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SCIENCE AND THE WORLD OF TOMORROW

Dr. Robert M. Page

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Reviewed by: Colonel Thomas C. Keach, USAF

Date: 6 January 1960

INDUSTRIAL COLLEGE OF THE ARMED FORCES

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Reporter: Ralph W. Bennett

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CAPT. FIKE: General Mundy, Gentlemen: This morning we are going to introduce a slightly different type of lecture in our science and security program. Our previous lecturers have dealt chiefly with the feats of science and its accomplishments. This morning "Science and the World of Tomorrow" is to appraise ^{these} ~~the~~ scientific feats in light of the dynamic and very complicated world in which we live.

Many learned people today, scientists included, are becoming quite concerned with the possible end results of our current scientific revolution. We are very fortunate this morning to have as our guest speaker a distinguished scientist, inventor, and technical author and lecturer. He has also been very active in the affairs of his church for the past several years, and currently is choir director. So you can see, he has quite a breadth of accomplishments.

It is indeed a distinct pleasure for me to present Dr. Robert M. Page, Director of Research, Naval Research Laboratory, for his first lecture before the Industrial College.

DR. PAGE: General Mundy, Gentlemen: I hope this isn't going to be a disappointment to you, because I am not going to tell you what science is going to do for tomorrow's world. I have been stimulated for this talk to go far afield from the usual scientific presentation; and at this point I won't attempt to place my finger on any individual who might be responsible for that stimulation, because when we are through, you might

want to get someone else to do the stimulating hereafter. But I have been challenged to go into some rather fundamental concepts of the relation between scientific research and the fundamental values of life.

Now, there are four specific questions to be dealt with under this subject. The first one is about the one which you will be expecting, and it will occupy about, oh, let us say as a guess, 5 percent of my talk. That question is, "What are the areas of basic research and technology which are most in need of exploitation and what are the chances and approximate dates that successes might be achieved?"

In the field of basic research and technology, neither the need nor the product can be precisely defined. They cannot be predicted with assurance. Progress in this area rests on two fundamental foundation supports-- new ideas and new instruments. New ideas are spontaneous and unpredictable. They may be stimulated, more in some people than in others; and they may be stimulated along certain lines of endeavor. But they remain individually spontaneous. The greatest advances, therefore, will be made where people gifted with a propensity for having ideas are stimulated to have ideas, and the ideas are supported when they appear.

Instruments are means of discovery. Like new ideas, the discoveries that come with new instruments are unpredictable. But when new instruments appear, it is safe to assume that important new discoveries will be made. The greatest need for exploitation, therefore, follows where new ideas and new instruments make their appearance. This is what is meant by controlling decisions in research administration being

made at the periphery, leaving management the task of supporting these decisions. I don't know whether you have heard this idea before or not. It's common language among people who go to conferences on administration of research, however else you wish to identify such people.

Well, now, without attempting to scan the whole field of current scientific activity, I am going to give one area of basic research where breakthroughs appear to be in the making. There are four families of new instruments making their appearance at the present time. They are (1) large radio telescopes with solid state amplifiers attached to them, (2) electronic sensing elements for optical telescopes, (3) instrumented rockets and satellites, and (4) very large emulsion stacks carried in huge balloons. And when I say "very large emulsion stacks" for capturing cosmic rays, I mean emulsion stacks that weigh several hundred pounds in a single stack of emulsions. And when I say "large balloons" I mean balloons of one and a half million ^{or so} cubic feet.

The combination of these four families of instruments covers almost the entire radiation spectrum, from the radio frequencies that will get through the ionosphere up to the visible, the ultraviolet, the X-rays, into the cosmic rays of the highest energies that appear in cosmic rays. It may be expected that resulting discoveries in the area of plasma physics will open vast areas of practical application of nuclear interactions. Among the possible applications--and we get here into the field of pure guessing--you might have such things as ionic jet propulsion, direct conversion of nuclear energy into electrical power, and

possibly even seemingly advances in materials engineering and ~~and~~ so far afield as the field of biology. You may find advances now unimagined. But, as I said before, these are only guesses. There is no possible way of pre-auditing discovery.

We will let this suffice for the first question, and we will go into the second question, which was the loop that got me into this, and that was this: "Will further understanding and breakthroughs in the sciences bring forth a better life, peace and prosperity, or will the relatively uncivilized nations gain increasing power therefrom and become more militant?"

Now, before one can answer a question like that, one must lay a foundation of understanding to get at what we are talking about; and to get such a foundation we are going to start out by talking about nature. But we are going to talk specifically about three kinds of nature. They are physical nature, human nature, and divine nature. We will consider these natures from a behavioristic viewpoint; that is, we will study them by observing how they express themselves in action.

Physical nature expresses itself in a set of cause and effect relationships. In physical nature, if all causes are known, the effects can be precisely predicted. When natural cause and effect relationships are thoroughly established by experience, they are expressed in formal statements called natural laws. These are the laws of behavior in the world of natural phenomena. The main objective of scientific research is the discovery of these cause and effect relationships and the formulation

of the corresponding laws of nature.

The validity of a natural law thus derived depends only upon the accuracy of the observation and the correctness of the interpretation. When observation and interpretation are both correct, there is no question concerning the operation of the law. A given cause will always produce a predicted effect under appropriately specified conditions. There is no choice in nature as to whether or not the law will be obeyed. There can therefore be no connotation of goodness or badness about a natural law. The only alternatives of judgment are true and false, not good and bad. One might say therefore that natural law has no moral aspect. Natural law, in other words, is amoral; and there is no relationship between the laws of nature and morality.

Man has learned a great deal about nature. However, there is still very much more to be learned, as we all know. The more one learns about nature, the more one becomes aware of the vast extent of unexplored areas. But scientific research is pursued in confidence that the ordered realm of cause and effect relationships which has been observed in all that is known extends on into the unknown to the limits of natural phenomena.

Now, just what are the limits of natural phenomena? Certainly we think of the physical universe as being entirely contained within these limits. Are there not facts of experience, however, which appear to be outside of or beyond what one commonly thinks of as the physical universe? Consider, for example, the area of psychological phenomena.

The strict behaviorist would reduce all psychological phenomena to matters of physics and chemistry. I'm not sure that we can go along with that view entirely, even when we are considering such every-day, common experiences as appreciation of beauty, because psychology, when pushed to its limits, merges into the area of parapsychology and involves things which are called metaphysical, because they appear to be outside of and not in accord with known physical principles. We think here, for example, of extra-sensory perception, such as precognition; and of extra-motor manipulation, such as telekinesis. If you don't know what these terms mean, I didn't either at one time. But precognition is the experience of knowing of something which has not yet happened; knowing it positively by experience; and then later seeing it happen exactly as you experienced it. Telekinesis is causing things to move without touching them and without any physical influence exerted on them, by mental activity. Many of you will say: "Why, that doesn't happen. That's impossible." I too say it is impossible, but many people have seen it happen, and professional psychologists, who are pretty hard-boiled on some of these things, acknowledge that these are phenomena which do happen. Phenomena that appear to violate the laws of space and time, such as these two examples do, are not understood; but they cannot be denied as facts of human experience, perhaps not universal, but none the less real.

These phenomena appear to be of an impersonal character. When they are experienced by one person, the wilful participation of a second person is not necessarily involved. This impersonal aspect may be true

also of other types of phenomena, such as what are sometimes called miracles or even prophetic visions. However, when we invade this area of human experience, we find the concept of wilful participation by intelligent consciousness other than our own.

Now, this clearly takes us into the spiritual realm, which is sometimes considered the province of religion. Experience involving interactions between human beings and other conscious and intelligent beings which seem to transcend the physical realm are numerous and well documented. We may not understand them, but we cannot deny their existence.

The point I now wish to make is that this spiritual realm, which at one extreme reaches to the very throne of God, seems at the other extreme to merge imperceptibly into the realm of parapsychology, which, as we pursue the regression, merges imperceptibly into the realm of psychology, whence eventually, imperceptibly, into the physical. Might it not be reasonable to assume that what we have referred to broadly as physical nature extends in a continuous spectrum of reality from the purely physical through the realm of the psychological, the metaphysical, and the spiritual? And if this is the case, then is it not also logical to assume that the realm of inviolable cause and effect relationships also extends throughout this entire realm of nature, or shall we say, this entire realm of reality?

As a matter of fact, one is encouraged in this assumption by what we recognize as the most widely accepted textbook on spiritual verities

when we read such words as "There is a great gulf fixed, so that they which would pass from hence to you cannot" or "Having loosed the pains of death; because it was not possible that He should be holden of it" or again "A good tree can not bring forth evil fruit, neither can a corrupt tree bring forth good fruit"; and another statement "Except a man be born anew, he can not see the Kingdom of God" or "A man can receive nothing except it be given him from Heaven." I quote these as examples from well-known literature.

This now leads to a conclusion most pertinent to the understanding of man's relationship to the world in which he lives. If throughout the entire spectrum of reality, from the purely physical here and now to the spiritual spacelessness and timelessness, there is an ordered system of cause and effect relationships, then it must be assumed that these cause and effect relationships are inviolable throughout the entire spectrum, just as they are in that small part of the spectrum which is known. Reference to an hypothetical occurrence as "impossible" seems to be a pretty clear inference of inviolability. And, if inviolable, then no choice is involved as to whether or not a given effect will follow a given cause; and the laws which express these relationships therefore cannot be broken.

Since there is no choice as to whether or not the laws will be obeyed, they have no moral significance, and the entire spectrum of cause and effect relationships must then be categorized as amoral. If it were not so, and moral significance were ascribed to natural laws, the possibility of capricious violation would be implied and science would be reduced

to chaos. The imposition of moral significance at the other end of the spectrum to what may be called spiritual laws may be responsible for some chaotic thinking in religious matters.

We have now considered the amoral character of natural law. We have assumed with some logic that what we know about natural law is a small part of a continuous spectrum of reality extending from the physical through the psychological, the metaphysical, and the spiritual, ruled throughout by a uniform and continuous spectrum of cause and effect relationships, all inviolable and therefore amoral in character. Against this background we will now consider human nature.

As with physical nature, so with human nature we study it by examining the way in which it expresses itself. To the extent that man is governed by the inviolable cause and effect relationships in the physical, psychological, and spiritual realms, he is denied the capability of self-expression. Man expresses his own nature only when he exercises choice among possible alternate courses of action. Human nature therefore expresses itself through human will. With the will, man exercises choice as to whether he will obey or disobey certain precepts. By the way in which he exercises these choices, he may be characterized as good or bad. Now, goodness and badness belong to the moral realm. We conclude, therefore, that human nature expresses itself in the moral realm.

Whether human nature is predominantly good or predominantly bad has been the debate of the ages. Most people seem to prefer to ride the fence with Dobbie Burns in his famous little ditty: "There is so much

good in the worst of us, and so much bad in the best of us, that it ill behooves the least of us to talk about the rest of us."

There have always been a few people, however, who have taken a strong stand on one side or the other. On the one hand, one hears of the natural depravity of man, and that "man is conceived in sin and born in iniquity"; that we are all born sinners. On the other hand, we hear that there is a spark of the divine in all of us and that mankind is fundamentally good and this goodness will come to the surface and be evident if it is given a chance. These two points of view are fundamentally irreconcilable; and, while they could both be wrong, they cannot both be right. This latter point is not immediately obvious, as evidenced by the philosophy of Eobbe Burns. However, if we examine the consequences which have been reached as a result of these two points of view, I think we will find that they are in fact mutually exclusive.

The view that seems to be most popular today, and that has been gaining in popularity through the last century, is that basically man is naturally good; and, if given a chance, his goodness will prevail. Some of the major institutions of our civilization are based largely on the psychology of the natural goodness of man. This is true for a large segment of our churches and for the majority of our public schools.

According to that psychology, the most ideal training is that which gives the least warping of the human personality. How many of you have heard that phrase before--that you should not warp the human personality? Develop it along its natural tendencies. Well, since the human personality

finds its expression in the will, this means training which provides the minimum deviation from the untrained, unguided will of the child. From this comes child care that aims, insofar as possible, at giving the child everything that it wants and denying it nothing. From this come school curricula that make no demands of sacrifice on the part of the student, permit the student to choose what subjects he wishes to study, and actually whether or not he wishes to study at all, since at the end of each year each student is promoted regardless of whether he learns anything or does anything in his classes. This is called "social promotion," on the grounds that a child is harmed more by being taken out of his age group than he is by being allowed to go through school without learning anything. This leads also to churches which exploit only the natural appetites to attract and hold membership. All of these things are logical consequences of the belief in the natural goodness of man.

We have now lived long enough in a society which believes this to see some of its consequences. The child who from the cradle has been taught that the only things that are really important are the things that he wants is not likely to grow into a shining example of the natural goodness of man. With this kind of training, the qualities which seem to rise to the surface are such things as total selfishness, irresponsibility, and rebellion against all authority, bearing a harvest rich in delinquency and crime. We seem to be finding out that human nature, when left to itself and given a free rein, is incomprehensibly bad. Do we not hear scripture quoting "For out of the heart proceed evil thoughts, murders, adulteries,

fornications, thefts, false witness, blasphemies"?

We recognize, of course, that there is no such thing as a child growing up with no influence whatever brought to bear on his will. Heaven help us if there were. There have been only a few in our experience who have approached it. The results seen in those few, however, are positively unforgettable. Let us accept the fact, then, that a necessary purpose in training is modification of the will, to bring it into alignment with the accepted standards of society. Was it not Solomon who said, "Train up a child in the way he should go and when he is old he will not depart ~~from~~ therefrom"?

The child can be trained. The will can be bent. His personality can be and should be warped, violently so, away from its innate anti-social tendencies and hammered and polished, so as to look like what society thinks the individual should be. Much that society calls good can be imposed on human nature; and by dint of much loving care and discipline, human beings can be made to appear very good indeed. It must be recognized, however, that this appearance of goodness does not change the basic nature on which it is imposed. It is merely a veneer, held in place by the pressures of society. Remove the fear of reprimand, punishment, disgrace, or social disapproval and the will reverts to a more accurate expression of human nature.

Now, human nature, of course, is capable of bearing a very heavy veneer, that will take a very high polish. Among factors which contribute to the polish are firm but fair discipline, severe when necessary; and

vigorous training in the fundamentals of culture. Among these we may list elegance in the use of language; knowledge in literature, history, religion, philosophy, science and mathematics; skill in the application of this knowledge in a few aptitudes; development of artistic self-expression according to talent; and thorough indoctrination in ethics and morality. Education along these lines should be commensurate with capability, recognizing that there are wide variations among individuals in this regard, but that achievement almost always falls far short of capability.

We must remember, however--and this is where the shoe pinches--that all of this training, all of this discipline, all of this education, all of this bending of the will to the needs of society, is still nothing but a veneer. It does not change the basic character of human nature. It seems to me that Saint Paul put it particularly succinctly when, in writing to the church at Philippi, after having described the perfection to which his personality had been warped and bent by his society, referred to it as just so much dung when compared to fundamental values.

What conclusions are we to draw from these observations? If human nature expresses itself in behavior that is immoral and anti-social, and all socially acceptable behavior is imposed from without, then human nature must be basically evil and rebellious in character. However, if that is inevitably so, then it is one of the inviolable facts of reality, and of itself is outside the realm of morality. The natural depravity of man is thus seen as a principle of reality which has reference to the basic character of human nature, and has no direct reference to human

behavior. Likewise the statement "Man is conceived in sin and born in iniquity" is a statement of an inviolable and therefore amoral law of nature, and has no direct reference to human acts or human behavior, good or bad.

We now find ourselves face to face with the problem of human responsibility. If man is not responsible for his basic nature--and how could he possibly be?--then is he to be held accountable for the way in which that nature expresses itself? We have reasoned that man's nature expresses itself through his will. If he does wrong, it's because he wants to and he has not succeeded in fully taming that "want to" to obedience to social standards.

Training and social pressures give the child--and the adult--knowledge of the difference between what he naturally wants and what society expects of him, thus imposing on him the responsibility to control his will so as to deny and suppress the natural impulse and substitute an acceptable response. Man's ingenuity is thus turned to devising ways and means to satisfy the natural impulses without running afoul of social controls. These ways and means run the gamut from out-and-out lawlessness to accomplishment of the same ends through channels entirely legal and apparently ethical. Let a man whose own nature is covered with the usual socially imposed veneer be removed from his social environment and subjected to stress under strange circumstances, and he falls apart. There is nothing in him to come to his rescue. He has no recourse but to serve the most narrow self-interest, which ultimately leads to his own destruction.

Let us now state as our conclusions that human nature, as expressed in the human will, is fundamentally anti-social and inordinately bad; that it is capable of accepting a thin veneer from society which makes it look good on the surface; that this veneer is capable of taking a very high polish; but the veneer does not change the base. Let us now turn our attention to divine nature.

Divine nature implies a divine being. That we accept without debate and we call that divine being "God." The first question to arise is, "How can man know anything about God?" There are two avenues by which man can gain information about God. One is through His works, the other through His word.

The realm of reality from the natural through the psychological to the spiritual represents, at least in part, the work of God. This corresponds to attributes of God in such categories as knowledge, power, and wisdom, with which we will not deal at the present time. We are more concerned with His moral character.

The moral nature of God, that part which is revealed most explicitly through His will, can be known to man only as God chooses to reveal it. I believe that most people acknowledge that such a revelation has been made, but agreement as to where it may be found is far from universal. We may escape that debate by stating the common conclusion that the moral character of divine nature as expressed in the will of God is completely and without exception good. For the purposes of our discussion that is as far as we need to go on the subject of divine nature. That is far enough,

however, to show that human nature and divine nature are diametrically opposite and irrevocably hostile to each other. This presents a problem which we will now face.

The irreconcilable difference between human nature and divine nature places a fatal separation between man and God. As has been pointed out earlier, man can put a veneer and a high polish around his nature, but he cannot fundamentally change his nature. Man is, therefore, incapable of overcoming his separation from God and he is forever doomed to live in that separation and suffer the consequences of his own evil nature unless God does something about it.

It is a central belief of religion that God has done something about it and that man can become reconciled to God. It is the teaching of religion that when man becomes reconciled to God, God implants in him His own nature; and that new nature, a divine nature, becomes a living entity beside and with the human nature in the human individual. These two natures proceed to war with each other for the control of the will. The sacrifice of self-will to the will of God is the supreme duty of every person, and his greatest privilege.

Strength of character, therefore, comes from the spirit of God, not from the spirit of man. Those traits of character of highest value to mankind may be truly possessed by any man only to the extent that his will is sacrificed to the will of God and his own nature is transformed into a divine nature. The transformation is the work of God; the sacrifice is the work of man.

In this particular, man's work comes first and sets the limit on God's work in him. Peace and a better life have their roots in the nature of man. As long as that nature is human and unregenerate, there is foundation only for wars and rumors of wars, for famine, pestilence, and human misery. Only when human nature is transformed into divine nature is there any possibility for genuine peace and a better life.

The power to accomplish the transformation is the power of God, not the power of science. Operation of the main switch which turns on that power is an act of human sacrifice--the sacrifice of self-will. The hand on that switch is man's own hand. Science contributes to prosperity, but neither science nor prosperity exert any persuasion on a man to throw the switch which cuts off all his pride and terminates the sovereignty of his own will.

We, therefore, can answer the second question only in the negative. Further understanding and breakthroughs in science are powerless to bring about peace and a better life. They serve to increase the power of nations, but more the so-called civilized than the relatively uncivilized nations. Whether they contribute to prosperity or militant aggressiveness depends on how those nations choose to use that power.

Now we come to the third question, which we have already partially answered: "Are our institutions and educational system in need of considerable readjustment to best adapt and contribute to the desired objectives?" An affirmative here should be quite evident.

If our schools and our churches would realize and accept as simple

fact that every human being is born into the world with a nature which is entirely rebellious and anti-social; that all man can do with all of his efforts is to impose on that nature a temporary and thin veneer, which may take a high polish, but which will not stand up under heat; that God, and God alone, can incarnate into man a nature which is divine and therefore fundamentally good; and that the extent to which human nature may be transformed into divine nature is limited only by man's reluctance to renounce pride and self-will for the will of God, the schools would drastically modify their policies of education. They would thoroughly overhaul their curricula and their methods of teaching. Our churches would put less attention on the veneer, more attention on the basic substance. And the Bible would enjoy a return to respectability, both in school and in church.

We come now to our last question, "Can the scientist exert sufficient pressure to transform this age into an age of peace?" Is it appropriate to ask, "What pressure?"

The "age of peace" will come when, and only when, all mankind turns wholeheartedly to God in complete humility and voluntary unconditional surrender. How much pressure would it take? What kind of pressure would it take? Scientists as a class are among the most respected and the most influential people in the world today. If scientists as a class were openly to lead the way in true repentance and personal surrender to God, it would exert a social pressure all out of proportion to their numbers. Do you think it would be enough?

I thank you.

CAPT. FIKE: Dr. Page is ready for questions.

QUESTION: Doctor, we have an enemy or competitor, Mr. Khrushchev, who seems to be completely immoral, and he doesn't have this divine guidance. All he has is human nature to guide him. How are we going to get along with him? What is the future?

DR. PAGE: I think that's a good question and a fair one, and I think it can be answered very easily. We're not going to get along with him, and the future is war.

QUESTION: Doctor, as I understand your philosophy, man is born into the world inherently evil and then coated with a thin veneer of morality or respectability. Isn't it possible that just the opposite is actually the fact--that the basic foundation is good; and then, after running the gauntlet of our social structure and the type of training that we are getting or giving our children these days, all that is left is a thin veneer of respectability? And, if this is not the case, then how do you explain this quote from your same source of literature, "Except ye become as a little child, ye cannot enter to the Kingdom of Heaven"?

DR. PAGE: As to the original nature, I have used logic on the basis of my experience, plus the teaching of the Good Book, in arriving at the conclusion that I did--that the nature originally is evil.

As to the quotation "Except ye become as a little child, ye cannot enter the Kingdom of Heaven," you think of a little child as innocent. Certainly before he gets any training, he is innocent, and he has a humility

and a sense of dependence and a willingness to be dependent on his elders. I think that statement refers to those characteristics.

QUESTION: Doctor, assuming that man's human nature is bad and there is this very high probability of war in the future, why is it that we in American science are so willing to turn over our scientific secrets to even our enemies, knowing that they will probably be used against us sometime in the future?

DR. PAGE: The words that I have expressed here in my opinions are not necessarily the beliefs of all of the, let us say, American diplomats who control our policy. There are many--and I would hazard to guess, the majority--who believe that if we do right with Russia, we can avoid war. I just happen to be an individual that doesn't believe that.

I missed a part of your question. I want to get it all.

QUESTION: Why is it that we share our secrets of scientific progress with our potential enemy?

DR. PAGE: We have actually two worlds of existence in our military science. We have the existence ~~under~~ in a military security atmosphere. We have also existence in a scientific atmosphere which has no military connotation. And in a scientific atmosphere you are not in an atmosphere of conflict. You are in an atmosphere of international competition, which can be friendly competition.

As to why we share our secrets, that I think is entirely outside the purview of my responsibility or authority. That is in the hands of people at high levels in our Government who make decisions on such policies.

I can express some philosophy on that subject, because that is one that is very close to me. In sharing the secrets of science, you have to try to follow this narrow line between "Are we hurting ourselves more than we are avoiding helping a potential enemy?" And I have seen a great deal of our security program from the inside, and "from the inside" I mean from the viewpoint of a scientist in the Government. I have seen a great deal of it, and I have seen a great deal of harm and a great deal of loss in our own country because we jealously guarded under secrecy many things that were easily known to all countries, many things that were known to be known in other countries; and yet our more or less cumbersome security system, which has to be cumbersome because no individual can be all-knowing, has operated very much to our own disadvantage. This is not to say that it has not at other times operated very much to our advantage. So I haven't answered your question, but I've given you a little confusing philosophy.

QUESTION: In your last area you painted everything in more or less black and white. To the question "Could scientists do anything to prevent war or make it less desirable?" you said "No." It seems to me we live in a gray world, in between absolutely good and absolutely bad. Do you think science can contribute either to making prosperity and peace more desirable or war more unattractive, rather than just ~~just~~ a black "No"?

DR. PAGE: When you say "science" I am assuming you are referring to scientific research, the pursuit of activity in the field of

science. Scientific research itself is completely amoral. It has one objective and only one, and that is to increase our understanding of nature. It has no responsibility and no interest as science in the control of nature; only in knowledge.

The use of that knowledge, the use that is made of that knowledge, in the control of nature is entirely outside of the field of science. And therefore that is why I say that science and scientific research of itself brings no moral pressure on the human race. It only gives the human race tools by which it can bring any kind of pressure it chooses.

Do I make that clear?

STUDENT: It's clear all right.

DR. PASE: That is part of the answer. The other part of the answer is that peace and a better world, as we have pointed out, are not products of prosperity; nor are they products of science. They are in quite a different realm from the realm of science.

Now, scientists as people, scientists as citizens, as individuals, have responsibility. They have moral responsibility outside the realm of science. They have responsibilities as citizens of our country which are quite different. Some of them are in the field of morality; but when you get into that field, you are no longer in the field of science. You are dealing with human beings who happen to be scientists.

QUESTION: In your simile of man throwing a switch to partake of the nature of God you said that science cannot help him; that he must do this by himself. If he does that, is that not an action of free will?

And, too, is this not a demonstration of the tendency of man to elect that which is good?

DR. FACE: The surrender of the will to the will of God, the thing that we are talking about here, is not something which is encouraged by the products of science. It is not something which is encouraged by prosperity, which may be one of the products of science. As a matter of fact, it is discouraged, it is inhibited, by prosperity. Adversity is one of the pressures which brings man to surrender his will to the will of God. As a matter of fact, a strong-minded person will never surrender his will to the will of God without extreme adversity forcing him to it. At least that's my feeling in the matter.

So that in a sense it is, as you say, an exercise of free will in the direction of good. You are almost getting me into a paradox here. In a sense it is. But it is with a recognition that that goodness is not in man but is in God. Man is therefore setting himself aside to allow God to act in him, to allow God's goodness to be effective in him. It sounds like a paradox perhaps.

QUESTION: Doctor, you indicated that one of the areas of research was the direct conversion of nuclear power to electrical energy. We can all imagine what an impact this would have upon the whole world to have this amount of energy around. Recently we read that the Naval Research had made some progress in starting progress in this direction. We also know that the British are working very considerably on this. Would you care to tell us how we're doing and make any predictions about what

the future might be and how soon it might come about?

DR. PAGE: You are baiting me now. I would say that we are doing excellently. We have just one serious impediment in our way, and that's the lack of money.

I'll speak now as a person, my views not representing the views of my employer or anyone else, and say that it is my personal opinion that L. N. Kolb, who is working in that field, is leading the world everywhere, with the possible exception of Russia. And that came out in this conference in Sweden, where it was announced. I think he's leading by a big jump. But that is a personal opinion, which will be debated by practically every laboratory which is working in the field.

The reason I say it's leading everywhere but in Russia is ^{that} in that meeting, no one in any other country than Russia outside of the U.S. had anything to contribute indicating progress approaching what L. N. Kolb has got. But the Russians made some announcements and made some statements indicating that they must be pretty close to the same point as Kolb.

QUESTION: To return to the philosophy of the two previous questions, ^{ers,} I believe that early in your talk you linked the natural sciences to psychology and parapsychology and then to religion. Now, will this not in due time tend to bridge this gulf which you indicated existed between man and God?

DR. PAGE: We may bridge the gaps in knowledge among these fields, and I hope we do, as time goes on. But increasing man's knowledge

does not change his nature.

It is an interesting fallacy, but it is a thing which people just will not believe, that if they have knowledge enough, they will be all right; they'll be good enough; that all they need is to know, and if they know, they will do correctly. But experience doesn't bear that out. Even Paul had that trouble when he said: "I know what to do, but I don't do it. What I will I do not." And I think that's true of all of us. It is human history that knowledge of what is right does not guarantee that you will do what is right.

Now we're talking about knowing and doing. We're skidding around the matter of the fundamental nature of man. What man knows, again, doesn't change his fundamental nature.

QUESTION: In regard to the feasibility considerations of having science lead man back to God, it seems to me that the impression I have gained over the years is that as scientists became more and more advanced in their knowledge, they became more and more skeptical, and that the leading people who contested the Bible and God were the scientists in fact. How do you relate these two? Do you mind discussing that?

DR. PAGE: You started out by referring to the feasibility of the scientist leading the way back to God. I think I can answer the whole question by saying that I believe it's entirely unfeasible. I don't think it will ever happen.

I had a great big "if" at the beginning of that sentence, if you will recall. I believe that if that happened, it would be a tremendous influence

on all society. I still am not convinced that it would be enough.

QUESTION: Doctor, we stand apparently on the verge of the exploration of space. One thing that has been bothering me is the fact that we are going to be limited in communications by the speed of electromagnetic radiations or light. Of course, while between here and the moon this will be just a ~~frustration~~^{nuisance,} if we ever reach the point where we are trying to communicate from one side of the solar system to the other, it's going to be a real disadvantage. And, of course, if we ever get into thinking of interstellar communications, we're just not going to communicate by those means. I am wondering, if we ever succeeded in understanding any more about some of these phenomena that you mentioned, such as precognition, extra-sensory perception, and the means by which intelligence is transmitted there, whether there is any possibility that we may find some means of communication which will not be limited by the speed of light? Or do you feel that this is just one of the basic constants of the universe that we will never overcome?

DR. PAGE: I think there is a place in this overall realm of reality where space and time are not limitations. I think if we ever got to the point where we understood enough about it, we might be able to take advantage of it.

But even in the physical realm there are phenomena the velocity of propagation of which is completely unknown. We don't know, for example, how fast the gravitational effect travels. We haven't yet found out a way to measure it.

I could say something else, which would just be completely confusing and make no sense at all, but I'll ~~say~~ throw it out just for the fun of it. I can say that my thoughts can travel from here to the farthest star we can see in an instant, but I don't know what it means. We don't know how fast thought travels. But to say that my thought can travel means nothing unless we put somebody out there who is aware of my thoughts. Then it will have meaning.

Now, when we get into the realm of parapsychology, of extra-sensory perception, here again is a place where there is a transfer of influence, but we know nothing about it, its velocity of propagation, or anything else. It may or may not be limited by time and space. But there are extra-sensory experiences of action taking place on opposite sides of the earth. We have no idea whatever what the time relationships are in those very distant actions.

QUESTION: Doctor, you stated that the basic objective of science is a better understanding of physical nature. But most of the Department of Defense scientific projects require dollars to do the work, and my experience with the Department of Defense is that in order to get the dollars, you have to have some objective other than a better understanding of ~~the~~ physical nature. They'll let a scientist explore a four-leaved clover provided he does it on a golf course, because he might find a golf ball. But he can't just go out and look. Do you find this true with you people? Or do you have some people actually looking for a better understanding of physical nature and nothing else?

DR. PAGE: Will I be held responsible for what I say?

Fortunately, we do have quite a few people who are looking for the secrets of nature, and that is their only motive. Among those people we have the people who, when we get into an emergency and are called upon for some special scientific help, can turn the trick overnight in a very practical way.

But here is the point that may be missed: We have those people looking for the secrets of nature, solely for the purpose of finding out what makes nature click; and we have them supported by very practical dollars that are supposed to buy something for Uncle Sam. Out of that work that they are doing, although they are not doing it for the specific purpose, come/^{many}very important innovations, ^{very}many/^{very}important contributions, which are later applied and used and go a long way toward increasing our military strength in the Department of Defense. That is why military defense dollars are used in supporting this kind of research.

Now, in order to keep those dollars coming, you've got to keep enough things coming out of that research that are recognized as useful to keep the dollars stimulated. The trouble is that the time from the time that you get the dollars to the time that something results from those particular dollars is measured in years.

So it is not something that you can build up overnight. You can't start out and get new money to start a new project that is in basic research and expect to keep it going, because you won't get anything out of it for three or four or five years; and by that time the person that was respon-

sible for supporting it has gone somewhere else and nobody else is interested. But if you can have some way gotten it going in the first place, you can keep results coming out which are a product of work done four, five, or six years ago, enough to keep the dollars coming now to guarantee something coming out five years hence. That is the area in which we have to work to maintain our support.

CAPT. FIKE: Doctor, on behalf of the Commandant and the students of the Industrial College, I wish to thank you very much for a very deep and penetrating talk on what science means to us in our daily and future lives. I really believe that the students will find that this talk is going to grow more on them as time goes by. They will find more time to reflect and pause to consider your remarks. Thank you very much.

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