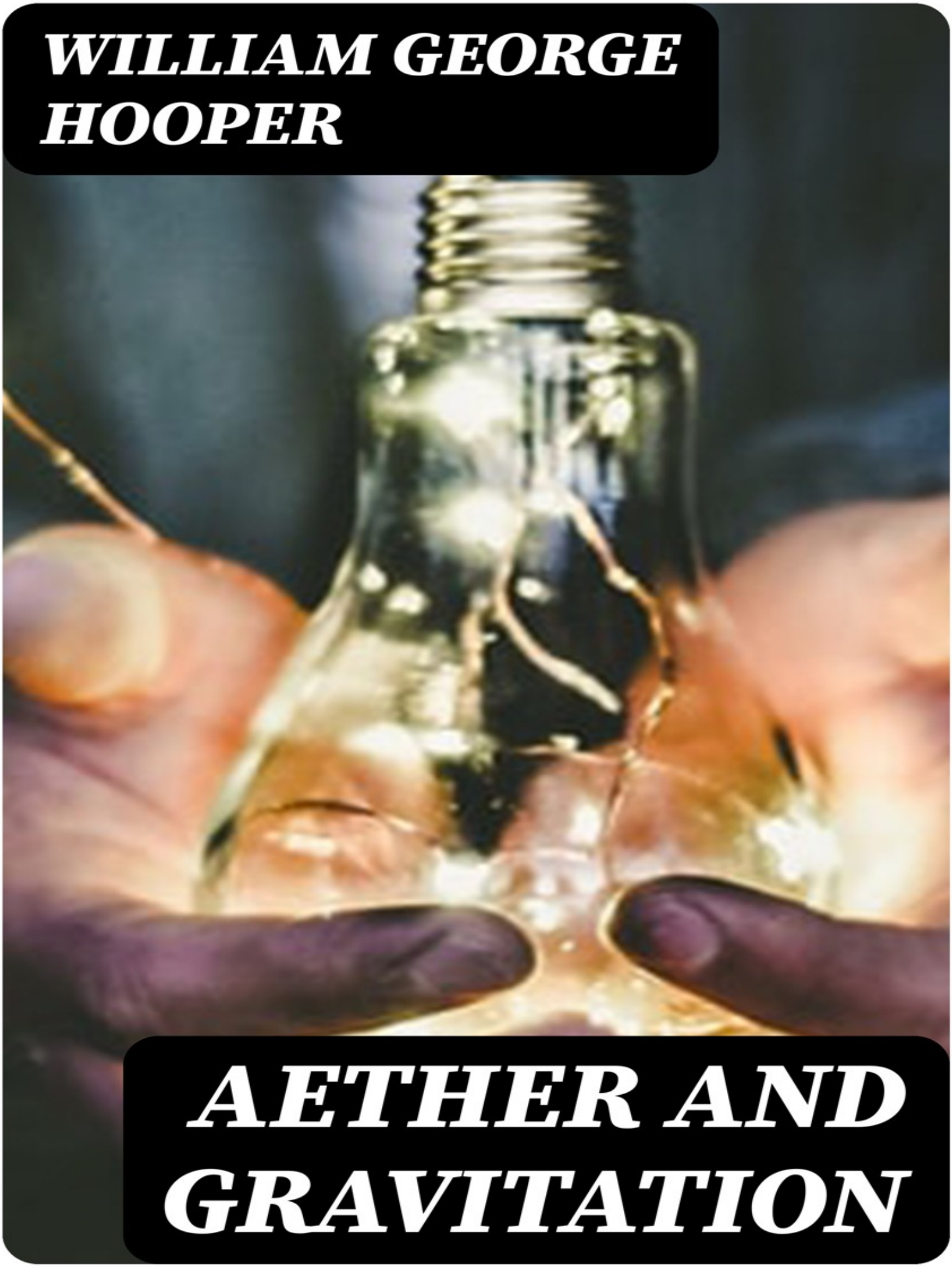
WILLIAM GEORGE HOOPER



AETHER AND GRAVITATION

William George Hooper

Aether and Gravitation

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CHAPTER I

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PHILOSOPHY OF GRAVITATION

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ART. 1. *Gravitation*.--In the realm of Science, there exists a Force or Law that pervades and influences all Nature, and from the power of which, nothing, not even an atom, is free.

It holds together the component parts of each and every individual world, and in the world's revolving prevents both its inhabitants and its vegetation from being whirled off its surface into space. It exists in each and every central sun, and circles round each sun its associated system of planets. It rolls each satellite around its primary planet, and regulates the comet's mysterious flight into the depths of space, while the pendulation of even the remotest star is accomplished by this same force. Our own rocking world obeys the same mysterious power, that seems to grasp the entire material creation as with the grasp of the Infinite.

It exists in, and influences every atom, whose combinations compose and constitute the entire material creation, or each and every orb that bespangle the blue infinity.

As is readily seen, it weaves as it were around each and all, a mysterious network or chain, that binds star to star, and world to world, blending all into one entire, vast and complete unity. It decides all their orbits and distances, regulates and controls all their motions, from the most simple even to the more complex and intricate, ultimately

producing that wondrous and beauteous order, unity and harmony that everywhere pervade and blend all the universe into one grand and harmonious whole.

That Law I need hardly say is the Law of Gravitation.

ART. 2. *Cause of Gravitation*.--Now the question arises, and indeed has arisen a thousand times since the discovery of this law by Sir Isaac Newton over two hundred years ago, as to what is the physical cause, the true explanation of this universal attraction.

MacLaurin in his work on the philosophical discoveries of Sir Isaac Newton says: “In all cases when bodies seem to act upon each other at a distance, and tend towards one another without any apparent cause impelling them, this force has been commonly called Attraction, and this term is frequently used by Sir Isaac Newton. But he gives repeated caution that he pretends not by the use of this term to define the nature of the power, or the manner in which it acts. Nor does he ever affirm or insinuate that a body can act upon another body at a distance, but by the intervention of other bodies.”

The results of modern discovery show that action at a distance, without the intervention of any medium, as for example the sun attracting the earth, is not the universal condition which governs all so-called forces.

It is now recognized that light and heat are both forms of energy, and therefore forces, using the term in the same sense that it is applied to Gravitation.

Both light and heat are transmitted through space with finite velocity through the intervention of a medium, the universal Aether. It is therefore only reasonable to suppose,

that if one or more particular kinds of energy, or forces, require a medium for their transmission, why not another force, as for example Gravitation?

Gravitation is an universal force which operates throughout the length and breadth of the entire universe, and if there be a medium which is to Gravitation, what the Aether is to light and heat, the question at once confronts us, as to what are the characteristics, properties, and qualities of that universal medium, which is to form the physical basis of this universal attraction?

Newton himself suggested that Gravitation was due to an aetherial subtle medium, which filled all space.

In his well-known letter to Bentley, Newton writes as follows: “That Gravity should be innate, inherent, and essential to matter, so that one body can act upon another body at a distance through a vacuum, without the mediation of anything else, by and through which their action and force may be conveyed from one to another, is to me so great an absurdity, that I believe no man who has any philosophical nature or competent faculty of thinking can ever fall into it.”

We also know from his Queries in his book on *Optics*, that he sought for the explanation of Gravitation in the properties of a subtle, aetherial medium diffused over the universe.

MacLaurin on this point says: “It appears from his letters to Boyle, that this was his opinion early, and if he did not publish his opinion sooner, it proceeded from hence only, that he found he was not able from experiment and observation to give a satisfactory account of this medium,

and the manner of its operations in producing the chief phenomena of Nature.”

Therefore, if we accept Newton's suggestion, and endeavour to trace the physical cause of Gravitation in the qualities, properties, and motions of this subtle aetherial medium to which he refers, we shall be simply working on the lines laid down by Sir Isaac Newton himself.

I wish therefore to premise, that the future pages of this work will deal with the hypothesis of this aetherial medium, by which will be accounted for, and that on a satisfactory and physical basis, the universal Law of Gravitation.

ART. 3. *Rules of Philosophy*.--In order that we may rightly understand the making of any hypothesis, I purpose giving some rules laid down by such philosophers as Newton and Herschel, so that we may be guided by right principles in the development of this new hypothesis as to the cause of Gravitation.

The rules that govern the making of any hypotheses, so far as I can discern, may be summed up under the three following heads--

(1) Simplicity of conception.

(2) Agreement with experience, observation, and experiment.

(3) Satisfactorily accounting for, and explaining all phenomena sought to be explained.

ART. 4. *1st Rule. Simplicity of Conception*.--From this rule we learn that the hypothesis must be simple in conception, and simple in its fundamental principles, and further, that the same characteristic of simplicity must mark each step of its development.

This rule of simplicity is distinctly laid down by Sir Isaac Newton in his *Principia*, Book 3, under the heading “Regulae Philosophandi.”

In that work he writes: “Natura simplex est, et rerum causis superfluis non luxuriat.”--“Nature is simple, and does not abound in superfluous causes of things.”

He further states that: “Not more of the natural causes of things ought to be admitted, than those which are true and suffice to explain phenomena. In the nature of Philosophy nothing is done in vain, and by means of many things, it is done in vain when it can be done by fewer. For Nature is simple, and does not abound in superfluous causes.”

While again in Rule 3, he adds: “Natura simplex est et sibi semper consona.”--“Nature is simple, and always agrees with itself.”

Whewell also considers simplicity as a fundamental principle of all true hypotheses. On this point he writes: “All the hypotheses should tend to simplicity and harmony. The new suppositions resolve themselves into the old ones, or at least only require some easy modification of the hypothesis first assumed. In false theories the contrary is the case.”

Thus, it is the very essence of philosophy to build upon a foundation of simplicity, combined with the results of experience, observation, and experiment. For example, if we desired to form a hypothesis as to the cause of day and night, two hypotheses might be assigned as to the cause.

First, that the earth revolves on its axis once a day, and so presents each part successively to the light and heat of the sun; and second, that the sun revolves round the earth once every 24 hours. But such an assumption as the latter

would involve the revolution of the sun through an immense orbit at an enormous velocity, in order for the journey to be accomplished in the time. So that it is much simpler to conceive of the earth revolving on its axis once every 24 hours, than it is for the sun to perform this journey in the same period. Hence the rule of simplicity is in favour of day and night being caused by the revolving of the earth on its axis. The same rule might be illustrated in many ways; but, however illustrated, the principle, according to Newton, always holds good that all effects are produced by the simplest causes, and if there are apparently two causes to the same phenomenon, then the simpler cause is the true and correct one. So that in the making and development of any hypotheses of the physical cause of Gravitation, this rule of simplicity must always be recognized; and, in conjunction with the other rules, we must seek to make our hypotheses, so as to be able to account and explain all phenomena sought to be explained.

ART. 5. *2nd Rule. Experience.*--Newton fully recognized the necessity of experience in Philosophy. He saw the absolute necessity of appealing to experience, observation, and experiment, both as a basis for philosophical reasoning, and further, for the data which were necessary to verify particular applications of the hypotheses suggested.

In his Rules of Philosophy, referring to experience as a guide, he says: “Hoc est fundamentum philosophiae.”--“This is the basis of philosophy.”

Herschel, writing on the same subject in his *Natural Philosophy*, writes thus with regard to experience: “We have pointed out that the great, and indeed the only ultimate

source of our knowledge of nature, and its laws, is experience. By which I mean, not the experience of one man only, or of one generation, but the accumulated experience of all mankind in all ages registered in books or recorded in tradition. But experience may be acquired in two ways, either first by noticing facts as they occur without any attempt to influence the frequency of their occurrence, or to vary the circumstances under which they occur. This is observation. Second, by putting in action causes and agents over which we have no control, and purposely varying their combination, and then noticing what effects take place. This is experiment. To these two sources we must look as the fountains of all natural science."

Herschel further writes: "Experience once recognized as the fountain of all our knowledge of nature, it follows, that in our study of nature and its laws, we ought at once to make up our minds to dismiss, as idle prejudices, or at least suspend as premature, all preconceived notion of what might, or ought to be the order of nature in any proposed case, and content ourselves as a plain matter of fact with what is. *To experience we refer as the only ground for all physical enquiry.* But before experience itself can be used to advantage, there is one preliminary step to make which depends wholly upon ourselves."

"It is the *absolute dismissal* and clearing the mind *of all prejudices* from whatever source arising, and the determination to stand or fall by the result of direct appeal to facts in the first instance, and to strict logical deduction from them afterwards."

From extracts like these, from such men as Newton and Herschel, it can at once be seen that experience, and experience alone, should be the chief fountain from whence we draw all our data to form the bases of any hypothesis or theory. If the hypothesis formed is contradicted by the result of any present or future observation or experiment, then such hypothesis will either become untenable, or must be so modified as to take in the new fact furnished by that observation and experiment.

It is a *sine quâ non* of all true philosophy, that philosophy should always agree with experience. To the extent that our Philosophy of Nature fails to agree with our experience, or with the results of observation and experiment, then to that extent it ceases to be philosophy. It may be a hypothesis or even a theory, but certainly it is not true Philosophy.

Now, in the elaboration and development of the theory as to the physical cause of Gravitation, I can premise that nothing will be postulated or supposed, unless such supposition can be directly verified by our own observation and experiments.

Any theory or hypotheses that are contradicted by our own experience in its widest form, will find no place in the development of this work. Further, any present accepted theory in relation to any natural phenomena, which is controverted by experiment, or observation, will be rejected as untenable in the scheme of Natural Philosophy to be submitted to the reader.

Whatever else the theory suggested may, or may not be, one thing it certainly shall be, and that is, that it shall be strictly based upon the Philosophical Rules as given by some

of the greatest philosophers the world has ever seen. I do not premise that the hypotheses advanced will be strictly correct in every detail.

That would be to assume that my experience of all natural phenomena was perfect. To the extent that our experience is limited, to that extent our hypotheses will be limited and faulty. It would need an Infinite mind to form a perfect theory of the philosophy of the universe, because only an Infinite mind possesses infinite experience. A finite mind can, however, form true philosophical conceptions of natural phenomena, if that mind will only follow the guidance of his own experience, and be willing to accept the teaching that always arises from the results of that experience. In order to do this, however, it must be observed, as Herschel points out, that all old prejudices must be put away, and the question or problem to be considered must be viewed with an open mind. Let me illustrate what I mean. Suppose, for example, that for two hundred years, chalk had always been thought to be a mineral, and then, owing to the development of the microscope, and to the increased magnifying powers of the lenses, it was conclusively demonstrated that chalk is made up of the shells and remains of certain organisms that lived in the sea ages ago. Would it be philosophical to throw over the results of the microscopical research, and, simply because for two hundred years chalk had been thought to be a mineral, to argue, and still retain the idea that chalk was a mineral?

Such a result would be entirely opposed to all the teaching and principles of philosophy. In a similar way,

suppose in the development of the physical cause of Gravitation, a certain conception of the universal Aether has to be put forth in order to account for Gravitation, and that that conception is opposed to some of the theories which have been held relative to the Aether medium for the past two hundred years; but that the conception so advanced is supported by the experiments and observation of some of the ablest scientists of the present century, would it be philosophical to reject the newer conception which harmonized with all experiment and observation, and still retain the old conception of the aetherial medium; or, to accept the newer conception of that medium, and to reject some of the ideas included in the old conception? From a purely philosophic standpoint, there can only be one reply, which would be in favour of the newer conception, by which our philosophy would be brought into harmony with our experience.

This I premise will be done in this work, and the result will be, that for the first time, our philosophy of the aetherial medium will agree with our experience; and, as the natural result, several outstanding problems will be explained on a physical basis, which at the present time cannot be satisfactorily explained except from the mathematical standpoint.

ART. 6. *3rd Rule. Satisfactory explanation of the Phenomena sought to be Explained.*--The third rule which governs the making of any hypothesis is, that the hypothesis formed in accordance with the first and second rules shall satisfactorily account for all the phenomena sought to be explained.

Newton writes on this point as follows: “No more causes of natural things are to be admitted, than such as are true, and sufficient to explain the phenomena.” While again in his fourth rule he states: “In experimental philosophy, propositions collected by induction from phenomena are to be regarded as accurately true, or very nearly true, notwithstanding any contrary hypothesis, till other phenomena occur by which they are made more accurate, or are rendered subject to exceptions.” *Principia*, Book 3. Herschel in his *Natural Philosophy* points out, that one of the chief requirements of any assumed hypothesis is, that it shall be sufficient to account for the phenomena to be explained, and that it shall be suggested by analogy.

Now the object of this work is to give a physical explanation of the cause and working of Gravitation, and to show how, by the properties, qualities and motions of the universal Aether, Universal Gravitation may be accounted for on a physical basis. So that every phenomenon, associated with, or included in the Law of Gravitation, should receive a satisfactory physical explanation by the proposed theory.

Thus the physical cause of the centripetal and centrifugal forces should receive for the first time a physical explanation.

Newton's Laws of Motion, in so far as they conform to his own Rules of Philosophy, should also receive a physical explanation.

Kepler's Laws, which govern the motion of planets in their orbits, should also receive a similar physical explanation. Indeed, all phenomena which the Law of

Gravitation explains from a mathematical standpoint, ought to receive a physical explanation by the proposed new conception of the Aether medium.

In addition to the outstanding physical cause of Gravitation, there are other physical problems that yet remain to be solved; as, for example, there is the question as to what is the relative motion of Aether to moving matter. Does the Aether move with matter through space as suggested by Michelson's and Morley's experiment of America, or does it flow freely through all matter, as it is usually thought to do? I premise I will give a satisfactory solution of this problem in due course.

Again, in relation to the Phenomena of Light, there is still outstanding the problem of the physical explanation as to the transverse vibration of light. This problem will also be dealt with from the standpoint of our new conception of the Aether. Whether it will be as satisfactorily solved, as the physical cause of Gravitation, remains to be seen.

Further, there is also the important question yet unsolved, as to what Matter is. Lord Kelvin and Dr. Larmor have recently given to the world certain conceptions as to the origin of Matter, and I shall endeavour to show that such conceptions receive confirmation and support by the proposed new conception of the Aether.

Another problem that will be attacked and solved, will be the cause of the Permanent Magnetism of the earth, with an answer to some of the questions propounded by Professor Schuster at the British Association of 1892 relative to the magnetism of solar bodies.

There is certainly some physical explanation as to the cause of the earth being a magnet, yet up to the present no satisfactory physical theory has been given. I premise that the new conception of the Aether, to be submitted in the after pages, will satisfactorily account, and that on a philosophical basis, for this phenomenon.

Lastly, one of the most interesting discoveries of the present day will receive an added confirmation and explanation in the conception of the Aether medium to be advanced. I refer to the system of Wireless Telegraphy that has been so successfully developed by Signor Marconi, and I premise that new light will be thrown on that discovery by the suggested theory of the Aether.

Now, if all these problems can be partially or wholly solved by the same theory that is advanced to explain the physical cause of Gravitation, it needs no further comment to show that that theory is considerably strengthened and more firmly established.

For it is a rule in Philosophy, that the more problems any suggested theory can solve, the greater are the claims of that theory for acceptance by scientists generally. For, if two rival theories can solve three and ten physical problems respectively, then, in giving a decision as to which is the better theory, the balance of opinion would be overwhelming in favour of that theory which could solve the ten problems. So that, if in addition to the satisfactory explanation of the physical cause of Gravitation, some, if not all of the other problems can be solved, as I premise they can, by the same conception of the Universal Aether, then it follows our third rule of Philosophy will be more than

fulfilled, and the theory so advanced will be placed upon such a strong foundation, that it can only be overthrown by proving that it contradicts the results of some undiscovered phenomena.

ART. 7. *Application of Rules to Gravitation.*--Let us therefore apply Newton's own Rules of Philosophy to the Law of Gravitation, and endeavour to find out if the law, as at present understood, fully satisfies his own Rules of Philosophy. No one can reasonably object to subjecting the Law of Gravitation to the test of those principles which he lays down as the fundamental Rules of Philosophy.

If it comes through the ordeal with complete success, that is, if it is essentially simple in its conception and development, and if all its details are fully in accord with experience, as revealed by observation and experiment, then there will be no need to alter any of its hypotheses or axioms. If, on the other hand, it violates any of the rules as laid down by Newton, then, to that extent, an alteration will be necessary, in order that the Law of Gravitation may be brought into conformity with his own rules, and our Philosophy made to agree with our experience and observation.

ART. 8. *Analysis of Law of Gravitation.*--In order to accomplish this, let us ask ourselves, “What are the component parts of this Law of Gravitation?” The Law is not a simple law, but a compound one. It is compounded primarily of three parts.

1st. A Primitive Impulse.

2nd. A Centripetal Force.

3rd. A Centrifugal Force.

To these must be added the three Laws of Motion; although they are not directly part of the Law of Gravitation, yet they are essential to its effectiveness and completion. Without any one of these, the Law of Gravitation would fail to account for all the phenomena that it does account for.

If there were no Primitive Impulse, then the planets and meteors, sun and stars would for ever remain at rest, and the Laws of Motion would remain inoperative. If there were no Centripetal Force, then the Centrifugal Force would hurl the planets and comets, asteroids or minor planets away into the depths of space, never to return to their central sun.

If there were no Centrifugal Force, then the Centripetal Force would draw all bodies, *i. e.* all planets, etc., to their central sun, and, instead of the planets continually revolving round the sun, there would be but one immense solitary mass in the centre of the solar system.

If there were no Laws of Motion, with their necessary corollary the Parallelogram of Forces, the Primitive Impulse would cease to act, and the Law of Gravitation would again fail in its attempt to account for those phenomena it does account for.

Thus, as it may easily be seen, Gravitation is a compound Law, depending upon at least four hypotheses, and therefore is not essentially a simple Force, or Law.

If, therefore, in giving a physical explanation of the cause of Gravitation, we can reduce all these four elements of the Law into one single physical cause, *i. e.* the Universal Aether, and show how they may all be explained and accounted for by the properties, qualities and motions of