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Planck's Theory of Causation

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PLANCK'S THEORY OF CAUSATION

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Vita Auctoris

Henry Francis Birkenhauer, S. J. was born February 26, 1914 at Toledo, Ohio. He entered Good Shepherd Grade School in that city September 13, 1920, and graduated June 10, 1927. He entered St. John's High School in Toledo September 8, 1927, and graduated from it June 12, 1931. On September 14, 1931 he entered St. John's College in Toledo and spent two years there.

On August 8, 1933 he entered Milford Novitiate at Milford, Ohio, and was thereupon enrolled as a student of Xavier University in Cincinnati, Ohio. He remained at Milford Novitiate until August 16, 1935, when he was transferred to West Baden College, West Baden Springs, Indiana. Here he was registered as an undergraduate student of Loyola University. On June 10, 1936 he graduated from Loyola University with the degree of Bachelor of Arts.

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INTRODUCTION

On September 10, 1937, the Catholic Universe Bulletin of Cleveland carried the following article:

Noted Savant Declares

His Faith in God

Non-Catholic Resigns

Nazi Post to Accept

Papal Honor

> VIENNA - (NC) - A scientist so distinguished that he had been awarded the Nobel prize and is one of the savants named by His Holiness Pope Pius XI to the new Pontifical Academy of Science, although a non-Catholic, has just made public confession of faith in religious belief.
>
> He is Professor Max Planck, one of the greatest savants in the domain of natural science....[1]

Doubtless many Americans have never heard of Professor Planck's contributions to scientific knowledge. Yet to call him "one of the greatest savants in the domain of natural science" is not to praise him beyond his due, for his Quantum Theory is the basis of a large part of contemporary physics. An international authority on atomic structure, Neils Bohr, writes, for example:

> Scarcely any other discovery in the history of science has produced such extraordinary results within the short span of our generation as those which have directly arisen from Max Planck's discovery of the elementary quantum of action.[2]

This discovery was given to the world after years of scholarly research, as a glance at Planck's life will testify. He was born at Kiel, Germany, April 23, 1858 and at seventeen entered the University of Munich with physics his chief subject. He studied there and at the University of Berlin, receiving his doctorate in 1879.[3]

> Having received his doctorate, Max Planck became a Privat Dozent at the Munich University. The Privat Dozent is a university lecturer who receives fees but no salary. In 1885 Planck was appointed Professor of Physics at the University of Kiel and in 1889 he came to Berlin as Professor Extraordinarius there. In 1892 he was appointed full professor in succession to Kirchhoff at the University of Berlin. In 1912 he became Permanent Secretary to the Prussian Academy of Science. In 1919 he received the Nobel Prize for Physics. And in 1926 he became Professor Emeritus, Schroedinger succeeding him in the Berlin Chair of Theoretical Physics. In 1930 Adolf Harnack died and Max Planck was elected President of the Emperor William Society for the Advancement of Science, which is the highest academic post in Germany.[4]

This post he resigned in 1937 and became a member of the Papal Academy of Science.

It was in 1900 that Professor Planck proposed his Quantum Theory as an explanation of a problem of heat radiation. Yet

> it soon became evident that Planck had brought to light something that not merely explained the puzzle of the spectrum of radiant heat but something that is universally fundamental in nature. This was shown by the gradual application of his

theory in all directions.[5]

In fact, twentieth century physics consists very largely in "quantizing" natural phenomena.

Yet with this ever widening application of the Quantum Theory a new view of nature began to take shape in the minds of scientists. To what extent the Quantum Theory was responsible for this new philosophy of science will be determined in Chapter I. It is true, however, that physical activity began to be looked upon as the chance motion of many particles rather than as the ordely movement of determining causes. From this belief it was but a step to the denial of the principle of causality.

Max Planck, sensing that this change of opinion would ultimately be hurtful to the best interests of his science, has himself written on the subject of causality in nature. He has given to the world his own theory of causation in three recent books, The Universe in the Light of Modern Physics, Where is Science Going?, and The Philosophy of Physics.[6] These works are true philosophical literature, for they endeavor to explain the ultimate causes of natural phenomena by means of unaided reason.

To study these three books, codifying their views on causality and examining the philosophical soundness of these views, is the purpose of the present thesis. The writer begins his task in no spirit of controversy but simply in the hope that his critique may clarify the truth. His first chapter will sketch the origin of the modern doubt about causality; the remaining chapters will consider Planck's solution to this doubt.

Notes to Introduction

1. Catholic Universe Bulletin, Vol. LXIV, No. 11, p. 11.

2. Max Planck, Where is Science Going?, translated by James Murphy, Norton, New York, 1932, p. 18.

3. Cf. idem p. 20, 21.

4. Idem, p. 21, 22.

5. Idem, p. 26.

6. These three books are all published by W. W. Norton and Company, 70 Fifth Avenue, New York. Their dates of publication are 1931, 1932, and 1936 respectively.

CHAPTER I

THE PROBLEM OF PROBABILITY

"In these days of rapidly recurring crises," writes Rev. James McWilliams, S.J., "it is perhaps not surprising that there should be a crisis, if not something approaching actual bankruptcy, in the realm of science. The most alarming symptom of this crisis is the frequent assertion that there has been a breakdown in the constancy of the physical laws."[1] Now this "constancy has been termed by scientists, rightly or wrongly, 'causality'."[2] Since, then, this constancy seems no longer to exist in nature, many philosophers of science have concluded that causality likewise is non-existent.

Erwin Schrödinger, who succeeded Planck in the Berlin Chair of Theoretical Physics, is inclined to hold "the new, a-causal (i.e., <u>not necessarily</u> causal) point of view."[3] Sir James Jeans says that the "loose jointedness" of the universe "destroys the case for absolutely strict causation."[4] Such denials of causality are characteristic of many leaders of the New Physics, and we must understand their difficulties if we are to appreciate Planck's answer in his theory of causation. It is the purpose of this chapter, therefore, to consider the modern attitude towards causality in nature.

The scientific thought of the nineteenth century was dominated by Classical Physics. This view of nature had two fundamental tenets: first, matter is composed of atoms; second, energy is

propagated continuously. Rigid laws governed both the movement of atoms and the uniform transfer of energy. Hence scientists held that, if they knew the present state of a physical system, they could describe all the motions that brought it to its present arrangement and could predict with certainty all the activity that would ensue.

There was, however, one operation in nature that did not seem to obey their rigid laws. This was the transfer of energy in a beam of light. As we are all aware, light waves carry energy. If we place our hand in a beam of sunlight, it becomes warm - the beam has brought energy which we perceive as heat. The heat energy received can be accurately determined by allowing the ray to fall upon a thermometer.

The white light which comes from an incandescent solid, such as the glowing filament of an electric light bulb, is a mixture of several colors. These colors can be separated by a triangular piece of glass called a prism, as shown in Diagram 1 on the next page. Six colors will be plainly visible: red, orange, yellow, green, blue, and violet. Now science has found that these colors are caused by light of different wave-lengths, the red having a long wave-length, the orange a wave-length slightly shorter, and so on. The violet has the shortest wave-length of all.

It is evident from the diagram that those colors which have long wave-lengths transmit fewer pulses per second than those which have short wave-lengths. We have seen that energy is transmitted by light. Now the classical physicist, assuming that

Diagram 1

Energy Transfer according to Classical Physics

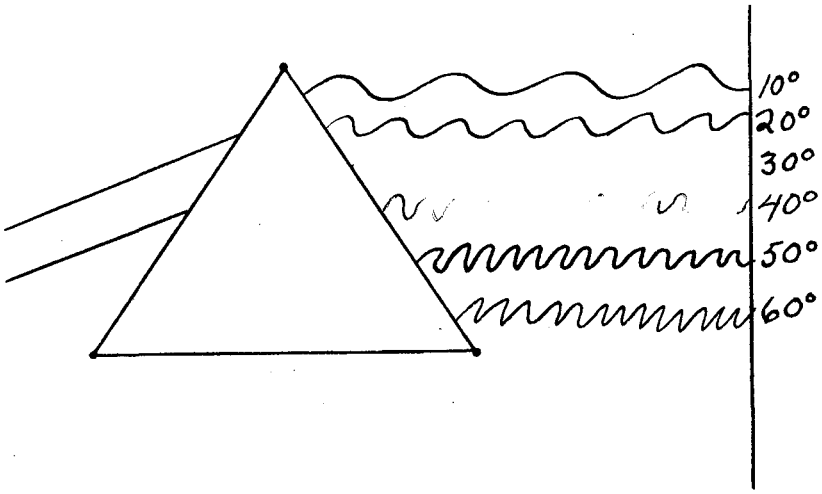
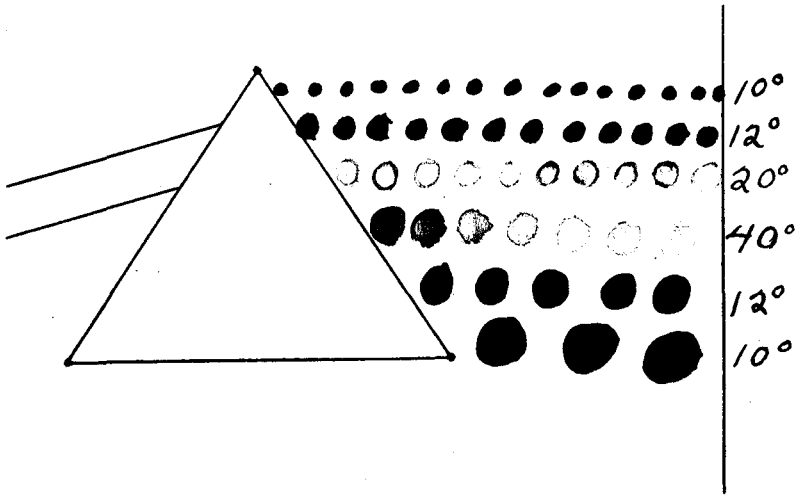


Diagram 2

Energy Transfer According to Quantum Physics



each of these colors had a continuous wave motion, would say: "The red waves have few pulses, therefore they will transmit a small amount of energy; the orange waves have more pulses, therefore they will transmit more energy; the violet waves have most pulses, therefore they will transmit most energy." Accordingly he would say that if the red waves gave a rise of ten degrees of temperature, the orange would give a rise of twenty, the yellow, a rise of thirty, and so on. In other words, the amount of energy would increase regularly, and this precisely because each beam of light flowed on uniformly, while one beam had more vibrations than another.

Yet when the physicist tried to verify his prediction, he found that the phenomena did not fit his theory. At both ends of the spectrum there is a small amount of energy given off, with a sharp rise in temperature at the center (see Diagram 2). Thus the red might give an increase of ten degrees, the orange of twelve, the yellow of twenty, and then the green might bring the thermometer to forty degrees, while the blue and violet would fall off again to the low amount of the red and orange.[5]

In 1900, however, Professor Planck proposed a view radically different from that of Classical Physics. "Radiant heat," he said, "is not a continuous flow and indefinitely divisible. It must be defined as a discontinuous mass made up of units all of which are similar to one another."[6] These units are not all of the same size: red light has small units of energy, orange light has larger units, violet light has the largest units of all.

planck called these units "quanta", and his Quantum Theory states that these quanta are larger for waves with many pulses such as the violet, and small for waves with few pulses, such as the red.[7]

This in itself, however, would not have solved the problem, for if the violet quanta are larger than the green, why do they not communicate more total energy? Hence Planck introduced a further qualification: these quanta are not emitted regularly like the bullets from a rapid-fire gun; their emission "will depend on the principles of probability."[8]

Just how this solved the problem can be seen from Diagram 2. The red quanta are small, that is, they require little energy to send them from the source. Therefore it is very probable that red quanta will be emitted, and hence the number of red quanta is large. One of these quanta, however, has only a very small amount of energy, and therefore, despite the large number of red quanta, the total energy sent to the red end of the spectrum will be small. The violet quanta are large, that is, they contain a large amount of energy. Yet, since much energy is needed to emit a violet quantum, the chances are small that a violet quantum will be emitted, and hence the total energy at the violet end of the spectrum will likewise be small. Somewhere between the red and the violet will lie a range in which the quanta have a fairly large amount of energy and for which the probability of emission is likewise high. This will be the range of maximum temperature.[9]

The Quantum Theory, therefore, solved the problem of the

uneven distribution of heat. This it did by introducing a radically new view of energy. Classical Physics had thought of energy first, as composed of continuous waves, and second, as emitted steadily from the source. Quantum Physics maintained first, that energy was composed of discontinuous particles, and second, that these particles were emitted at random from the source. It is this second tenet that has so greatly influenced modern scientific thought; the real significance of the Quantum Theory for philosophy is not that it solved a problem of heat radiation, but that it made probability an essential part of that solution. Let us therefore consider what is implied in the term "probability".

When a scientist says that one event is more probable than another he means that, of the two, the former will occur oftener than the latter if a very large number of trials is made. The reason why the former will happen oftener is that there are more possible ways through which it can come about. Thus in throwing dice, of the thirty-six possible combinations of the faces, there is but one combination that will give a two, and hence the probability of throwing a two is 1/36. There are, however, six combinations that will give a seven, and hence the probability of throwing a seven is 6/36 or 1/6. In a large number of throws, according to the scientist, seven will thus be thrown six times oftener than two.[10] It is this mathematical concept of probability which Planck applied in the Quantum Theory. Just as the

probability of throwing a two is small, so the probability of the emission of a violet quantum is small. And just as the probability of throwing a seven is large, so the probability of emission of a red quantum is large.

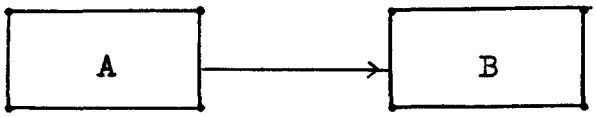
But probability has a further meaning. There is indeed regularity in the result, regularity for example in the ratio of throwing a two to that of throwing a seven, but the individual events are determined purely by chance. Thus it is mere chance that a two should result from any particular throw, though the aggregate effect shows regularity. Similarly, it is mere chance which determines that a red quantum should be emitted instead of a violet one, though the aggregate result will show regularity. And the reason why one outcome is more probable than another is simply that the number of possible accidents is greater for one than for another; the chances for the former are greater.

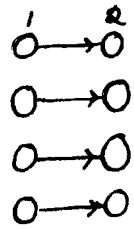
Diagram 3 on the following page is an attempt to show the difference between the view of nature adopted by Classical Physics and that accepted by Quantum Physics. First, to depict a whole physical state: state A, a body of water at ten degrees let us say, is always followed by state B, a temperature of twenty degrees, if the requisite quantity of heat is applied. The activity is inevitable and unique.

The same rigid laws were believed to govern the individuals taking part in the process. Each atom moves from position 1 to position 2, and their movements result in the change of the whole system. The activity of the atoms is also inevitable and unique.

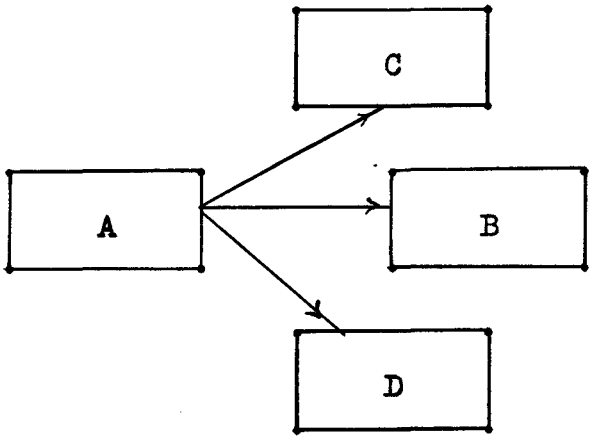
Diagram 3

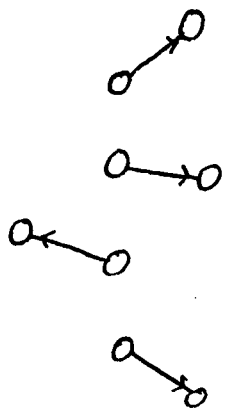
Classical Physics





Quantum Physics





In Quantum Physics, the process is conceived quite differently. State A may change to state B or state C or state D. The overwhelming probability, perhaps one million to one, is that it will change to state B. Yet because the direction is only highly probable, the activity is neither absolutely inevitable nor necessarily unique.[11]

Still more at variance is the concept of the activity of the units. The atoms move entirely by chance and we have as little right to call their activity inevitable as we have to call the outcome of a throw of dice or the spinning of a roulette wheel inevitable.

This, then, is the new view of nature which the twentieth century has brought to scientific thought. Two beliefs are fundamental to this view: first, activity in nature is aggregate activity; second, chance, not order, rules the movement of its units.

But why should this new picture of nature bring about a crisis in the world of science? Why, in particular, should scientists be led to believe "that new physical theories have rendered the principle of causality null and void"?[12] To answer this question we must consider how scientific men before the time of the Quantum Theory looked upon causality in nature.

Until the sixteenth century the accepted view of causality in nature was the scholastic dictum: "Physical beings are determined necessary causes and if left to themselves will produce the same effects under the same conditions."[13] It was Galileo who first decided to prescind altogether from metaphysical principles and "begin with experimental data."[14] The course of events which followed this introduction of a method largely empirical is thus described by Rev. Joseph Kelly, S.J.:

> The scientific genius of men like Tycho Brahe, Kepler, and Newton produced a picture of the universe in which the actions of bodies, the laws of nature, and the order of the world (were) expressed in mathematical terms. The accurate results obtained from this method obscured the philosophical concepts of the universe... A successful investigation of nature was to be found through the experimental method and the guiding principle was Physical Determinism,...the postulate... that natural activity will follow definite modes of action...

> Whether or not this was dependent upon the metaphysical principle of causality, the scientist did not inquire. He was content that experience justified him in the use of the principle and that he was able to generalize his experience and formulate his laws of nature according to which physical beings acted....
>
> An important consequence of this principle has been a notable emphasis on the predictability of events. Since nature is determined in its activity and there is an invariable sequence of phenomena, it follows necessarily, as Laplace states, that if we know sufficiently the antecedent factors, we can predict the consequent results. Science has adopted this course. This process introduced a practical identity between predictability and causality.[15]

From the foregoing analysis it is evident that the scientific concept of causality in nature consisted primarily in this: the philosophical notion of cause was neglected and causality was identified with predictability.

Now the Quantum Theory denies on principle that absolute predictability can ever be completely verified, for predictability fails when chance governs the motion of particles. Science can tell what will be the most probable configuration of atoms or quanta, but it cannot predict with certainty.

This, then, is the source of the modern doubt about the existence of causality in nature. The scientific concept of cause, a concept which confused causality with predictable succession, has been shown to be inadequate.

Science, therefore, is faced with a serious crisis. A decision has to be made between two alternatives: the denial of

causality in nature or the assertion that causality holds even in those atomic processes which seem to be ruled by chance. Those who deny causality, the indeterminists, are thus depicted by Planck:

> (They) maintain that there is no genuine causality or law in nature, and that the illusion of their existence is due to the fact that certain rules are found to occur which are very nearly but not absolutely valid. In principle the indeterminist looks for a statistical foundation for every physical law, even in that of gravitation; all these laws are for him laws of probability, referring to averages drawn from numerous similar observations, claiming no more than approximate validity for single observations and always admitting exceptions.[16]

The second alternative, scientific indeterminism, is described by Schrödinger as follows:

> We shall maintain that the behavior of each atom is in every single event determined by rigid causality. And we shall even contend that strictly causal determinism of the elementary processes, although we cannot observe their details, must necessarily be admitted, in order to allow the mass phenomena, which result from their operation, to be treated by the methods of statistics and the probability calculus. From this viewpoint causality would lie at the basis of statistical law.[17]

Scientists have taken sides upon these two alternatives. Some, such as Heisenberg and Dirac, are indeterminists; others, like Professor Einstein, favor the determinist view. One thing, however, is significant. Both sides mean by "causality" exactly what science has always meant by it: predictable succession. The

indeterminists deny that equations can be found which will describe the chance activity of particles; the determinists look for a higher mathematical synthesis which will explain all motion of atoms and quanta.

Into this controversy, in part at least precipitated by his Quantum Theory, Professor Planck has entered. He has endeavored to solve the problem of probability with what we have called his theory of causation. It remains now to examine that theory. For clarity's sake we shall consider his views under three headings: causality in the individual instance, causality as a universal law, and the relation of causality to free will.

Notes to Chapter I

1. J. McWilliams, S. J. Contingency in Physical Laws, Proceedings of the American Catholic Philosophical Association, Vol. XI, p. 39.

2. Idem.

3. Erwin Schrödinger, Science and the Human Temperament, translated by James Murphy and W. H. Johnston, Norton, New York, 1935, p. 145.

4. Sir James Jeans, The Mysterious Universe, Macmillan, New York, 1932, p. 32.

5. Cf. Encyclopaedia Britannica, eleventh edition, Vol. XXVI, p. 87.

6. Die Naturwissenschaften, Vol. 26, p. 490, quoted in Where is Science Going? p. 19.

7. Cf. Sir William Dampier, A History of Science and its Relations with Philosophy and Religion, Macmillan, New York, 1936, p. 401.

8. Idem.

9. Idem.

10. Cf. G. A. Wentworth, Elements of Algebra, Complete Edition, Ginn, Boston, 1881, p. 353.

11. Cf. Sir James Jeans, The Mysterious Universe, p. 23, 24.

12. Dr. Fulton J. Sheen, Philosophy of Science, Bruce, Milwaukee, 1934, p. 155.

13. J. Kelly, S.J., Nature's Laws and the Principle of Causality, Bulletin of the American Association of Jesuit Scientists, Loyola College, Baltimore, Vol. XIII, no. 2, p. 54.

14. Idem.

15. Idem, p. 55, 57.

16. Max Planck, The Philosophy of Physics, translated by W. H. Johnston, Norton, New York, 1936, p. 50.

17. Erwin Schrödinger, op. cit., p. 49, 50. His Fig. 1, p. 56, suggested our Diagram 3 (p. 15).

CHAPTER II

INDIVIDUAL CAUSATION

Since causality is nothing but an explanation of change in the real world, any adequate theory of causality must first answer the question: Does the external world exist? Dr. Planck replies in the affirmative in his first philosophical book by appealing to "reason" or "common sense."[1] In his next book, Where is Science Going?, he gives two "theorems":

> (1) There is a real outer world which exists independently of our act of knowing, and (2) The real outer world is not directly knowable.[2]

Planck calls these propositions theorems because he maintains that they are not provable logically but are rather truths which it is necessary for us to assume. This point of view is stated more explicitly in a later chapter of his second work:

> In other words, the fundamental principles and indispensable postulates of every genuinely productive science are not based on pure logic but rather on the metaphysical hypothesis -which no rules of logic can refute - that there exists an outer world which is entirely independent of ourselves....
>
> Once the scientist has begun by taking his leap into the transcendental he never discusses the leap itself nor worries about it. If he did science could not advance so rapidly. And anyhow - which is fundamentally a consideration of no less importance - this line of conduct cannot be refuted as inconsistent on logical grounds.[3]

According to Planck, therefore, the existence of the external world is an assumption which it is necessary to make at the beginning of any scientific investigation, an hypothesis which has the merit of self-consistency. In our critique of his theory in the second part of this chapter we shall endeavor to show that our belief in the existence of the real world can rest on other and more compelling evidence.

Like the existence of the real world, causality seems to be something independent of us:

> ...the conclusion to which we are led is that causality is something fundamental. We suspect that it is ultimately independent of our senses and of our intelligence and is deeply rooted in that world of reality where a direct scientific scrutiny becomes impossible. For surely it will be admitted that even if the earth with all its inhabitants were to perish, the cosmic events would still continue to obey their causal laws, even though no human being were alive to test the meaning and justification of such a claim.[4]

Since the world exists, causality exists; the mind may as reasonably admit the latter as the former.

What, then, is the nature of causality? Dr. Planck continues:

> I propose to commence the next stage with the simple and general proposition that an event is causally conditioned if it can be foretold with certainty. Of course I mean no more by this than that the possibility of correctly foretelling the future is a safe criterion of the presence of a causal connection; I do not mean that the two are identical. To take a familiar instance: during the day we can foretell the coming

> of night with certainty and we may hence infer that the night has a cause; but we do not for that reason treat day as being the cause of night. On the other hand it frequently happens that we assume the existence of a causal nexus where it is wholly impossible to make a correct forecast. This applies, for example, to the weather.[5]

Predictability seems, therefore, to be a safe criterion of causality.

Yet, as Dr. Planck continues his analysis, he is confronted with a difficulty in the practical order:

> On further scrutiny, however, we reach a very remarkable discovery. However simple the conditions which we select and however delicate our instruments, we shall never be able to calculate in advance the result of the measurement with absolute accuracy, i.e. so as to agree to all places of decimals with the number measured. There always remains an element of inaccuracy. This is not the case in purely mathematical calculations, e.g. when the square root of 2 is calculated, which can be stated with complete accuracy to any number of places. And what applies to mechanics and heat is true of all the branches of physics, e.g. of electrical and optical events.
>
> The available facts accordingly compel us to admit that the state of affairs may be correctly summed up by saying that in no single instance is it possible accurately to predict a physical event.
>
> If we place this fact in juxtaposition with the proposition from which we started previously, when it was said that an event is causally determined if it can be accurately predicted, we find ourselves faced with an inconvenient but inescapable dilemma. If we rigidly maintain our original proposition then nature does not present us with a single instance where it is possible to assert that there is a causal connection; if we

> insist that somehow room must be found for strict causality then we are compelled in some respect to modify the proposition from which we started.[6]

This is the dilemma which we discussed in Chapter I (p. 17, 18) and there we indicated the two solutions: determinism, which still believes in causality, and indeterminism, which calls all laws of nature statistical. Planck accepts the former solution, as he makes clear in the following passage:

> In point of fact, statistical laws are dependent on the assumption of the strict law of causality functioning in each particular case. And the non-fulfillment of the statistical rule in particular cases is not therefore due to the fact that the law of causality is not fulfilled, but rather to the fact that our observations are not sufficiently delicate and accurate to put the law of causality to a direct test in each case. If it were possible for us to follow the movement of each individual molecule in this very intricate labyrinth of processes, then we should find in each case an exact fulfillment of the dynamical laws.[7]

The "dynamical laws" are the physical laws which suppose predictable causality. Hence, according to Planck, causality does exist in nature, for statistical laws suppose that the individual is moved by some other being. Furthermore, his criterion of causality, predictability, could really be had but for our limited knowledge, and is had by an omniscient intellect:

> ...we are induced to assume that an ideal intellect having complete knowledge of to-day's physical events in all places should be in a position to foretell tomorrow's weather with complete accuracy. The same applies to every forecast of

physical events.[8]

These, then, are the first steps in Dr. Planck's theory of causation: (1) The external world must be assumed to exist; (2) causality, whose criterion is predictability, is as real as that world; (3) in individual cases we may not be able to predict, yet the activity of nature is causal and can be predicted by an omniscient intellect. Let us now consider each of these points philosophically.

First, the external world must be assumed to exist. The existence of the world should certainly be established at the beginning of any philosophical inquiry, for if we are to explain what takes place in the world we must first be sure that the world exists. However, Dr. Planck does not establish this fact but merely takes it for granted, as his words "theorem,"[9] "hypothesis,"[10] "leap into the transcendental,"[11] clearly show. Now it is quite true that we cannot <u>reason to</u> the existence of the external world, yet we can adduce abundant <u>evidence</u> for its existence. Let us briefly examine some of this evidence.

Fundamental to this whole inquiry is the aptitude of the mind for truth. If our knowing faculties are capable of attaining reality, then we may use their testimony to show that the world does exist. But our knowing faculties are apt for truth, since to deny that they are involves a self-contradiction. One who asserts that his intellect is perpetually deceiving him equivalently declares that he can be sure of nothing. Yet he cannot

deny the validity of knowledge without being certain of at least one thing - that knowledge is of itself fallible. He is convinced that he must doubt, hence he maintains that the necessity of doubting is most certain and undeniable. Such a state of mind, however, manifestly contradicts itself, for the sceptic is sure of nothing and sure of something (the necessity of doubting) at one and the same time. Universal doubt, therefore, and hence the honest denial of the aptitude of the mind for truth, is impossible.[12]

Furthermore, there are many things of which we are naturally, spontaneously certain. As soon as we know what is meant by a "thing" we realize that a thing cannot be and not be at one and the same time. We also know with certitude that twice two is four, that the whole is greater than its part, and many other self-evident truths. Now in our very knowledge of these things, we make an implicit act of reflection, that is, we look at the subject and the predicate of the statement, see that these apprehensions represent reality, see that these realities are connected, and see further that we are justified in giving our assent precisely because the matter is as we judge it to be. In other words, we implicitly see the nature of our cognition to be an accurate representation of reality; we verify the aptitude of the mind for truth.[13]

Having shown that the mind is trustworthy, we may now consider the evidence which it offers in support of the existence of the external world. The first fact is the "concept of external-

ity, which cannot be accounted for"[14] unless there is something beyond the thinking subject, for

> If a man were living on an estate so vast that he could never reach the boundaries of it, he would never know - of his own knowledge - that it had any, and so that there was anything outside it or that he himself was within it....If, as the Idealists suppose, this state of affairs could be extended to all our knowledge, so that we could never know anything external to it, we could know nothing as internal either, and the distinction between the two could not be drawn.[15]

Other facts are the distinction which we make between possible things and things which actually exist, the distinction between the things which we fancy and the things which we labor to produce, and the distinction between truth and error. The only explanation which can be given for our even adverting to these differences is the existence of the external world.[16]

The facts just cited are neither assumptions nor logical processes. They are, if you wish, experimental evidence which anyone may verify for himself. Had Dr. Planck based his theory on some such evidence, his further reasoning would have a more solid foundation. The fact that he did not is, in our mind, a basic defect.

Second, causality, whose criterion is predictability, is as real as the external world. Dr. Planck declares, therefore, that the concepts of cause and effect have objective validity. Yet he seems to confuse the criterion of causality with causality itself, for no sooner does he begin to discuss causality than he devotes

his entire attention to predictability:

> When we say that there is a causal connection between two events, we mean that there is some kind of law connecting them, the earlier event being called the cause, and the latter the effect. The question then arises as to what is the specific nature of the nexus between them. Is there any criterion permitting us to say that a given natural event is the effect of another?[17]

Now, although we may know the criterion of the presence of a thing, our knowledge is incomplete until we grasp its nature. Thus no chemist would be content to know merely that starch turns blue at the presence of iodine; he wants to discover the nature and further properties of the iodine molecule. Accordingly, it seems to us that a philosopher should not rest satisfied with the statement that predictability is a criterion of causality; he should examine the origin, content, and verification of the concept of cause. This threefold analysis, applied by Planck himself to scientific ideas,[18] reveals the following facts.

The numerous changes taking place in the world about us are among the first objects of our experience. As we grow older we observe that we ourselves can make things change by moving them, altering their shape, or converting them into other things. We notice that in every change an object already existing acts. These facts are altogether unrelated in our mind, however, until we begin to ask the question, Why? What reason can we assign for a particular change? Obviously the thing which has just begun to

exist is not the reason for its own existence since before it existed it was unable to act. The reason for its existence must be sought outside it. This reason we call a cause.

Furthermore, we soon learn to know just what causes are responsible for certain effects. The bruise on our forehead resulted from the causal influx of a particular stone; the heavy weight on the floor owes its present position to me. We acquire the concept of cause, therefore, by asking the question, "Why do things change?" and noting the influx of physical agents. Hence a cause is that which by its physical action produces another being which of itself cannot exist.[19]

Having examined the origin and content of the concept of cause, let us now consider the verification of this concept in nature. First of all, we may say that, in general, natural objects are true causes. The same senses which bring us knowledge of the external world represent objects as acting upon us; thus not only do I perceive heat, but I perceive the heat of a fire, and I perceive that the fire is hot.[20] Now if the fire were not the cause of the heat which I feel, I ought merely to experience a sensation of warmth without acknowledging any source of that warmth. Either, then, the fire is really a cause or my senses err about a most evident object and I am compelled to deny their veracity, saying that the real world which I know through them is only an illusion. This admission is altogether untenable, as we have shown above (p. 26). In other words, my senses reveal that

beings are causes just as surely as they reveal the existence of things about me.

When we try to find a particular cause for a particular effect, however, we often meet with difficulties. The interplay of forces in nature's activity is so complicated that frequently we are at a loss to decide which precise natural agents are responsible for an individual effect. We do observe that certain things are required to produce a particular object: sunlight, air, and nourishment are needed for the growth of a plant. We note that if these are there in the proper proportions, the plant will mature; if they are absent, the plant will die. This is not a mere perception of succession - we understand that the plant depends upon these factors.[21] And because the effect inevitably results from these antecedents we can say that this inevitability is a criterion of the presence of causal action. Now "inevitable" means for the observer the same as "predictable" - he can forecast the result because it will always follow. Hence predictability may with justice be called a criterion of causality.

Predictability, however, is merely an external sign that a being is a cause. What is the intrinsic reason why I am able to predict? It must be that the internal nature of the agent is so constituted that it will necessarily act if the required conditions are present.[22] We know that natural bodies act; therefore they have some internal source of activity. We know that natural bodies must act if the required conditions are present; therefore

this source of activity is endowed with a necessity for action.

Necessity, however, can be either absolute or contingent.[23] Thus it is absolutely necessary that twice two should equal four. Any other result from this multiplication is simply impossible, and therefore the doubling of two is determined to one result independently of any conceivable circumstance. The activity of bodies, on the other hand, is not determined to one result with the same absolute necessity, for it would not involve a contradiction in terms if some natural cause, given all the required perceptible conditions, would not act. The actions of bodies are truly determined to one thing, yet that determination is not absolutely binding, for its cessation involves no internal contradiction. Such necessity we may call contingent to distinguish it from absolute or independent necessity.

The necessity with which bodies act, therefore, is a contingent or dependent necessity. Upon what does this necessity depend to be effective? Clearly it does not depend on the cooperation of natural bodies or of man himself - the laws of nature can be set aside by neither. Only He Who is indispensable for the existence of a body can be likewise indispensable for its activity, and therefore it is upon God that natural causes depend for their effectiveness. Let us briefly consider the reasoning which leads us to this affirmation.[24]

The world exists outside the mind, as we have seen, and the intellect gives us accurate information about this world. Indi-

vidual beings which we observe in this world do not by their very nature demand existence, for there was a time when they were not and there comes a time when they cease to be what they are. Hence these beings need a cause for their existence. An infinite series of finite causes cannot explain the real world for the whole series is just as impotent as is each member to produce its own being. Therefore some uncaused cause must ultimately be responsible for whatever exists. This uncaused, self-existent Being we call God. He must be one, absolutely simple; composition implies another cause, a composer. If simple, immutable; change presupposes duality: a given perfection and a capacity for further perfection. God, then, is infinitely perfect, for He lacks all capacity for further perfection.

It is clear, then, that natural causes depend on God at least for their beginning. But their activity must also depend on Him, for if one of His creatures could act independently of Him God would not be all-perfect. His power would be limited, since that creature would not be subject to Him.[25] The harmony of the universe points to a Supreme Lawgiver Who implanted in His creatures tendencies to orderly activity.[26] But if that Lawgiver could not set aside those laws in some particular case to achieve a higher end He would not be a ruler but a subject of His own vassals.

Dr. Planck's third point, that in individual cases we may not be able to predict, yet that prediction can be had by an omniscient intellect, is elucidated in the light of what we have just

seen. This omniscient intellect, which for Planck may be just a mere abstraction, is a real Being, Who suffers neither from lack of knowledge nor lack of power and can therefore see the true causes which may be unknown to us as well as direct their activity according to His most wise designs.

Dr. Planck, therefore, considers individual causation in its threefold aspect: the existence of the real world, the criterion of causality, the explanation of exceptions. We have endeavored to show where his doctrine is inadequate, basing our analysis on evidence available to all. Our conclusions, that the external world most assuredly does exist, that predictability is based on contingent necessity, and that exceptions are to be explained not only through our ignorance but also through God's omnipotence, will, we trust, be admitted as readily as the facts on which they rest.

Notes to Chapter II

1. Max Planck, The Universe in the Light of Modern Physics, translated by W. H. Johnston, Norton, New York, 1931, p. 8, 9 - "reason"; p. 15 - "common sense." The terms are used synonymously, though distinguished on p. 8. Both seem to mean "the ordinary judgment of men."

2. Where is Science Going?, p. 82. The second theorem refers to the manner of our cognition of the real world; we have omitted discussing it because the point at issue is the existence of that world.

3. Idem, p. 138, 139.

4. The Philosophy of Physics, p. 46.

5. Idem, p. 47, 48.

6. Idem, p. 49, 50.

7. Where is Science Going?, p. 145.

8. The Philosophy of Physics, p. 76.

9. Where is Science Going?, p. 82.

10. Idem, p. 138.

11. Idem, p. 139.

12. Cf. C. Frick, S. J., Logica, Herder, Friburg, 1931, ed. 7a, p. 154.

13. Cf. C. Boyer, S.J., Cursus Philosophiae, De Brouer, Paris, 1935, Vol. I, p. 175 - 181.

14. R. P. Phillips, Modern Thomistic Philosophy, Burns, Oates, and Washbourne, London, 1935, Vol. II, p. 57.

15. Idem.

16. Cf. B. Wuellner, S. J., Logic Notes (MS.), Thesis 19.

17. The Philosophy of Physics, p. 44.

18. Cf. idem, p. 89 - 102.

19. Cf. B. Wuellner, S. J., Ontologia (MS.), Thesis 23. We are using the word "cause" only in the sense of an efficient

cause.

20. Cf.St. Thomas Aquinas, De Potentia, q. 3, art. 7, c.; in Quaestiones Disputatae, Marietti edition, Vol. I, p. 58.

21. Cf. J. Kelly, S. J., Nature's Laws and the Principle of Causality, Bulletin of the American Association of Jesuit Scientists, Loyola College, Baltimore, Vol. XIII, no. 2, p. 56, footnote.

22. Cf. "Ratio autem sumenda est ex intrinseca conditione et determinatione naturae" - F. Suarez, S. J., Disputationes Metaphysicae, disp. 19, sectio 1, 1; in Opera Omnia, ed. nova, Louis Vivès, Paris, 1861, Tomus XXV, p. 688. In the same place Suarez enumerates as the conditions required for the action of a necessary cause: (1) Complete and sufficient power on the part of the cause, (2) an object capable of being changed and ready to be acted upon, (3) a medium (if one is needed) which is ready to transmit the action of the agent and able to transmit it, (4) absence of impeding causes of power equal to that of the agent, (5) that the object to be acted upon is not already in the state to which it is to be brought.

23. Cf. C. Frick, S. J., op. cit., p. 140, no. 229.

24. Cf. P. Nolan, S.J., Theodicea (MS.), p. 17, 32, 33, 39, 48.

25. Cf. V. Remer, S.J., Summa Philosophiae Scholasticae, ed. 7a, Gregorian University, Rome, 1931, Vol. VI, p. 218.

26. Cf. B. Boedder, S.J., Natural Theology, second edition, Longmans, London, 1899, p. 46 - 62.

CHAPTER III

THE LAW OF CAUSALITY

The second aspect of causation which Dr. Planck discusses is the principle or law of causality. This principle states: "Whatever exists contingently requires an efficient cause for its existence,"[1] and the point at issue is to determine whether this principle is true universally or not. Is an uncaused contingent event a contradiction in terms? If so, then the statement "Whatever happens is caused" is absolutely certain and valid for all past, present, and future events.

That Dr. Planck understands the problem precisely as we have stated it is evident from the following quotation. His second sentence is identical in meaning with our formulation of the principle of causality, for "whatever exists contingently" is the same as "every event in every instance":

> When we find ourselves face to face with an event which we cannot possibly refer to any cause or series of causes, and which lies outside the range of all the causes we are familiar with, then what happens? Is it perfectly certain and necessary that for every event in every instance there must be a corresponding cause? Would the thought involve a logical contradiction that in this or that case the event has absolutely happened of itself and has no causal relation whatever to any other event? Of course the answer is in the negative; for it is very easy to <u>think</u> of an event as having no explanatory cause whatsoever. In such cases we speak of miracles and wonders and magic. And the simple fact that there

> exists a whole range of literature whose scenes are laid in wonderland is proof in itself that the concept of strict causality is not an inherent necessity of human thought. Indeed the human mind finds little difficulty in thinking of everything in the world as turning topsy-turvy. We can say to ourselves that to-morrow the sun may rise in the east,(*) for a change. We can say to ourselves that a miracle of nature may occur, contrary to all the known laws of nature. We can think of the Niagra Falls for instance as shooting upwards, though this would be impossible in the world of reality. I can think of the door of my room in which I am now writing as opening of its own accord. And I can think of historical personages as entering the room and standing beside my table. In the world of reality to talk of such events may be meaningless and we may call them impossible, at least in our everyday way of reasoning. But we must distinguish this kind of impossibility from a logical impossibility, such as the idea of a square circle or that the part of something is greater than the whole, for no matter what efforts we make to think such things we cannot think them, inasmuch as they entail an inner contradiction. We can think of a part and we can think of the whole to which it belongs but we cannot think of the part as greater than the whole. This kind of impossibility is inherent in the nature of human thought itself, whereas the idea of something happening outside the range of causation is quite logically coherent.
>
> Thus from the outset we can be quite clear about one very important fact, namely, that the validity of the law of causation cannot be decided on grounds of abstract reasoning.[2]

Dr. Planck holds, therefore, that human reason cannot prove the necessity of the principle of causality. According to him, "A strictly causal way of looking at things...is wholly compat-

ible with modern physics although its necessity cannot be demonstrated either a priori or a posteriori."[3]

But, since the principle of causality cannot be proved valid, is it then to be rejected? No, answers Dr. Planck, it is to be assumed in the same way as the existence of the real world is assumed:

> Having once assumed the existence of an independent external world, science concomitantly assumes the principle of causality as a concept entirely independent of sense-perception. In applying this principle to the study of natural phenomena science first investigates if and how far the law of causal relation is applicable to the various happenings in the world of nature and in the realm of the human spirit. Science finds itself here exactly on the same footing which Kant took as the starting-point of his theory of knowledge. As in the case of Kantian philosophy, so also in the case of each special branch of science the causal concept is accepted at the outset as belonging to those categories without which no progress in knowledge can be made. But we must make a certain differentiation here. Kant took not merely the concept of causality but also to a certain degree the meaning of the causal law itself as an immediate datum of knowledge and therefore universally valid. Specialized science cannot go thus far. It must rather confine itself to the question as to what significance the law of causality can be proved to have in each individual case, and thus through research give practical meaning and value to the empty framework of the causal concept.[4]

In other words, science must assume the principle of causality but not as unequivocally as it assumes the existence of the external world. Science is prepared to accept the world as it

seems to be; science is prepared to acknowledge the principle of causality only in those cases which she has tested. The principle of causality is therefore a helpful guide in understanding nature but not an absolutely certain law. This point of view is summed up by Planck in the following sentence:

> It is true that the law of causality cannot be demonstrated any more than it can be logically refuted: it is neither correct nor incorrect; it is a heuristic principle; it points the way, and in my opinion it is the most valuable pointer that we possess in order to find a path through the confusion of events, and in order to know in what direction scientific investigation must proceed so that it shall reach useful results.[5]

From the above quotations it is clear that Planck's views on the law of causality can be reduced to three: (1) An uncaused contingent event is not a contradiction in terms; (2) the principle of causality cannot be demonstrated; (3) therefore this principle is not universal but to be acknowledged by science when circumstances justify its validity. Let us now consider the philosophical soundness of each of these three tenets.

First, an uncaused contingent event is not a contradiction in terms, for we can "<u>think</u> of an event as having no explanatory cause whatsoever,"[6] whereas we cannot think of a square circle or of a part greater than its whole, since these concepts "entail an inner contradiction."[7] Let us examine the validity of this proof.

When we "<u>think</u> of an event as having no explanatory cause

whatsoever," what precisely have we in mind? Are we trying to conceive a causeless contingent event or are we simply representing nature as acting in an unaccustomed way? From all of Dr. Planck's examples it is evident that we are doing the latter. Now, as we saw in Chapter II (p. 31), nature's laws are not absolutely necessary; their abrogation does not involve a contradiction in terms. The cessation of accustomed physical activity, as was mentioned, is not self-contradictory, and hence conceivable. Therefore Dr. Planck's argument merely proves that we can represent nature as acting differently - a fact which does not reach the point of the problem.

The point at issue is not: "Can nature act differently?" but "Can an event happen absolutely of itself?"[8] This problem, since it deals with a universal law, is similar to the problem of the whole and its part. Dr. Planck has shown how the latter is to be solved: by forming a concept of whole and part and seeing if there is "an inner contradiction."[9] This method, which supposes that opposition of ideas argues incompatibility of realities, is perfectly valid, for the mind represents reality truly. Hence we shall analyze the concepts "an event" and "happen absolutely of itself" to see if they "entail an inner contradiction."

An event, i.e. a contingent happening, is one which does not exist necessarily; its nature does not demand existence but is indifferent to it.[10] Hence an event "happens" - it is possible for it to exist and it is possible for it to cease to exist;

there is no iron law of its inner essence requiring that it come into being. Yet, as a matter of fact, events do come into being - the happenings of daily life, the changes taking place in the external world are nothing but contingent occurrences which could be otherwise. Now when faced with an actual event, we naturally ask, "Why does it exist?" That question, "Why?" demands the sufficient reason for the thing. Now it is as certain as the principle of contradiction that every single thing has a sufficient reason, that is, has everything needed to make it what it is. He who denies this principle asserts that a thing can exist without what is indispensable for its existence - a manifest contradiction.[11] Clearly the reason for the existence of the event is not itself, for then it would have produced itself; it would have existed before it actually was. Therefore the reason for its existence must be sought outside it, in some other being. This other being we call a cause.

The analysis which we have just made applies to every event which happens, for all are alike in this, that the sufficient reason for their existence is not within them, and therefore in some external cause. Hence no event can happen absolutely of itself, for the idea "event" demands an external cause and the idea "happens absolutely of itself" denies that such a cause exists. In other words, the principle of causality, "Whatever exists contingently requires an efficient cause for its existence,"[12] is as certain as the statement, "The whole is greater than any of its parts."

This conclusion, that the principle of causality is absolutely certain, proves that an uncaused contingent event is a contradiction in terms, and therefore that the first of Dr. Planck's views on the law of causality is inadmissible. His second tenet, that the principle of causality cannot be demonstrated, is shown false by the same investigation. Our analysis did establish the necessity of the principle of causality, for the predicate, "requires a cause," is necessarily connected with the subject, "contingent event," and that connection is known by the mind from the nature of the terms. The reason for this necessary connection is the intrinsic nature of the objects represented, which, as is evident from the above analysis, demands their interconnection.[13]

Because the judgment, "Every contingent event requires a cause," is analytic, i.e. derived from an analysis of subject and predicate, it is absolutely universal, for it fits the nature of the thing wherever found[14] since the concepts "contingent event" and "caused" represent two essences and prescind from this or that individual. These concepts are true, for the mind represents things as they are; therefore, wherever and whenever a contingent event takes place, it is absolutely necessary that it proceed from a cause. Hence Dr. Planck's third point, that the principle of causality is not universal, must be denied.

From this chapter it is evident, then, that we cannot agree with Dr. Planck in holding that the law of causality is neither

necessary, demonstrable, nor universal. We must maintain, in view of the facts cited, that this principle is necessary, certain, and absolutely universal. And hence, in the words of Msgr. Sheen,

> If the principle of causality is metaphysical and transcendental, if by its nature its foundation is its indirect relation with the principle of identity, it is therefore independent of time and space; if its objectivity is grounded on an abstractive communion with the real, it follows that the physical theories no more affect its validity than the discovery of manganese affects mother-love.[15]

Notes to Chapter III

1. B. Wuellner, S.J., Ontologia (MS.), Thesis 25, p. 1.
2. Max Planck, Where is Science Going?, p. 112, 113. *The word "east" is the one used in the text; clearly it should be "west".
3. Max Planck, The Philosophy of Physics, p. 73.
4. Where is Science Going?, p. 140.
5. The Philosophy of Physics, p. 82, 83.
6. Where is Science Going?, p. 112.
7. Idem, p. 113.
8. Idem, p. 112.
9. Idem, p. 113.
10. Cf. B. Wuellner, S.J., op. cit., Thesis 25, p. 1.
11. Cf. Idem, Thesis 22, p. 3.
12. Idem, Thesis 25, p. 1.
13. Cf. C. Frick, S.J., Logica, Herder, Friburg, 1931, ed. 7a, p. 254 - 257.
14. Cf. Idem, p. 255, 256.
15. F. J. Sheen, Philosophy of Science, Bruce, Milwaukee, 1934, p. 155.

CHAPTER IV

CAUSATION AND FREE WILL

We have seen that a cause is a being which by its physical action brings something into existence.[1] In the sense of this definition human beings are most assuredly causes, yet the fact that we do produce things in the external world gives rise to a problem. If we are true causes, it seems that, given all the required conditions, we should inevitably produce a definite effect. Such a supposition, however, contradicts experience by denying freedom to the human will. Let us see how Dr. Planck solves this difficulty.

First we must consider precisely how Dr. Planck understands the problem of causation and free will. He puts the question in the following words:

> This is one of man's oldest riddles. How can the independence of human volition be harmonized with the fact that we are integral parts of a universe which is subject to the rigid order of nature's laws?
>
> At first sight these two aspects of human existence seem to be logically irreconcilable. On the one hand we have the fact that natural phenomena invariably occur according to the rigid sequence of cause and effect. This is an indispensable postulate of all scientific research, not merely in the case of those sciences that deal with the physical aspects of nature, but also in the case of the mental sciences, such as psychology. Moreover, the assumption of an unfailing causal sequence in all happenings is the basis on which our conduct of

> everyday life is regulated. But, on the other hand, we have our most direct and intimate source of knowledge, which is the human consciousness, telling us that in the last resort our thought and volition are not subject to this causal order. The inner voice of consciousness assures us that at any given moment we are capable of willing this or that alternative.[2]

Again,

> Each one of us is an integral part of the world in which we live. If every other event in the universe be a link in the causal chain, which we call the order of nature, how can the act of human volition be looked upon as independent of that order? The principle of causation is either universally applicable or it is not. If not, where do we draw the line, and why should one part of creation be subject to a law that of its nature seems universal, and another part be exempted from that law?[3]

From these citations it is evident that Dr. Planck conceives the problem as an antinomy between the principle of causality and the freedom of the human will. However, he understands by the "principle of causality" something quite different from the principle which we discussed in Chapter III. His words, "natural phenomena invariably occur according to the rigid sequence of cause and effect," "the rigid order of nature's laws," and "the causal chain, which we call the order of nature,"[4] show that when he talks of causation he is thinking of the uniformity of nature's activity. That is to say, the principle of causality can have two meanings: (1) Every contingent thing must have a cause,

(2) Every cause will produce its effect under the required conditions. It is the second meaning of this principle which Dr. Planck has in mind.

In Chapter III we have shown that the principle of causality, understood in its first meaning, is necessary, certain, and absolutely universal (p. 40 - 43). We said nothing about the second meaning of this principle; we shall consider this second meaning in the latter part of this chapter. Dr. Planck, however, as is evident from his indiscriminate use of both forms,[5] does not distinguish between the two. For him it is the same to say, "Every contingent thing must have a cause," as "Every cause will produce its effect under the required conditions."

Furthermore, Dr. Planck, although he maintains that the validity of the principle of causality "cannot be decided on grounds of abstract reasoning,"[6] believes nevertheless that this principle"is an indispensable postulate of all scientific research," even for psychology.[7] Hence science must hold, according to him, that "natural phenomena invariably occur according to the rigid sequence of cause and effect."[8] Mental phenomena (including volition), it would seem, must therefore be necessarily determined.

But perhaps the principle of causality, understood as requiring that every cause must produce its effect, is not universal. Perhaps there are exceptions to "the rigid sequence of cause and effect."[9] If there are, then human volition can be exempted from "the causal chain."[10] Accordingly, Dr. Planck

considers the possibility of exceptions:

> For our present purpose it is much more important to ask whether the causal connection between events must be condidered as absolutely complete and always unbroken or are there events in the world which do not enter the chain as connecting links?[11]

Because philosophers have differed so widely in their answers to this question, Dr. Planck decides that he cannot get a satisfactory answer from them and accordingly turns to science.[12] He observes that the physical sciences, physics, astronomy, chemistry, and mineralogy "are all based on the strict and universal validity of the principle of causality."[13] Biology, too, "sets its face against permitting exceptions as such to exist."[14]

Next Dr. Planck turns to "those sciences which deal with human events," history and sociology.[15] According to his theory that we must test the validity of the principle of causality in each individual case,[16] he considers a particular person:

> That individual personality has inherited qualities such as bodily conformation, intelligence, imaginative capacity, temperament, personal tastes and so on. Working on this personality we have the physical and psychic influences of the environment, such as climate, food, upbringing, companionship, family life, education, reading, etc. Now the question is whether all these data determine the conduct of this personality in all its particulars and according to definite laws. In other words if we suppose, what is impossible in practice, that we had a thorough and detailed knowledge of all these factors here and now, could we tell with certainty, on the causal basis, how the individual will act a moment hence?[17]

And his answer:

> ...I think that it may be said definitely that the direction which the humanist sciences, such as psychology and history, are developing nowadays furnishes certain grounds for presuming that the question should be answered in the affirmative. The part which force plays in nature, as the cause of motion, has its counterpart in the mental sphere in motive as the cause of conduct. Just as at each and every moment the motion of a material body results necessarily from the combined action of many forces, so human conduct results with the same necessity from the interplay of mutually reinforced or contradicting motives which partly in the conscious and partly also in the unconscious sphere work their way forward towards the result.[18]

According to Dr. Planck, therefore, motives inevitably determine conduct and hence the principle of causality, understood as meaning "Every cause produces its effect under the required conditions" applies to human volition. In Planck's theory, man's power of choice, i.e. his will, is determined to one line of activity by the conditions and motives which influence it.

After he has proposed this deterministic solution, however, Dr. Planck forsees two difficulties which attend it, and these he attempts to solve.

The first difficulty is the fact that predictability, his criterion of causality, does not seem to be verified for the actions of men. Dr. Planck admits that "it is perfectly true that many acts which are done by human beings appear to be inexplicable."[19] Yet he solves this problem just as he solved the

problem of non-predictability for the actions of natural bodies: he asserts that we cannot predict because of lack of knowledge of the influencing motives and that such knowledge is within the power of higher intelligences. In his own words:

> The conclusion, therefore, is that the highest types of human intelligence are subject to the causal law in the processes that result in even their greatest achievements. That is the first part of our conclusion. And the second part is that in principle we must reckon with the possibility that a day will come when the more profound and increasingly more refined development of scientific research will be able to understand the mental workings not only of the ordinary mortal but also of the highest human genius in their causal relations; because scientific thought is identical with causal thought, so much so that the last goal of every science is the full and complete application of the causal principle to the object of research.[20]

The second difficulty which confronts Dr. Planck is the fact that his solution contradicts the testimony of consciousness that man is free. In attempting to reconcile his determinism with human liberty Dr. Planck proposes a most subtile explanation. Freedom, according to him, does not consist in <u>being</u> free but in <u>feeling</u> free. This opinion is stated in the first of his three philosophical books:

> The existence of strict causality implies that the actions, the mental processes, and especially the will of every individual are completely determined at any given moment by the state of his mind, taken as a whole, in the previous moment, and by any influences acting upon him coming from the external world. We have no reason whatever for doubting the

> truth of this assertion. But the question of free will is not concerned with the question whether there is such a definite connection, but whether the person in question is aware of this connection. This, and this alone, determines whether a person can or cannot feel free. If a man were able to forecast his future solely on the ground of causality, then and then only we would have to deny this consciousness of freedom of the will.[21]

Since freedom is made the same as feeling free, it is perfectly conceivable that a man should think himself free and yet be determined. This is precisely the case, according to Dr. Planck, and the reason why the internal necessitating force cannot be perceived is that the very act by which we reflect on our volition is an unperceived motive which influences the will. This opinion is stated in his first book:

> Complete knowledge implies that the object apprehended is not altered by any events taking place in the knowing subject; and if subject and object are identical this assumption does not apply. To put it more concretely, the knowledge of any motive or any activity of the will is an inner experience, from which a fresh motive may spring; consequently such an awareness increases the number of possible motives. But as soon as this is recognized, the recognition brings about a fresh act of awareness, which in its turn can generate yet another activity of the will. In this way the chain proceeds, without it ever being possible to reach a motive which is definitely decisive for any future action; in other words, to reach an awareness which is not in its turn the occasion of a fresh act of the will.[22]

This opinion is reiterated in his second book:

> ...I am saying that <u>in principle</u> there is no reason why we should not discover the causal connections in our own personal conduct, but that in practice we can never do so because this would mean that the observing subject would also be the object of research. And that is impossible, for no eye can see itself.[23]

Two brief citations from his third book show that his belief has not been altered:

> ...every application of the law of causality to the will of the individual and every information gained in this way [by introspection] is itself a motive acting upon the will, so that the result which is being looked for is continually being changed.[24]

> In other words, we might say that looked at from outside (objectively) the will is causally determined, and that looked at from inside (subjectively) it is free.[25]

We have quoted at considerable length from the books of Dr. Planck in order to present his opinion precisely and to show that it is the same in all his philosophical works. Let us now look into his views on the whole question of causality and free will.

The question, as we have stated, is an apparent antinomy between the principle of causality and our consciousness that we are free. We may tabulate Dr. Planck's views on this antithesis as follows: (1) The principle of causality requires that every cause produce its effect under the required conditions; (2) motive, the cause of conduct, determines the will; (3) a superior intelligence could predict any man's acts, given the knowledge

bodies, that the scientist deals. Hence he may with confidence rely on the constancy of their activity. It is only when he says that the power to act in every cause is determined that he reasons beyond the evidence.

There is evidence to show that the power to act in physical bodies is determined; this we have seen in Chapter II (p. 30) But there is likewise evidence to show that the power of choice in human beings is not determined. To rule out this latter evidence it is not enough to say that science finds the principle of causality indispensable for its researches.[26] What science does need is assurance that nature's laws are uniform. This evidence we have given in Chapter II (p. 30) without prejudice to the existence of free causes.

Yet it may be urged that the "sciences which deal with human events;"[27] history and sociology, assume that human beings do act in a definite way from definite motives. We shall examine this point more fully in treating of motive as a cause of conduct. However, we may note here that to assert freedom is not to deny rationality to man. The humanist sciences do assume that man will act reasonably, but if they maintain as certain that man acts necessarily in all that he does then they are simply asserting something which they have not proved and which is contradicted by a wealth of evidence.

Hence Dr. Planck's first point, that every cause must produce its effect under the required conditions, is an interpretation

of the principle of causality which is verified only for certain kinds of causes and has not been proved to extend to man. Consequently, when human freedom is the point at issue, it is begging the question to assume that every cause must act necessarily especially when no reasons other than an unproved postulate of science are offered in support of this position.[28]

Second, motive, the cause of conduct, determines the will. In this and the remaining points of Dr. Planck's theory we shall consider the second part of his antinomy, human volition. Since this is an internal operation we must study it by means of introspection, "that is, by the turning of the mind in on itself."[29] With Dr. Planck we call this process "our most direct and intimate source of knowledge"[30] and we insist that the information acquired in this way is most certain and valid. For, since our mind does know reality, as we saw in Chapter II,[31] it must have most certain knowledge of that reality which is closest and most evident to it.

Now introspection reveals many internal acts of the will: emotional states such as fear and love, deliberation, consultation, resolution, choice. The following description of choice agrees perfectly with what each of us knows from his own internal experience.

> The acceptance of some suggested course or its rejection constitutes the act of <u>choice</u>. For this exercise of choice there must be the self-conscious reflective cognizance of at least two possible alternatives, though one may be mere ab-

stinence from action.[32]

> When we consent to either of these conflicting desires, we experience an active interposition of the Ego through which the issue of the conflict is decided.[33]

Choice, then, as our consciousness reveals it, consists in selecting one of several alternatives. But the same "human consciousness"[34] which reveals to us the fact of choice reveals also the evidence for the freedom of choice. We know that several motives frequently present themselves and that we are not passive spectators while one or other inevitably moves our will.[35] We see ourselves taking an active part, considering each alternative, examining the prospective results, weighing the objective value of the inducements. All this activity, however, is inefficacious until by an "active interposition of the Ego"[36] we strengthen one of the motives and decide to act upon it.

Motive, according to the testimony of our consciousness, is not something mechanical, not a compelling necessity like force in nature. The clearest and most certain evidence shows that motive is nothing but some good, attractive, indeed, but not necessitating. We do act for motives but we are not forced by them. It is true, of course, that sometimes we are so carried away by love or excitement that we can act in only one way. Yet we readily distinguish such events from our ordinary calm decisions. It is likewise true that temperament, health, "physical and psychic influences"[37] do affect our decisions. These factors do not necessitate them, however; indeed, we praise most highly a man who

overcomes these internal impulses and does what he knows is right. And thus, since we cannot deny that consciousness testifies truly, we must maintain that the freedom which it reveals in our actions is as real as the existence of the will itself. Dr. Planck's second point, that motive determines conduct, therefore, is inadmissible.

His third point, that a superior intelligence could predict our activity if it knew all the motives which influence us, falls before the testimony of introspection. Since motives are not psychic forces but attractions to objects which we may choose or reject, they do not impel one to any particular course of action. Hence no created intelligence, just from examining the motives in a man's will, can forecast with absolute certitude what he will do under given circumstances. However, it must be admitted that the normal person can be relied upon to follow certain courses and that this stability can give us grounds for a type of conditioned certitude called moral certitude.[38]

We are sure, for example, that the cook will not poison the dinner, that a man will take ordinary care to preserve his life, that a mother will love her children. Such actions are the normal result of healthy human nature. Since this nature is found in every man, it is safe to say that under ordinary circumstances a man will follow the natural instincts of that nature. This fact gives value to the predictions of the "sciences which deal with human events."[39] When the sociologist predicts, he does so be-

cause he relies on the saneness of his subjects, not because he denies free will. And the fact that occasionally a man does violate one of the primary instincts of human nature is proof both that the certitude of the sociologist is conditioned and that the beings with which he deals are free.

We must conclude, then, that a superior intelligence could not predict a man's actions from the knowledge of the motives present in his will. To assert such predictability is to deny human freedom, which we have already proved. However, moral certitude, which is based on the normal workings of human nature, can be had even by men.

Dr. Planck's fourth point, that individual freedom consists in feeling free, is the most important tenet of his whole system, for on the nature of human freedom depends all that he has said and all that he will say. If freedom means nothing but an internal persuasion that we are not subject to necessity, then there is nothing to prevent us from being bound in reality by inescapable physical force. However, let us see whether freedom really does mean a mere subjective illusion.

Certainly, men generally do not understand by freedom a feeling that one is free. "Free-will, as common sense understands this term, may be defined as <u>the power of self-determination</u>."[40] This power is as real as anything in the world about us, at least in the ordinary judgment of men. The culprit who is given physical punishment for abusing liberty is not conscious that his free act is any less real than the penalty. On the other hand, the lu-

natic who casts his fortune overboard may think that he is most free,[41] while the cautious judge may feel harassed by a dozen different motives. Yet we know that the former is deluded and the latter really free. Finally, if we reduce freedom to an internal illusion, then our consciousness deceives us and scepticism is the only logical consequence. Of course, it is true that our consciousness does not immediately experience the capacity of free choice, but it does see the evidence of freedom - that certain of our actions "depend on our consent."[42] If we are to deny the value of this evidence, then we must admit that the mind errs of itself, and this is one admission which we cannot make.[43]

Freedom, therefore, does not consist in feeling free. If it did, it would scarcely merit the attention of philosophy. Freedom is something objective; it is a power or capacity in man to determine his own activity. This is the meaning of freedom in the daily usage of man, this is freedom as it is revealed to us by consciousness. Dr. Planck surely would not say that the will is an illusion. Yet the same consciousness which reveals the existence of the will reveals to us that we are free. There is no reason to call the former a fact, the latter an illusion, and hence we must conclude that Dr. Planck is wrong in asserting that human freedom means nothing more than a feeling that we are free.

Dr. Planck's fifth point is that the individual feels free while he is objectively determined. We have shown, however, that freedom does not consist in feeling free but in having the "abil-

ity to settle the issue between conflicting motives by the active interposition of the Ego."[44] We also proved that man really has this freedom when we saw that the same consciousness which reveals the existence of choice reveals its freedom. Hence the assertion that the individual feels free while he is objectively determined is inadmissible.

Dr. Planck's final point, that each act of reflection is an unperceived determination of the will and hence that we can never know that we are necessitated, rests upon the opinion that this reflection provides a motive which disturbs the will and thus inclines it to another course. Such, however, is not in accord with the nature of motive as revealed by consciousness. Not every mental act is a motive, but only those whose object offers some attraction to the will. An ordinary act of reflection evidently does not fall into this category. We must deny that reflection is comparable to a beam of light which disturbs the velocity of a particle while measuring its position.[45] This analogy is not borne out by consciousness but is an unsupported assertion which is contradicted by all that we know of motives from introspection.

Of course, it is possible that in certain cases reflection would disturb the subject who is choosing. Yet we clearly distinguish such events from the normal consciousness of our activities. Dr. Planck's sixth point, therefore, that each act of reflection by disturbing the will prevents us from ever seeing

that we are necessitated, cannot be admitted.

In this chapter we have considered that portion of Dr. Planck's theory of causation which deals with the apparent antinomy between the principle of causality and human free will. We have noted that this principle may not be taken to mean "Every cause must act under the requisite conditions." We were able to establish the existence of human freedom and were obliged to reject Dr. Planck's opinion that man's will is really though unperceivably determined.

Notes to Chapter IV

1. Cf. B. Wuellner, S.J., Ontologia (MS.), Thesis 23, p. 1; p.29 of this thesis.
2. Max Planck, Where is Science Going?, p. 107.
3. Idem, p. 108.
4. Idem, p. 107, 108.
5. Cf. Where is Science Going?, p. 108, 110, 111, 112, 113, 117.
6. Idem, p. 113.
7. Idem, p. 107.
8. Idem.
9. Idem.
10. Idem, p. 108.
11. Idem, p. 117.
12. Cf. Idem, p. 132.
13. Idem, p. 147.
14. Idem.
15. Idem, p. 150.
16. Cf. Idem, p. 140.
17. Idem, p. 152.
18. Idem, p. 152, 153.
19. Idem, p. 153.
20. Idem, p. 158.
21. Max Planck, The Universe in the Light of Modern Physics, translated by W. H.Johnston,Norton,New York,1931, p. 90,91.
22. Idem, p. 91, 92.
23. Where is Science Going?, p. 163.

24. Max Planck, The Philosophy of Physics, p. 80.

25. Idem, p. 33.

26. Cf. Where is Science Going?, p. 136, 140.

27. Idem, p. 150.

28. Cf. J. Fröbes, S.J., Psychologia Speculativa, Herder, Friburg, 1927, Tomus II, p. 192 - 196.

29. M. Maher, S.J., Psychology, Longmans, London, ninth edition, 1933, p. 11.

30. Where is Science Going?, p. 107.

31. Cf. p. 25 - 27 of this thesis and, on the validity of the testimony of consciousness, C.Frick,S.J.,Logica,ed. 7a, p. 181 - 192.

32. M. Maher, S.J., op. cit.,p. 382.

33. H. Gruender, S.J., Experimental Psychology,Bruce, Milwaukee, 1932, p. 400.

34. Where is Science Going?, p. 107.

35. Cf. J. Fröbes, S.J., op. cit., Tomus II, p. 176.

36. H. Gruender, S.J., op. cit., p. 400.

37. Where is Science Going?, p. 152.

38. Cf. C. Frick, S.J., op. cit., p. 139.- 149.

39. Where is Science Going?, p. 150.

40. H. Gruender, S.J., op. cit., p. 428.

41. Cf. J. Fröbes, S.J., op. cit., Tomus II, p. 211.

42. H. Gruender, S.J., op. cit., p. 435.

43. Cf. p. 25, 26 of this thesis.

44. H. Gruender, S.J., op. cit., p. 428.

45. Cf. The Philosophy of Physics, p. 80.

CONCLUSION

With the examination of Dr. Planck's views on causality and free will we conclude our critique of his theory of causation. We have endeavored in these pages to sketch the setting, origin, and principal tenets of Dr. Planck's explanation of causality in nature. His theory was occasioned, as we have seen, by the failure of scientific prediction of events, after that prediction had become identified with causality.

Throughout his theory, however, Dr. Planck has tended towards the same identification. After assuming the existence of the real world he fastens on predictability as the sole criterion of causality, and then endeavors to explain our inability to predict. Similarly, he believes that an uncaused contingent event is not self-contradictory (since an unpredictable event is not intrinsecally repugnant), and therefore maintains that the principle of causality is not universal but to be maintained by science only when circumstances justify - in other words, when science has found that it can predict. Finally, Dr. Planck believes human activity to be scientifically predictable, and therefore tries to reconcile determinism with our consciousness of freedom.

The writer of this thesis has endeavored to establish another approach to the problem of causality - the seeking of sufficient reason for change. Every new being requires a sufficient reason and therefore the principle of causality is universal. Certain changes result from natural bodies; these act necessarily, in

accord with their nature. Here predictability, at best an external sign of internal necessity, may be had. Other changes are due to human beings; these act freely, in accord with their nature. Predictability of their activities is moral certitude. The necessity of physical causality and the freedom of human causality are established from facts available to all. To present these facts, to test Dr. Planck's theory with them, and to show the strength and weakness of that theory has been the purpose of this thesis. It is the writer's hope that this purpose has been accomplished.

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The thesis, "Planck's Theory of Causation," written by Henry F. Birkenhauer,S.J., has been accepted by the Graduate School with reference to form, and by the readers whose names appear below, with reference to content. It is, therefore, accepted in partial fulfillment of the requirements for the degree of Master of Arts.

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