Chapter 6
Macroscopic Consequences

Abstract Philosophical consequences of the view of science and in particular the view of quantum theory expressed in this book are discussed. In particular the relationship between science and religion is briefly touched upon. Culture is seen as a part of the context for making decisions. A thorough discussion of the concept of complementarity, also extended to macroscopic settings, is given.

6.1 Philosophical Considerations

To repeat the views of this book: The quantum formulation can be seen as having to do not with how nature is, but with our process of obtaining knowledge about nature. We focus on certain questions to nature, and obtain answers to those focused questions. I indicate in different ways that essential parts of the quantum formulation can be derived by considering such a process—an epistemic process. These are relatively deep results which require some mathematics to derive.

Who is this 'we' who ask questions and obtain answers? It can be a single observer or a group of communicating observers. The epistemic process that this (these) observers perform(s) can be likened to statistical inference in some way, and the quantity which he/she (they) ask questions about and obtain information on, can be likened to a statistical parameter. I have introduced a new name, an e-variable, to cover both parameters in statistics and these physical quantities.

I claim that the basic principles of statistics, the conditionality principle, the sufficiency principle and the likelihood principle can be generalized to all inference on parameters and to all simple e-variables connected to experiments.

I go on and derive the Born formula from a version of the likelihood principle together with an assumption of rationality. Also, the Schrödinger equation is derived by an assumption of observers taking into account both σ-algebras in the past and in the future.

I stress that my theory is not a hidden variable theory, although it bears some resemblance with such a theory. The inaccessible variable ϕ is not a hidden variable, but a mathematical variable upon which group actions may be defined. The e-variables are not hidden variables, but closely connected to the epistemic processes. (Note that the parameters of statistics exist only in our minds.) Also:

I. S. Helland, *Epistemic Processes*, https://doi.org/10.1007/978-3-319-95068-6_6

Doing inference has to do with intuitive processes in the brain, and the brain is no computer and cannot be simulated by any system of computers, so the epistemic process which lie in the foundation here, cannot be simulated by any system of computers.

Although essentially new arguments behind quantum mechanics are presented in this book, I still regard conventional Hilbert space based quantum mechanics as extremely useful when it comes to calculations. It has developed very far since its beginning in the previous century; see for instance a modern book like Ballentine (1998). It still has a very vigorous development; see the many articles posted each month in arXiv:quant-ph or articles published in many good journals. It is not the purpose of this book to try to change this culture. I only claim that an alternative, and perhaps more intuitive basis can be found.

In the same way, the statistical culture, as it is described in Chap. 2, has a vigorous development today. What I try to point out, is, that these two cultures may be seen to have a common basis in the concept of an epistemic process. Nevertheless, I am quite sure that neither quantum mechanics as a science nor mathematical statistics as a science nor applied statistics as a tool in many empirical sciences would have developed as far as they have if some sort of a synthesis between the two cultures had been taken place from the beginning. This may be linked to the quantum mechanical concept of complementarity. Universality and creativity may in some sense be seen as complementary qualities.

The concept of complementarity is extremely important in this book. Up to now it has mainly been connected to the process of obtaining knowledge, that is, the epistemic process. As just seen, it can also be associated with human abilities. Humans observe, make decisions and act. The complementarity concept can also be connected to the decisions and the actions. Assume for instance that a student is to work on some given assignment. He can have his focus on satisfying teacher A or on satisfying teacher B in the decisions and actions he make when working on the assignment. These can be complementary foci. The complementarity can be reduced if more time and concentration is devoted to the assignment.

There are other, complementary, approaches to quantum mechanics than the one through epistemic processes. Some of these were mentioned in Sect. 4.1. Of particular interest are the approaches by Hardy (2001, 2011, 2012, 2013). In a series of papers, Wetterich (2008a,b, 2009, 2010a,b,c,d) has explored the relationship between classical statistical ensembles and quantum mechanics.

Also for mathematical statistics there are other, complementary, approaches, for instance through ordinary decision theory.

Going back to the epistemic process situation, the basic feature of the approach in Chap. 4 was focusing: Ask a selected focused question to nature and obtain a specific answer. From a given observer's point of view this defines a state of nature. The remaining assumptions on the group actions introduced there are mainly to make the derivation of the ordinary Hilbert space apparatus under certain conditions possible.

The focusing used in Assumption 4.1 was precise and formal. Informally, focusing is very often necessary in our daily life when we want to obtain knowledge

before making decisions and acting from these decisions. We simply do not have the capacity to absorb all the knowledge from all the sources that we are confronted with.

An epistemic process as used in this book is a very wide concept. As stated in Sect. 3.4, every epistemic process involves decisions, a decision to ask a question and a decision to accept the answer. It is interesting to note that also the other assumptions made in this book have informal analogues for humans making decisions.

1. The rational epistemic setting and the arguing leading to the Born formula was derived from assuming: (a) The perfectly rational actor D. When making decisions, most humans will have ideals which they look up to, ideals to the effect of being as rational as they are able to be. (b) The focused likelihood principle. When making decisions, most humans will try to use all relevant available data and if possible also use their prior model for the situation. These are the important elements which they rely upon.
2. The Schrödinger equation was discussed in detail only for the case of a one-dimensional position, but it was stated that it can be generalized. The assumptions made in this derivation were related to an inaccessible stochastic processes where the observers were able to condition both on the past events and on the future events for accessible focusing from this process. This has an analogue the situation a human is in before and after his actions when planning what decisions to do next. He then takes into account both past events and possible future events.

Thus if we stretch our imagination a little, the two time developments of the quantum state, which have caused so much discussion in the physical literature, can both be said to be connected to mechanisms related to the decision making processes of an observer.

It may also be interesting to speculate around the fact that the free will theorem follows from the assumptions of quantum mechanics, admittedly in a special case, but it is possible that it is valid for most situations that are complicated enough. Humans are governed by their free will, and they are constantly confronted with other humans that are governed by *their* free will.

So what should one mean about the question of reality? It is obvious that the moon is there when nobody looks. (See the title of Mermin 1985). In general *any physical system has an existence which is independent of all observers, and it exists even when there is no observer at all*. It is the state of the system—whatever that means—which we have limited ability to obtain information of.

All these speculations, and indeed the whole idea of a purely epistemic foundation of quantum mechanics, make one a little uneasy, however. The universe was created 13.8 billion years ago, and physical laws, including quantum mechanics have presumably been valid since then. How can then everything be so tightly connected to the human observer? This is of course an obvious question; I nevertheless thank Bill Wootters, oral communication, for mentioning this point to me.

A possible solution in the spirit of this book, is connected to the imagined observers of Assumption 5.4 (Sect. 5.1) and the perfectly rational actor D of Sect. 5.5. To go into more details on the question on what these elements stand for, is again mere speculation, but at least all assumptions made up to now are consistent with the following world view, which also provides a link to the ontic interpretation of quantum mechanics. A similar proposal was in due time made by the philosopher George Berkeley in order to avoid accusations of solipsism. (Bent Selchau, personal communication.)

For several reasons I have chosen to believe that there is a Creator of the universe, who during the creation also observed it. Then later this Creator is at each time able to observe, make decisions and act. He is perfectly rational.

I believe that we humans are created in His image, but we are imperfect. The last statement is obvious; the first may be argued for from the fact that we also are able to observe, make decisions and act. This is the basis for the idea of an epistemic process.

With now a divine Creator entering the stage, this idea obtains a new dimension. If the idealized Heavenly observers agree on the result of *their* epistemic process, this result must be said to be an objective fact. This gives us a simple tentative argument through the concept of an epistemic process, which was argued above to lie behind the formalism of quantum mechanics, to an ontic view of the world. (And all attempts to find an ontological foundation of quantum mechanics can be seen as attempts to see the world from the perspective of the Heavenly Creator.)

Such an ideal epistemic process can only be imperfectly mimicked by human observers. Nevertheless, when several of us agree on an observation, we can be fairly sure that this is an objective fact. Such a conclusion is strengthened if the epistemic process leading to the conclusion is a scientific investigation.

The divine Creator may be called God. He is worshiped in different ways in different cultures and He is seen in different ways by different humans. This can be explained by the fact that we humans only can have an imperfect image of God. It is also connected to the fact that we all have different contexts, also when making deep decisions. The concept of a context has played an important role in this book, it is important in any epistemic process and it is important for any process of making decisions.

From my perspective, the ultimate actor God must in some way be the same across all cultures, and He must be acting over and above what particular image each single person might have of Him or of aspects of Him.

At the outset we know little about the goals behind the decisions made by God. My own conviction is related on Albert Einstein's saying: The Lord is subtle, but not malicious. It is also based upon the God who ends the play Brand of Henrik Ibsen: Deus caritatis; the God of love. Thus there seems in my opinion to be a God which is good and wants the best for us humans. But in a world where we all have our free will, God is confronted with many complementary goals. On the one hand He is almighty. On the other hand He seems to meet logical impossibilities if He should do the best for absolutely all of us.

By all these speculations I have been entering the realm of theology, which is not my speciality. However, one can never stop wondering about the large and difficult questions. Some of the answers must remain open at this stage.

Thus I value high very many aspects of religion. However, I have great difficulties with the attitude: 'We in our religious community are right. The others are wrong.'

I am strongly against any kind of fundamentalism. Extreme Muslims may become terrorists in the belief that they have the right religion. Israeli settlers occupy Palestinian land in the belief that they have the right religion. It is important to have an open mind towards the beliefs of other people, but such an open mind should also have its limitation. There are no simple solutions to the deep conflicts in this world.

In the same way as I believe that there exists an ultimate God, I also believe that there in some sense is an ultimate science. It is very fruitful to do science in various scientific cultures, but there must be a logical way to understand the conclusions obtained in different cultures in a unified way. This is a personal conviction behind the work of this book, but the view may perhaps be generalized to other human activities.

At this point it is natural to stress that also science has its limitations. Science is not able to explain consciousness. Science is not able to grasp in any way the spiritual power behind a symphony by Ludvig von Beethoven, a painting of Pablo Picasso, the finding of theorems by Nils Henrik Abel or the finding of theories by Richard Feynman.

We all have a mind which can not be scrutinized in detail by any scientific investigation, however far our knowledge of the brain is developed. Thus there is a room for a dimension in life that goes beyond science, in my view, also a room for religion. A further discussion of my views on science and religion can be found in Helland (2017).

6.2 More on the Nature of the Superior Actor

We all go through our lives making repeated decisions in different contexts. These decisions are governed by our free will, but they may also be influenced by people that we look up to, who perhaps have done similar decisions before. In our childhood, the persons that form our basis are most often our parents, but later other ideals may take over. Human beings that suffer from a confused relation to their first ideals, may later have difficulties in making good decisions, and they may end up with having psychological problems. Much mental illnesses can be explained in this way.

As scientists we also have ideals that we look up to. These may be personal, or they may be substantiated through certain well-defined principles. In Sect. 5.5 I made the assumption that the experimentalist A, when posing a focused question to nature, made his decisions inspired by an ideal D, and that D was perfectly rational. This may be regarded as a simplification. In reality, when making our decisions, we are influenced by a multitude of conscious or subconscious sources. All these

sources are here collected together in the actor D. I assume that D has a positive influence on A, positive with respect to the goal that A has, in this case the question that A has chosen as the focus of his experiment.

Let us look at the process of making decisions in some greater generality. People in different cultures make their decisions partly intuitively on the basis of cultural values. These values may have a historical origin, and they may also be related to religion. Christianity, Islam and Judaism are all founded upon the belief in a personal God. The believers act under the assumption that there is a God behind everything, and that God is perfect. They believe at the same time that He influences all human beings, also those who serve as ideals for others. In this sense, God may take the role as the ultimate ideal D within the relevant culture.

In general a culture may be looked upon as part of a man's context when making his decisions. At the outset, all human beings should be respected, and so also the context they have for making their choices. Hence it is a part of my philosophy that no culture should in principle be seen as definitely better than other cultures when it comes to inspiring people's decisions. However, this tolerance has it limits; one of these is an ultimate respect for people's life. Extremists taking lives under the belief that their own culture is threatened by other cultures, should of course not in any way be accepted. But in addition there are other universal ethical rules that should be respected.

In essence certain cultural values and more generally certain value-contexts for making decisions may be seen from a global point of view to be more satisfactory than other set of values, but this can only be determined by rational arguments. Hence communication between cultures is very important in our world as it is now. As a particular continuation of this statement, this book in itself is written with the partial purpose of finding a common language with which one can communicate across scientific epistemic cultures.

6.3 Quantum Mechanics, Decisions, and Complementarity

This Section can be read independently of the rest of the book.

The modern technological development would have been extremely difficult without scientific theories. In a certain sense physics lies behind all natural science, and it is impossible to discuss modern physics without touching quantum mechanics in some way or other.

The great American physicist Richard Feynman said once: 'If somebody claims that he understands quantum mechanics, he lies.' This statement is still valid, but during the recent years new elements of understanding have appeared.

The crucial point is that quantum mechanics is a formalism, a set of calculating rules for how one can predict the outcome of experiments. These calculating rules have had an enormous success; they have been used for everything from small elementary particles to complex chemical and biological systems, and in every case the predictions have been 100% in agreement with the results of experiments.

However, the great question is how one shall interpret these calculating rules. Here the physicists disagree, also today. During the recent years there has been held a long range of international conferences on the foundation of quantum mechanics. A great number of interpretations have been proposed; some of them look very peculiar to the laymen. For instance, during one period it was popular to assume that there exist millions or billions of parallel worlds, and that a new world appears every time when one performs a measurement. Some take this point of view even today.

On two of these conferences recently there was taken an opinion poll among the participants. It turned out to be an astonishing disagreement on many fundamental and fairly simple questions. One of these questions was: Is the quantum mechanics a description of the objective world, or is it only a description of how we obtain knowledge about reality? The first of these descriptions is called ontological, the second epistemic. (From Webster's Unabridged Dictionary: epistemic: what concerns or comes from knowledge, or the conditions for obtaining knowledge.) A similar, but not quite identical distinction is realistic versus non-realistic. Up to now most physicists have supported the ontological or realistic interpretation of quantum mechanics, but versions of the epistemic interpretation have received a fresh impetus during the recent years.

One such version is QBism, or quantum-Bayesianism. The predictions of quantum mechanics involve probabilities, and a QBist interpret these as purely subjective probabilities, attached to a concrete agent, or observer. There are many elements of QBism which represents something completely new, both in relation to classical physical theory, in relation to many peoples conceptions of science in general and also in relation to earlier interpretations of quantum mechanics. The essential thing is that the observer plays a role which cannot be eliminated. The comprehension of reality for a person differ from person to person, at least at a given point of time, and this is in principle everything that can be said, at a given point of time.

According to QBism there is no other reality than the subjective one attached to each single agent. This statement must be made precise to be understood correctly. Firstly, one talks about an ideal agent, and secondly, groups of agents which communicate mutually, can go in and act as one agent as long as one talks about one measurements. When all potential ideal agents agree about an observation, this observation is a real property of the world.

Nevertheless, these are aspects of physics—and science—which can be surprising for many people, but in my opinion such viewpoints may be necessary, not only in physics, but also in many other areas of life.

Such an understanding of reality can in my opinion be made valid for very many aspects of reality. We humans can have a tendency to experience reality differently. Partly, this can be explained by the fact that we give different meaning to the concepts we use. Or we can have different contexts for our appreciations. An important aspect is that we focus differently.

Subjective Bayes-probabilities have also been in fashion among groups of statisticians. Personally, I mean that it can be very fruitful to look for analogies

between statistical inference theory and quantum mechanics, but then one must look more broadly upon statistics and statistical inference theory, not only focus on subjective Bayesianism. This is only one of several philosophies that can form a basis for statistics as a science. Referring to Sects. 6.1 and 6.2, I will assume that the superior actor D acts as a Bayesian, but for human observers also other philosophies must be allowed.

My point of departure is that I look upon a quantum state as the result of two decisions: A decision to focus upon a question to nature, and a decision to interpret the answer. The present section is also about focusing in human decisions in general, simple decisions, more complicated decisions and even deeper decisions which can concern philosophical questions. We all go through life and make decision after decision, make choice after choice.

It can be of interest to look upon how some ideas from modern physics can illuminate these processes. It must be emphasized that this an account of my own opinions, which are far from shared by all physicists. However, Niels Bohr, nearly hundred years ago, expressed similar thoughts, admittedly not quite as radical as this.

My own view upon quantum mechanics is inspired by the QBism, but I mean that one more generally should take as a point of departure a fundamental theory for epistemic processes, processes with the purpose of obtaining knowledge about something. In my opinion a theory of such processes could play a role both for our understanding of daily life and for our understanding of science, quantum mechanics in particular.

Epistemic processes, at least the simplest of them, involve decisions in two stages: First a decision to choose a focus. Then collection of data, and finally an informed decision about what these data say about the phenomenon that we have focused upon. Traditional decision theory is only concerned with the last one of these decisions.

It is very important to find a good enough theory of human decisions. What dominates science today, is a far developed—but in its basis relatively simple—theory for decisions under uncertainty. This covers much of economic theory and also statistical inference theory, and is thus an important part of the foundation both of economy as a science and of statistics as a science.

But human decisions are very complex. Firstly, the decisions may depend on the order in which we want to do our decisions; more generally most decisions will depend on a context, partly determined by earlier decisions. Secondly, many decisions may be a result of a complicated interaction between the conscious and the subconscious. This is not covered by traditional decision theory.

During the recent 5–6 years there has been proposed and developed a new formal theory for decisions, where these are in part conscious and in part subconscious. This theory is inspired by quantum mechanics (Yukalov and Sornette 2008, 2009, 2010, 2011, 2014). There has also in the recent years appeared aspects of the sciences economy and psychology which are analogous to certain aspects of basic quantum theory. (See Khrennikov 2010.) This can all be coupled to decisions.

Decisions can be made by single persons or by groups of people. A group of people can agree to go collectively into a decision process, and can make collective decisions on which actions should be done after the process is finished. All decisions and all actions—whether done on a single person level or on a group level, should to the best of one's ability be done in an intelligent way, where one takes into account all accessible knowledge. For many decisions this may take time.

But in certain case we do not have so much time for our decisions. This is true for most practical decisions taken in everyday life. An important example taken from daily life is that of driving a car. Here one must take quick decisions and at every point of time focus on other car drivers, pedestrians, bicyclists, traffic signs etc.. To be able to do this, concentration is important, but it is also important to have good training. Other cases where we have to take quick decisions, are in verbal communication with other people.

All decisions are made in a context. This context may be purely physical, but it can also be historically determined or be tied to the personality of the one who takes the decision. If it is a question of a conscious decision, it can be critical to know what concept the person has at his disposal in order to formulate his thoughts.

Our opinions can depend on our background, what we have experienced earlier and what persons we have been communicating with or have been influenced by. But at the same time we have free will to take decisions, in particular to formulate our viewpoints and opinions.

In discussing these and similar questions, it can be useful to look at the quantum mechanical concept *complementarity*. For a thorough discussion of complementarity in physics, see Plotnitsky (2013). The concept was originally introduced by Niels Bohr to describe what it is possible to measure physically, but in various talks Bohr also looked upon extensions of the complementarity concept. Such extensions are also of great current interest.

First look upon the purely physical aspect. It turns out that in principle it is impossible to simultaneously measure the velocity and position of a particle. Velocity and position are complementary quantities. It turns also out that this problem is less for particles with large mass, i.e., heavy particles. Thus the degree of complementarity in this sense is largest for light particles. Concretely this is expressed in Heisenberg's uncertainty relation: The product of the uncertainty in velocity and the uncertainty in position is greater or equal to Planck's constant divided by the mass of the particle. If we try to measure the position accurately, we disturb the system so much that it is impossible to measure the velocity accurately. And similarly if we try to measure the velocity accurately.

The terms complementary and complementarity have several meanings, both in physics and elsewhere. In this section I will let these concepts refer to two or more aspects of reality which are difficult or impossible to grasp or to have an attitude to at the same time, but where both (all) in some way are needed to get a complete picture of reality.

In this way the accurate measurement of velocity and the accurate measurement of position are complementary *activities*, and the corresponding *quantities* are also

complementary. Many physicists are skeptical to using these concepts outside the concrete physical context, but we will see that it can be fruitful.

Here is Plotnitsky's definition of complementarity:

(a) a mutual exclusivity of certain phenomena, entities, or conceptions; and yet
(b) the possibility of applying each one of them separately at any given point; and
(c) the necessity of using all of them at different moments for a comprehensive account of the totality of phenomena that we consider.

This definition points at the physical situation discussed above, and has Niels Bohr's interpretation of quantum mechanics as a point of departure. However, in my opinion the definition can also be carried over to a long range of macroscopic phenomena or conceptions.

A simple example: A student works with a difficult assignment. One goal can be to get it finished fast; another goal can be to hand in a paper which is as good as possible. These are clearly complementary goals. If his ability to concentrate is good, this may to some extent reduce the degree of complementarity.

Opinions and viewpoints of different persons may often be complementary. Examples of this can be seen daily in newspaper debates. But the differences in opinions may go deeper, and have their basis in complementary *world views*.

Good authors can write novels where the reader understands each single person's descriptions of reality, even in cases where these descriptions are not fully compatible. In such cases one can of course discuss if there is an objective reality behind these world views. It may be that the author's point is just that it is not very fruitful to look for such a complicated objective reality. In any case, to find such an objective reality, one may have to go beyond the conceptual basis for each single person. This is similar in many political conflicts, where the schism is between groups of people.

In quantum mechanics, the concept of reality has played a prominent role in recent discussions. In QBism, the emphasis is moved to each person's experience of reality. In this section I want to go one step further and talk about the collective experience of each group of communicating persons. For different persons or for different groups of communicating persons, their perceptions of reality may be complementary. This may be true when observing the microworld.

Many physics papers discuss two actors Alice and Bob, being so far away from each other that they do not communicate. All physicists agree that there exist situations where the observations of Alice and Bob are entangled. From an epistemic point of view the two actors may also have complementary comprehensions of the world because they focus differently. According to the physicist John A. Wheeler, each observer can create his/her own history.

I claim that this may be equally true for persons—or groups of persons—making experiences in the macroworld. People may tend to have different—complementary—world views.

The summer 2014, in the middle of the Gaza war, both the Israeli and the Palestinian ambassador to Norway were interviewed in a major Norwegian newspaper about the situation in the Middle East. The two had clearly complementary world views.

The Israeli ambassador talked about safety for his population and about Hamas using human shields for their launching of rockets. He also referred to holocaust and stressed that the Jews had strong reasons for seeking their own land. He also mentioned that Hamas had broken several cease-fire agreements, and emphasized that Hamas would not recognize Israel as a sovereign state.

The Palestinian ambassador described the long term occupation of the West Bank and the brutal attacks on the Gaza stripe. He emphasized strongly all the humiliations that the Palestinians are and have been met with. He mentioned illegal Israeli settlements and Apartheid-like conditions in Israel. Of course he also talked about the many civilian losses during the war, especially losses of children.

We, while hearing all this, can of course form our own opinions. But to what extent are these opinions dependent upon which information we by chance have obtained, and not least, upon which group we belong to? It is a fact that Danes largely are more Israel-friendly than Norwegians. Demark would not sign a common Nordic resolution about the Middle East war, but chose instead a more watered down EU-resolution.

Without doubt, our opinions in general can be influences by which country we happen to live in, by which period of time we live in, and more generally, by which culture we belong to.

Sometimes, in such situations, it can be useful to step back and just say that the two world views are complementary. This can be linked to trying to respect both parties, something which is important if one should happen to be in a position where one can help in peace negotiations.

Nevertheless, to only be neutral and rest on the complementarity concept can be dangerous. As humans we have both the right and the duty to take a definite stand on various questions. This is the great logical dilemma that we are faced with in every situation: To make a conscious decision while we at the same time know that we are guided by unknown subconscious causes. In reality this is a problem in every case where we shall make a difficult decision. However, for many people this dilemma is not a big problem: One makes decisions on an intuitive basis.

The complementarity concept must not make us into value-relativists. There is something right and wrong in this world. During the last world war it was right to dissociate oneself from Hitler and his fellows, and we must definitely dissociate ourselves from the human cleansings of Stalin and Pol Pot. In general we should dissociate ourselves from everybody who do not respect fundamental human rights, and there are also other moral issues where we can say something of absolute validity. My own conviction is that moral questions of this kind could be approached through a faith in God, but unfortunately there are many problems where such a conviction do not lead to simple, unique solutions.

To take a concrete and very actual problem: What should we mean about the European refugee issue? From an ideal point of view our borders should be more open, when seeing all the suffering among the refugees. But at the same time there is a limitation on how many refugees the various countries have a capacity to receive in a decent way. This is an area where the public debate has been hard recently. To a certain extent the debate has been dominated by complementary points of view. This should not prevent us from making up our own opinions.

Politics is not simple, and it should not be simple. Many people in Western countries were unambiguously enthusiastic when the Arabic spring started, overthrowing regime after regime. But unfortunately, the spring has turned into winter in many of the affected countries.

Both in daily life, in politics and in science it can be necessary to focus. Another essential point is that all decisions are made in a context. Finally, one should be able to communicate verbally all conscious decisions.

Focusing can be done at all stages of the decision process. As complementary goals, complementary activities and complementary world views are concerned, it can be a solution to focus upon one of the goals, one of the activities and one of the world views. But in particular in the last case, a more intelligent and creative solution can be to try to find a partial synthesis.

Look again on the Middle East conflict, and the two ambassadors who had complementary world views. For many westerners it has been important to take a clear and unambiguous standpoint for one or the other party in this conflict. But as a sensible person has said: This is not a soccer game. There are serious issues at stake for both parties. A more constructive question can be: What can reduce the degree of complementarity? What obstacles get in our way for at the end to reach a lasting two state solution? Or for other lasting solutions? As emphasized in the previous two sections, I do not think that any solution can be found without taking religion and cultural aspects of religion into account.

Concepts from our understanding of modern physics can contribute to enlightening difficult problems, both concerning our own decisions, decisions by groups of people, and world views lying behind serious conflicts. One hope should be that a correct understanding of science may create a conceptual apparatus giving both scientists, politicians and others in leading positions inspiration to work for good human purposes, in its final consequence to work for peace here on earth. A clear view on interpretations of modern physics, and extensions of such interpretations to other areas, can in my opinion contribute to making such a conceptual apparatus. Of course, this does not mean that this contribution from modern physics is a unique contribution for peace. Many good people in our societies work for a similar final goal, and many good people pray for a solution. One point with this section has been to explain how such a work can be partly motivated completely rationally—with a basis in a possible interpretation of the most rational of all sciences: Fundamental physical theory.

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