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TRANSDISCIPLINARY AND INTEGRATIVE SCIENCES: HUMANITY’S MIND AND POTENTIAL

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Glossary

Symbiosis: The intimate association of two dissimilar organisms from which each organism benefits.

Dynamics: The moving moral, as well as physical, forces in any sphere, e.g. the dynamics of social change.

Analysis: The process of analyzing

Synthesis: The formation of a compound from elements or simpler compounds

Autonomous: Self-governing and self-organizing

Summary

We put forward two fundamental problems with which humanity is confronted in relation to sustainable development, and analyze them from a transdisciplinary point of view. The first problem is related to the incapacity of human talent to control and steer the actual complex world society. We suggest some solutions to this problem, ones that arise from a comparison of human

society with the human mind and body as a multicellular entity, and analyze in which way human society could develop the capacity to see, think, evaluate and plan for the future as a semi-autonomous cooperative system. The second problem is related to the confusion and misunderstanding that exists in our actual society about the fundamental contradiction between potency and variety versus efficiency and yield. We show in which way this contradiction is a profound property of all layers of reality. By transdisciplinary reflection we investigate in which way solutions to this contradiction in old layers of reality can be applied to the present day. We show that very concrete problems, such as the problem of the acceleration of present-day society and the problem of peaceful collaboration, are due to the subtle confusion about this contradiction, and apply our analysis of it to the proposal of concrete solutions to these problems.

1. Knowledge, Science, Integration and Transdisciplinarity

The cosmos, the solar system, and the earth are self-sustaining. They are the result of billions of years of evolution and survival, and have settled themselves into stable and self-supporting patterns of existence. The plant and animal kingdoms that have come into being on the surface of the earth are organized according to the same evolutionary groundswell, in ever-varying complex interaction with their surroundings, which in turn are also changing and adapting. It is this interaction which leads to stable and symbiotic forms of existence. The aim of sustainable development is to investigate how human beings, as living, thinking, acting and evaluating creatures, and how humanity as a social and cultural entity, can fit into this basic ‘natural’ dynamic, so as to safeguard their long-term survival. This is not a trivial matter; evolutionary history is strewn with extinction.

The specific new feature that humanity has introduced into the world is ‘knowledge’, with its corresponding potential for ‘action’ and ‘influence’ on the environment. Knowledge itself generates some of the risks of extinction; the threat of nuclear obliteration during the Cold War is just one illustration of this that springs to mind. However, knowledge also provides us with certainly the most important and perhaps the only available tool by which the goal of sustainable development may be achieved. It might therefore constitute humanity’s most precious asset in striving for a better, more valuable, and more beautiful world.

One of humanity’s precious attainment is the structuring of knowledge into an experimentally testable or verifiable system, which we call ‘science’. Scientific knowledge as a basis of more sophisticated ways of looking at the world has become the most important point of reference for humanity in its quest for a sustainable planet. However, this same knowledge not only carries in itself the risk of misuse, but is also fundamentally fragmented. The scientific method tends towards ever-increasing specialization as a result of its necessary preoccupation with analysis and expertise, leading to fragmentation of the total body of knowledge. Equal in importance to analysis, however, are synthesis and integration. It is in integrating different fragments of scientific knowledge that humanity is able to discover profound and more general aspects of the world. Synthesis will be of even greater importance with regard to sustainable development, because the principles by which humanity’s actions must be organized on a planetary scale will of necessity be integrative.

It is for this reason that special attention to transdisciplinary and integrative research will be of crucial importance in the decades to come, as well as being needed to counter the pressure for specialization and fragmentation generated by the social structures involved in the current scientific dynamics of society. The most convincing way we can argue for the importance of transdisciplinary research and the common action that results from it, is by putting forward a concrete analysis of what in our view are several of the major problems with which our present world society is faced. We would then like to show how this analysis arose from transdisciplinary reflection on these problems.

2. Individual Human Talent: Seeing, Thinking, Evaluating and Planning

One of the most notable differences between humans and the other living creatures they share the planet with: bacteria, plants, animals, etc., is the fact that humans can ‘see’, ‘think’, ‘evaluate’ and ‘plan’ for the future. By the verb ‘see’ we here mean ‘foresee’ and not just seeing visually. The higher mammals also have these capacities to a certain extent, but they remain at a primitive level compared to humans. The individual human capacity to ‘see’, ‘think’, ‘evaluate’ and ‘plan’, which developed during a long evolution in symbiosis with the material and living entities our ancestors cohabited with, is a marvelous and unique quality. As far as we know it has not developed anywhere else. It is based on very subtle dealings and interaction with the evolution of the entities in reality, which surround and influence human and which he or she in his or her turn influences. It challenges the intrinsic impossibility of predicting the future, and plays with the ability to change and direct reality. In the following section we shall focus on several of these aspects when we discuss the actual subject of the article. First of all we want to point out what in our view will be one of the greatest problems for humanity in the future.

The marvelous capacity that man has developed for ‘seeing’, ‘thinking’, ‘evaluating’ and ‘planning’ for the future is at present in a crisis, as a consequence of the globalization of world events. This capacity developed in a situation where man moved between relatively small communities, and was confronted by a relatively simple interactive dynamics, certainly when one compares it to the present state of world events. It is becoming increasingly clear that this capacity is losing its ability to keep a directive and influential hold on the evolution of today’s world society. It still works to a degree, by means of the system of states, peoples and associations that developed in the run-up to our global world society, but the impact of this individual ability has been drastically reduced. This loss can be largely put down to the increasing complexity of the world society. At first sight it looks like a hopeless situation, because no one believes that the world society will once again become simpler, either spontaneously or by its own will. Yet we would like to put forward a view that may offer a solution to this fundamental problem. This view implies a fundamental change with regard to the way the ‘political aspirations’ of various action groups are expressed. What it largely comes down to is that man has to orient himself towards an organization of society, whereby the society itself, as a living, semi-autonomous and interactive structure, develops the capacity to ‘see’, ‘think’, ‘evaluate’ and ‘plan’, and does this in a ‘forceful way’. As a result of this enterprise a society that is ‘strong’ should emerge, one that has the capacity to take advantage of unexpected changes. Man should aspire to an organization of society in which it gradually, step by step, develops ‘eyes’, ‘mind’, ‘morals’, ‘planning ability’ and ‘potential’ as an emergent property of society itself. We will refer to this emergent property of society as to humanity’s mind and potential. In order to make clear what we mean we would first like to analyze several examples in this light.

A peculiar phenomenon occurred in the developed countries as from the nineteen-seventies: a long-term unemployment problem. Large numbers of people were no longer able to participate in the dynamic of the developing society and had to be taken care of by the safety net of social security, which had originally been designed for occasional cases of unemployment. When we look at this with hindsight we can point out with apparent ease the direct cause of this evolution, which is in fact still applicable today. The nature of the work offered does not correspond to the abilities of the labor force. This is why it is mainly the semi and unskilled workers who suffered, and are still suffering, from this problem. The remedy would appear to be additional training, so that they would again be qualified for a job that fits in with the dynamics of our society. But this is a shortsighted analysis that ignores the essence of this unemployment. Let us try to put the phenomenon into a broader context.

In our society, apart from the long-term unemployed, there are also many who are employed but who are not doing the work that they and society as a whole consider the most important and meaningful. For example, the dynamics of our society make no problem of putting capital into the development of more highly perfected electronics for a new, sophisticated electronic product. This means it is no problem for engineers to participate in society's dynamics in a natural way. However, our society makes it much more difficult to generate capital for people who want to work, for example, in 'development cooperation' or 'health care', or even just 'work for a better world in general'. As a consequence of this one can claim with some certainty that humanity as a whole is occupied far too little with the really important things. We would like to make a few observations with regard to this last statement, so that it is not misunderstood.

The first is that we cannot really just know what 'the most important things' are, or what it would imply 'to work for a better world'. This is a pertinent observation and we shall have to devote more attention to it later in this article. We shall argue that to a great extent we can know these things. In fact one aspect of the 'Encyclopedia of Life Support Systems', of which this article is a part, assumes that we can know this to greater or lesser degree, and that it is partly linked to the body of thought regarding 'sustainable development'. Nevertheless, we shall see in the sequel to our article that we are putting forward a highly specific analysis in connection with this question.

The second observation is that we do not want to make the positive assertion that humankind as a whole is too little occupied with the things that are really important in the framework of a moralist discourse on the nature of society. We do not believe it is right to think that people should in fact occupy themselves with 'better' and 'more worthwhile' things, and that they are aware of it, but do not get around to it as a result of one or another characteristic of the human condition. It is rather the reverse: we believe that most people would like to become involved in things they consider more important and worthwhile, and by which they would be personally and intrinsically linked to the splendid and beautiful adventure of humankind on this planet, but that they cannot because they are all victims of the dynamics of society as it is now. It is made impossible for them, and this situation has become so natural over the years that we have already completely forgotten that it can be different.

This does not have to be interpreted as the common criticism of the present capitalist free market system that conquered the world after the fall of the communist system. That would be too easy and also incorrect. We think that the dynamic aspect of the free market has a special value that is worth fostering, and we also think that a 'more worthwhile activity by society as a whole' cannot be achieved on the basis of a centrally organized state structure, such as communism tried to set up. We shall see how our continued analysis brings in well-founded arguments for this.

3. The Short-Term Orientation of the Free Market System and Corrections by the State

If we analyze the example from the foregoing chapter in more detail we can understand to which aspect of the present free market system our criticism does apply: its 'short-term orientation'. Since our present-day free market system is to be found primarily in the dynamics of 'production', oriented towards 'direct consumption', it inevitably becomes short-term oriented. The engineer who is employed to work on the development of new sophisticated electronics to be used in a new generation of apparatus can easily be introduced into the dynamics of today's society, since this apparatus can almost immediately be sold, and thereby yield 'immediate profit' for the company in question. It is this profit that can be reinvested for the engineer's next task, or his or her successor's, so that he or she can work on a new and improved form of the same electronics. A company that can deal with this dynamic within today's society is a healthy one. It is a company which, together with its employees, genuinely participates in the dynamics of our society. It is a company that

‘lives’. By contrast, someone who works in an organization for development cooperation does not participate in the same way. His or her organization will be subsidized by capital from the state, which, by means of taxes, has the job of redistribution in this dynamic.

In the proposed analysis the fundamental role of the state is to see to it that capital is also available for the human activities which cannot be naturally linked into this short-term dynamic of the free market. These are by definition acts with a long-term orientation. It is therefore not surprising that the human acts financed by the state in this way are mainly those which we classify as ‘more important’. The complex technocratic and democratic mechanism of the state enables human to succeed in siphoning off part of his or her personal capacity to ‘see’, ‘think’, ‘evaluate’ and ‘plan’ for the future into an act that is supported by the whole of society. If we take up the metaphor from the second chapter once again, we can say that the state, by redistributing capital, succeeds in providing society with a ‘mind’. It is the totality of the minds of the politicians who embody the representation of the people that is being passed on to the whole of society. It is not without justification that people sometimes refer to the ‘vision’ of one or more statesmen who put forward certain original and significant plans. This dynamic, brought to life by the technocratic and democratic state structure which, like the free market, spreads all over the world, is a sort of counter-force to the blind short-term dynamic of the pure free market. Our present political-economic system is rightly called an ‘adjusted free market economy’. The adjustment is done for the welfare of the community as a whole, because it is clear to everyone that the blindness of the pure free market would very soon have catastrophic results for humankind.

If we analyze this in our own way it turns out not to work too badly. The aspect we want to focus on in our article is partly achieved by the state and its subtle mechanism of redistribution by way of taxes. So what is the reason for our criticism in the previous chapters? We would like to answer this on the basis of several observations. First and foremost we observe that the state structure we now have arose from a complex historical evolution, which can be traced back to the ‘more or less successful’ attempts to find a system of organization made by small groups of people living together. In the course of time the structure has evolved alongside the increasingly global human society, but has not kept pace with it. The concrete proposals we shall formulate in the sequel to this article are intended to remedy this lost ground. So they are not proposals that go against what already exists. They are intended to subtly and fundamentally help the ‘mind’ of society as a whole continue to develop.

They are also intended to generalize and harmonize the dual structure that currently exists, and most of all to demonstrate theoretically that it is not in the deep structure of the dynamics of society that this duality lies. Historically we see that the liberal political movements have always defended the efficiency of the pure free market, while the socialists upheld the role of the state (we remark that we use ‘liberal’ and ‘socialist’ as referring to the situation on the European continent. In Great Britain, ‘liberal’ stands for ‘conservative’, as well as in the USA and Canada, where ‘socialist’ stands for ‘liberal’). These movements have always interpreted their ideals as largely mutually exclusive. The communist experiment, in which the attempt was made to develop a structure that entirely excluded the free market, and its failure, demonstrated for the first time that reality is not so simple as the traditional socialist movements suspected. The wrongs that arise in countries where a purely liberal course is followed show that reality is more complex, and that the free market cannot take over the state’s regulating role. What we want to argue is that both the liberal and the socialist ideologies are only local views of things, which focus on particular aspects of the nature of the dynamics of human society, but lose sight of the way in which they are only part of the picture. In fact this is why we are hopeful about the new developments whereby liberal and socialist movements are working together in several countries, on a movement which is called ‘the third way’ in Great Britain and ‘the active welfare state’ in Belgium. And yet the idea that this third way is only a compromise seems to prevail. We hope to be able to demonstrate that, although this was not

the intention, the third way is closer to the deep nature of society's dynamics than was the case for the traditional liberal and socialist movements.

4. Children and Artists, Copyright and Royalties, How the Market Deals with Cultural Entities

In this respect it is important to consider for a moment the position of children and adolescents in our society. Since children are born and grow up close to their parents' immediate care and as part of their parents' personal prospects, first in the family and then at school, they avoid the dynamics of the free market. Regulations on child labor are very strict in every developed country and this has evolved historically as a protective measure against exploitation and abuse. In this respect, the pitiful and reprehensible state of child labor in the initial stages of the industrial revolution acted as a stimulus for the present strict laws. When one analyses it more deeply, it becomes clear that our society has reserved a special place for children and adolescents, with a clear 'seeing', 'thinking', 'evaluating' and 'planning' for the future at the back of its mind. Children and adolescents have to be prepared for tomorrow's society and this is a long-term investment (at least 20 to 25 years) which has no direct yield in the free market economy. This economy and its enterprises and businesses 'see' the necessity of this way of doing things because they are now benefiting from the investment made 20 to 25 years ago in the form of well-educated, intelligent young employees. This investment has a tradition and a history and is therefore nowhere questioned. However, we must be aware that its origins lay in the concern of the parents, who wanted 'the best' for their offspring. So this is an interesting example of a situation where the human talent of 'seeing', 'thinking', 'evaluating' and 'planning' for the future is introduced and maintained in a normal and uncontested way. In many countries, half the revenue from taxes is spent on education. This is not questioned anywhere either.

Artists also occupy a special place in our society. Perhaps we should explain more clearly what we mean by the term 'artist'. There are a great many artists who have no trouble in selling their works of art at a good price, and in this way they participate in the pure free market just like engineers. Other artists are much less successful and, like children and adolescents, have to be subsidized by the state. This difference can in part be attributed to the nature of the work of art the artist produces and the prevailing investment conditions regarding art. But on the basis of the example of the artist we would most of all like to focus on another aspect of the dynamics of our society.

If we once again take the example of the engineer and the new electronics produced, it is clear that the attachment of this electronics to a material entity partly determines the ease with which it participates in the free market. Many artists produce cultural rather than material entities. A cultural entity can sometimes be attached to a material entity, such as a painting on a canvas, and that eases its introduction into the free market. This is in part a consequence of the fact that the free market focuses on the exchange of entities for money, and the more these entities are permanently and irreversibly attached to a single material support, the easier it is for this process of exchange to take place. Some artists produce cultural entities that are not attached at all to a permanent, single material support. Writers and composers, for example. A writer or composer's work of art can easily be copied without losing any of its original quality. This confronted the free market with a new phenomenon, and had to think up a solution for it in the form of copyright and royalties. We must consider this for a moment, because although this solution was thought up at a local level, for the concrete problem with which writers and composers are faced, in our analysis the first symptom of a more fundamental process has taken place.

Here the free market is attempting to draw into its mechanism a cultural entity that is not linked to a single material entity. This action by the free market gives us the opportunity to put forward a new

analysis of a much more global nature. The free market has acted in that direction in many other situations which are not at first sight so closely related. In paying for labor and services, non-materially linked entities, such as abstract labor and the services rendered, also have to be drawn into the free market. Karl Marx made an analysis of this situation a long time ago. But in this case an attempt was clearly made to link the abstract non-material entities to measurable and controllable material entities. In connection with labor and services, for example, the number of hours is often taken as a criterion (wage work), or the concrete material finished product of the labor or services (contract work). One could also consider in this perspective that which we analyzed previously in connection with the education of children and adolescents. In this situation it is 'knowledge' that is 'traded'. Parents and teachers pass on knowledge products to children and adolescents. The fundamental difference from labor and services is that these knowledge products are long-term oriented.

5. The 'Maxwell Fund' and the 'Human Rights Fund'

We now have several elements available that enable us to put forward one of the ideas behind this article. We shall do this on the basis of specific examples and then move towards a more general view. Let us make the following assertion: Just like a music-lover who listens to a piece by his or her favorite composer, or a book-lover who enjoys a book by his or her favorite author, and finds it normal that part of what he or she has paid goes to that composer or author, we are all continual users of the profound achievements of our Western humanist culture. It would therefore also be normal for part of the value we attach to the use of these achievements to go to entities that maintain and develop them. There is no form of society that has any difficulty in acknowledging copyright and royalties. In the same way, no form of society should object to the broader and deeper application of this idea.

Although the realization of the ideas we are formulating here may in the end have to assume a completely different form, we would for the sake of clarity like to propose a very concrete form in which it could be done, in order, on this basis, to analyze the remedies found for the problems we have already mentioned fragmentarily in previous chapters. Suppose for example that a 'Maxwell Fund' were set up on a worldwide scale. James Clerk Maxwell was the scientist who developed the theory of electromagnetism and light, and it would be right to call him the originator of all electronic applications in our Western society. The concrete form in which we want to express our idea is as follows: at every moment when an electronic application is used in a particular way, a payment should be made to the Maxwell Fund. This fund would obviously have huge financial resources at its disposal. These would be used to support human activities, in this case fundamental research into basic natural forces. At the moment this sort of resource is made available by the state, which sets aside a certain annual sum for fundamental research. But it is always a struggle to justify these resources and there is always too little, even when one only takes account of the number of brilliant young people who are enthusiastic to dedicate themselves to this sort of research. The creation of the Maxwell Fund is only one concrete example, of course. A Pascal Fund could also be set up in the same way. Pascal was the scientist who made the first calculating machine and can therefore rightly be considered the father of the modern computer. And a Darwin Fund, for the founder of evolutionary biology etc. With a little imagination the reader can think up other funds himself.

An important observation has to be made here. The creation of these funds would of course not be limited to the icons of Western science. Other achievements of our humanist society cannot be traced back to the inspiration of one particular person, but rather to an event, or even just a particular cultural entity itself. For example, a 'Human Rights Fund'. Whenever one draws on the intellectual property of human rights thinking, and this occurs in so many places and areas in our society, a payment would be made to this Human Rights Fund. This fund's resources would be

employed to extend respect for human rights and the practice of this all over the world, and also to continue consideration of this topic and to make plans. In the same way one could imagine a 'French Revolution Fund'. Again the reader can use his or her own imagination. Now we have put forward some concrete examples, we can explain more fully the basic idea behind the establishment of these funds, and also go back to the analysis we have already made in the preceding paragraphs.

6. Developing Humanity's Mind and Body

The basic idea is that we want to close the gap between free market dynamics and the state's correction dynamics, on the one hand by expanding the free market itself so that it can also include long-term activities in its dynamics, and on the other hand by connecting the state's corrective action to the free market in an organic way, and thereby make it less dependent on personal discretion. The establishment of the funds as described above is a possible method of bringing this about, but probably not the only one. This proposal must therefore also be interpreted as an 'example', keeping in mind that there may be other methods. We shall now describe our intention in a more abstract way.

One of our aims is to tackle the long-term orientation within the free market, but also, and more fundamentally, to attach major cultural entities more systematically to material entities, so that they can participate in the free market in a more dynamic way. We also have a third intention that is even more important. We have already observed that even the active part of our population cannot be occupied with the things that are really important, and that, in connection with this problem, it is hard to know what really is important. The approach we have sketched also contains the key to this problem. If we succeed in introducing the cultural entities considered fundamental to our Western humanist culture into the dynamics of society, these dynamics will of themselves undergo a change of direction that will take them closer to the most important things. The reason for this is that our changes would make the dynamics of society much more fundamentally grounded. They would be directly and dynamically connected to the most fundamental achievements of our culture. So the process we are proposing would bring about not only a growth of a 'mind' and a 'body' for the whole of society, but also a 'mind' and a 'body' that would be involved with the most important things.

This process also eliminates the apparently irreconcilable duality between socialist and liberal political movements. In fact we observe that this duality is being removed from most Western countries as a result of the complexity of present-day society. Traditional parties everywhere are shifting towards the center, and this movement is unconscious but unavoidable, since it has become clear that traditional ideologies are incapable of getting a hold on the complex society we live in. This creates great confusion in the traditional parties, who think they are losing their credibility. In our analysis we can see this movement as a natural process. It is often said nowadays that the policy pursued by a particular government, whether it is traditionally right or left, is almost identical to the one the opposition would have pursued. This observation is formulated as a criticism of the lack of a clear profile in the traditional political parties. It is proclaimed that governments should carry out the policies in their election manifestos, which are still polarized in the traditional way. We can now interpret this differently. Election manifestos are much more remote from the real problems in our society than the actions the government takes. It is these election manifestos, rather than what the government does, that are due for review. The parties do not understand this because they assume that they have to present a face to their grassroots supporters. Why should it not be possible for several parties to fight each other with election manifestos that genuinely address the real problems of society, and which differ in terms of fine details, and not on the basis of a cliché-ridden body of thought. The choice between the various parties with this sort of election manifesto will then be determined more on the basis of the quality

of their differing programs. An even better development would be that the population should be able to choose in a precise and detailed way between several possible solutions for various problems and is not obliged to choose between whole packages of inseparably bundled solutions. We shall return to this aspect of the political decision-making process in chapter 8, where we shall analyze efficiency and potency.

We observe that the mechanism of the various funds for accumulating capital, linked to our society's most important achievements, should not be used as a substitute for the state's present distribution mechanism. This mechanism must also continue to exist, alongside the funds. New challenges will always be appearing which are not obviously connected to the fundamental traditions of our society. The capital accumulated by this free redistribution mechanism should be employed by the democratically elected political mandataries in response to these new challenges, which cannot be met by the existing funds. The Maxwell Fund and the Human Rights Fund are two such. The creation of these funds should not take place on the basis of an intuitive impulse, as we have proposed them here. They should be accompanied by thorough academic research into the roots of our society. In fact this research should be established on a permanent basis to enable constant adjustment of the various funds. The body of academics and representatives of all branches of society that is permanently engaged in the creation and development of the various funds should be composed on an interdisciplinary and pluralist basis. This body should start from the deepest possible knowledge we currently have of reality and the specific state of our society and should also take account of all the sensitivities of each branch of society. This seems like an immense task when presented in this way, and that is what it is. But we also have to remember that it is a task of inestimable academic value which, with meaningful motives, and not only the motive of academic curiosity, will set us on the trail of the deepest characteristics of our existence.

7. The Importance of Transdisciplinarity: Idealization and the Modesty of Science

After this analysis of the dynamics of our society and the concrete proposals we have formulated, it is time to return to the more global plea for the importance of transdisciplinarity. Our position here is strong and clear: good science should be aware of the importance of transdisciplinary science, as well as science that remains within one discipline. We first observe that applied science is in general transdisciplinary, because it studies a particular concrete problem in a particular concrete context, and concrete problems are not easily covered by one particular scientific discipline. The formation of strictly delineated disciplines in the theoretical sciences is an historical evolution that is partly linked to the noncommittal nature of these sciences. However, the fact that these disciplines are successful in themselves and are able, independently of the rest, to produce a profound analysis of a particular area of reality, tells us something about the nature of reality. It means that reality has a stratified structure, whose largest and most distinct layers we can name: the pre-material layer, in which quantum mechanics apply, a material layer, in which classical physics apply, a biological layer, in which biology applies, a social layer, which is studied by sociology, and a psycho-cognitive layer, which is studied by psychology and the cognitive sciences.

Reality allows very profound theories to be developed about these layers without necessarily involving the others. But we also know that reality is a coherent whole, and we must therefore be constantly aware that this division is an idealization. The reason the applied sciences suffer less from divisions by discipline is that when a particular concrete problem is studied in depth, it will always come into contact with several layers of reality. We must therefore look for the value of the division of present-day theoretical sciences by discipline in the value of the act of 'idealization'. In the sciences it is just as important to be able to isolate a problem and study it from an idealized point of view, as it is not to lose sight of the whole. Idealization, linked to division by discipline, as

well as integration, linked to transdisciplinarity, are both indispensable aspects of scientific dynamics.

It is important that scientists remain aware of this, and that they know that when they idealize a problem and isolate it from the rest of reality, their results must also be seen in this light. But it is equally important that scientists actively recognize the importance of idealization and isolation, and do not think that genuine science can only consider the whole. The modest approach taken by science, by making progress step by step, always using idealization and leaving aside the less relevant entities, is one of its most innovative aspects compared to earlier systems of human knowledge. Because in our era science has acquired very great prestige, there is the danger that the modest intention of idealization and the accompanying division into disciplines might be forgotten, and that the image, which is fragmented as a result of this method, is thought to be reality. This is why, in the present historical period, it is important to devote a great deal of attention to integration and transdisciplinarity.

The concrete analysis in connection with the growth of humanity's mind and body which we are proposing in this article is the fruit of transdisciplinary thinking. It is based on the idea that there are significant analogies between the evolution of the multicellular plants, animals and humans, and the evolution of society, which is also considered as a collection of individuals who together organize a larger whole. Our point of view regarding the role of transdisciplinarity should make it clear that the analysis we are proposing here should be seen as complementary and not a substitute for studies based on sociology as a scientific discipline. Now we have placed the metaphor we used into a broader transdisciplinary framework we would like to continue to reflect on the development of the mind and body of society.

8. Variety, Potency and Robustness versus Efficiency, Uniformity and Yield

We have already stated that we do not believe that a better society can be organized on the basis of a centralist outlook. One of the reasons is that a centralist organization leaves too little space for variety and thereby neglects potential. We know from biology how variety, such as that of the gene pool, is linked to robustness. This fact from biology is based on a deeper principle that applies to many forms of organization. In ecology it takes the form of the choice between polyculture and monoculture. We all know how dangerous it is when a monoculture of particular crops is substituted for an existing polyculture adapted to the needs of the local population. The general principle underlying these situations is as follows: a highly varied group of entities is better able to adapt and defend itself against changing conditions because it has a greater internal flexibility and potential.

In this respect we would like to look at the concept of 'potential' for a moment. An entity has great 'potential' when it is capable of taking advantage of circumstances different from those currently prevailing. For example, the muscles in our arm are much stronger than is necessary for what we normally do with them. They have a 'hidden potential' that enables them to react adequately in extreme situations that hardly ever occur. This potential is linked to the variety of qualities our arms have, perhaps without ever actually having to use them. This applies not only to our arms but also to all the qualities we have as human beings. The same is true for all existing stable and living entities, whether they be rocks, plants, animals or bacteria. They all possess a variety of possibilities whose consequence is a hidden, latent potential that provides robustness.

Account must also be taken of this fundamental law in the organization of society. It will only be possible to build a 'strong' (robust) society when variety and potential are allowed to develop properly. This profound truth is too little understood. This is mainly because it is in conflict with

several aspects of society which in our era are overvalued at the expense of variety and potential. These other aspects are 'efficiency' and 'profitability'. It is true that the monoculture also arose out of a concern for efficiency and yield. When one keeps an eye on profit and wishes to optimize, it is more efficient to make the production process uniform so there is a greater yield. The consequence of this is an irrevocable vulnerability with regard to changing circumstances. If our own body were also to subscribe to this 'efficiency and yield' reasoning, it would not waste any energy in maintaining strong arm muscles which are potentially capable of doing much more than is usually required of them.

The fact that our body, and all existing stable and living entities, have evolved in this way on the basis of a Darwinian mechanism of selection, in which efficiency and yield play an obvious and important role, and have yet developed great potential, proves that it is a very pernicious strategy to over-emphasize efficiency and yield at the expense of variety and potential. And yet this is what is happening in our society. The origin of this dangerous evolution is a major, serious error, and we would like to try to straighten it out. In fact we shall see that this error is once again connected to short-term thinking. We have already asserted at several places in this article that we do not believe in a centralist view of society. This might create the impression that we are not especially keen on socialist political forces either. Nothing could be further from the truth. The socialist forces in Western society are of inestimable value because, as we argued in the first part of this article, they defend the state's mechanism of redistribution and thereby contribute to the formation of a primitive 'mind' for humanity, but also because they contribute to the so essential variety and potential. In fact the liberal forces do the same. It is therefore a good thing for the potential of society that the two exist alongside each other and expand their grassroots.

This last statement might seem to contradict our positive assessment of the 'third way', where the duality between the two is removed. Since this is an important point let us consider it for a moment. If the third way, and the shifting of all the parties towards the center, were to mean that the range of political choice shrank, it would be an unfortunate development. The third way should therefore mean that a situation is created where the variety of political choice is increased, on the basis of fine-tuning and details. We have to allow society to evolve in a natural way towards an amalgam of political, economic and cultural niches that exist alongside each other and interact. Duality should evolve towards plurality, and it is only when the 'third way' refers to this sort of plurality that it is a good evolution. We must also watch out for the forces that only have an eye to efficiency and yield, not because they are in themselves negative values - they are not - but because they repeatedly endanger variety and potential.

It would be best if the future world society were a varied collection of political, economic and cultural niches between which various individuals could move, and which exist alongside each other in interaction. The multicultural society that is coming into being on a world scale is a good starting point for further evolution in that direction. But efficiency-thinking lurks around many corners. At the moment, there is for example a generally accepted discourse in connection with 'integration' into the Western world. Immigrants are accepted if they integrate. If this integration means they have to become uniform in accordance with the norms of an already over-uniform Western society, we consider this to be the wrong idea. A genuinely robust multicultural society consists of a collection of differing cultures that nevertheless live together and are as aware of the richness and potential that ensues from the differences as of the ease and efficiency that ensue from the likenesses. Both likeness and difference should be fostered because they are both fundamental values of reality.

9. The Lion and the Profiteer, Dioxin and Health

We have all seen pictures of that splendid creature the lion in nature documentaries. We are convinced that one of the most typical images imprinted on our mind's eye is that of a lion lazing in the sun, slowly looking round, looking at its claws, and otherwise doing nothing. But what a latent potential this animal has. The lion can suddenly leap into action and catch an antelope in a few flashing, graceful movements. At that moment the incredible variety of qualities that add up to its enormous potential are briefly to be seen in all their terrible beauty. It is easy to understand why the lion has not lost this potential over the millions of years of its evolution, even though it is a lazy animal most of the time. Those few flashing moments are essential to its survival. We can see a similar dazzling beauty in the human potential of sports people, or chess-players during a tournament, or in young children who take a new fundamental cognitive step forwards. Will we also observe them in the typical contemporary manager, with an 80-hour week, who is always at work, including weekends? Possibly, but unlikely. Nevertheless, the manager will score much more highly than the sportsman, the chess-player or the child in terms of efficiency and yield. Will we see the lion's potential in a group of workers at a modern company, who must constantly increase their productivity until they all show signs of 'burn-out'? Perhaps, but again unlikely. In this respect it is a good idea to consider the term 'burn-out' for a moment. In our analysis it means literally 'burnt-out potential'.

It does indeed seem that our society, striving as it does for greater efficiency and yield, is evolving towards a situation in which everybody must always and constantly work at their maximum. It is true that this leads to a situation of maximum efficiency and yield, but at the same time it destroys all potential and variety. If we once again take up the metaphor of man and society, our society appears to have become one of people constantly running their fastest, who are always tired, and have therefore lost all their latent potential and variety. It is in fact the quiet, resting human who now and then uses his or her whole range of potential at the right moments, which should be the objective of any healthy society. In present society, this person may well be called a 'profiteer'.

In this regard we would like to look at a recent problem that occurred on a large scale in Belgium and even assumed international dimensions. We are referring to the recent dioxin poisoning in the food chain. As a result of several fat-melters' addition of waste oil containing dioxin to the fat they supplied to feed companies, this dioxin had been introduced into the human food chain. This meant that for some time a large number of foodstuffs had to be removed entirely from the shops. After this the media devoted so much attention to the food crisis that it spread all over the world, whereby Belgian products were considered with suspicion almost everywhere. A parliamentary inquiry was set up which studied the problem thoroughly and the most important conclusion was that there must be much better control of the whole food chain in the future. However, the thing that had not been considered in this affair was that by developing the food chain so efficiently in the past, and this does not apply only to Belgium, it had become extremely vulnerable. The nature of this food chain means that it needs only a minor error to occur in one of its many links to lead to catastrophe. The food chain is therefore an example of a highly efficient process that is in fact not at all robust. If, by contrast, one looks at alternative 'organic' food production, one will see that it is less efficient but much more robust. Society must be alert to over-efficient processes and in one way or another see to it that efficiency is only pursued in combination with consideration for robustness, potential and variety.

It is easy to see that the sort of efficiency we are criticizing here is a short-term oriented entity. If we look at the examples we put forward earlier in this article, we can shed more light on the situation. Is it efficient to send children and adolescents to school to give them a good education? In this case we would say, rather, that we were increasing their potential. We are making our children into potentially very strong beings, prepared for the many possible turns and changes that may

occur in their surroundings in the future. But the energy invested in this education could certainly be used more efficiently, on the basis of the short-term concept of efficiency. The proposal to set up the various funds we made in a previous chapter can also be put in the context of this way of thinking, of efficiency versus potential. We can now emphasize that it would be good to set up a great many funds, which could all develop their own patterns on the basis of their specific local objectives.

10. The Running and Stumbling Society, Permanence of the Exceptional, War and Peace

We must admit, to our regret, that this article has been written under the pressure of a deadline. This is probably the most common way that articles are produced nowadays. The word 'deadline' has become an everyday concept. A deadline is a situation where the participating person is forced out of his or her normal dynamics with the purpose of finishing a certain product before a certain fixed date. It is the situation of the 'running' human. The running human showing his or her potential ability to 'run', but who in this respect is weak in relation to other aspects of his or her potential. Indeed, all his or her energy and concentration flows into the running and this makes him or her inflexible and potentially unable to react to certain unexpected changes and influences. The situation of the 'running human' should in principle be exceptional, and only arise under specific circumstances. It should be on the same level as that of the 'jumping human', the 'swimming human', the 'shouting human', the 'carefully listening human', etc., all situations of exceptional nature that illustrate the variety and capacity of the human.

If one of these situations threatens to become permanent it is time to worry, because it means that other exceptional potential situations will not be within the human's capacity and this leads to an irreversible narrowing and impoverishment. For this reason the running human is also very often a stumbling human. The sudden occurrence of an unexpected event is sufficient to make him or her stumble. The state of the running human is a state of great efficiency and yield but little potency and variety. Our society seems to be evolving towards a situation where this 'running situation' is becoming almost permanent. We are increasingly becoming a society that is constantly on the go and has a very large short term efficiency and yield, but a very low potency and variety. We all watch how it happens and have the feeling that we cannot do anything about it. We also know that there is no guilty party at the root of this development. There is no central point from where this continuous acceleration is guided. The phenomenon is a global dynamic event, in whose cause we all participate and from whose consequences we all suffer. The accelerating society resembles a train that is moving so fast that it might go off the rails and cause a serious accident. Is this really so? Is there no possible way back?

Our foregoing analysis of potency, variety, efficiency and yield can throw light on this situation and suggest possible solutions. We even think that the solution we propose is perhaps the only one that will avoid disaster in the long term. But, as we shall see, it is not a simple solution. We can only hope that awareness of the seriousness of this situation grows sufficiently fast for enough energy and will to be found to consider more profound solutions than the ones now considered. To formulate our proposal for a possible solution in a simple way we would first like to consider a very old problem that has persecuted humanity for thousands of years. We want to reflect on war and peace and on the way humanity has handled this age-old problem.

In the framework we have introduced we might state that war and peace are special situations of acceleration and rest. War is such an accelerated and chaotic situation that it even endangers older, already stabilized aspects of human existence. Human bodies for example, already very old stabilized patterns of existence, are often destroyed in a war. That is only one of the reasons why war is universally classified as a negative value. All societies have struggled with the problem of war

and most are still struggling with it even now. How can war be prevented? If we can put forward a good analysis of the situation of war and peace and how humans have coped with it, this may throw light on the problem of the accelerating society.

First we have to introduce two very general concepts: stability and instability. A situation is 'stable', if a disturbance of this situation by means of external or internal causes, creates forces that have the effect of recovering the situation. A typical example of a stable situation is the state of a pendulum in rest. Indeed, suppose that the pendulum is disturbed while in this rest state, gravity will bring it back to that state. A situation is 'unstable', if a disturbance of it by means of external or internal causes creates forces that have the effect of continuing to destroy it. A typical example of an unstable situation is a stick standing upright on a horizontal surface. Suppose that the stick is slightly disturbed, gravity will take it further away from the original situation and make it fall onto the horizontal surface. The two types of situation, stable and unstable, exist in many places in the reality that surrounds us.

Let us return to the situations of war and peace. To be able to see a more clear connection with the problem of the accelerating society, instead of the situations of war and peace, let us consider two other, more limited and more concrete situations representing war and peace. We mention that the reasoning that we put forward here is similar to the analysis of the well known prisoners dilemma as studied in sociology. We however prefer our example to the prisoners dilemma situation because it is connected in a more straightforward way to the point that we want to make. The first situation is that of ten people negotiating a contract they all want to sign. To make the situation even more simple we propose that the purpose of each person taking part in the negotiations is to obtain by means of the contract as much money as possible from an available 100,000 Euro. We suppose that the situation is such that the negotiations take place in a peaceful manner. Even if each one of the participants defends his or her situation as well as possible and hence tries to get as much as possible of the 100,000 Euro. The second situation we consider is one where the ten people are physically fighting for the money, and again each one of them wants to get as much money as possible out of the fight. Both situations represent examples of possible human interactions. It is possible that during the peaceful negotiations a quarrel arises such that the situation evolves into a fight. On the other hand, it is also possible that during the fight some of the participants take the initiative for peaceful negotiations. Which are the forces and changes that we can identify in both cases?

If we analyze the situations by only taking account of some of the forces present, namely the primitive physical forces by which each person has to grab the money and run away with it, then the situation of peaceful negotiation is an unstable situation. Indeed, it is sufficient for one person to start grabbing the money with the aim of getting it all, to arouse forces that will steer the situation further away from its peaceful nature and generate a fight. Because on the primitive level of the existing forces the only reaction the others can have is to start grabbing the money too. In this way a fight will be engendered. If we limit ourselves to considering the primitive forces just mentioned there is no obvious way that the fight can evolve back to the peaceful situation. If, however, we take into account other forces than these primitive ones, the situation of peaceful negotiation can be stabilized. We can identify these stabilizing forces by asking ourselves what prevents us, during a peaceful negotiation about the money, from trying to get all the money and eventually even fight for it.

First of all there is the fact that if we suddenly and unexpectedly decided to try to get all the money this would be followed by reactions from the others. A fight will start in which we could be severely injured. Such an injury might harm us much more than the result of a peaceful negotiation where we would get only part of the money. Hence the stabilizing forces originate in the hidden potency of all of the people participating. If one of the participants starts to fight, then the others

have the potency to defend themselves and fight back. We have analyzed the way ‘potency’ and ‘variety’ lead to robustness, and in this specific situation of a negotiation the potency of each participant guarantees the stability of the peaceful situation. We observe that passive potency is not enough, it is also necessary that each participant possesses a kind of active potency that makes it possible to react quickly and adequately to an attack. Only if the participants possess this form of complex potency do the forces lead to a peaceful situation of negotiation.

If, after this example, we return to the situation of war and peace, we can easily see that humanity has indeed undergone such an evolution. In well-functioning and prosperous countries the armies are there to keep the peace. An army will have a greater capacity for peacekeeping if it is always alert and ready for a possible war. The army is therefore a good example of how the mechanism of potency has already been consciously applied in human society. We recognize the deep properties that we have already mentioned. When peace reigns the army is mostly at rest and only exercises its potency in virtual situations. A very flexible army that is capable of adapting to all forms of aggression delivers a great potential for peace to its country.

We now have all the elements we need to state how the problem of the accelerating society can be resolved. Let us again do this by means of a concrete example. A large part of this acceleration is due to the constant competition in our free market society. Hence we should evolve towards a situation where companies have the potency for strong competition, but where they are not forced to actualize this potency. Companies should evolve towards a state where they can be very competitive if they are forced to, but where this is not a permanent situation. In their day to day functioning, companies should be delightful and peaceful environments for their workers, like the lion that rests in the sun. The state of high efficiency and yield into which companies are now permanently forced should be a potential state, to which they can change quickly and flexibly, if necessary. It is clear that if this were achieved, the quality of life of the workers would increase enormously. But this should be considered merely as a ‘normal’ side effect. The main reason to strive for such a situation is that in this way companies would guarantee the necessary potency and variety of the interactive dynamics of society. As we have shown clearly in our earlier reasoning, it is this state of peaceful cooperation that corresponds to the deep nature of reality.

We can identify very well that we are far from realizing this situation of peaceful cooperation. We seem rather to be in a war like situation concerning this part of reality. We also can predict that it will take quite some time before awareness of the nature of the solution that we present here has spread sufficiently to make the solution possible. Therefore we think that in this transitional period it is best to try to eliminate the most virulent aspect of the competitive nature of the free market by means of government regulations, knowing however that this should not be the ultimate solution.

11. Actuality and potentiality and the nature of reality

We want to show in this section that our reasoning about potency and variety, and its implications for the concrete situations connected to sustainable development, have a sound basis in reflection on the fundamental nature of reality. Aristotle introduced the concepts of potential and actual, and these concepts constituted a basis for his world view. The author was engaged in an approach to the foundations of physics in which the concepts of ‘potential’ and ‘actual’ are basic concepts in the Aristotelian sense, and which is nowadays commonly called the Geneva-Brussels formalism. Within this approach, a physical entity is described by the set of its states and the set of its properties. A property can be ‘actual’, which is the case if the entity possesses the property ‘in acto’, or potential, which happens when the entity possesses the ‘potency’ to ‘actualize’ the property. The state of the physical entity at a certain moment is the total of all its actual properties at that

moment. Change is described by potential properties becoming actual and actual properties becoming potential.

A lot of research has been done within this approach, mostly on problems connected to the foundations of physics. We do not want to elaborate on the formalism itself in this article, but the main point we want to make is the observation that the concepts of actual and potential already play a predominant role in the most basic formalism describing physical entities. It follows that a physical entity is structured in such a way that the set of ‘all’ properties, actual as well as potential, contains the basic symmetries and characteristics of the entity. Physicists have never wondered why this is the case. We want to put forward the hypothesis that at this deep level the stability (robustness, strength) of the entity is already connected to this subtle equilibrium between efficiency and potency. The efficiency is expressed by the simplicity of the dynamic laws and the potency is incorporated in the set of actual and potential properties. We make this connection with the basics of physics because we want to show the depth of this equilibrium principle, and also put forward once more the value of transdisciplinary reflection.

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