THE COMPLEMENTARITY OF RELIGION AND SCIENCE: A TRIALOGUE

by Max Rudolf Lemberg

The world is so large
And we are so small
We cannot be in harmony
With ourselves at all.

Angelus Silesius

If God held all the truth in His closed right hand, and in His left the single ever-living urge towards truth, though with the proviso that I must forever err, and said to me: "Choose," I should bow down humbly before the left hand and say: "Father give me this. Pure truth is for Thee alone."

G. E. Lessing

THE GARMENTS OF TRUTH

I dreamed when I lay awake at night:
Of a woman called truth
And her four garments.

The first was precious, but somewhat stiff.
Some people thought it made of gold,
But it was made of platinum.
It was her garment of knowledge and science.

The second garment was quite different,
Gay in all the colors of the rainbow,
Somewhat restless,
With all manners of forms and shapes on it.
It was her garment of joy and art.

The third was of much darker hue.
It was the stuff of which this tale is made.
It was serene, an old garment of myths and fairy tales.

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The fourth was the most beautiful of all.
It was radiantly white,
Her garment of faith, hope, purity, and compassion

Most people thought that she must also own
A golden garment, but she had none.
That was her own skin,
But nobody had ever seen it.

SCIENCE AND RELIGION

R.: As a scientist I believe in the need for objectivity. Objectivity is the hallmark of science. The object of science is not—as was and still is often believed—matter and only matter; that is a mistake of the past. Matter today is recognized as a mere condensation of energy. The true basis of science is objectivity, which demands the abandonment of all preconceived ideas and values, such as are present in all systems of religion, philosophy, and ethics.

M.: For me it is essential that my own life here on earth should have meaning. This for me is an essential value that I cannot doubt. To have a system that answers all questions is not essential. Perhaps much of past philosophy, of past theology, and of organized religion has failed because it tried to press everything into a single system attempting to answer all questions. But, tell me, has science no values which it accepts without questioning?

R.: I admit only one such value, that of objectivity. This in your opinion may be a rather negative value. However, you may say that it has a semireligious character in that it binds every scientist to a definite attitude and to a discipline which to a certain degree can be compared in its strictness to that of a medieval monastery. Science also uses a more disciplined, symbolic language which is superior to verbal language. Moreover, the scientist accepts that our knowledge is never complete, and therefore he cannot accept any final truth. This makes him more humble and more tolerant than most philosophers and adherents of religions have shown themselves to be.

M.: Yet I believe that scientists also accept other values which they do not recognize. They accept as obvious truth that the universe is orderly and accessible to rational understanding. With regard to religion and philosophy it is no longer true that all philosophers and religious thinkers build watertight systems. The Religious Society of Friends (the Quakers) has no creed or dogma; and this religion shares with science the belief that we cannot know a final truth, although it

accepts that the teachings of Jesus are the pole toward which its search is directed and shares the hope to be able to approach it.

M. R.: While it is true that, in some areas of science, value other than objectivity and the belief in the possibility of rational understanding can be neglected, this does not appear to me to be true in all fields of science and still less so in other fields of human endeavor. In biological science, at least as far as its applications to human affairs are concerned, still more so in social and political sciences, other value judgments cannot be avoided. These are value judgments which some scientists naively assume to be "self-evident," although events of the recent past disprove this. The history of science itself ought to have taught scientists that the assumption that something is self-evident can merely hide our ignorance, as Albert Einstein shows in his relativity theory, and thus can be a cause of error. This is of course also true for dogmatic religious and philosophical claims.

Do not "objective" scientists lose sight of the fact that science is after all a creation of human consciousness alone, and thus by necessity its ideas are as "anthropomorphic" as religious ideas?

R.: The scientist, however, does examine his hypotheses by verification and attempts at falsification. Even if he does not do this himself (as a good scientist should), his colleagues will do it for him. It may be true that not all fields of human endeavor are accessible to scientific analysis; yet the fields in which this is possible are increasing continuously, and there is hardly a field of human knowledge and action in which scientific methods cannot be helpful.

M.: However, what can we do in the many fields in which the application of the scientific method covers only a small area of the whole field? Action, whether political, social, biological, or medical, cannot always wait until our scientific knowledge is developed enough to suggest a definite answer. It is just in these areas in which value judgments give at least preliminary guidelines. Moreover, what is the answer of science to the question of the meaning of individual human life and of the human community?

R.: Some scientists claim that this question is in itself meaningless. Such a claim leads to the radically existentialist attitude that man's life is meaningless and that man has to learn to live "like a gypsy" as a stranger in a meaningless world (see Jacques Monod's *Chance and Necessity*). Not all scientists, however, adopt this attitude.

M.: Monod's answer may be a logical consequence, but it is rather cheerless; suicide would be a still more logical answer. A gypsy does not seem to me a happy person, and such a pseudoheroic attitude appears to me rather that of a disappointed, weak character who has lost faith not only in the world but also in himself.

M. R.: Let us not forget that the scientist is never merely a scientist but also a man with all his hopes and fears and that a religious believer usually accepts without qualm the advantages which science has to offer in scientific technology, for example, medical services, cars, or airplanes. Present adherents of the "counterculture" protest against the excesses and the misuse of technology. Their attack is justified. However, their attempts to reject the whole of science on the basis of "you will recognize them by their fruits" (Matt. 7:17-20) are condemned to sterility. The rejection of science, as a reaction against the past exaggeration of its unique value by some scientists or the misuse of scientific technology by nonscientists, has great dangers if it becomes fashionable. It turns the clock back not only against the use of science in fighting the spoilage of our environment but also against rationality. Rejecting science does not help close the gap between religion and science but widens it as does the claim that objectivity is the sole value. Science and religion are truly complementary even if we cannot yet draw the line between their legitimate and illegitimate uses exactly in all instances. This is a task which should attract more attention and effort in the future and replace futile attempts to deny the importance of the one or the other. Religion is more important for showing the direction and the major ends of human efforts, while science shows the possible means available to us to achieve these ends; if this is correct, they are in fact complementary and both are essential for our ethics. Science, however, can set new ends insofar as it demonstrates the means to achieve them. The fights against bacteria obviously could become an ethical demand only after their role in human diseases had been recognized by science. Thus it hardly can be accepted that there is a free choice of ethics for everyone. Are we really free to choose the ethics of an Adolf Hitler? We ought to have learned our lesson.

Nor can we accept that nature, which after all has created man in evolution, is utterly alien to the human spirit and that love of beauty in nature is merely self-deception. It appears to me that scientists who deny any direction in evolution close their eyes to something undeniable, even though the problem is not without difficulties. They fail to see the forest for all the trees.

COMPLEMENTARITY

R.: Since we have spoken of complementarity, it may be worth our while to look at the origin of this concept in modern science. A complementary angle in geometry is the one which added to an angle makes the complete circle of 360 degrees. It was the great Danish physicist Niels Bohr who stressed the significance of complementarity in modern science. His starting point was that physicists had become quite accustomed to using in the theory of light two apparently irreconcilable ideas—that of waves and that of moving particles. Neither of the two concepts alone could explain all the phenomena observed. Only the wave theory satisfactorily explained interference and polarization, and only the corpuscular theory the photoelectric effect of Einstein, that is, the sending out of an electron from an atom hit by a light quantum. Thus there can be two apparently logical, contradictory theories which offer a more nearly complete understanding of phenomena than a single theory. They are thus complementary.

It should be noted that there is no arbitrary choice in the application of the one or the other of the two theories. Only the one helps in the understanding of some phenomena and only the other in the understanding of others. Thus the accusation against Bohr of a wishy-washy attitude appears unjustified. Even if later theories may be able to achieve a rational synthesis of the two complementary ones at a higher level, they will not destroy the value of complementary analysis. Such a comprehensive theory may never be found.

After Bohr had developed atomic models of electrons circling the atomic nucleus in certain orbits as an explanation of the nature of chemical elements, another complementarity appeared in quantum physics. By the way, the Bohr models, though now rejected by physicists are still used by chemists on account of their clearness and simplicity. The new complementarity of quantum mechanics appeared when Werner Heisenberg showed that if it was possible to establish the exact position of an electron circling an atom it was impossible to establish its momentum (the product of mass and velocity) exactly; if the momentum could be determined exactly, the exact position of the electron could not. Heisenberg's "uncertainty principle" throws doubt on strict determinacy and hence on causality in atomic processes. Bohr spoke of "alarm," Heisenberg of "despair." We cannot discuss here whether the uncertainty principle really would be complementary to the usual physicochemical processes in giving us a more nearly complete understanding of life processes, of the mind-brain problem, and of free will as Bohr believed. Erwin

Schroedinger's criticism is directed not so much against the concept of complementarity per se as against the particular significance of the quantum mechanical uncertainty for the theory of life. In his view the complementarity is rather one between the well-known physical laws based on statistical probability and the still unknown laws which are not less but more deterministic. He considers a living organism as a macroscopic system resembling a crystal, so that its behavior rather resembles that of a machine with solid parts. Thus its conduct differs from thermodynamic systems and becomes more like systems at temperatures approaching absolute zero, when molecular disorder disappears. Thus living systems escape to some extent the law of increasing entropy, that is, of heat disorder which makes part of the energy unavailable. However, this does not account for the fact that inside living systems there is increasing order which can be achieved only by its complex organization.

Similarly, in spite of their mutual friendship and admiration, Einstein did not accept Bohr's use of the uncertainty principle. Several discussions at international physical meetings left the question undecided.

M.: Einstein's objections, however, had a far more general and fundamental, in fact, a religious aspect. It was directed against the whole probability foundation of modern science, unless probability was used in a merely pragmatic way. Einstein asked Bohr, "Do you really believe God resorts to dice playing?" Bohr answered: "Don't you think caution is needed in ascribing attitudes to Providence in ordinary language?" However, it is clear from many statements of Einstein that he accepted complementarity in a wider sense: (1) "Man tries to make for himself, in the fashion that suits him best, a simplified and intelligible picture of the world. This is what the painter, the poet, the speculative philosopher and the natural scientist do, each in his own fashion." (2) "The state of mind that enables a man to do work of this [scientific] kind is akin to that of the religious worshipper or the lover." (3) "The most beautiful experiences we can have is the mysterious. It is the fundamental emotion that stands at the cradle of true art and of true science."

There is, however, another important aspect—the apparent irrationality of modern physics which concerns the relativity theory no less than the quantum theory. Simone Weil has attacked this irrationality. Is it, for example, essential to accept that there is no simultaneity of events in the universe because it is practically impossible to demonstrate it owing to the limited velocity of light? Is the positivistic basis of physics paid for too highly if it means accepting irrationality?

We find the same problem when we compare the commonsense concept of time with its past, present, and future with the physical concept of time which recognizes only earlier and later and makes time only a coordinate of space-time, without the polarity of past and future. This makes questionable whether the physical concept of time, which reduces "becoming" to merely psychological and mental events, can be acceptable in scientific biology, let alone in social sciences and history. We may have to accept the complementarity of physical (tenseless) and commonsense (tensed) times, unless we accept that time has no meaning. Without this complementarity we should have to sacrifice the logical polarity of time, of unalterable past and possible future, of true becoming, of choice, and of deliberate action, of the difference between expectation and memory, of birth and death, perhaps even of causality.

M. R.: The problem of allowing unpredictable chance in a realm of order is far older than quantum mechanics. It has been with us ever since the probabilistic theory of heat and molecular motion replaced the earlier mechanical and strictly causal science. This can be overlooked for very long because most physical events involve a very large number of particles and events so that the de facto causality of these events remains. Now, however, the great importance of simple molecular events such as mutations in the field of life is known, although macroscopic events play a great role in the neo-Darwinian theory of natural selection. Strictly speaking, single events and highly improbable events, for example, the origin of life and the origin of consciousness, are outside the field of science, which is restricted to probable events.

It is of interest that the problem of chance and order was recognized much earlier in its religious dimension. The Old Testament book of Job was written many centuries B.C. I do not here refer to the dramatic framework, to the fight of God and the Devil, which inspired Johann Wolfgang von Goethe's Faust. What is amazing is that the biblical writer lets God himself take the side of Job against his "friends" in spite of Job impiously accusing God and his impertinence in challenging God to appear before a "higher court of justice." The problem of affliction, deeper even than that of evil (Weil), thus was raised. This remains a mystery even today; however, we are now aware of the fact that there are powers of chance in the world which are independent of morals and ethics and yet on the other hand that chance is unable to destroy God's directiveness. Thus the end of Job, his acceptance of God's power, is not a lame excuse of a pious

apologist but a deep truth. What a pity that this truth was overlooked by John Calvin so that his theory of predestination obtained its fatal power.

The same truth, however, is overlooked by most biologists who fail to see the direction in natural evolution despite man and his consciousness and his science, including the recognition of evolution, all being the product of that evolution. Only a few—Pierre Teilhard de Chardin and Theodosius Dobzhansky among them—have understood that there is in toto, though not in every single step, a direction in evolution which has made us and our science and our religion. In view of this it appears to me senseless to criticize all nonscientific thinking as "anthropomorphic." Of course it is anthropomorphic by necessity, as is science too. One may differentiate only between primitive, for example, animistic, and more refined and critical anthropomorphic thinking. In like manner, is it nonsense to consider any and every instance of wishful thinking as wrong? Hope and faith are powerful forces for the higher evolution of individual men and of human society as contrasted, for example, with the cargo cults of primitive people.

R.: Is it not then essential to establish clearer lines of demarcation between complementary notions similar to those available for the two theories of light? And what differentiates notions of complementarity from those of dualism, such as were developed by René Descartes for the mind-body problem?

M.: To answer your second question first, the dualism accepted by the theory of complementarity is only provisional. While rejecting a premature monism, it leaves open the question whether a later theory may not be able to unite the two complementary theories.

I also believe that it will be much more fruitful to search for clearer lines of demarcation than to try to find reasons for the rejection of large areas of human knowledge. We should avoid the "nothing-but" and "merely" statements of the past generations, both of positivistic-pseudoscientific and of religious-fundamentalist, dogmatic thinking. They are relatively sterile since it is impossible to reconstruct from them the whole of human experience. We shall find that it may not be an easy task to discover demarcation lines between the fields of, say, science, art, and religion; yet for that very reason it is today the most necessary and essential task. It will be all the more difficult because we can expect an enormous resistance both from inertia and from vested interests. Today a scientist who is interested in religion comes to feel

that he is not taken quite seriously by his scientific colleagues; so does a religious man who takes science to be more than merely technologically useful; so also does an artist interested in science or religion.

Beginnings have been made by those who differentiate between fields in which qualities and values are of greater significance than scientifically ascertainable facts and quantities. But apart from the destructive criticism of those who reject either values or facts, the demarcation line is not sharp, lying, for example, right inside science in its larger connotation, entering the biological sciences, and dividing the fields of psychology and political and social sciences into almost equal parts. Although man is a rational being, he is a crippled and incomplete being if his emotions and aspirations, his hopes and fears are left out. Man after all is a rational being who, made in the image of God, aspires to transcend his state.

M. R.: The more we approach this realm of higher aspirations, the realm where we can doubt even our own reason, the more necessary it will become to use criteria other than those of abstract reasoning. Here the exact equations of science give way to the metaphors of poetry and to the myths and parables of religion. Certainly they are less exact, but they are not indefinite and are closer to truth in those fields in which another approach to truth is impossible. The fight between dualism and monism (even characteristically different types of monism—the positivistic-scientific and the dogmatic-religious) has gone on for centuries, and this indicates to me that monism is still premature. The concept of complementarity allows us to be more sincere and more nearly complete human beings, provided that it not be accepted as another dogmatic and final solution. The conviction that all claims of being in the possession of the final truth are unjustified and even dangerous to human brotherhood and humility has made me a Quaker. It may appear paradoxical but nevertheless true that we may be able to approach God in our whole living and being more closely than by rational thinking.

We are creatures of the earth and part of nature and made in God's image in a sense deeper than that nature is also God's creation. We are in a special way God's helpmates to whom some creativity has been delegated. We remain part of nature and as such can enjoy its beauty. The knowledge of the really great scientists has not diminished but enhanced their sense of wonder and mystery. Teilhard de Chardin has shown us that, far from being a hindrance to the freedom of our souls, matter is in fact the complement, providing the handholds and footholds on the mountain of our spiritual climb. It appears that some

mere scientists of today have forgotten that man is part of nature, and therefore nature can never become entirely alien to him.

SCIENCE AND METAPHYSICS

R.: The logical positivists have an easy solution to this problem. For them metaphysics is meaningless, and only science has meaning. Karl R. Popper in his *Conjectures and Refutations* differs from them. He does not consider metaphysics meaningless but draws a demarcation line between science and metaphysics. It is important that scientific statements can be refuted or falsified more so than that they can be confirmed. Thus metaphysics is excluded from the realm of science, but its value as another field of human knowledge is not denied. Popper extends this criterion of possible falsification to Marxism and Freudian psychology, which claim to be scientific but are in fact not so because there appears to be no way to falsify them. It is just this apparent nonfalsifiability which impresses so many uncritical and particularly young people. Popper goes even so far as to state that a single fact which does not agree with a scientific hypothesis shows it to be wrong, whereas a large number of facts which appear to confirm the hypothesis can in fact never prove it to be right. Its truth therefore remains provisional.

M.: On the whole I am in sympathy with Popper's definitions. The claim of Marxism to be a science has tended even to decrease its real importance. The surplus theory is of dubious value as it overlooks the just claim of organizers and managers for recompense, and the Marxist predictions of the future all have been long shown to be erroneous. Karl Marx is far more important as a Jewish prophet. He angrily protested against the exploitation of human beings by the employers who neglected basic human rights and degraded the employee to a cog of the machinery in the factory. Again the discovery of the great importance of the unconscious by Sigmund Freud will remain long after his exaggerated claim of the preponderance of the sex drive and his dream interpretations will have been forgotten.

M. R.: I confess some hesitation in accepting the criterion of falsifiability as one distinguishing clearly between science and pseudoscience. This is not quite as clear-cut as Popper believes it to be. To illustrate what I mean I give you an example. Spiders and other arachnids are arthropods with eight legs, right or wrong? Does the discovery of a single arachnid with six, not eight, legs falsify the hypothesis? The larval form of the Australian bush tick *Ixodes*, an arachnid, has six, not

eight, legs; is it an insect or a spider? The hypothesis can be made correct by restricting the number-of-legs hypothesis to adult forms, excluding larval forms; yet this and other examples can be adduced to show that the falsifiability criterion is not always so straightforward in its application as Popper assumes. No scientific hypothesis stands on its own in isolation, and its merits and demerits will have to be judged on a wider basis of logical coherence, for example, in the tick case on the basis of the theory of natural evolution. Also confirmation and refutation are always mixed up. Every scientist likes to see his hypothesis confirmed and may develop even auxiliary hypotheses if it is attacked; yet, if he is worth his salt as a scientist, he also will try to devise experimental situations to confirm or refute his hypothesis. Every scientist is aware of the real difficulty of finding ways toward a clear-cut decision and answer to this question; if he does not find them himself, his professional colleagues certainly will. If a hypothesis appears reasonable, it will not be thrown out by a single piece of evidence against it. It may require a very minor modification to let it stand. This must be pointed out in order to understand the cumulative process in science, which appears to me to be more marked than the cumulative approach to truth in fields such as philosophy. The technical term for this in the field of physics is the "correspondence principle." The very important conversion of Newtonian into Einsteinian physics, for example, left large parts of Newtonian physics untouched and did not falsify them. It only showed the boundaries outside which they were no longer valid and found more general laws which were applicable in this wider field, which, however, had to include the whole field.

R.: What Popper claims for metaphysical truth can be claimed also for poetical truth. Do scientific truth and the approach to truth by art, such as poetical truth, exclude each other? Or are they different approaches to truth? Where is the demarcation line between these two different human activities? When is the one a more fertile approach than the other? The hallmark of science is an equation which deals with quantities, and such an equation is falsifiable. What takes the place of the equation in poetry, and is this falsifiable?

M.: The metaphor in a poem replaces the scientific equation. Such a metaphor is not strictly falsifiable as it has a more subjective content. But while it is not falsifiable it has a certain validity in the common experiences of men. These are not so completely universal as quantities; yet they are not entirely subjective since they are based on more

or less shared experiences of many. No poet is a good poet who speaks only to himself. The poet's metaphor opens up to some others a new experience. "To suppose, with some who write about the scientific method that a scientific theory stands or falls on the issue of one experiment, is to misunderstand science indeed." This warning from James Bryant Conant should not be neglected.

M. R.: Experience and experiment differ. An experiment is repeatable. There are few instances in which the results of a single experiment are accepted in science without confirmation by repetition. Even then it can be repeated and confirmed by others. An experience is not of this nature. It remains unique to a certain extent, although it can be shared by others. It cannot be readily produced at will. Experience is the domain of poetry and religion; experiment is the domain of science, although science does not consist entirely of experiments. Logical coherence is also an important guide in science, and imagination is as important in science as it is in art. I agree with Popper that science is more fundamentally deductive than inductive. Sense observations are irrelevant unless they can be correlated with some hypothesis or theory. The first step of a major scientific theory is often a dreamlike revelation such as that which led to the hypothesis of the ring structure of benzene. It is not an induction but rather like the first conception of the artist. Only then begins the checking of the conceptions for conformity with other known facts and for logical coherence with related fields of science, which is essential for science. In other instances, often the most important ones (as in the conception of the relativity theory of Einstein), the first step is also deductive, based here on a thorough examination of what has been considered as "self-evident" (in this instance, the concept of simultaneity). (Einstein's theory is scientific since it examines the verifiability of simultaneity and its dependence on the velocity of light.) There are other equally profound problems of the conception of time which are not scientific but metaphysical. I believe that many of our traditional religious concepts, of heaven and hell and of life after death, require a metaphysical Einstein who investigates the metaphysical conceptions of time and eternity. Plotinus in the second century A.D. stressed that eternity was before and beyond time and not a very long time after death, but the Christian churches often have forgotten this.

Dimensions

R.: One of the essential differences between science and common sense is that science deals with a far greater diversity of dimensions

than those met by common sense. The natural dimensions in which man lives are the boundaries of his direct experience. Take only the simple category of length and distance. Man is from one to two meters tall. The world which he can experience with a degree of some immediacy is wider, from about one-tenth of a millimeter (a line width or point), a centimeter (a fingerbreadth), a decimeter (a handbreadth), ten meters (a house), 100 meters (a tall tree), to several thousands of meters (a tall mountain peak or long travel on the earth's surface). If we use ten as defining an "order of magnitude" and one meter as a unit, man's field thus extends from -4 (i.e., $1/10^4$) to $+4$ (10^4), over eight orders of magnitude.

The world accessible to scientific information is, however, far greater. If we divide the lowest limit of man's direct experience by one thousand (three orders of magnitude) we arrive at the dimension of the smallest bacteria and viruses and of the largest chemical molecules, for example, the proteins. The inner complexity of a single cell and of a bacterium is still almost as great as that of the human body, and large protein molecules are very complex structures. However, the realm of the atom is still three orders of magnitude smaller ($1/10^{10}$) and that of the atomic nucleus still another five orders of magnitude smaller ($1/10^{15}$).

Up the scale, the moon is almost five orders of magnitude more distant from earth than is the highest mountain peak from the earth's surface; this is the farthest man has traveled by scientifically controlled rockets. The distance of the sun from the earth is almost another three magnitudes larger (one thousand times), the nearest fixed star another six orders of magnitude (one million times). Beyond that, astronomers measure distances in light-years, the number of years it takes light to travel from a star to the earth. One light-year corresponds to 10^{16} meters, and the most distant stars, which perhaps mark the edge of the universe, are 10^{25} meters away (imagine a figure with twenty-five zeros!). The reach of magnitudes in the scientifically explorable universe is thus from -15 to $+25$, or forty orders, of which only eight are accessible to man's direct experience. Note that this does not mean one-fifth but $1/10^{32}$, an infinitesimally small portion.

Similarly our direct experience of time has a much smaller extent than that measurable by science. The life span of an individual is about 10^9 seconds—a second being his smallest time measure. Atomic light radiation frequencies measure about ten orders of magnitude in a second, while the time span of the solar system, only slightly (in this dimension) longer than that of evolution of all living organisms on

earth, is five thousand million years. Compare this with the seventy or eighty years of man's individual life, with about five thousand years of human history, and with more than three million years of man's existence on earth. Again the orders of magnitude accessible to scientific time measurements, from -10 to $+17$, or twenty-seven orders, far exceed those experienced by man directly, nine orders. Again this is not three times but 10^{18} times greater.

M.: You have dazzled us with the practically incomprehensible size, or smallness, of these figures. It is certainly true: "The world is so large, and we are so small." But what is the significance of these figures? Are not qualities far more important than quantities?

R.: Yes, but until recently it was believed that qualities are independent of quantities. This has turned out to be true, however, only for the rather narrow realm experienced by man directly and accessible to common sense—it is not even strictly correct for this. It is certainly wrong for the differences of magnitude encountered by science. In the realm of common sense we find infinite subdivisibility and continuity, together with an almost infinite variability; this still holds down to the realm of microorganisms. All this no longer holds in the realm of atomic dimensions. True, an atom is recognized now as divisible, but if it is divided, and certainly if the atomic nucleus is divided, it loses the chemical identity and becomes something quite different. Thus the distribution of matter becomes discontinuous. Energy too is then discontinuous. There is a smallest possible division of action, that is, energy times time—the quantum. Hence the laws of quantum mechanics differ from those of the usual mechanics. The quantum was postulated first by Max Planck at the beginning of our century on the basis of observations on "black body radiation." In 1913 Bohr established its significance for the explanation of atomic spectra and the structure of atoms. Quantum mechanics was developed from 1926 onward by contributions of Heisenberg, Schroedinger, Louis Victor de Broglie, Paul Dirac, P. Jordan, as well as Bohr. It is thus only fifty years old, but it has revolutionized science. The concept of causality which ruled the macroscopic world has been replaced by that of probability. This was used before by science but only as a utilitarian device. There is no longer an almost infinite variety but (according to chemists) only about two hundred kinds of atoms (counting also naturally occurring isotopes). Finally in the realm of the atomic nucleus there are only a few recognizable units, and any two electrons are indistinguishable from each other in prin-

ciple. Many of the laws valid in this realm are still unknown; others are quite strange to common sense. Even the laws of mathematics and of logic which apply in the macroscopic world must be modified in the realm of quantum physics. Notions which formed the basis of scientific theory (e.g., of thermodynamics) such as closed systems, ideal gases, and perfect crystals are recognized as mere abstractions. The concepts of space and time are replaced by that of four-dimensional space-time, the Euclidean by non-Euclidean geometry and a multidimensional (curved) space. Time has lost the polarity of past and future. The universe and the velocity of light are definite yet infinite in the sense that they cannot be surpassed.

This has introduced into science an apparent irrationality which has led to bitter criticisms, not all of which was so blatantly prejudiced as that of the physicist Philipp Lenard in his antisemitic attacks on Einstein. Weil, for example, contrasted this irrationality with the Greek attempts at a rational science. It gave great cause of uneasiness and disturbance to the scientific positivist to whom it appeared to open the "floodgates" of doubt and "idealistic" confusion and obscurantism. This prompted the Russians to attack modern genetics and Linus Pauling's resonance theory.

What holds when going down the scales of magnitude into the depth of matter perhaps also holds when going up to astronomical magnitudes and to the structure of the universe. The notion of the continuous increase of entropy, that is, the continuous decrease of available energy which will lead ultimately to the deep freezing of motion and life in the universe, is probably untenable and will have to be supplemented by new physical laws which demonstrate the recreation of life and of motion. Logically a distinction will have to be made between the impossible and the highly unlikely. Perhaps the American joke that it takes a little longer to do the impossible than the difficult has a real kernel of truth. We should not forget that human consciousness finally evolved, although it took a large proportion of the time of existence of the whole solar system. Human consciousness can be used to decrease the decay of free energy, as every builder of dams and his engineers can testify.

M.: You have shown us that penetrating the depth of the very small, which lies hidden under the surface, as well as rising to the very large outside ourselves makes us enter new dimensions in which we find unfamiliar and astonishing laws. The same holds for the more metaphorical use of the term "dimension." Thus Paul Tillich speaks of God as the "depth of our being" and of religion as the "dimension

of ultimate concern." For him, and for me, religion is not a human activity parallel and comparable to other human activities and departments of human knowledge but the dimension which gives all other efforts and cultural activities their meaning and value. Its measuring rods, however, are not those of size or even those of complexity, and this makes it more difficult to establish rules and laws. There are other dimensions, such as that of consciousness and that of dreams which obey their own laws; they appear to belong to both the physical and the metaphysical realms.

M. R.: How much religious thinking has been mocked because it led to paradoxes and to conclusions which failed to harmonize with those of common sense! Now we find the same paradoxes in science, and this ought to have a chastening effect on the arrogance which has been a hallmark of the prequantum and prerelativity sciences and the positivism of the late nineteenth and early twentieth centuries, which tried to exclude everything except scientific facts from reality. Thus because of its great achievements modern physics has produced greater modesty and less cocksureness, although this has not yet penetrated other fields of science such as biology. Taken together with the parallel decrease of the arrogance and cocksureness of traditional religions, in particular orthodox Christian religions, these phenomena give us hope that the complete lack of understanding between science and religion may be diminishing and may give way to reintegration. This will prevent the schoolboy attitudes of describing science as "stinks" and religion as "vapors." However, public opinion still has to go a long way before it realizes that science is more than a technological producer of desirable goods together with atomic bombs and other threats which endanger the existence of the human race. We ought to realize that, like other essential human activities, science ought to be judged not so much by its "fruits," which like those of religion have not always been beneficial (religious wars and the burning of heretics), as by its being a necessary part of human culture and an activity of the human mind. Even magic was bad religion and bad science. It is partly the fault of some apologists of science who for utilitarian, financial, and political reasons so overstressed and still overstress the benefits of technology that we now are caught in the rejection of technology and with it of science in toto by the counterculture of radical youth. Similarly one-sided apologists of orthodox religion—one may even say of God, as if God needed defense—have done damage to religion by their claims of infallibility, of literal and of final truth, and by their identification of religion with conventional morality.

There are important, though perhaps less fundamental, differences of laws inside the narrower realm of purely human dimensions. The laws which hold for the relationship between two individuals, for the family, for the small community of the village, for the city, for the society of the nation-state, for the global society, and for the relationships between smaller and larger units all depend on laws of science and religion; yet there are distinctive differences. We now live in a state of global interdependence—no longer a mere ideal but a reality, as Teilhard de Chardin has pointed out ("planetization"). This development, however, has not been present long enough to become a dominant factor in human consciousness. For example, in my country, Australia, it would be easy to write a farce on low-stature politicians who blow themselves up to retard the development of Australia—the only one, by the way, which owns a whole continent—into full nationhood. It is a tragicomedy rather than a farce, an example of human small-mindedness and outright stupidity. Some citizens have hardly grown out of the mentality of a caveman, or many of our politicians out of that of neolithic villagers. Most of our and other national leaders do not live in the present but at best at the time of the relations between small nation-states. Perhaps I forget here how slowly God's mills work; one hundred years is a very small time for men to adjust to the tremendous alterations of speed of traffic and communications, and the forces of inertia are immense. One day we shall have to pay—perhaps by the destruction of human civilization, of science, of religion, and of art—for our failure to adjust with sufficient speed. One can sympathize with, though not approve of, the youngsters who would like to turn back the clock on our realities because they feel unable to deal with them. There is no dimension of youth, for the young cannot avoid growing up and youth is far too short a time. There may be, however, a dimension of divine discontent in which young and old can combine; this will have to consider present realities or else become merely destructive.

The Dimension of Life

R.: Until recently biology was divided into three realms—animals (including man), plants, and microorganisms. It was known that the distinction among them was not quite sharp, but what division is? Modern biology has learned, however, that the division hid a far greater unity of the dimension of life than had been suspected. Biochemistry and biophysics have established the essential similarity of all life processes in spite of the apparent diversity among animals, plants, and bacteria. They also have revealed the immense complexity

of these processes which in the single cell of a bacterium are only a little less complex than in the whole of a highly developed multicellular organism and are even more complex than in a single differentiated cell of the multicellular organism. There are no "primitive" cells which we may study in the hope of coming closer to the mystery of the origin of life.

The science of genetics too has established the essential identity of the genetic determination of all life processes, although we stand only at the beginning of understanding how the genetic code carried by nucleic acids is translated into the regulation of the synthesis of proteins and enzymes, which in turn regulate the metabolism. Some biologists have stressed the importance of the theory of information, but it must not be forgotten that there is an essential difference between human symbols (e.g., words or ciphers) and genetic information in that the latter, but not the former, must be able also to explain the mechanism of the code translation.

The realm of biology has been united also by the theory of evolution, which demonstrated a historical element in the processes of life. By it the stabilizing effect of the genetic information on the molecular level was complemented by the dynamic possibility of change on a macroscopic, phenotypical level. Whether (as, e.g., Dobzhansky thinks) the complementarity of Cartesian mechanistic and neo-Darwinian evolutionary thinking suffices to determine the dimension of life must remain an open question, however. Mechanistic thinking and historical thinking comprise and are sufficient for the science of geology but in my opinion do not suffice to determine the dimension of life. There thus remains a spark of vitalism, although this can be looked for no longer in the existence of a special life force but perhaps in the mystery of the evolution of a multilevel cybernetic system. This allows for the relative stability of the living organism not in an equilibrium but in a dynamic "steady state" with an inbuilt tendency to return to the normal level even if temporarily disturbed ("homeostasis"—it stays the same). "What I eat becomes myself" is correct but only by very complex processes of ingestion of nourishment, digestion, resynthesis, rejection, and excretion of waste materials.

There is much variety in the way living organisms provide themselves with the necessary energy—"heterotrophic" use of organic food material, "autotrophic" use of energy from inorganic energy processes in bacteria, or the use of solar light energy in green plants and in algae. In the anaerobic and aerobic (dependent on oxygen) processes not only are there similar enzymes at work—the cytochromes, the

flavins, and others—but also there is an intrinsic similarity in all living organisms. All display an ability to preserve a large part of the energy gained from outside in their energy-rich state, above that of a static equilibrium. As long as life lasts, a static equilibrium is never reached. Thus inside the circumscribed realm of the organism the usual loss of free energy is reversed. (Compare the "anagenetic energies" of Henri Bergson.) I believe that this concept is understood more readily than the usual, perhaps slightly more exact expression, "gain of entropy," that is, nonavailable energy.

Finally all living organisms form part of a community of living organisms on the earth's surface, the biosphere, in a great variety of distinct niches (ecology) with other organisms; they are all interdependent in a web of life, in which building and decomposition are finely balanced, once again in a dynamic steady state. Here there is no absolute boundary between organism and environment. L. J. Henderson has stressed not only that organisms are fit to live in their environment but also that the environment of the earth's surface is well fitted to make life possible—its temperature, the presence and properties of water, the atmosphere with its content of oxygen, nitrogen, and carbon dioxide, as well as the ozone layer in the upper atmosphere which protects living organisms from an excess of ultraviolet radiation. A balance is maintained for each chemical element—oxygen, nitrogen, sulphur, phosphorus, metals, and compounds such as water or carbon dioxide. The nitrogen of the living organisms returns to the atmosphere by the action of decomposing bacteria, and microorganisms bind it again to compounds in the soil and thus make it available to plants and through the food chain also the animals and men. There is a great complexity of these cycles in the environment as well as in the organisms themselves. The organisms play an essential role in the environmental cycles too. Therefore seeing nature "red in tooth and claw" has been a wrong and one-sided way of seeing the dimension of life. We now see collaboration in nature. Animal herds demonstrate this. But we also see a far wider range of mutual dependence, for example, between algae and fungi in their symbiosis in lichens, between bacteria and animals in the rumen of cattle or sheep, or between termites. Even the competition between predator and prey, wolf and reindeer, is not merely destructive but also helpful in keeping the balance of nature alive, as does that between energy providers and decomposers.

There are still many unsolved problems in biology in addition to those mentioned. We do not know how the nucleus of the cell was separated from the cytoplasm by a separate membrane when the

eukaryotes developed from the earlier prokaryotes, bacteria, or blue algae. This occured about two thousand million years ago when the genetic apparatus with its nucleic acids was taken up by the nucleus. We do not know how the other organelles of the cell (e.g., the chloroplasts, the carriers of photosynthesis, or the mitrochondria, the carriers of cellular respiration and the use of oxygen) were developed. Nor do we know much about the formation of colonies from single cells from which later separate tissues developed or about the differentiation of genetically identical cells into different cell types such as root, stem, and leaf cells in plants, and epidermal, nerve, muscle, and bone cells in animals, and how various tissues grew together into distinct organs—lung, heart, kidney, stomach and intestine, glands and brain—to fulfill their essential functions. We know that their growth is regulated by hormones, chemical substances circulating in plants and animals; yet what regulates the secretion of the hormones? This appears to be almost a problem of infinite regression. We can say only that somehow there is a cybernetic regulation presided over by the genes, but the working of that regulation is still largely unknown.

M.: What the scientist Henderson found was seen also by the poet William Wordsworth: "How exquisitely the individual mind/—to the external world/Is fitted: —and how exquisitely too—/Theme this but little heard of among men—/The external world is fitted to the mind.—/This is our high argument." Can we really glibly reject vitalism when our knowledge of the mechanism has still such wide gaps? I agree with C. A. Coulson that a religion merely based on such gaps stands on feet of clay, but, while this is a convincing argument against supporting religion on such a basis, it is not an argument for a merely mechanical basis of life. Life by necessity includes human life, thought, and science. Earlier attempts to assume a special life force were probably mistaken, all the more so because the way in which such a special life force could influence the physicochemical forces at work in living organisms remained quite obscure. We previously reported that some physicists accepted the existence of other hitherto unknown natural laws at work in the dimension of life, either positively at work (Schroedinger) or permissively (uncertainty principle) or possibly both. There is an obvious difference between living and nonliving in the complexity of life processes.

Speculations on the origin of life are interesting but no more than speculations. Since they deal with highly improbable, possibly unique events, and since they are not falsifiable, they have no legitimate standing in the realm of science. This already was stated by Bergson: "Science can work only on what is supposed to repeat itself. Anything

that is irreducible and irreversible in the successive moments of a history eludes science." Thus previous speculations of A. Oparin on the existence of a reducing atmosphere at the time when life probably appeared on earth are now in doubt.

A machine is certainly a very poor model of life. A much better model would be a complete factory including the director of the factory. Such a model is in fact closer to the concept of a divine creator and his creation than to that of a machine. Moreover, we must not forget, as do some scientists, that the dimensions of life and evolution must include consciousness and human self-consciousness, thinking, and willing. Reductionist thinkers of the past century and some up to now are all too ready to relegate such conscious experiences to the shadow realm of "superstructure."

I believe that modern biology has made us realize much more than was previously possible on a personal and emotional basis that life and death closely belong together. Those who have not yet learned the lesson will have to learn it in the population crisis which already has begun to teach us the dynamic steady state depending on the balance between life and death. This lesson will be of great religious significance. We shall have to live a life in a manner which includes our coming death. Great men always have known this and have not succumbed to the cheap temptation that therefore all life is in vain, and the seeking of pleasure thereby justified. On the contrary, they have been stimulated to use their creative powers lent to them by God to the utmost of their strength.

Another lesson we can learn from biology concerns other religions, in particular Eastern religions more than the Christian religion. In spite of the continuous changes in the body's metabolism, with millions and millions of atoms and molecules going in and out, there is a constancy of the body far greater than these changes lead one to believe. This constancy is maintained by the overall organization of the living organism in spite of continuous flux. The same holds for the individual soul in spite of the continuous ingestion, digestion, and rejection of psychic influences. There is thus no need to accept the Buddhist rejection of a real unity of soul and of God as mere appearances, *maya. Panta rhei* is true only comparatively, with the immense numbers of total atoms, molecules, and thoughts. The Christian stress on the unity of the individual soul is in harmony with the insights of modern biology.

M. R.: So far we have paid insufficient attention—and biologists are inclined to do the same—to a mystery as great as that of the origin of

life. I mean the origin of consciousness in animals and of self-consciousness in human beings. In one of his most inspiring paintings Michelangelo depicts on the ceiling of the Sistine Chapel human consciousness as being awakened at the bidding of the Creator. This interpretation remains complementary to our biological vision, even though it depicts metaphorically a single and singular event, while biology lets us suspect that the potentiality of consciousness must have been present right from the origin of life and that the actual origin must have been a far more gradual process connected with the increasing complexity of the structures of the nervous system and the brain. This does not make the development of consciousness any less mysterious. However, I see no necessity to postulate—as Teilhard de Chardin does—the existence of consciousness ("inner feeling") in the nonliving world, although we may say that as the origin of life was potential in the nonliving environment on the earth's surface so was the origin of consciousness. Again biology and prehistory make it likely that the origin of human self-consciousness was gradual. By direct experience we know only our own consciousness, but we have valid evidence for postulating the same self-consciousness in other human beings from their speaking and writing. Popper and John C. Eccles have shown how much the existence of a "World 3," that of documentation of all intellectual efforts and knowledge, has been neglected in philosophy. This World 3 exists above the physical ("World 1") and above consciousness and imagination ("World 2"). We can postulate conscious actions in highly developed animals by analogy, but these conclusions are far less certain in spite of our dog, cat, and bird lovers and their profound conviction. When, however, it comes to the movements of an amoeba or of the leaves of *Mimosa pudica* in response to the touch of our fingers, we are on very uncertain ground if we assume a feeling akin to ours. Animism is a poor science as well as a poor religion.

In an age when some of our revolutionary youngsters, disgusted with modern technology and its results, seek refuge in magic and all kinds of religion and pseudoreligions, including drug hallucination, it must be stressed that our understanding of the unconscious is still far below that of the conscious in man. I am not an adherent of Cartesian dualism, but the essential truth of "cogito, ergo sum" remains, and it is even more correct with regard to thinking than feeling.

In spite of man's certain standing in the dimension of life, his coming has made tremendous, qualitative changes which some reductionists and romanticists are unable to see. The slow groping of natural evolution has been replaced by the much faster and more

efficient cultural evolution. Until such a time when mankind destroys itself willingly and criminally, cultural evolution supersedes natural evolution, and learning supersedes natural selection. This holds not only for man himself but also to a certain extent for the whole of the dimension of life. Today man decides what species are to continue to live or to die, to live freely or in reservations. Man has taken over willy-nilly this great responsibility for which he is still poorly prepared. One can only marvel at the forethought and wisdom of the writer of Genesis 1, when the truth of man's domination must have been far less obvious than it is today and when man must have felt far more insecure among animals more powerful than himself. The clear recognition of the decisive difference between cultural and natural evolution came surprisingly late with Teilhard de Chardin and Julian Huxley.

There will be no way back to the paradise of Genesis 2 when man had not yet eaten the fruit of the tree of knowing good and evil and man could leave responsibility for his deeds in the hands of God. Man may well be frightened by this responsibility and has now to recognize that God has to work on earth only through human hands and minds. This makes it even more essential for us to seek the will of God using all our wisdom and all our knowledge, including the wisdom collected in the myths and religions of past centuries, which must be reinterpreted so that it can be harmonized with new insights—religious, ethical, and scientific. Man indeed has come "of age," but only just, and this ought to make him less arrogant and more modest. Being little more than a very young adolescent in terms of cultural evolution and a baby in terms of natural evolution, he—or she—still has much to learn.

Eternity and Life after Death

R.: M.'s remarks on the interrelationship of life and death are of special interest to me. The belief in a life after death has a variety of causes, most of them based on wishful thinking, some noble, others far from noble. There is the wish not to be separated from loved ones; there is the idea of the just (sometimes not really just) reward in another world for real or imagined injustices suffered in this world; there is the hope for the "pie in the sky"; and there is the fear of extinction of one's highly valued individuality. That death belongs to life is conveniently forgotten. An overpopulation of eternally surviving individual souls appears to me hardly less horrifying to contemplate than an overpopulation of the earth with many billions of human bodies.

The scientist knows that an amoeba probably never dies, but it pays for its eternal life by a lack of individuality which it shares with the electrons, which also never or rarely die. However, death of more developed and individual entities—men, animals, plants (or even molecules)—is a necessity. It makes room for other and potentially more highly developed life, establishing a balance between coming and going. This scientific idea of death is nobler than the wishful religious thinking of just reward in heaven and the concomitant idea of hell as punishment for one's opponents (see, e.g., Dante's much praised *Divine Comedy*). Is it not really high time that we repudiate these medieval and far from beautiful ideas?

M.: I cannot entirely agree with you, although some of your strictures are justified. Most men carry within them the feeling of some eternal value of their individual soul which they believe to be worth preserving. True, one great religion, Buddhism, has come to the conclusion that the individual soul entity does not exist and is *maya*, but the evidence does not convince me. It neglects the coexistence of flux with permanence, which we have seen is one of the essential characteristics of all life. The eternal value of the individual soul is recognized clearly in Christian and Judaic thought, although Judaism does not necessarily demand the belief in a life after death. Thus death has a greater significance in Western thought than in Eastern—hence the preoccupation with it not only in religion but also in art and poetry. In fact everybody fears death not only because it means the end of his or her identity but also because it is the door to an unknown. Others fear death less than dying with its frequently unpleasant experiences of pain. It appears to me significant that in Australia we have developed almost a system of bypassing the unpleasant character of death and of dying as rapidly and painlessly as we possibly can—and this not only because climatic conditions make this desirable for reasons of hygiene—while the Americans have developed their own system of perfumed death. Both are loathe to face death's reality.

M. R.: This is an important yet difficult subject because it has many overtones. I believe it most essential to differentiate between the idea of life after death and the concept of eternity. Most people, whether scientific, commonsense, or religious, do not make this differentiation—for them they are synonymous. Yet this is a profound misconception of eternity. About 250 A.D. Plotinus stressed that eternity predates time and was latent in the eternal being before the creation of the universe and of time. Christian orthodox teaching has

contributed much to the destruction of this insight. In the dogmas of the churches, miserable life here on earth was contrasted with the "kingdom to come." Injustice experienced during life on earth became accepted in the hope of receiving eternal justice after death when Christ would come on judgment day and be himself the just judge. Undoubtedly some dignitaries benefited from this arrangement, and Marx's accusation of this being opium for the suffering people was justifiable. Jesus is represented still as the stern judge in Byzantine churches, like that in Daphne in Greece. What could have been further removed from the spirit of the man who said, "Pass no judgment and you will not be judged" (Matt. 7:1)? But for obvious reasons the idea was acceptable to Constantine and later emperors as well as their bishops and magistrates. What injustices against Jews, Moslems, and heretics have not been justified by the notion of heaven, hell, and salvation? Yet the insight of Plotinus has never quite disappeared from the teaching of the mystics. Thus Angelus Silesius (Johann Scheffler, born 1624 at Breslau): "I am myself Eternity if I leave time/And comprehend myself in God and God in myself./And Time is more noble than a thousand eternities:/I can prepare myself for God here, but not there."

I believe that eternity does not begin after my death; it was before I came and will remain when I die. But above all it is during my life here on earth, and this is indeed the only time during which I am responsible for my contribution to it. I have this responsibility, however little a single person can do. Any person with some nobility of heart will not make its relative insignificance an excuse for disobeying the categorical imperative. It is, I believe, untrue that what I have done during my life, however insignificant in itself, will not count from the viewpoint of eternity. What I mean is not that it will be remembered. Nobody remembers the man who split the first flint or lit the first fire, who made the first tool, drew the first painting of an animal on a cave wall, or made the first sculpture of a human figure, who had the first dawning of the awe of God, or loved his wife, his children, or his comrades of hunt or war. Nobody remembers the first woman who spun or planted seeds. My individual unity may be remembered for a few years and that of the great man, Jesus, for thousands of years. It is not important whether my name or any special deed of mine will be remembered; it will certainly not be remembered forever. However, what I have done, whatever it was, good or evil, has become eternal in the sense that it has become an indestructible and irremovable part and parcel of the tissue of the life of mankind. Not all life is sacramental, but much more than what we

often believe is; and in this wider sense it belongs to eternity. Not only books or discoveries or statements but even passing acts of generosity or lack of it—anything which has influenced other persons, adult or child, belongs to the eternal realm, even a mere loving act, thought, or gesture. That I shall not survive in my uniqueness of person may be a serious blow to my self-love, but the contributions of myself and millions of other persons are not in vain, whatever is said in Ecclesiastes.

Why then did I call this a difficult subject? Why did Jesus see and say that the hypocrites had "their reward already" (Matt. 6) but did not see or at least did not say that those who sincerely tried to do God's will on earth should feel that they also had received their reward and need not wait until they would receive it in another life after their death? Was it perhaps because he felt that the wisdom of the apostles would not be great enough to understand this more sophisticated notion of a reward of merely inner satisfaction? In this he was certainly right as Peter's question shows: "What will be there for us?" (Matt. 29:27). Or was it the insight that there was so much obvious injustice in the world of his time that it was almost cruel to make such a demand? Or was life after death very much of the accepted belief of Hellenistic thinking and also his own? It is certain that he believed that the apocalypse was to come during the lifetime of the apostles. Perhaps we have not even today reached the degree of wisdom which would make the renunciation of external rewards acceptable to any but a few; they are obviously not yet acceptable to the great majority of Christians who attend the large Christian congregations, both Protestant and Catholic. Yet the idea that a good deed or a clear conscience carries the highest reward in itself and that a bad deed or a bad conscience carries its own punishment in an internal hell is generally accepted. Even where there is no evidence for internal suffering in evil doers, are not their very bluntness to higher motivation and their unnatural lack of feeling in themselves sufficient punishment from the point of view of eternity? For they can hardly lack the feeling of higher potentialities in themselves, whatever they say—and if indeed they do they are animals, not human beings, and must be judged as animals who are beyond good and evil.

I can speak only for myself, but I am satisfied to leave judgment on what my life here on earth has been in the hands of the eternal, recognizing that by the grace of God I have not been so wronged in my life that—in spite of suffering the fate of a refugee—I shall have to expect recompense in another life. Whether there will be a life after death for any man or woman I do not know and cannot know. I know, however, that insofar as a belief in a life after death in any way

decreases the acceptance of our responsibilities and obligations here on earth and leads to a selfish concern about personal "salvation" its destructive tendencies far outweigh any possible good.