

Science and Spirituality

The Need for a Change in Culture

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Foreword

LATE IN HIS CAREER, ACCLAIMED PHYSICIST DAVID BOHM (1917-1992), was a scholar in residence at the Fetzer Institute. A student of Robert Oppenheimer and a colleague of Albert Einstein, Bohm proposed that all parts of the universe are fundamentally interconnected, forming what he called “an unbroken flowing whole.” This paper, delivered as a public lecture on October 23, 1990, addresses what Bohm considers the essential relationship between science and spirituality, wholeness, culture, and the role of dialogue. We reissue this version of Bohm’s talk in honor of the 100th anniversary of his birth (December 20, 1917).

“Everyone who is seriously involved in the pursuit of science becomes convinced that a Spirit is manifest in the Laws of the Universe—a Spirit vastly superior to that of man, and one in the face of which we, with our modest powers, must feel humble.”—Albert Einstein

MANY THOUSANDS OF YEARS AGO, our culture was not broken into fragments as it is now. At that time, science and spirituality were not separated. Since then, they have grown far apart. In my view, it is important to bring them together.

I will begin by discussing science. Science is basically an abstract sort of knowledge, systematically and rationally organized and aimed at grasping knowledge of what is general and what is necessary. Newton’s laws provide one of the ideal forms of such knowledge. Science is basically a collective activity, and through it people work together to build up a body of common knowledge over time. Science would not mean much without that. However, science has in it certain features, such as wonder and curiosity, which go beyond knowledge. And it has an additional feature that is crucial; science acknowledges a fact or its interpretation—whether we like it or not—that is, whether it agrees with deeply held beliefs or not. This dedication to facts is seldom the case. For example, one would not get very far that way in politics or in religious organizations.

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Such an insistence on a certain kind of honesty is the key point of what I call “the scientific spirit.” This is a principle that infuses scientific activity. The very way science has developed has, implicitly, considerable spiritual significance. It would be extraordinary if this spirit could prevail in the whole of life. I think it would remove a large part of our problems.

What is spirit? The word is derived from a Latin word meaning breath or wind (like respiration or inspiration). It is suggested by the trees moving with the invisible force of the wind. We may thus think of spirit as an invisible force—a life-giving essence that moves us deeply, or as a source that moves everything from within.

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Spirit is, therefore, not manifest. The word manifest means literally in Latin “what can be held in the hand.” You cannot hold spirit in the hand. It is subtle, which is really the opposite of manifest. According to my dictionary, the word subtle means “highly refined, delicate, elusive, undefinable.” The Latin root of the word is *subtilis*, meaning finely woven. We can picture finer and finer nets to grasp reality, but ultimately spirit is so subtle that it passes through all of them. Therefore, although unseen and ungraspable, it is of key importance.

One important point that we connect with spirit is meaning. According to my dictionary, there are three definitions for the word “meaning:” “significance, value, and purpose.” Significance is simply like a sign that points to something. Value has the same root as valor and valiant and means strong. We sense the value of something by being strongly moved. We could further say that if something is very significant, we sense its value and that generates a strong purpose.

These three are key features of life. Life would have little value if it lacked meaning, for then it would lack significance and we would generate little energy or purpose. Therefore, spirit, although its meaning may be very subtle or ungraspable, seems to have a tremendous effect. We could, indeed, say that without significance, value, and purpose, life would have little point. A sense of pointlessness or meaninglessness in our society may be at the root of much of its current malaise.

I would add further that meaning is at the root of our whole being. How we act is determined by what everything means to us. A very elementary case is a person walking in a dark place who sees a shadow, which suggests an assailant may be present. This interpretation of the shadow may arouse the whole body . . . the adrenalin, the heart, everything. The *meaning* of the shadow made these changes occur. Meanings of much greater subtlety may move us much more. If we are going to face difficult questions and problems, we have to see their meaning and have the energy to do it. But as we have seen, the ultimate source of meaning is subtle and cannot be made manifest. Deeper meanings lead us toward the question of spirituality.

The human being has a natural orientation to spirituality. Indeed, our early ancestors saw spirit in everything *and* as the ultimate source of everything. Everything was alive and each individual was a part of it all. That was a rather natural view. Gradually, as civilization developed, people moved away from direct contact with nature into farms and into cities. Organized religions developed as a spiritual activity and replaced nature as the key contact with spirit, as well as connecting spiritual needs with the needs of society. Religions generally included a certain kind of philosophical knowledge, including an overall worldview that was compatible with the basic notions of that particular religion about spirituality.

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Later, however, as technology and science developed, they split off from religion. A different worldview developed that became more and more independent of religion. In the more modern times, this scientific view began to prevail. Thus, in ancient Greece there was a view that the universe was ordered from the center of the earth and that spirit became more important as we went out toward heaven, with its order of increasing perfection. Everything was highly imperfect on the earth, while the planets moved in eternal perfect orbits. It was said that an object would fall because the natural place for it to be was the center of the earth and it was striving to get there. Everything had its place and moved according to its place. This idea was carried further in the Middle Ages. It produced a worldview in complete harmony with the prevailing religion.

In modern times this harmony has broken up. The modern view has been that of mechanism. The universe was compared to a gigantic machine, like a clockwork, and later to a structure of atoms. This outlook has gone on to compare the human being to a machine and is linked to the development of artificial intelligence. Even Descartes said that everything was a machine—all animals, the body, etc. Only the immortal soul of man was not a machine. This perception led to a division of labor between religion and science. Science thereby gained freedom from interference by religion. God created the world, this machine, and let it run. Scientists could study the cosmic machine, while theologians could deal with the immortal soul of man.

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The scientists could thus feel that this machine is their business. Clearly, this vision suited the scientists at that time. Theologians were happy, too, because they wanted to fight pantheism, which said that there was spirit in nature. They did not like that for many reasons and, therefore, they were very ready to accept this idea, which is just what they needed for that purpose. But then they lost in the long run, because science began to work and probe into what appeared to be the ultimate: into the edges of the universe, into life, into the body, and into artificial intelligence, and nowhere did it see this immortal soul. It looked as if we could explain everything as a machine.

This development has led to a view that has had bad effects. For example, Steven Weinberg, one of the leading physicists of our time, said that the more we look into the cosmos, the less we see any evidence of meaning. There is no place in this for spirit. It is all mechanism. The domain of the spirit has receded until it is gone, as far as science is concerned. Science has largely taken the place of religion as the source of truth in our society.

We may still hold to the idea of spirit in spite of this, but at the expense of a kind of split in life. For example, when I was at college, there was a biology professor who taught evolution. He had, more or less, fundamentalist views on religion. When asked how he could do this, he responded, “Well, on weekdays I teach evolution and on Sundays I have an entirely different view.”

Similarly, when we work in society we are actually mechanists. Almost everything that is done in society is mechanical or mechanistically oriented, but we try to bring spirituality into other areas of life on special occasions. This demonstrates a lack of coherence. Incoherence means that we are working against ourselves, wasting energy, and being counterproductive. To have real meaning, in any case, requires coherence. Incoherent meanings eventually have no meaning. That is probably the root of meaninglessness. There are so many meanings around that do not cohere and do not add up to a whole meaning.

Modern views on science must be contributing to the current lack of meaning. First of all, directly, by being mechanistic and secondly, indirectly, by forcing people who want to hold on to spirituality to be incoherent in various aspects of their lives. But does modern science really force us into mechanism?

At present, most scientists seem to believe that this is inevitable. A reasonable argument could have been made for this in the nineteenth century, but, since then, there has been relativity and quantum theory, which were fundamental revolutions. I want to suggest that relativity and quantum theory are more compatible with a non-mechanistic worldview than with a mechanistic worldview. The mathematics of the quantum theory suggest that the basic movement of matter is to be understood as a process of unfoldment and enfoldment. From something subtle there is unfoldment into something manifest. Any manifest thing is constantly sustained by unfoldment from the subtle . . . again and again. The mathematics suggest, for example, a set of waves that unfold from a whole into each region of space, and enfold from each region back to the whole. The hologram is an instrument that illustrates this principle. The key point is that modern physics really suggests that everything is thus internally related to everything else.

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An image of this is consciousness, because in consciousness we take in everything, it is all in us, and the total content of consciousness determines what we are and how we will respond. We are internally related to the whole. We are not mechanically related. For example, if people want to change the course of action of others, they do not generally push and pull mechanically—that would be violence—but rather they say something to transmit meaning. If their communication succeeds, the listeners act accordingly to take it in.

Everything is internally related to some degree and to some extent. This still allows for a limited and relative independence of objects such as we experience ordinarily on a large scale. I am not denying the role of classical physics with its relative independence of objects. But more deeply, not only ourselves and our minds are not mechanical, even physical objects are not mechanical when looked at deeply from an electronic level. The non-mechanistic world will produce something that behaves in a limited area like a machine. (For example, people can imitate a machine if they really want to.) Therefore, the key point is that science can now be understood as showing limits to mechanism and ultimately allowing something more subtle, such as spirituality, to play a key role.

Nevertheless, science as we know it cannot, by itself, give meaning in the deep sense of ultimate significance, value, and purpose. Science does have values in it. To acknowledge that fact, whether you like it or not, is an important value. Also, science has the purpose of obtaining knowledge and satisfying curiosity. However, this is still a rather limited meaning. Science can interfere with a coherent broader meaning if it is taken in a strictly mechanistic sense. Organized religions can also do this by forcefully imposing beliefs, with their implied values and purposes, in a mechanical way. Ultimately, such views lead to repetitive mechanical meanings in a way that is not basically different from that which results from the mechanistic view of science.

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An inquiry into spirituality, therefore, has to be done in a scientific spirit of freely acknowledging any fact or interpretation. Whether we like it or not, we are at least looking at it and not simply rejecting it, or refusing to look, as many scientists do. But can we really do this? Or will we be too attached to the sense of security that comes from firmly held beliefs? Religious beliefs have frequently been held in this way. I happen to know the Dalai Lama and have had many talks with him. I remember once someone said to him: Suppose science should show that one of the beliefs of Buddhism was not right. He said, "Then we would surely drop it, if it is clearly shown." This shows that it is possible to have some sort of religious view and not to take your beliefs so firmly that nothing could ever be questioned.

Alternatively, could there be more of a spiritual part in science also? A current notion that is commonly accepted is that science is value-free, except possibly for truth and honesty and similar concepts. But that is not really so. Thomas Kuhn has said that scientists almost unconsciously pick up paradigms in their apprenticeships that have all sorts of values in them. One of the current values is that mechanism is the right way and the only way. Another value is that we want to make everything predictable and controllable.

It would be good for scientists to be aware of their values and to examine them in a truly scientific manner, as we let the scientific spirit extend to allow for the examination of the values of science or, at least for the frank acknowledgment that they are there and that many of them may have no necessary basis. In such an approach, scientists can detect incoherences in their basic values, and this may lead them to want to change these values.

The importance of values is thus clear. Values have significance behind them; wholeness is one significance and mechanism is another. If the universe signifies mechanism and the values implicit therein, then individuals must fend for themselves. With mechanism, individuals are separate and have to take care of themselves first. We are all pushing against each other and everyone is trying to win. The significance of wholeness is that everything is related internally to everything else and, therefore, in the long run, it has no meaning for people to ignore the needs

of others. Similarly, if we regard the world as made up of a lot of little bits, we will try to exploit each bit and we will end up by destroying the planet. At present, we do not generally realize that we are one whole with the planet and that our whole being and substance comes out of it. A key part of the general significance is our overall worldview, and worldviews have profound effects on values. Therefore, what we see or presume about these things is not to be taken lightly.

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An inquiry of this kind clearly has a broader significance for the whole of our culture. To see what this means, I would first point out that culture, in my view, is shared meaning. Whatever form of culture we see is the sharing of meaning, whether this be in science, spirituality, or art.

What is art? Going back to the derivation of words, the word art is based on a Latin root meaning “to fit.” It appears in English in words like artifact, articulate, article, and artisan.

All this suggests that in earlier times, art was not regarded as being separate from life as a whole. But with the general tendency of civilization to fragmentation, we have broken things up and have said that art is a special activity. It has very little practical significance and is primarily aesthetic in its value. However, as far as art is concerned, I would emphasize that fitting means coherency. In its own way, art is generally concerned with making coherent wholes. People are looking for holism, but not all holistic views are coherent. For example, Nazism aimed at a kind of totalitarian approach, which means whole, but it was highly incoherent and it certainly did not bring about good results.

It is clear that we are looking for a coherent wholeness, not just any wholeness. The artist, like the scientist, is looking to create a coherent whole, but he/she differs from the scientist in that he/she is not looking for general knowledge of what is necessary. Nor is he/she, as a rule, building a collective structure of art. Rather, artists want to create individual works. A given work of art may have a universal significance, but it has to be in a concretely perceptible form, experienced in an actual moment or a succession of moments. It is not treated by rules or universal laws, so it is not like a scientific theory whose very essence is the aim for universality and necessity. Necessity is to be perceived in each work of art. Art has its own internal necessity that is not mainly an abstract general structure of ideas that an artist might build up over a period of time. The individual work of art, therefore, can stand by itself, whereas scientific theories have to be seen as part of the overall body of scientific knowledge. It seems to be commonly agreed that art may have a deep spiritual significance, not only in its content, but in the creativity that produces it. We may, therefore, speak of the artistic spirit and ask whether life as a whole could be infused with this artistic spirit as well as with the scientific.

That is to say, in our actions from moment to moment, we would have a perceptive attitude—not mechanical, not repetitious or routine—in which we would be moving to make everything fit . . . to cohere. Even science should properly be done with this artistic spirit, in its actual doing rather than by following rules and formulas. I do not think a “science” of science would be right, nor would it get very far. I think it would be best to call it the “art” of science.

Without the scientific spirit and the artistic spirit, we cannot have an overall coherent spirituality. To have incoherent spirituality is not going to be helpful. It could be said that science, art, and spirituality are the principal content of culture. There is not a great deal of culture that would not be somehow included in these if we broadened the meaning of those terms the way I would like to. As long as these elements are separate, we cannot have an overall coherent culture.

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Since culture is shared meaning, we cannot then have a coherent shared meaning. That is to say, our culture ultimately will have little or no meaning. Without meaning, our society will fall apart. It will have no value, no purpose. We can see evidence that society is falling apart throughout the world. At least in the West, society has lost much of the impetus that it had in the nineteenth and early twentieth century.

Not only that, but the individual cannot be healthy or whole in a culture that is split at its foundations. If individuals lack coherence, significance, value, and purpose, they will suffer, not only mentally but also physically. In this regard, social incoherence and individual incoherence feed on each other. Individuals living in an incoherent society tend to become inwardly incoherent and then, in turn, they help to make up an incoherent society.

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The human species is now presented with a challenge to its very existence. Can we provide everyone with an adequate physical and social basis for life without destroying the planet through ecological disasters, climate changes, and so on? Will the forces of nationalism and religious divisions allow us to get together to meet these problems, which are of a worldwide nature? Clearly this depends on a widespread sharing of meaning, allowing for the creation of a coherent culture, which would eventually be planetary.

How can a coherent culture come about? I want to suggest that the essential start is to be able to have a dialogue. In this way, people in different subcultures can come together to dialogue and to share their meanings, perhaps to emerge with new meanings that would be common. We have to begin with people who are open enough to start the dialogue—we cannot begin with those who don't want to. We need a place where people could get together merely to talk without trying to solve any problems, simply to communicate, to share, and see if they can come to a common understanding. There is no set form or practice to establish communication except to engage in communicating itself and then encounter the problems of doing that. Also, if we say that we want to communicate, but we give first priority to solving a certain practical problem, it will limit us. Behind every practical problem there is an assumption that may stop us. Some of the things that we want to communicate may go out on that assumption. Suppose we say that we want to communicate and we are not going to give first priority to solving any problem.

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This reminds me of a story I read many years ago. An anthropologist was studying a North American Indian tribe. He observed that they got together in a circle frequently—20–30 people, I suppose—and they would talk. There was no agenda, no decision making, no authority. They would stop talking at a certain point, and the anthropologist did not understand the stopping point. However, when they stopped, they all seemed to know what action to take, because they understood each other so well. We cannot do this now. Our meetings are much more difficult when we try to get people to really work together. Imagine people all getting together, even in one country. We cannot do it even in one family, much less between countries, cultures, and religions, because we are unconsciously committed from the very outset to doing the opposite. This is the point. It is not an accident that we find this so hard. We try to overcome this commitment, but this means that we are unconsciously resisting the very thing that we are trying to do. This resistance is in our memory and in the whole system, including our whole culture. And it is not coherent—it is counterproductive—to try to do something and hold back at the same time.

I think we have to transform the culture by starting with a nucleus—a small group of people that might make a new culture. As I said, to do this is not really a practice, but a constant situation of learning creatively in communication. As we begin to share meaning, we will also share values and develop a common purpose. If everyone understands the same thing, we can all work together. If we all see it differently, and have different ends, we cannot do it. The real trouble is that we do not have a coherent culture.

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Anthropological studies suggest that in earlier times, people generally had a more coherent culture. It is essential that we create a coherent culture now. Otherwise, I do not think that the human race is viable very far beyond the level of the Stone Age. With the arrival of modern technology, we have to take this step or we cannot go on. Modern technology is increasing our power by leaps and bounds—power to destroy, as well as to create. For example, with the iron ax we were able to cut down trees at a great rate and make deserts out of most of northern Africa. And now, with the chain saw we could cut down everything within a short time if we wanted to. The point is, we must get together to do something intelligent about this. And if people cannot talk together, how can we do it?

We have to begin with those who understand the point and see its necessity. They are the nucleus. We could call this the microcosm of a larger, coherent culture. If we could establish such a micro-culture this might spread. However, we cannot establish this through an agenda with a definite end in view, because there will already be a distortion by the unconscious motives that lead to resistance. The people who thought of establishing socialism made an attempt to confront this problem, but all the unconscious motives of self-centeredness resisted, and it never really worked. I think people will, sooner or later, discover that capitalism does not work either. Just look at our ecological problems . . . we really must do something different. If we would establish free communication, in which all these unconscious motives could be explored, all this might change. What we need to be able to do is to talk, to communicate. People in the U.N. are not discussing the basic issues at all, because they are really not negotiable. They are negotiating the small points that people are ready to trade off, but we cannot come to a common policy that way.

What is needed is a dialogue in the basic sense of the word “dialogue,” which implies that meaning is flowing through and amongst people, rather than an exchange where each person tries to win by making his view prevail. Dialogue, therefore, means creating something new where everybody wins.

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The basic idea of dialogue is to be able to talk while suspending personal opinions—as it were, holding them out in front of you and the group for all to see their coherence or incoherence—while neither suppressing them, nor insisting on them, nor trying to convince or persuade others of their value. Instead we just want to understand. In a way, this is comparable to allowing the scientific spirit to infuse our communication. We need to have a kind of scientific attitude when we talk. It does not mean that we are doing laboratory experiments but, for the most part, we are listening to the opinions of all, whether they are pleasing or outrageous. That is the essence of the scientific spirit. We are just *listening*—if we can do it.

In this art of dialogue, the first priority is to see the whole meaning of everyone without having to make any decision as to who is right and who is wrong. It is more important to see the whole meaning than that any particular opinion should prevail. Because seeing this will create a new frame of mind in which the consciousness of all has a common content. The content being all these opinions at which we are looking. The other person's opinion is looked at the same as mine is. It means a common consciousness that is coherent. It is a kind of implicate order where each unfolds into the whole consciousness.

With this common coherent consciousness, we have a new kind of intelligence capable of thinking together. Usually people in a group do not think together. Each one has his/her own idea and tries to get it across, even though he/she might sometimes accept a part of someone else's opinion. In thinking together, however, one person will have an idea and it will pass to the next person, who will pick it up as though it were their own, and it will go on like that, just as though one person were thinking. The idea does not belong to anybody. This requires complete trust, which develops only if we are able to get through all the obstacles to dialogue—these unconscious motives of self-centeredness that I have mentioned.

I do not want to give the impression that this will be straightforward or easy. But I think if people see the necessity and are serious about it, we can do something. We can have this common consciousness, this intelligence. We can also have a common bond of impersonal fellowship or participation. This fellowship is one of the more powerful feelings that there are. I read recently that many people used to find something good in war because they experienced a valuable comradeship that they could never get in civilian life. They were ready to go through all the horrors of war to gain this.

In Charles Lamb's essay "Roast Pork," an explanation is given of the origin of this dish. Somebody's house burned down with a pig in it. A boy went out and touched the pig, put his hand to his mouth and found that it tasted good, so they ate the pig. After that, houses started to burn down at a great rate until a great genius discovered that you do not have to burn down the house to have great roast pork. Similarly, we do not need to have a war to have comradeship. That is one discovery that we must make.

With this common consciousness, people could create a coherent culture, which implies a coherent mind and body for each individual as well. What underlies consciousness is this infinitely subtle spirit which cannot be defined, out of which emerge the ultimate meanings in ways we cannot see and grasp. This infuses the whole with a coherent but dynamic and creative meaning. This spirit is in some sense one—undivided. It is so subtle that we can say little about it, but it is essential to consider the possibility that it is there. If we try to say it is not there, we will go over to mechanism in the end.

This spirit unfolds into many aspects, including the scientific, artistic, and religious, and would bring about a different way of living—both individually and together—which would move toward an unbroken whole. It would allow creative freedom to the individual that is not imposed, but would arise naturally. People would see the necessity of it and see that it is so much better than the other way. Since wholeness, health, and holiness have the same root and since sanity has basically a similar meaning, it would imply the health of body, mind, and society and, of course, the spirit beyond.

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David Bohm, 1917-1992

DAVID BOHM, physicist and philosopher, lectured and wrote widely about his belief that the complexities and order of subatomic physics have implications for disciplines such as the arts, humanities, philosophy, and religion. Author of *Causality and Chance in Modern Physics*, the classic text in quantum mechanics, Bohm would go on to propose that all parts of the universe are fundamentally interconnected, forming what he called “an unbroken flowing whole.”

From Bohm’s point of view, quantum mechanics contained certain inherent contradictions, which led him to the conclusion that the world of the atom is intricately interwoven and should not be viewed merely as a collection of independent components.

Having as much an impact on Bohm’s thinking as his teacher Robert Oppenheimer and his colleague Albert Einstein was Jiddu Krishnamurti, an Indian philosopher of whom Bohm became aware in the late 1950s. Bohm’s belief about wholeness at the atomic level meshed with Krishnamurti’s insistence that all relationships must be viewed holistically, because there are no fundamental divisions in the cosmos.