for page 11

(1957)

THE SEARCH FOR A SOLUTION OF GRAVITY

TITLE: The direction we must take to attempt solving the problem of gravity.

...by C. F. MARTIN
6435 Coral Way
Miami, Florida

SUMMARY: This essay is intended to show the absolute necessity of extending quantum mechanics to include the force of gravity.

If a gravity insulator can exist then this paper attempts to show that quantum theory offers the only logical method by which we can even hope to find a solution.

The only logical experiments that can possibly attempt to offer us evidence toward securing a solution of gravity are shown to be either the extremely high energy states or the extremely low energy states. A short discussion of the feasibility (both financial and practical) of considering the extremely low energy states rather than the high energy states.

PART ONE

Quite a few years ago I became interested in trying to find some other than mechanistic method of overcoming the force of gravity. I reasoned that gravity was but a force that in some manner acted upon matter, and that some method could be found to overcome this force by the direct application of some other force. The completely negative results of various experiments convinced me that only through an understanding of the nature of gravity could we hope to find an answer. A knowledge of just how and why the force of gravity acted seemed necessary. At first I tried to isolate the problem by trying to consider gravity as some disembodied force working through space and exerting a force upon some material body. Starting with the simple point that things obviously fell down, I wound up with the fact that things fell down, but not obviously, and a serious question as to just what the words "fell" and "down" implied.

I was forced to conclude that gravity could not be considered as a force that was simply applied to matter. Since gravity does exert a force upon matter the only alternative was to consider this force as being applied to matter in such a manner as to be an integral part of matter. Since this force seemingly originates from matter and acts upon other matter in such a manner as to be an integral part of that matter I was forced to assume that gravity was an inherent force that was in some manner produced by the existance of matter, and that only through the study of the structure of matter could an explanation of gravity be found.

Now, if being wise is but an awareness of just how little one knows then the study of the structure of matter certainly made a wise man of me. The only real knowledge that I obtained from several years of study and contemplation was of a negative character. This was a rather humiliating concept of just how little we actually know about the basic forces of our universe.

I became interested in pursuing the so-called mathematical approach to the study of matter after finding that the classical mechanistic concept seemingly demanded such a study. Space and time became the space-time continuum. Non-Euclidean geometries beckoned. Quanitization seemed natural and inevitable. Entirely new horizons of scientific thought began to emerge. Due to the flat contradiction of the basic theories of Relativity and Quantum the theory of the incomprehensibility of matter seemed not only logical but inevitable. I accepted as profound truths

such statements as:

1. "Matter has revealed itself as being so extraordinary, even incomprehensible, a thing that the resultant change in our outlook has been described as the greatest revolution in the history of scientific thought."
   .... J. W. N. Sullivan

2. "It is impossible for us, constituted as we are to escape from spatio-temporal coordinates. We cannot think in other terms, we cannot even speak the new language which would be required. Physics expressed in quanta of action would convey nothing to our minds. We are therefore obliged to submit to the necessity of describing reality in terms of space and time, we are compelled to use unsuitable, and in certain circumstances meaningless coordinates."
   .... Prof. Lindemann

3. "Henceforth space by itself, and time by itself, are doomed to fade away into mere shadows, and only a kind of union of the two will preserve an independant reality."
   .... Prof. Minkowski

Since my primary interest was the nature of gravity I was drawn to the Relativistic explanation of gravity. In this concept Einstein showed that gravity is not a force at all but instead a certain kind of curvature in a four dimensional continuum, governed by Riemannian geometry, in the neighborhood of matter. I did, for a while, firmly believe that matter must be ultimately incomprehensible, that gravity could be explained as being a curvature in space-time, and that some non-Euclidean geometry was the basis of our universe.

But somewhere along the line a reaction set in. I found that I could not firmly believe that matter was incomprehensible. I found that I simply could not accept matter as being beyond comprehension on the unscientific and stubborn ground that I believed an understandable answer could be found. I found myself making this rather trite summation of the results of the last fifty years of scientific endeavor concerning the structure of matter:

> Starting with the impossible we have arrived at the incomprehensible.

I tried to convince myself that matter could be

regarded as being incomprehensible and that as a natural result thereof that gravity itself was beyond our power of comprehension. I simply could not accept this point of view. While it is undoubtedly true that something must exist which is beyond our ability to comprehend or understand it is equally true that we have our mechanical laws which must apply to all parts of matter until the limit of our power of comprehension is reached. Therefore it is a matter of personal belief as to whether we have or have not reached the ultimate limit of comprehension.

Since I found that I could not accept the theory of matter, as we know it, being incomprehensible and since I could not see how any other result could possibly arise from the divergence of our two basic theories, relativity and quantum, the only course left open was to retire and admit defeat. But I found it difficult to admit complete and final defeat. I found myself speculating upon the possible nature of future developments. Although I had been humiliated by proving to myself my incompetance to deal with the problem I found that I could not completely give up searching for a solution of gravity. So I found myself again starting to seek an explanation of gravity.

END OF PART ONE

PART TWO

Since I had thoroughly learned the impossibility of dealing with the problem by the consideration of observed facts and mathematical deductions I decided to adopt some fundamental postulate and try to make this postulate conform to our proven theories. My original idea was to try to find some other than mechanical force that could be directly applied to matter and nullify the force of gravity. But it is difficult to postulate about such a thing as an unknown force; I reasoned that if such a force could exist and could be produced by man then some material substance would have to exist that could stop this force. So I decided to postulate that a gravity insulator could exist and to set as my goal the discovery of the insulator. At first glance this may seem to be a simple and illogical statement. Starting with the concept of some force it was necessary to assume that some substance could act as an insulator to the force, but we cannot postulate about the insulator of an unknown force any more than we can postulate about the unknown force itself. But if an insulator can exist for a force that would nullify gravity then it is logical to assume that an insulator for gravity itself can exist. If we make the simple statement that a gravity insulator can exist and accept this as our fundamental postulate then we are in effect saying that our known facts and proven theories are capable of explaining how a gravity insulator can be produced. Now is this insulator possible or is it not? If we say that it is and attempt to find this insulator by following only the accepted methods of science then there are only three methods of approach open for consideration.

Firstly, we can assume that a gravity insulator will be found quite accidentally or as the result of some haphazard search. This possibility cannot be ignored nor can it be lightly cast aside for scientific history is crowded with instances of accidental important discoveries. If a thing can exist then it is entirely possible that it can be chanced upon. Since this possibility cannot help us achieve our goal, beyond keeping us alert for such an accidental discovery, I think it should be ignored.

Secondly, we can attempt searching for a new theory of the structure of matter in the hope that the force of gravity in this new theory could be completely explained in mechanical terms. Now of all the courses that we could possibly follow this is by far the most nebulous and insubstantial. At the turn of the century Einstein and Bohr opened new horizons of scientific research. Einstein's theory of relativity was confirmed by celestial observation and experiment. Bohr's seemingly crude explanation of the

structure of the atom explained the structure of the hydrogen spectra and the Rydberg constant. Bohr's work stimulated further research and led inevitably to the development of quantum mechanics. But relativity and the quantum are ultimately utterly incompatible. Since both theories were experimentally verified it was assumed that some new theory would arise that could contain both relativity and quantum mechanics. The entire scientific world interpreted the flat contradiction of relativity and quantum as positive evidence that some new theory was inevitable. The search for a new theory was actively and whole-heartedly engaged upon. No new theory was developed and no possible course whereby a new theory might be developed was discovered. No possible explanation of the incongruity could be found that was consistant with the known facts. Insofar as proof was possible, it was definitely established that no new theory could possibly embrace both relativity and the quantum. The ultimate structure of matter was deemed incomprehensible. Due to the fact that every possible approach to a new theory has been so fully explored I cannot believe that any further advantage can accrue from an attempt to formulate an all-embracing theory concerning the structure of matter.

Lastly, we can assume that a gravity insulator can be found and that it will be consistant with our known and proven theories. Since the theory of relativity flatly asserts that no possible material substance could act as an insulator of gravity, we are forced to assume that the key to our complete understanding of the nature of gravity must be contained within the framework of quantum mechanics.

Now by postulating that a gravity insulator can exist and by assuming that by the methods of scientific research we can find this insulator we are logically and inevitably led to conclude that quantum theory must provide some explanation of the gravity constant. While this is not a surprising nor unlooked for statement it does introduce a very difficult problem. The present energy equations of quantum theory are balanced and all forces are accounted for. Our problem is to introduce a new force and still find some method whereby the energy equations are balanced. The fact that quantum theory does break down when high energy collisions are observed provides us some hope that some method may be found of abstracting the derivation of the gravitational constant from quantum considerations. There are two clues that may lead us to a quantum solution:

1. The Negative Energy State

2. The Exchange Forces

The negative energy state, although it accurately accounts for the positron, does not lend itself to scientific observation or consideration. This state can only be treated satisfactorily by philosophical or epistemological methods, and these methods cannot be considered satisfactory for our purpose. Although we must ignore the negative energy state we cannot belittle it. Our equations produce the indication of the state and the only satisfactory explanation of the observed phenomena of the positron requires the negative energy state. It is unfortunate that we cannot hope to devise any practical method to use or consider this state. So we have by rather logical methods arrived at the point where the exchange forces must be made to account for the force of gravity.

If it were possible I would prefer to ignore the exchange forces. We cannot afford to ignore because we have no other choice. Our energy equations are balanced and must remain balanced. If we seek to include the force of gravity into our quantum energy equations then we must by some method balance our equations. The only possible hope we have is to consider the exchange forces. The negative energy state is too far removed from the real and physical qualities required to provide us any hope of deriving any satisfactory results by considering this state. The exchange force characteristic is the only other possibility of introducing some new force into our quantum equations.

The only possible method whereby the exchange forces can be made to account for gravity is to extend these forces to other particles. The present accepted nuclear exchange forces are completely accounted for by the actions between electrons, protons and neutrons. So far we have not deemed it necessary or desirable to consider extending the exchange forces to other particles. If we are to attempt to account for gravity by considering some new force as existing within the nucleus then this new force must undoubtedly be a new exchange force and this implies that the force must be considered as existing between particles which have not been considered as possessing the exchange force characteristic.

The neutrino is an integral part of the nuclear exchange force action between electrons, protons and neutrons but the neutrino has not been considered as sharing in this force characteristic. This is rather peculiar for in any action involving the four particles only the three share in the exchange force and the neutrino does not. The energy equations are balanced without the use of neutrino exchange forces. I cannot help but wonder if we cannot include this exchange force and the counter-

balancing force of gravity and still have our energy equations balanced. If we could succeed in doing this we would have derived the gravitational constant and the way would be open for an active and directed search to find some practical method of overcoming or utilizing gravity to suit our needs. In fact the only conclusion that we can draw from our original postulate and the most logical development thereof is the existance of neutrino exchange forces, and that gravity can quite possibly be the result of this neutrino exchange force.

It may appear that we have made some progress in that we have reduced our general problem to the problem of the consideration of the neutrino exchange force. This is a very difficult problem. In fact this problem is so very difficult that it may prove that we have made no progress in that we have presented ourselves with a problem that we cannot solve. We do have a slight amount of hope in the fact that we have not yet proven that we cannot solve the problem.

Unfortunately the experimental data available to us at this time is far too meager and inconclusive to offer any immediate hope of deriving empirical equations that could account for gravity. It seems conclusive that we cannot derive the gravitational constant from logical mathematical considerations. Therefore we must depend upon new experimental data. The natural thing to do would be to perform sufficient experiments at the extremely high energy levels to secure more data so that theory could be made to conform with fact. This is far easier to say than to perform. The gigantic cyclotrons and other equipment necessary to secure such data simply are not available. The large equipment that we do have has only been powerful enough to show that quantum theory does tend to break down. These machines are very expensive to build and maintain. So expensive that any thought of building the necessary equipment is out of the question. Only the Government or a group of very richly endowed Universities could possibly finance the construction of such equipment. Therefore it is apparent that we must content ourselves with whatever information is released concerning the experiments performed with the existing large equipment. It is indeed unfortunate that the world political situation is such that we cannot depend upon receiving the information we require. Anything new and interesting is too certain to be classified.

By accepting that a gravity insulator could exist and by following the most logical and plausible course a method whereby a solution could probably be found was derived. The

steps taken were both simple and logical but no attempt at rigorous presentation of proof was attempted because the general information is widely known.

Although we have derived a logical and promising method of approach to the problem this method can be of but scant interest to us if we are denied the opportunity of pursuing that method. The direct method is denied us but we can attempt to follow the indirect method. We can but do the best we can. The best we can hope to achieve without experimental confirmation is to be ready to explain and analyze the experimental data when it does become available. Therefore it is apparent that we must familiarize ourselves with all the known exchange forces; the characteristics of the neutrino must be minutely examined. The theory of the quantum must be reviewed again and again so that experimental data will show us just where we have erred. We can attempt to use the evidence provided by the high energy cosmic rays. In fact this last statement may prove to be our best hope.

Because the indirect method is so unsatisfactory in that it cannot provide us any immediate hope of achieving a solution of gravity I decided to include a part three to this essay showing one other possible course.

END OF PART TWO

PART THREE

It is indeed unfortunate that the problem of gravity is such a difficult one, but then we could hardly expect it to be otherwise. If the problem was such that it could be easily solved or practically stumbled upon then it would have been found long before this. Due to the fact that this problem is so difficult I think we are fully justified in departing from the accepted methods of scientific research. We must adopt some principle and conduct experiments in the blind hope that we may find something interesting. The hope need not be so very blind if the principle we choose to work upon is wisely and logically chosen.

In choosing the principle we have only one fact to comfort us, this is the fact that quantum theory does break down. Since we know that quantum theory does break down we must assume that it will break down at the low energy states as well as at the high. This is no wild and dreamy-eyed assumption for errors are more pronounced and more easily detectable at the limits of any theory or equation. The very fact that quantum theory does break down at the extremely high energy levels implies that it will also break down at the extremely low energy states. Many strange and odd things occur at the extremely low temperatures. While there has been no flat contradiction of quantum theory many observed reactions were enough out of agreement with theoretical predictions to cause some speculation upon the validity of the predictions. Because the quantum is concerned with probabilities the resulting hazy viewpoint taken by science is such that only absolute contradiction of quantum theory with observed phenomena can be considered positive evidence. This certainly makes our job tougher. For we must assume that the theory does break down and it would be far better if we knew that the theory did break down.

About two years ago, or possibly three, I read an account of an experiment conducted by the Physics Institute of Moscow. The account of this experiment was extremely brief and treated the subject as a mere inconsequential laboratory curiosity. And at the time I did not consider the report of the experiment worth more than a passing glance. This requires some explanation. There is such a volume of material published concerning experiments and research work in physics that one cannot possibly hope to even read lightly all the material presented; the fact that many of the experiments and research work reported upon is of such a highly doubtful nature causes one to edit very carefully the material he wishes to study. But this one experiment was curious, so curious that I could not forget it.

The report was a simple one and merely stated that a piece of nickel would remain suspended above a plate that was at a temperature approaching absolute zero. The report was so brief and inconclusive that no mention was made of any of the pertinent data. The exact conditions under which the experiment was performed were not mentioned. The size and shape of the piece of nickel, whether the metal was pure or contained impurities, the external conditions that might have influenced the experiment, and whether the nickel was dropped to the plate or very carefully placed all these things were omitted. As I mentioned before the whole thing was treated as a mere laboratory curiosity and as such I accepted it and ignored it.

Some time later when I came to the conclusion that quantum theory must break down at the low energy states this account naturally came to mind. I tried to find some explanation for any metallic object being suspended for any distance above any plate. I found that a difference in temperature could not possibly account for this phenomena. Unfortunately I do not know under what conditions the experiment was originally performed, but I do know that we cannot possibly explain this occurence by the mere difference of a few hundred degrees temperature. If this event does take place at this low temperature when the same event would not take place at ordinary temperature then this event is of such great significance that it must be studied and studied thoroughly.

I cannot vouch for the validity of the experiment. I do not have the equipment or the facilities to perform the experiment. Of my own knowledge I cannot say that the above mentioned experiment was ever performed. I do know that I did read an account of such an experiment being performed. I certainly hope that it was; for it will, if true, provide us with a very powerful tool to use in finding a solution of gravity. I do not like to pursue will-o-the-wisps, mine is not a nature that likes blithful assumptions. Therefore I feel that it is necessary to discuss the few things that we do know that are in favor of the experiment.

1. The physics institute in question has long been known to be interested in low temp. experiments.
2. There would be no purpose served in attempting to foist a hoax upon us because the experiment was reported to be of such a simple nature that it could be easily verified.
3. Scientific oddities are reported in this manner.
4. The very fact that it was published without comment shows that no reason was known to doubt the validity of the experiment.
5. We know that many odd things do occur at extremely low temperatures.

These reasons are not positive evidence of anything, but they are sufficient to argue well in favor of pursuing the matter further. Experiments should be performed to see if this reported happening actually occurs. If we find that it does we would be able to observe directly just what would, or would not, effect this suspended piece of metal. We would have a method of performing gravity experiments upon a substance that gravity acted strangely upon. We certainly could not lessen our knowledge by performing such experiments.

Even if we should be disappointed in trying to duplicate the reported experiment we should still investigate the low energy states. For if quantum theory does break down at the energy limits then the low energy states provide us with a very convenient method of directly observing experiments.

This much we know. If a gravity insulator can exist then quantum theory must be made to account for gravity. For quantum theory to account for gravity some method of obtaining a new force equation must be found. The exchange forces provide us with the best hope of doing this. If quantum theory is not complete it will break down. It does break down at the high energy states. It seems logical to assume that it will also break down at the low energy states. And since the low energy states provide us with the best and cheapest method of directly observing precisely what does happen then the low energy states should be studied very, very carefully.

THE END