether - Part 2, ResearchGate, August, 2021

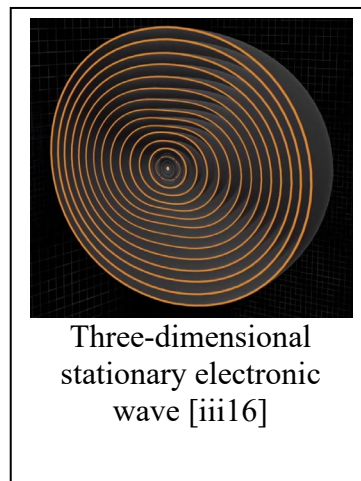
mentioned in [iii15]. Noteworthy in this respect are the recent works [iii16] [iii17] [iii18], that start from de Broglie's original proposal of two-dimensional stationary electronic wave in an atom and take it to its logical and natural three-dimensional representation, leading to atomic vibration modes with different frequencies, while the shape of the vibrating atom in spherical geometry resembles strikingly the atomic orbitals obtained by quantum mechanics calculations (QM).



(diagram from [iii16])



de Broglie's two-dimensional stationary electronic wave [iii16]



Three-dimensional stationary electronic wave [iii16]

These atomic vibrations, brought about when the atoms of an element are excited through sparks, arcs, or electrical discharges in low-pressure glass tubes, cause the emission of radiations with frequencies corresponding to their respective vibration modes, say (f_m) and (f_n), in contradiction with Bohr's postulate that the emission of radiation has the frequency (f_{mn}) and takes place when one electron jumps between two stationary states corresponding to the atomic orbitals of energy (E_m) and (E_n) such that :

$$h f_{mn} = E_m - E_n$$

What many modern textbooks on the quantum theory of atom fail to make explicit and clear is that all the frequencies (f_m), (f_n) and (f_{mn}) are observed in the emission spectrum of an element, and are connected through the simple relationship discovered by Walther-Ritz and called *Rydberg-Ritz combination principle* :

$$f_{mn} = f_m - f_n$$

from which it can be seen that,

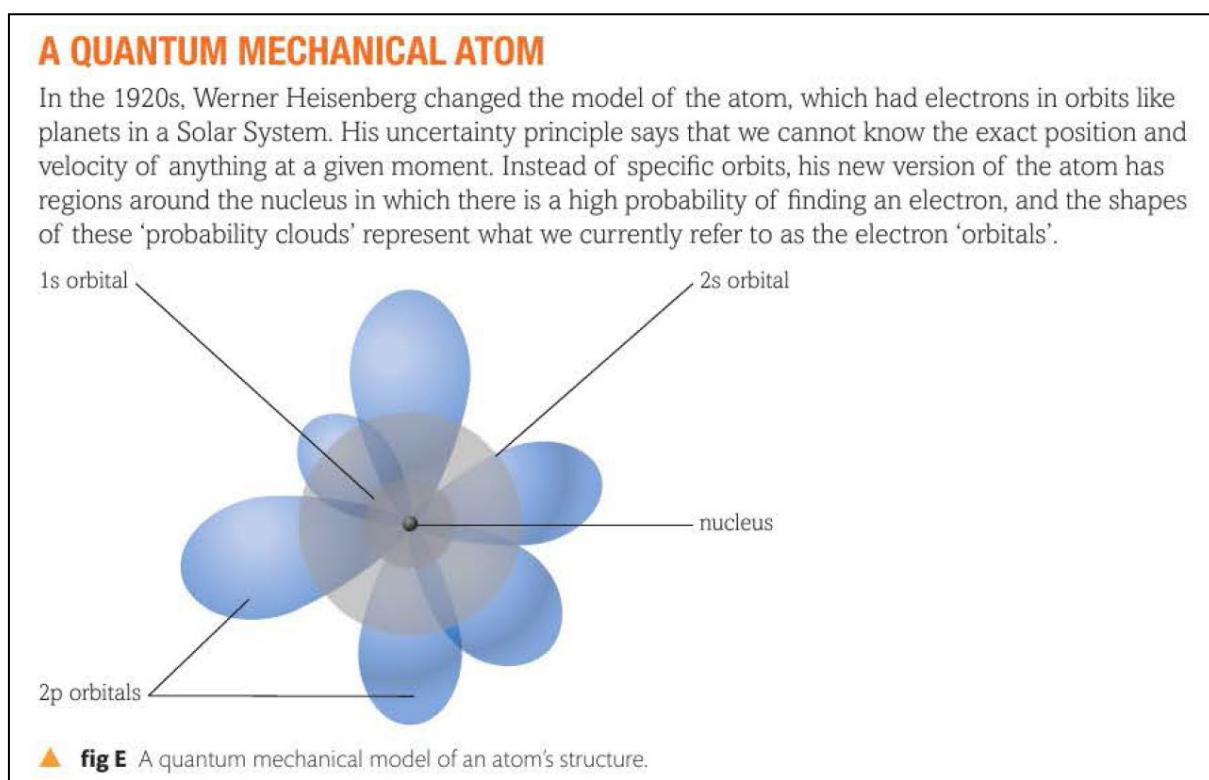
$$f_m = f_{mn} + f_n$$

As such, the whole line emission spectrum of an element can be considered as a mixture of radiations emitted by the excited atoms of the gas vibrating in different modes and frequencies, and in which higher frequencies are obtained through the principle of heterodyning, proposed by Juliana Mortenson [iii19].

[iii16] Malte Ubben and Stefan Heusler, www.quantumreflections.net , Atom 4 The Bohr Model
 [iii17] Malte Ubben and Stefan Heusler, A haptic model of vibration modes in spherical geometry and its application in atomic physics, nuclear physics and beyond, Eur. J. Phys. 39 (2018) (8pp)
 [iii18] Malte Ubben and Stefan Heusler, www.quantumreflections.net , Atom 6 Atomic Orbitals
 [iii19] Juliana Mortenson, Resonance LLC and Forgotten Physics, formerly: Juliana Brooks, Berkshire Laboratories and General Resonance LLC, A Frequency Based Theory of Catalysts, 1999, Spectral Chemistry, 2002, <https://forgottenphysics.com/>

Another notable consequence of the theory proposed here is that, starting from the complete line spectrum of an atom, it is possible to predict the real shape of the atom of an element, since it is the real structure whose vibration produces the radiation, and the possible shape, or shapes, of a vibrating structure can be determined from its normal vibration modes.

On the next three pages I have tried to show through diagrams the *great leap in our understanding of the atom* brought about by the atomic theory proposed in this work, that improves upon [iii16] [iii17] [iii18] through the use of **real** spherical surface waves of electrigen covering the atomic nucleus that act on the aether mechanically to produce radiation, over the currently accepted model of the atom based on quantum mechanical calculations (QM) that use the Schrodinger's **probability** wave equation for a negatively charged electron around a positively charged proton, and presently taught to high-school [iii20, figure below] and to college students [iii21].



[iii20] Miles HUDSON, Physics, Student Book 1, Pearson Edexcel International AS / A Level, Pearson Education Ltd, London, 2018, p77

[iii21] Hugh D. Young, Roger A. Freedman, A. Lewis Ford, Sears and Zemansky's University Physics with Modern Physics, 15th Edition, 2020, p1368-137

(diagrams from [iii21])

Figure 41.5 The Schrödinger equation for the hydrogen atom can be solved most readily by using spherical coordinates.

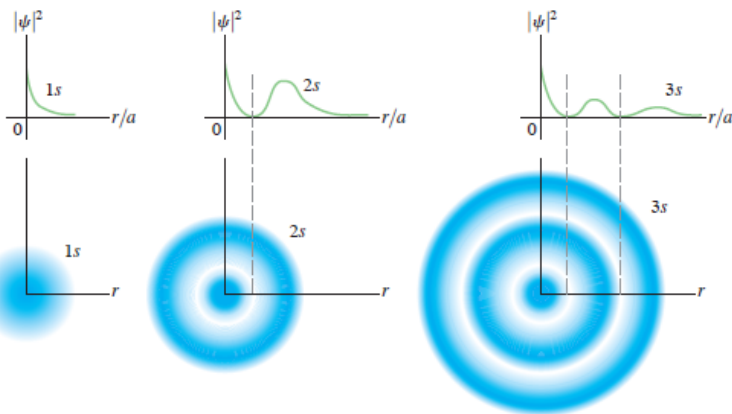
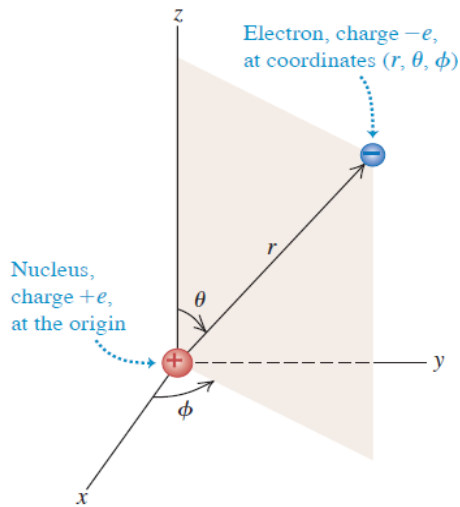
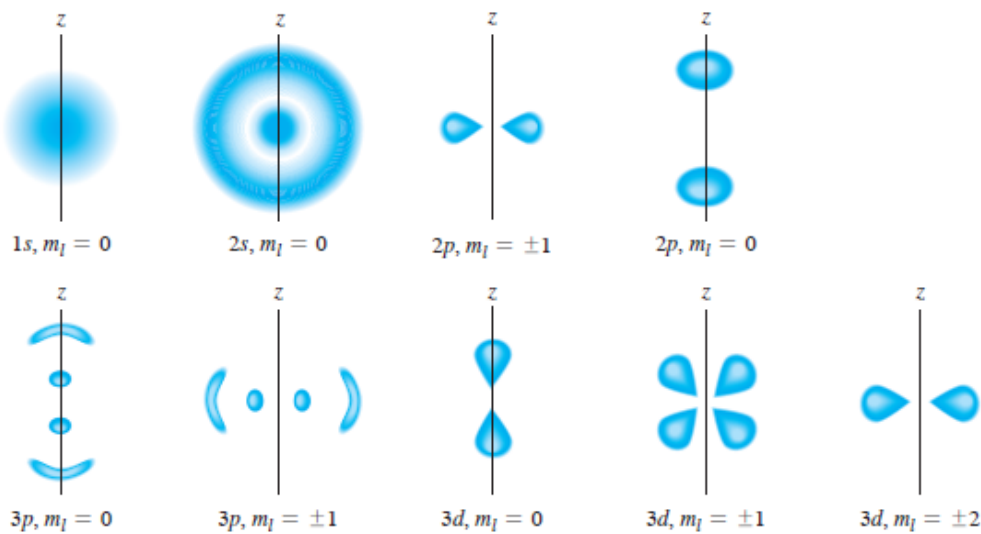


Figure 41.9 Three-dimensional probability distribution functions $|\psi|^2$ for the spherically symmetric 1s, 2s, and 3s hydrogen-atom wave functions.

Figure 41.10 Cross sections of three-dimensional probability distributions for a few quantum states of the hydrogen atom. They are not to the same scale. Mentally rotate each drawing about the z -axis to obtain the three-dimensional representation of $|\psi|^2$. For example, the $2p$, $m_l = \pm 1$ probability distribution looks like a fuzzy donut.



(only the diagrams have been reproduced from [iii18], the captions and comments are added to correspond to the theory proposed here)

Electrigen vibration with no nodal lines resemble the s - orbital.
The atom expands and contracts radially.

Electrigen vibrations with one nodal line resemble the p - orbitals.
The atom expands and contracts along three perpendicular directions.

Detail of the electrigen vibration resembling one of the p - orbitals.

“Chemistry does not describe the entire vibration in space, only the location of maximum probability of finding an electron. It corresponds to the points of greatest vibration amplitude.” [iii18]

(only the diagrams have been reproduced from [iii18], the captions and comments are added to correspond to the theory proposed here)

