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**Subslug:** [Article by Boris Viktorovich Raushenbakh, academician, department head at the Moscow Physical-Technical Institute, Lenin Prize winner, member of the International Academy of Astronautics]

**FULL TEXT OF ARTICLE:**

1. [Text] Very lively debates are currently under way in society, in the course of which the qualitatively renovated features of socialism are emerging more clearly. By no means the least important in such discussions, in my view, should be problems related to the world outlook of modern man and the determination of his place in Space, in the universe, as well as, metaphorically speaking, in the space of relations with other people, society and nature on earth, outside of which we shall not be able to exist in the foreseeable future. The extent to which we shall be able to understand such problems and find the proper ways of solving them will determine, without exaggeration, the future of civilization as a whole. And although man since most ancient times has considered such problems, the rapidly changing reality and surrounding world ascribe ever new content to them, motivating us again and again to turn to them and to seek answers consistent with the realities of the present and, perhaps, the future.

2. Let me begin with an example drawn from my own life.

3. In the past I wrote books on graphic art without resorting to mathematics but using my customary logic of rational scientific knowledge. In discussions with readers an amazing pattern emerged: I was perfectly understood by mathematicians, physicists and engineers but totally misunderstood by many artists who, actually, praised the books (possibly unwilling to insult the author). At that point I recalled that I personally "did not understand" some works by our outstanding art experts. It turned out that something similar was

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felt by other representatives of the "precise" sciences: to us in frequent cases works on art are "streams of words" without any strictly defined rational meaning. Yet the universally known names of their authors unquestionably guaranteed the high quality of such books and it is we who were to be blamed for our failure to understand them.

4. Thus, I came across the fact that, conventionally speaking, we could divide the Russian language into two components: the first uses the logic of rational scientific knowledge and the other the logic of metaphorical thinking. These are not only two components of the language but also two types of viewing the world, the supporters of which find it difficult to understand one another.

5. In order to explain this phenomenon more fully, I believe, we should turn to the currently intensively studied fact of the functional asymmetry of the brain. It turns out that the left hemisphere is responsible essentially for the processes of rational thinking while the right one deals with the metaphorical perception of the world. Apparently the fact that a person could be classified as a "physicist" or a "lyricist" also depends on which of the hemispheres dominates in his brain. Naturally, this separation is not absolute. Geniuses such as Leonardo da Vinci and Goethe, for example, were able to achieve outstanding successes in the precise sciences, which require a strictly rational thinking, and in the arts, which demand of the artist particular emotionality and a developed metaphorical way of thinking. As a rule, however, it is one of the types that nonetheless dominates, whether it applies to noted workers in science and culture or ordinary people not possessing any particular talent.

6. The metaphoric perception of the world is older than logical thinking, which developed later (perhaps that is why dreams which originate in the right hemisphere do not amaze man by presenting the most incredible miracles, for the left hemisphere, the "rational" one, is "disengaged" during that time). There are two different ways for perceiving and knowing the world, as was pointed out a long time ago. In Homer's "Iliad," Hector speaks of the tragic fate awaiting him:

7. "...I firmly tell myself, talking to myself in my mind and my heart that the day will come when sacred Troy will perish...."

8. What matters to us is that Hector speaks both of the mind (based on rational thinking) and the "heart" (based on metaphorical foreboding). It is characteristic of latter ancient tradition to separate the "opinion," i.e., that which has been obtained through the senses, from the "knowledge," which has the mind as its source.

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It is only these two ways that lead to the integral perception of the world. Both are identically essential and neglecting either of them is fatal to the individual as well as to society.

9. We live in the age of the scientific and technical revolution, which is rich with impressive scientific discoveries which gradually encompass all areas of knowledge. In that case, why do we need some kind of irrational perception of the world based on feelings (such as, for example, the feeling of duty) rather than the mind and, consequently, something which is of indefinite and loose nature? The point is that it does not change what is rational and scientific but supplements it with essentially new elements.

10. For example, let us consider the problem of man's moral behavior. The results of scientific studies obtained through rational ways of thinking may be true or false regardless of moral considerations. The table of multiplication and now also the art of making computer programs can be successfully applied by a very good person for good and useful purposes as well as by the worst scoundrel for his criminal intents. This situation is well familiar: science serves progress but can be used also by the most reactionary forces. Therefore, the conclusions of rational science do not include a moral principle. However, to the people morality is of vital importance. Concepts of morality, and even more so "a moral feeling," appeared long before science, from the metaphorical and "irrational" (I am deliberately using this word) knowledge of the world as well as in the process of the summation of human empirical collective experience. It is only subsequently, in connection with the establishment of the world religions that, on a parallel basis, rational and ethic substantiations for moral doctrines appeared (Socrates, Plato, Aristotle, Spinoza and Kant).

11. What meaning do I invest in the concept of the irrational? It is by no means something secret, mystical or, in general, unattainable by the mind. Rather it is a question of what is irrational in the narrow logical understanding: an intuitive accomplishment seems irrational in terms of a discursive one; from the viewpoint of individual unique experience a logical conclusion and evaluation is irrational in terms of experimental proof, etc. Therefore, anything which I will be subsequently calling irrational and illogical, and so on, may turn out to be entirely rational from a broader viewpoint of the knowledgeable intellect, which explains and evaluates its own experience and metaphorical thinking.

12. The behavior of the individual in the world around him is based on the knowledge of this world. This knowledge is developed in two interrelated areas: one in which logic has the final word and another dominated by the feelings: compassion, love of one's neighbor and of

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the fatherland, religious feeling, a poetic feeling (distinguished not only from literature but also from music and graphic arts), etc. Do these feelings lead to knowledge, albeit not logical-discursive but intuitive, sometimes subconscious, yet nonetheless knowledge?

13. Everything seems to indicate that they do. Indeed, when someone, even a child meets a person for the first time he immediately develops a sympathy or antipathy toward him without any obvious rational reason. This feeling becomes the first (albeit sometimes erroneous) intuitive knowledge (or, if you wish, a "preknowledge") about the person, which largely defines our behavior. Sometimes behavior is dictated by a moral feeling and, in justifying the nature of his actions, the person states: "I cannot explain why but I was unable to act differently." This too is not related to a direct logical analysis (for otherwise it could have been explained) of the knowledge of how one should behave in any give situation.

14. At the turn of the century such examples, and they are numerous, enabled some poets to claim that there are truths which cannot be described through prose, i.e., truths which are based not on the formal understanding of logic but on the specific logic of the poetic imagery used in the perception of the world. Consequently, the metaphorical, the nonrational perception of the world, is another necessary source of our knowledge. Furthermore, occasionally such knowledge turns out to be more accurate than the rational-logical one in the area of rational science itself. If we ask what will be the aspect of technology in the future, it happens that the projections of specialists are frequently less accurate than those of writers. Thus, as late as the 1930s, many scientists, including some of the most noted ones, claimed that nuclear power can never be used by man, whereas "irresponsible" writers fully accepted it in their works. In his "The Hyperboloid of Engineer Garin," A. Tolstoy described a "death ray" which, at that time, was absolutely impossible according to the scientists. Today, however, we speak of laser weapons as something obvious. In his novel "Doroga na Okean" [Ocean Road] Leonid Leonov described a radar system which did not exist as yet at that time. How to explain this? In all likelihood, the scientists are excessively attached to science and technology and to their present postulates and axioms and, proceeding on the basis of strictly logical conclusions, are unable to anticipate revolutionary discoveries, whereas the writer, the artist, who is free from such "prejudices," can obviously "sense" (or anticipate) better the course of mankind's development. Naturally, this is not a call for proceeding from knowledge to feelings in the areas of science and technology. As we pointed out, the irrational, the emotional component of human knowledge is related, above all, to the moral and poetic factors in human awareness.

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15. In harmoniously developed people both sources of knowledge--rational and illogical--define their behavior and are in some state of balance. Naturally, this is the ideal system. In reality, a great deal depends on the individual characteristics of mental development and on the individual's living conditions.

16. In contemporary society the volume and significance of rational and logical knowledge are increasing steadily. This is clearly manifested not only in the way computers are taking over ever new areas of life (from children's games to computing the trajectory of space apparatus), but also in human motivations and actions. Today, with increasing frequency the people are seeking optimal solutions to the problems which face them and, as a rule, the concept of optimality has a strictly rational sense, such as how to build a given system at the lowest possible cost, how can an enterprise obtain maximal profits, what is the likelihood that any given event may happen, and so on. This way of thinking is basic in our daily life as well: how to handle our available funds in the best possible way; how to reach our place of work within optimal time; etc. In this case the headlong pace of change in our lives exclude the formulation of "traditional solutions" which would be considered acceptable both today and in 10 or 20 years. All of these problems must be resolved under new circumstances on each separate occasion. Today even professional knowledge and skills cannot remain unchanged throughout a lifetime. Experience proves that many people have to be retrained each 10 or 20 years, for the average "life span" of contemporary technology is much shorter than that of human life.

17. These are precisely the circumstances governing the fact that the rational component of our knowledge of the world must be used all the time and increased steadily. Man's attention is focused mainly on it while irrational knowledge assumes second priority. However, the latter has a major influence on important aspects of the perception of the world: a moral assessment of events or moral motivation for actions. Yet morality becomes somehow secondary, which is something of increasing concern to the human community. Actually, is it not a matter of concern the fact that a rating such as "successful businessman," or "good production organizer" occasionally proves to be more important than the term "decent person?"

18. In speaking of the decline of morality, at this point we draw attention to the fact that in the past a rational component of knowledge did not play such an excessive role. Let us consider the life of a peasant in past centuries. The grandson used the same "technology" as his grandfather and this technology of peasant labor was defined less by strictly rational considerations than the age-old experience passed on from generation to generation in the

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form of customs, habits and traditions. The brain was not overburdened by the problem of seeking optimal solutions to rationally formulated problems, and man was able to a greater extent to concentrate on problems of morality (naturally, as time passed the assessment itself of what was moral and what was immoral changed; here it is a question only of the trend followed in intellectual activities).

19. Today, in the time of triumph of the natural science and impressive discoveries in physics, astronomy, biology and other sciences which provide a rational explanation of life in the universe, the tremendous task has appeared of drawing a scientific picture of the world and, on its basis, developing a scientific outlook. Many people believe that the solution of this supertask will benefit mankind. However this claim is quite arguable.

20. Mankind needs an integral world outlook based on a scientific picture of the world, as well as an unscientific (including metaphorical) perception of the world. The world can be learned, as Homer said, both by the mind and the heart. It is only the sum of the scientific and the "heart" picture that can provide an image of the world worthy of man in his own conscience and that could be a reliable foundation for behavior.

21. In speaking of the need and possibility of creating an integral picture of the world, we cannot ignore the question of religion. It is frequently believed that religion is a sum of myths, behavioral rules and ceremonies. Obviously, in that case poetry will be the ability to speak rhythmically and in rime. It is obvious to everyone that such a definition of poetry loses its main feature: the poetic image, the poetic feeling. In precisely the same way failure to mention the religious feeling in the concept of "religion" deprives it of its main feature.

22. A religious feeling may be inherent in a given person (naturally, however, by no means in everyone) in the same way that people frequently have a sense of beauty. And if such a person is raised in an atheistic family and finds himself in an atheistic atmosphere, he may feel a certain spiritual discomfort, frequently without knowing why. In some cases, trying clumsily to satisfy his mental aspiration toward mystery and miracle, such a person feverishly seeks some kind of surrogate: he becomes attracted to mysticism, begins to believe in "flying saucers" (should such "saucers" become universally acknowledged by reality, he would immediately lose any interest in them), etc. We know of many cases when such "hereditary" atheists have joined the church and felt a sudden fullness of life and become happy people, in the full meaning of the term. It is difficult today to say at which stage in the

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history of the human community this need appeared. In any case, the need for some kind of "faith," consistent with the human mentality, including religious faith, became more complex and stronger in the course of the biosocial evolution.

23. Therefore today the religious feeling of people in developed countries is by no means related to their "ignorance," or insufficient enlightenment (in the sense of sciences based on rational knowledge). The satisfaction of this feeling is a natural need for many people with a strongly developed emotionality. Is this not the reason for which there are more frequently believers among members of the artistic intelligentsia than among engineers?

24. However, if a religious feeling is a normal phenomenon for such people, no primitive atheistic propaganda can be effective. Some propagandists of atheism proceed from the fact that faith in God will disappear the moment the people are given a "intelligible explanation" of the natural scientific picture of the world and proven that religion is the consequence of the lack of scientific knowledge and that it should yield to the pressure of science. However, in the case of a person in whom a metaphorical thinking prevails, the arguments of rational knowledge will appear secondary and unconvincing (we already cited the example of the reciprocal lack of understanding between "physicists" and "lyricists"). These arguments to him are insignificant compared with the living feeling of the presence of God, which is so strong that he not simply believes in God's existence but, on the basis of his own feelings, he "knows" that God exists. Therefore, any rational proof provided by the atheist can only irritate the person who is certain of the veracity of his concepts.

25. Naturally, religion cannot be reduced exclusively to the phenomenon of an irrational component of the mind or, even less so, to the belief that one cannot get rid of it as long as the right hemisphere of the brain retains its functions. Unquestionably, the religious feeling is related to features of the human mentality, such as imagination, and so on. However, theology is also the rational substantiation of religion. And whereas scientific atheism can refute more or less successfully precisely such rational substantiations concerning the existence of God (ontological, gnosiological, teleological, etc.) it is unable to do anything with the need of man to believe.

26. Let us say a couple of words about the meaning which is usually invested in the concept of "God." To the contemporary Christian, for example, faith in God means faith in the supernatural, a transcendental reality with personal characteristics, paralleled by faith in the existence of a meaning to individual human life,

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exceeding the limits of a limited human life. Belief in the purposefulness of the world and the meaning of history have not been proven scientifically to their fullest extent.

27. In millennia old human practice, rational knowledge and moral values have always supplemented each other, for which reason the contemporary believer considers his religious feeling a supplement to his rational knowledge. Furthermore, this feeling does not prevent major scientists from achieving the highest possible peaks in the natural sciences.

28. Therefore, in itself science is unable to suppress the religious feelings of a sincere believer. A religious faith can be defeated only by another "faith" (or by something of the same nature). In this case the word "faith" should be understood in the broad meaning of the term. It could be some kind of ethical view, such as early Confucianism; in general, it could be any emotional-irrational component of human nature, which makes it possible to satisfy that which was already described as a religious feeling. It could fill but not crush it. In that case, however, the atheists must add to their "scientific atheism" some kind of "atheism of the heart," which is addressed to the metaphorical part of the human awareness (it is true that today the specific forms of the latter, to the best of my knowledge, are unknown to anyone). Naturally, a feeling in itself is not morality and morality is not in itself religion. However, unquestionably there is a tie, a profound one at that, between them.

29. Let us go back to the question of the correlation between rational and irrational knowledge and consider how to strengthen the moral principle in contemporary life. This has become an urgent need both in our country and in the West. However, the way of restoring to morality its proper place in social life is by no means clear.

30. Of late there has been frequent talk, in this connection, of the need to humanize contemporary life. In my understanding, this means somewhat to restrain the "rational" and technocratic motivation and give some space to spirituality in shaping the behavior of the individual and of society as a whole. Although the term "spirituality" is being used today even more frequently than is necessary, it lack a universally accepted definition. Actually, a strict terminology here may be unnecessary, for this is not a concept of rational logic. It was claimed in the past that the spirit is the wedge of the soul. In such a case spirituality implies the highest and most refined aspects of the soul. In my view, such statements could be accepted as a kind of, albeit not excessively precise, indication of the general meaning of the concept of spirituality.

31. Many are those who are hoping to strengthen the spiritual

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principles in our life by humanizing it, by turning to the priceless monuments of domestic and global culture which, in the most people, in the course of their daily concerns, have somehow been pushed into the periphery of the mind and no longer participate in shaping human behavior. Familiarity with the history of the fatherland and its heroic pages and the activities of outstanding compatriots (public figures, artists, military leaders) to whom lofty (and by no means advantageous) objectives determined the meaning of their lives would all, unquestionably, contribute to restructuring the mind in the desired aspect.

32. It would be difficult to overestimate the role of the monuments of history and culture which materialize the past of the fatherland and which make it possible to feel the link of time and to feel that one is a link in the chain going deep into the centuries and to be imbued with pride in the past and awareness of the need to pursue the great cause bequeathed to us by previous generations. It may be useful to note here that "living" monuments yield much more than the "dead" ones. Touring the new building of Leningrad University is entirely different from walking along its old lengthy hall, the walls of which remember Mendeleev. Naturally, erecting new university buildings is necessary. It is important, however, for the old building to remain "alive," i.e., to remain part of the university and not become one more set of offices.

33. Russian literature, in which problems of morality have always played a key role, could give us no less and, possibly, even more. Suffice it to recall such guiding lights as F.M. Dostoyevskiy, and L.N. Tolstoy and their search for moral ideals.

34. All of this was justifiably and frequently said and written by many of our contemporaries concerned with the gradual decline in spirituality and the strengthening of narrow-minded and short-sighted practicalism in all areas of life. Humanizing could be likened to a beneficial rain which allows the flowers of spirituality to bloom. I chose this pompous comparison to emphasize the problem. The thorough watering of the rows is, in itself, no guarantee of a good crop. If nothing has been planted nothing will grow. Water is merely one of the components which agriculture needs. This is precisely the case of a humanitarian education and the reading of the literary classics. Had this been sufficient, our writers would have been people of ideal morality. Unfortunately, the history of Soviet literature firmly refutes such an assumption and, consequently, all that we mentioned above is, naturally, a prerequisite which is necessary in order to assert the moral principles in the life of man and society but is by no means sufficient.

35. In order for humanizing to justify the hopes placed on it a

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certain starting system of elements of morality must exist, which humanizing could strengthen, refine and channel. In the past this initial system was somehow spontaneously developed by life itself. Today this process has been weakened and distorted. Therefore, it would be useful to turn to the experience of the past.

36. The child developed the elements of morality in the family which in the past played a significantly greater role in the life of all of its members than it does today. Today the family is no longer the focal point of common concerns and interests of its members. Frequently the father and the mother work in different areas, the children attend the "extended-day" school and everyone has his own interests, which frequently are difficult to combine within some kind of unity. Furthermore, in frequent cases intimate family talk is replaced by joint watching of television. It is not astounding that today the initial concepts of morality are acquired by the child at best from parental instructions rather than direct observation of their lives and the natural desire to imitate them.

37. In the past the moral obligations imposed upon man by virtue of his belonging to one stratum or another played a certain positive role. Let us recall perhaps the sense of honor of the nobility which made some immoral (from the viewpoint of the nobility) actions impossible. The unwritten honor code of the nobility was mastered by the individual in childhood by observing the behavior of the adults, listening to their conversions and evaluations of events and becoming the subject of strict remarks if the child committed an error: "a member of the nobility does not act like this!"

38. We must acknowledge that the church as well played a major role in the development of morality. It would be an unforgivable error to believe that moral behavior can be the result exclusively of any type of education in school or elsewhere. Here again we have the same law as in the other areas of human activity: if you want to do something good you need systematic and daily training. Familiarity with the rules of moral behavior is not enough. One must live according to such rules in order gradually to turn knowledge into habit, into a natural standard. Metaphorically speaking, one should commit a moral act at least once a day. Real daily life is always more complex than beautiful plans and by no means could we classify all of our actions as being entirely moral. In such a case a person who aspires to lead a moral life must feel, as is now usually said, conflicting emotions. He may become sincerely regretful for his failure to cope with a situation which has appeared.

39. It would be unwise to let a serious matter such as moral "training" develop uncontrolled. Let us give the church its due: it developed a long time ago an efficient mechanism not only for

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proclaiming morality but also for providing practical education and support of morality. I am referring to the sacrament of repentance. The believer must regularly confess his sins (i.e., his violation of the laws of morality), not only should he commit immoral actions but even should he think about them. Sometimes the penitent would be punished by the church. It is important to note that there are no witnesses to the confession and that the priest does not dare to make this secret public. Therefore, conditions are created for the penitent to be maximally truthful, without which a true moral upbringing is impossible. In principle, it requires a secluded talk with an authoritative person. This circumstance has been well understood not only by Christianity but also by other religious and ethical doctrines in which student and teacher are a constant pair, who talk, as we used to say, heart to heart.

40. In our present life there is virtually no such mechanism for developing and upholding morality. The sacrament of repentance cannot be replaced by self-reports or by the discussion of immoral actions at large meetings. The concept of the class honor has virtually disappeared. Some people write about worker's honor but, unfortunately, usually this means nothing (although in the past worker's honor was found everywhere and did not allow a true master to do hack work. Incidentally, I began my own labor career at the start of the 1930s as an apprentice joiner at one of Leningrad's aviation plants, and I well remember the way old hereditary workers were literally pressured into "fulfilling the plan" at all cost. This was accomplished, above all, at the cost of low quality work and loss of criteria of professional honor. Today a great many people, in committing an immoral act, experience a feeling of happiness rather than remorse (such as, for example, pilferers who have stolen with impunity something from their place of work).

41. I believe that humanizing will yield the desired results only when it is based on already accepted and practiced common moral principles. How to achieve this today? For the time being, there is no specific answer but an answer must be mandatorily found, for it is this, as we mentioned at the beginning of this article, that will determine the future not only of our socialist society but also of civilization as a whole.

42. Contemporary life, with its exaggerated aspiration to rely above all on rational knowledge and, as a result, with its scornful attitude toward what I described as irrational, intuitive and emotional knowledge, is causing dangerous deformations in the behavior of the human community. As we consider the problems of the optimal combination of rational with other knowledge as guiding impetus in our activities, we unwittingly reach the following conclusion:

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43. The irrational component must be mandatorily taken into consideration in defining the objective toward which we must advance. The rational component calls for suggesting the most sensible ways of solving the problems. In other words, the objective must be moral and the way to achieve it, reliable. It is entirely obvious that not only the end objective but each step toward it must be consistent with the criteria of morality.

44. This problem has assumed new features in recent years. Until recently, rational science looked at anything "irrational" with a certain feeling of superiority, as though even as an obstruction to progress. However, this was progress conceived precisely from the viewpoint of rational knowledge. Let us consider the unrestrained aspiration of departments to build huge dams, canals and such similar "construction projects of the century." When the humanitarian public was indignant by this, pointing out that this would destroy historical monuments, unique landscapes and the habitats of small nations or, in other words, the immorality of such projects, its arguments were considered secondary, far-fetched and unworthy of attention. The claim that "the country needs metal, electric power, irrigation," and so on was always considered more substantive. The strictly "rationally" oriented "thinkers" undertook to define what precisely "the country needs," with enviable conceit. In a somewhat different form, this process is also inherent in the West. It is the natural consequence of uncontrolled scientific and technical progress. We now see its results. The entire world is beginning to consider with concern its current condition, and forecasts leave no room for complacency.

45. Everywhere we note an exceptionally curious picture: the strictly rational knowledge, based on numerous computers, all of a sudden noticed with a feeling of horror, where this had taken mankind. It became clear that a radical restructuring is needed, if one may say so, in human behavior. Continuing the practice of recent decades would inevitably lead to ecological catastrophe. However, even before this had been realized the humanitarians, the creative intelligentsia and a high percentage of the people had already started, with an enhanced feeling of moral responsibility, to struggle against the arising catastrophe: for many long years "red books" for the protection of the natural world from destruction have been kept, ever new movements are appearing for the rescue of unique natural formations such as Lake Baykal, etc.

46. It would be useful to reemphasize that the feeling, a kind of ache for the fate of the earth and the country, preceded the computations which merely confirmed that which was said initially. Furthermore, the loss of moral criteria in the daily behavior of the

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people began to alarm not only 'lyricists' but also 'physicists.' The result has been an increased interest in extralogical, in nondiscursive knowledge, the aspiration to achieve an integral perception of the world instead of progress toward the triumph of one-sided interpretation of the 'scientific picture of the world.' It is precisely thus that an integral world outlook is developed instead of a narrow rationally understood 'scientific outlook.'

47. Another important feature of the new world outlook should include asserting the priority of universal human values. But then one of the main universal human values is the planet earth, for which reason the new thinking should encompass not only the political and military areas but also all other areas of human activities, particularly those related to ecology. The primacy of universal human values is becoming increasingly important in relations among people and in the aspiration to unite mankind within a single harmonious family. New thinking is needed everywhere and one of its characteristic features should be the harmonious combination of the mind with the 'heart,' the rational with the emotional and logical with intuitive knowledge.

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