

THE NATURAL CAUSATION OF FREE WILL

by *Gardner Williams*

I. THE PROBLEM

One intricate spiritual problem with which most naturalistic-humanistic thinkers fail to deal precisely and correctly is how freedom, or free will, and both legal and moral responsibility are produced by natural causes which do not negate the freedom or the responsibility which they create. Many have given up their natural scientific belief in causal uniformity so as to keep their faith in moral responsibility and the dignity of human freedom. And many others have denied the latter because they know both that uncaused events do not occur and that the causal uniformities are never violated. Very probably natural causal law, in the sense of these uniformities, does not change and very probably cannot be broken. Of course, this does not necessarily apply to many attempted human formulations of these natural causal laws, such as Newton's law of gravity or Einstein's relativity. But it does apply to the actual uniformities in nature which in most cases underlie these formulations and to which, probably, the latter approximate very closely for the most part. Perhaps some, perhaps even all, contemporary human statements of natural causal law are absolutely accurate. But it is no great calamity if some or all of them are a bit off. And whether they are or not is wholly irrelevant to the problems of free will versus causal determinism. For free will properly means freedom from obstacles, not from causes. Very probably there is no freedom from uniform causation.

In order to understand this subject, one must always clearly bear in mind that psychology is a natural science and that spiritual things like *wish*, *will*, *preference*, and *choice* are not the manifestations of any supernatural immaterial mind-substance or soul-substance but, together with their neural foundations, are natural occurrences resulting from natural causal processes and having natural results. Scientific psychology and evolutionary biology show that there is no soul-substance. The brain is a natural biological substance, a highly evolved form of the ultimate physical energy-substance of the universe, and all instances

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of experience, awareness, or consciousness are attributes of somebody's brain.¹

The belief in a soul-substance is derived from the old mythology about personal immortality. It was accepted also by the philosophers Descartes, Locke, and Berkeley. Kant's transcendental ego is a reasonably accurate facsimile. It is with us today in many religious cults. And some prominent physicists seem not to have freed their minds from it. It may be in their subconscious, never openly avowed, but a deep causal influence upon their conscious thought. Arthur Compton² denied that man's preferences and choices were predetermined by natural causes. He thought that they functioned by a different sort of intrinsically spiritual force (or substance?) operating within a range (or gap?) left open between natural physical, physiological, and psychological causal restrictions. True freedom and responsibility, he said, occur within this range (or gap?). He thought that Werner Heisenberg had proved its existence. A. S. Eddington agreed.

The ancient theological idea, functioning here perhaps just below the fringe of consciousness, was that the soul while on earth is locked in the prison house of the flesh. Any natural biological or instinctive forces (sensuous, sexual, ambitious, avaricious), as far as they actually exercised a causal influence on the human will and behavior, defeated the true spiritual function and destiny of the soul. But if, in its hour of trial, it remained steadfast in its adherence to the ultimate spiritual principles of love and submission to the divine (supernatural) will, it could escape later to a higher heavenly realm of pure spiritual freedom and fulfilment.

Thus the basic spiritual assumption of these physicists is that *unfreedom* of the will is essentially obstruction and defeat. This, I think, is exactly what it is. Only, with a rigorously scientific naturalistic metaphysics, one realizes that in fact all wills are 100 per cent natural and operate strictly in accord with natural causal determinism, which produces all the actual free fulfilment, as well as all the slavish obstruction, that occurs. I shall deal further with Heisenberg's indeterminacy in Part VII (2). What he has really proved is cognitive, not causal indeterminism.

I believe that there is no contradiction between free will and causal determinism. The problem is semantic—that is, it concerns the meanings of words. With wrong definitions for the terms we use, the subject cannot be understood. An apt or correct meaning is, by definition, the one that makes things most intelligible to people capable of understanding the matter in hand. Any such definition is usually one of the various ordinary meanings of the word as used in the common speech

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of our daily lives, or else it is very close to one of them. Note that most of the words used in ordinary language are ambiguous, which does not necessarily mean that they are vague. It means that tradition endorses several meanings. In writing or speaking, a person should be able to make clear by context or explanation which meaning he intends. Several different meanings might possibly all be correct, each in a different context.

We shall be concerned chiefly with the precise meanings of the terms *free will*, *free choice*, *free preference*, *determinism*, and *responsibility*. Both moral and legal responsibility are involved.

II. FREE WILL

The word *will* ought to be used in social, moral, and metaphysical philosophy to signify any conscious impulse, motive, desire, wish, interest, craving, longing, yearning, etc., which is put into action. A *free will* is one that achieves its purpose. The wish is fulfilled. It is free to attain its goal. Whether or not it is caused is irrelevant to its freedom. In moral philosophy it is wrong to define free will as an uncaused act of will, because this definition does not make the subject of human freedom and responsibility most intelligible. Such a will, if it ever occurred, would, of course, be free from causes, this expression signifying simply that causes would be lacking. But such freedom is not the political, social, or spiritual freedom for which, through the ages, men have struggled, sought education, fought, and died. Nor is it the kind of freedom which is essential for human dignity and responsibility. It would have little or no significance in moral philosophy if it ever actually happened, and I think it never does. The important thing for man in a causally indeterministic world (if there were one) would be to act successfully, that is, freely (free from obstacles), by *wish*, *preference*, and *choice*. A free will is a successful participation in the causal processes of nature, not an escape from them. The only relevant unfreedom in this connection is produced by obstacles that cannot be overcome and that compulsively defeat the will. When such obstacles exist, they are caused; here causal determinism prevents free will. But if, as is constantly happening in various places, there are no obstacles to fulfilment, or if all apparent obstacles are overcome, then that situation too is caused, and here natural causes have compulsively produced or created a free or successful will which by its compulsive energy causes certain results to ensue which are its desired goals. There are compulsions which destroy human freedom, but other compulsions create it and still others are ingredients in it. All human freedom, and all unfreedom, are

causally predetermined. In moral philosophy, I say, freedom is fulfillment whether it is caused or not. Causal determinism, I say, never negates the freedom that it creates.

For instance, if a criminal is imprisoned, he is in very large measure unfree because barred gates and menacing guards prevent him from going out to engage in his strongly desired and preferred activities. It is true, of course, that he still has a low degree of freedom. He can pace up and down at will in his cell and perhaps also at times in the prison yard. He is free, privately or openly, to execrate the penal system of the civilized order within which he has been conceived, born, brought up, and frustrated. But prisoners are supposed to be frustrated. Responsible citizens try to make the consequences of crime irksome (frustrating) to felons so as to deter (prevent) as much crime as possible. Crime is a menace and an obstruction to the lives, to the prosperity, and to the freedoms of law-abiding citizens.

However, when the culprit completes his sentence, the prison gates are thrown open, and he issues forth of his own free will. This, of course, does not mean that his egress is uncaused. It is not free from causes. It is caused by his own natural energies and desires and by the opening of the gates. His will to leave is free because it is free from obstacles. It is unobstructed and successful.

III. FREE CHOICE

My thesis is that in addition to *free will* man has *free choice* amid universal causal predeterminism. He also has *free preference*, with which I shall deal in Part V.

To many students of the subject these statements will seem absurd and self-contradictory. For, *in case* a person, X, faces two apparently alternative courses of action (A and B), each exclusive of the other and either one of which he has the power to perform *if* he prefers it over the other, *and in case* seemingly free choice or selection of A in preference to B is causally (compulsively) predetermined from the infinite past by heredity and environment so that choosing B now was made utterly impossible long ago, *then*, superficially, this would seem to be not a genuine choice, or at least not a genuinely free choice. X cannot choose B! Is it a real choice between the alternatives when X can take only one of them, the one he prefers, A? Most people think that it is not! We should look more deeply into this.

Note first that all through life people are constantly making choices by preference and, in each case, freely willing to carry out the chosen alternative successfully. At almost every moment one faces an A and a

B. In addition, there may be alternatives C, D, etc., themselves exclusive of A, of B, and of each other; and let us assume that X prefers B over either C or D, etc. Also, there may be an alternative M, exclusive of all of these, which X prefers even over A and of course over all of the others. But an external obstacle which X cannot overcome prevents him from choosing and doing M. Then X would prefer M over A, A over B, B over C, C over D, etc. He prefers A over any other within his power. He necessarily chooses and performs it freely.

Many examples of this sort of thing will come to mind, such as deciding which motion picture to see on a given evening, or which job to train for, or which person, if any, to marry. In each example let us concentrate for the moment on M. M would be the motion picture which X now most wants to see, but it is not playing tonight. It would be the career he most yearns for, but he lacks the money or the ability necessary to train for it. Perhaps he fails the tests for entrance to medical school. M would be the man (such as, perhaps, Franz Liszt) whom the passionate lady (around 1845) worshiped most of all, but who, at the time, was not interested in her. Of course, later on, one's favorite movie of the year may be shown in town, or it may not; the money to train for the lucrative and socially distinguished profession may come as a bequest or as a fellowship, or it may not; and the man with that indefinable fascination which is truly irresistible may, in time, burst again into the life orbit of the receptively preconditioned lady, with a deep and genuine concern for her, or he may not. In each case, thus, the movie, the professional training, or the potential lover, that is, the former M, may become a new A, B, C, etc., or he or it may not.

Let us examine the essential factors in *free choice*. Every choice is free, and every such choice has six components: (1) A person, X, is faced with at least two desired courses of action, A and B, each one of which he has the power to perform if he prefers it over the others; (2) A and B are mutually exclusive alternatives: doing either makes the other impossible; (3) he prefers A over B; that is, his desire for A is stronger than his desire for B; (4) he selects A by his own preference and he performs it successfully (this covers what we have defined as *free will* in Part II: free will is *preference* plus *power*); (5) he could have chosen and performed B *if* he had preferred it over A, that is, *if* his desire for B had been stronger than his desire for A (here is the very essence of *free choice*, using this term, and using the hypothetical *if*, in their correct traditional English meanings); (6) but X could have chosen B only *if* he preferred it, and not *if* he did not prefer it. And we are

assuming that X did not prefer B over A. So X cannot perform B in the situation which we are assuming.

Put briefly, components (1)–(6) mean that, by definition, as I said, *preference plus power make free will and free choice*. With free choice, X cannot select or choose B when, and because, he has freely chosen A, an exclusive alternative to it. Here he is not free to choose or do B, whether his will and choice are wholly caused, or partly caused, or wholly uncaused.

The situation which I have delineated in components (1)–(6) is what absolutely (by correct definition) determines the degrees of X's freedom and unfreedom at the moment. By it he is free to choose and to do A, and he is not free to choose or do M, B, C, D, etc.

Note that, like everybody else, X is part slave and part free. As to A he is necessarily free, and there is always an A while he is alive and awake. *Freedom*, as Hegel said, *is the very essence of the human spirit*, though the ever present M, B, C, etc., corroborate Fulton Sheen's dictum that, at the same time, *frustrated man is all mankind*. Every human soul, and every nation composed of human souls, exists, as I said, part slave and part free, in spite of Abraham Lincoln and in spite of the Civil War.

IV. THE MEANING OF "IF"

All this may be made clearer by reminding ourselves of the correct meaning of the word "if," together with its frequent companion "then." In a hypothetical (*if-then*) proposition, the *if*-clause, the antecedent, is neither asserted nor denied. Neither is the *then*-clause, the consequent. The hypothetical proposition merely asserts a necessary connection between the two. The statement, "If X had preferred B, then he could have chosen B," does not either assert or deny that X preferred or chose B. Its truth in no way contradicts the truths that X did not prefer or choose B, that he preferred and chose A, and that his doing so was causally predetermined from the infinite past. To grasp this is absolutely essential for an understanding of the free-will problem.

Consider another example: *If* the rear axle of my automobile breaks, *then* the car will be stalled. If it is broken now, the car is stalled. These statements are true now, even though, in fact, the axle is not broken and the car will run.

The necessary connection asserted in a hypothetical statement may be logical, as in Aristotle's formal causation. For instance, *if* 2 is added to 3, *then* the sum is greater than 4; 2 plus 3 *make* 5, a sum greater than 4. Or the necessity may involve push-or-pull of energy (Aristotle's

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efficient causation), as in the rear axle example. Any force or energy which breaks the axle will cut the flow of power from the engine to the wheel.

The hypothetical proposition is true even if both antecedent and consequent are false. In fact, I say, the axle is not broken and the car does run. But the hypothetical (or conditional) statement does not assert that the axle is broken, nor does it assert that the car is stalled.

To summarize, X could have chosen B *if*, but *only if*, he preferred, and not *if* he did not. And when he preferred A, he did not—and, by logical necessity, he could not—prefer B. So he could not choose B. But still, even if, causally and thus inexorably predetermined from the infinite past, he chose A by his own preference, the truth is that he could have chosen B *if* he had preferred to. This, by the correct definition of *free choice*, makes his choice free. Also, if it was uncaused, it was free. In this sense the causal determinism of a choice is irrelevant to its freedom. Obviously this determinism is equally irrelevant to *free will*, which is a successful will whether it is caused or not. And we shall find that causal determinism is equally irrelevant to *free preference*.

V. FREE PREFERENCE

Man, we have said, has three freedoms: free will, free choice, and free preference. Preference, properly defined, is a complex wish for two or more exclusive alternatives, the wish for one being stronger than the wish for the other. Being X's wish, it is exactly as he wishes. X is always free to wish exactly as he wishes. Freedom of preference is absolutely unlimited. To wish to prefer A over B is to prefer A over B. This is a strict identity. There can be no obstacle that defeats a wish to prefer one alternative over another.

Of course, when X prefers A over B, *he cannot prefer B over A*. As I have pointed out and as must be obvious, his desire for A cannot at the same time be both stronger and weaker than his desire for B. Logical or mathematical necessity make this impossible. But, at that moment, since his wish is a preference for A over B, he does not wish to prefer B over A. *And there is no unfreedom whatever in not being able to do what one does not wish to do*. Here no desire is defeated. If he really wished his wish for B to be stronger than his wish for A, that would be because he wished to do B more than he wished to do A. So he would prefer B already. And then he would be free to do B and not free to do A. X could prefer B if he wished to, but only if he wished to, and not if he did not wish to; when he prefers A over B, that is his wish,

and he does not wish to prefer B over A, so he could not prefer B over A.

I am assuming that A is in fact X's preference over B. I said, let A stand for whichever of the alternatives he prefers among those within his power.

VI. LIMITATIONS ON HUMAN FREEDOM

1. There are, then, no limitations upon X's freedom of *preference*.

But there are limitations upon his freedom of *will* and his freedom of *choice*.

2. *Freedom of will* is limited to the one alternative, A, where power coincides with preference among the alternatives within X's power. X is not free to do M because he lacks the power. He is not free to do B, or C, etc., only because of his lack of preference for any one of them over A. But by correct definition, and thus by Aristotle's formal causation, preference plus power make free will.

3. *Free choice* is limited to a selection among the two or more alternatives within X's power. He can choose freely any one of these which he prefers, but, at the given moment of choice, nothing else.

I said he can never choose or do M. This last presents, perhaps, a special problem, but one which is easily clarified. X can, if he wishes, prefer and choose to *try* to do M, but he will fail to perform it. We assume that he lacks the power (and there are always alternatives which a person lacks the power to perform and which he prefers above all those within his power). Choosing to try, and trying, would then coincide with A. It would be what he prefers among the exclusive alternatives, any one of which he has the power to do if he prefers. Here what he actually does is only the process of trying. He will succeed in trying to perform M, but not in performing M. And he will probably soon find something else more satisfying than this futile striving. If a permanently rejected lover never gives up, his case is pathological.

VII. THE THREE MEANINGS OF DETERMINISM

The word *determinism* has three different meanings—*causal*, *cognitive*, and *logical*—which many have failed to distinguish. We have defined *causal determinism* as the principle that every actual thing or event is caused by the push-or-pull of energy and that similar causes always have similar results. Nature is uniform. *Cognitive determinism* means that someone can determine or know what something is or what caused it or what its results will be. *Logical determinism* is the principle of identity. Everything has *determinate* being. It is exactly what it is.

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The denial of causal determinism by physicists and others in the Heisenberg (Germany)-Eddington (England)-Compton (U.S.) tradition is due to their confusion of it with the cognitive type. These meanings need to be clarified.

1. *Causal determinism*, we said, is the push-or-pull of energy. It is, or is like, Aristotle's efficient causation. The whole cosmic process is that of energy structures producing simultaneous or later energy structures, which latter may be quite dissimilar from their causes. Here inevitably we get into a bit of cosmology. Physical energy is probably the basic substance, ultimate reality, or supreme being; if not, there may be some more basic physical substance underlying energy which is the ground of all being. Energy structures are constantly changing, and new qualities or attributes (sometimes called emergents), such as life, consciousness, free will, culture, free choice, free preference, reason, love, ambition, many other kinds of purpose, are occasionally being produced. But the ultimate substance probably never changes its intrinsic nature. Basic natural causal law, uniformities in nature itself, and, as I said, not necessarily the human formulations of these, are very probably unchangeable manifestations of this ultimate substance (supreme being or ground of being) which creates or causes all good and all evil.

It is unlikely, but possible, for instance, that the speed of light has ever changed or will ever do so. If it does, it will probably be in accordance with some more basic unchanging natural law. Nearly everything changes except the ultimate laws of change, the intrinsic nature of the substance of the cosmos (of which these laws are a manifestation), and the laws of logic and mathematics.

It is important to emphasize that reason, purpose, and free will have been the results, not the causes, of the prehuman creative evolutionary processes on this earth, though man is now, with his own reason and purpose, dabbling in a small way with the intentional and somewhat rational guidance of both biological and cultural evolution through education, selective breeding of plants and animals, eugenics (both negative and positive),³ and cultural changes in the environmental conditions of selection such as the Industrial Revolution.

2. *Cognitive determinism*. To determine may mean not to cause but to know. If there is a big bang out in the street and if Mr. X, in the house, is unable to determine what it was or what caused it, this means that he does not know what it was or what caused it. Here we have *cognitive indeterminism*, which is ignorance; and there is much of it in human experience. Heisenberg has proved its presence in the physicists' dealings with minute particles. He has shown conclusively that in the

very nature of the processes of sensuous perception it is impossible to find out, determine, or know simultaneously both the location and the velocity of an electron (if such things do in fact exist; no one has ever seen one).

In many fields of our best scientific thinking, predictions are mere guesses (not knowledge but cognitive indeterminism). Neither biological mutations nor the paths of subatomic particles nor the coming of the next glacial age can be foretold with precision.

Physicists and other intelligentsia have hailed Heisenberg's indeterminism as a demonstration of the truth of free will in contrast with the crass mechanistic materialism of some of the nineteenth-century biologists and physicists (Buechner, Moleschott, and Vogt in Germany; Tyndall in England). But this conclusion involves two bad mistakes which I have already noted. (1) They assume that causal indeterminism has been demonstrated by Heisenberg, whereas only cognitive indeterminism is implied by his work. (2) They assume that causal determinism would preclude free choice and that Heisenberg's proof of indeterminism shows the possibility of the latter. This, it is thought, warrants us in trusting our immediate feeling or intuition of free will, free choice, and free preference. But, as I have pointed out, a careful consideration of the meaning of the words *if-then* in connection with the freedom problem shows that Heisenberg has not given us any warrant to trust our feelings of freedom. It is only the rigorous and correct definition of basic concepts that can and does give us this *valid* warrant.

3. *Logical determinism*, I pointed out, is the principle of identity. Everything is exactly what it is, and everything has the determinate being that it has. This principle may appear to be a bit obvious, but we still need to state it clearly because some have denied its universality, usually confusing it with cognitive determinism. It is absolutely binding on everything, including free will, free choice, and free preference. Each of these three things is exactly what it is. Each is a form of freedom. The inexorable logical compulsion of the principle of identity in no way contradicts these freedoms.

Logical determinism covers Aristotle's formal causation, to which I have referred above. Examples are found in mathematics and logic; 2 plus 3 *make* 5, a sum larger than 4, because they are 5. Together they contain 5 units. And the true premises of a valid syllogism *make* the conclusion true because the latter *is* included in the total true meaning of the premises.

Clearly, every actual free voluntary action, like everything else, is absolutely determinate logically. It is exactly what it is. The principle

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of identity stands firm, as also do the principles of non-contradiction and excluded middle. An example of a violation of non-contradiction, as well as of identity, would be where Mr. X preferred A over B and at the same time performed B rather than A. His desire for A would be simultaneously both stronger and weaker than his desire for B. This is logically impossible, and saying that it is impossible is no denial that a distracted X might shift back and forth frantically, now preferring A over B and again B over A, in successive moments of time. Also, genuine spiritual maturation, derived from reason and experience, could, through the years, lead X from preferring A over B when he is young to preferring B over A when he is older and wiser. He may freely will to get an education which will change his character. In such a case, in order to preserve our terminology which defines A as the preferred alternative within X's power, the old B would become a new A and the old A a new B.

But, obviously, no free will, free choice, or free preference can ever escape from these inexorable logical compulsions. However, the utter subjection of all freedom to them, as also to the cosmic rules of push-or-pull-of-energy causal determinism, does not necessarily imply any trace of slavishness and thus is wholly irrelevant to their freedom. Whether or not the will is identical with itself, whether or not it is caused, if it attains its goal it is free to do so, and if it fails it is unfree to do so. And in man's moral experience, doing so is all that counts.

VIII. RESPONSIBILITY

Both free will, as I have defined it, and a degree of rationality are necessary for moral and legal responsibility. When a rational person voluntarily commits a criminal or other antisocial act, prudent citizens, who understand their dependence upon law enforcement and the preservation of their institutions for their prosperity, security, freedom, and happiness, have an interest in penalizing him in order to dissuade or deter him and others from performing similar future acts. Law-abiding persons will be better satisfied in the long run if they make him suffer for what he has done, so they have constructed a penal system of police, law courts, prisons, and various sorts of apparatus for conducting executions. If their agents catch the culprit, he is forced to stand trial and, if found guilty, is punished accordingly. He must *answer* to society for his sins against it. A *response* is an answer. Responsibility is answerability. No social institution, whether family, school, church, army, business corporation, steamship, social club, etc., can survive without punishments for infractions of the rules. And there are always infractions, due

to man's biologically inherited tendency to do the wrong thing at times. This latter is original sin, and, when it occurs, it is causally predetermined.

The deterrent menace of legal and other social penalties will not affect any person devoid of practical reason, foresight, and prudence, nor will it prevent any socially harmful acts not performed freely and voluntarily. Only one's acts of free will can be controlled by his rational foresight of the consequences, happy or unhappy. Therefore, as I said, free will (as I have defined it) and a degree of rationality are necessary for responsibility.

Of course, Freudian psychosocial rehabilitation should be employed with criminals wherever it will work. This tends to protect social institutions and law-abiding people. But I think that, because of original sin, it can never wholly replace penalties. Rehabilitation itself involves discipline to which, in many cases, the culprit will be hostile and which in his perspective will amount to punishment, whatever the intent of his presumptive or intended benefactors.

It will, I think, be obvious that these same basic principles apply when the culprit has offended or threatened society without breaking any positive law. Without any illegality he may have been mean or unjust to his friends, his parents, his children, or grandchildren. Then the individuals who largely compose and dominate society may condemn him, and they usually can, within the law, injure him in some way, such as by social rejection. This, in its extreme forms, is one of the most terrible of punishments. The people who inflict this penalty do it partly for the joy of vengeance, but also partly because it makes them feel more secure to discourage antisocial acts which injure them and those whom they love and need.

Praise and blame are rational activities in a society every aspect of which may by hypothesis be 100 per cent inexorably predetermined causally from the infinite past to the infinite future. We love and thus delight to honor those who have helped us. We dislike, and thus naturally enjoy condemning, those who have harmed us. These are the ultimate reasons why we, from our own points of view, should praise the former and execrate the latter. Also, our heroes enjoy being glorified, and our enemies usually dislike being vilified. This tends to encourage the former and to deter the latter, which is good for us. It is what we need. Causally predetermined love, hate, and need, thus, are the psychological roots and the justification of praise and blame.

Thomas Hobbes (1588-1679) understood most of what I have been saying. He explains it in his two treatises on free will and determinism:

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On Liberty and Necessity, 1654, and *Questions Concerning Liberty, Necessity and Chance*, 1656. The gist of his thought on the subject is in Alburey Castell's *An Introduction to Modern Philosophy* ([2d ed.; New York: Macmillan Co., 1963], pp. 106-14). His ideas need to be reformulated in the light of modern knowledge because so few who write about free will understand them.

NOTES

1. For strong corroborative evidence of this, see Wilder Penfield, "The Interpretative Cortex," *Science*, Vol. CXXIX, No. 3365 (June 20, 1959).

2. Arthur Compton, "Science and Man's Freedom," *Atlantic Monthly*, CC, No. 4 (October, 1957), 74. Dr. Compton also has published a book, *The Freedom of Man* (New Haven, Conn.: Yale University Press, 1935).

3. See Herman J. Muller, "Human Evolution by Voluntary Choice of Germ Plasm," *Science*, Vol. CXXXIV, No. 3480 (September 8, 1961). This paper is of overwhelming importance for man in the twentieth century.