EPISTEMOLOGY, TECHNOLOGY, AND SPIRITUAL SCIENCE

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ABSTRACT. This paper has two main parts; one about epistemology and another about technology. Both are related to the possibility of a spiritual science. Over the latter decades a new paradigm of science has been slowly emerging, containing various strands such as post-materialism, panpsychism, or panspiritism. One basic presumption of the paper is that this new paradigm must be consolidated with a participatory epistemology, as well as a revival of the Aristotelian concept of causality as a basis for a new technological rationality. Participatory epistemology overcomes the dualism of consciousness and world and the Kantian notion of limits to knowledge. Aristotelian causality builds on the notion of Form and the formative forces of Nature. This can be taken as the basis for a technology that cooperates with Nature rather than strives to conquer it. Throughout the paper the spiritual science of Rudolf Steiner (Anthroposophy) is used as an example of how this alternative epistemology and technology can be formulated and expressed. At the end the anthroposophical technologies of water purification and Waldorf pedagogy are shortly presented as illustrations.

KEYWORDS: Post-materialist/spiritual science; Participatory epistemology; Aristotelian causality; Technology

INTRODUCTION

There seems to be a paradigm shift slowly under way within parts of the scientific community. One of the impulses behind this shift is the process philosophy of Alfred N. Whitehead, often taken as a starting point for moving away from mechanistic and materialistic views to holistic and organismic ones, which support "interconnectedness, cooperation, and the intersection of science and

spirituality" (Hirst, 2008, p. 78). Another impulse is that of a group of researchers who already in 1973 started the Scientific and Medical Network,[1] based on the desire to reconcile scientific research and the scientific understanding of reality with the spiritual dimension of life, as well as to open a dialogue between science and the spirituality of all world religions. This network inaugurated the Galileo Commission, which recently (2020) published a report titled *Beyond a materialist worldview*.[2] The report goes through a number of areas – such as quantum physics, medicine, parapsychology, near-death experiences – where research more or less strongly indicates that reality does not consist of mere matter and mechanical laws. For example, on the basis of meta-analyses of a number of studies in parapsychology, Radin (1997) concludes that if studies in this field were judged by the same standards as applied in any other discipline, the results would be seen to be as consistent as those observed in the "hardest" science. Hence, science is fully compatible with the idea that consciousness or mind belongs to the basic fabric of the world. This idea has lately been dressed up in terms like "panpsychism" (Chalmers, 2010), "panprotopsychism" (Chalmers, 2015), or even "panspiritism" (Taylor, 2018). In a similar vein, Nagel considers "mind as a basic aspect of nature" (2012, p. 16), and regards a *neutral* (in relation to idealism and materialism), *naturalistic monism* as probably the most fruitful alternative to the reductionist physicalism and Neo-Darwinism of mainstream science.

There are many other scholars and scientists today working towards a post-materialist or spiritual paradigm shift; too many to account for here. Suffice it to mention one particular example from the field of philosophy and intellectual history. A group of Anglophone scholars in this field have inaugurated a kind of revival of the early – mainly German – Romantic philosophy of Nature as expressed by thinkers like Goethe, Schelling, Novalis, and others.[3] These scholars take the term "post-materialist" one step further by pointing out, like the

[1] See https://scientificandmedical.net/.

[2] See https://galileocommission.org/report/.

[3] For a critical review of some of these works, see Millán-Zaibert (2005). This review fails however to point out the influence on Romanticism of Western esotericism, as discussed by Hanegraaff (1998). If Romantic thought for long has been marginalised by philosophical discourse, then the Western esoteric stream belongs to the margins of the margins, as it were.

Romantics, the spiritual dimension of existence.[4] This is important because there is a certain difference between admitting "mind" or "consciousness" as a basic ontological category, versus acknowledging *spirit* in the same way. Most people would probably agree that we all have direct experience of consciousness, but this is not self-evident regarding what is called spirit or spiritual. From this observation we may conclude that a science which takes mind or consciousness for real is not necessarily a *science of the spirit*, in the more pregnant sense of the term.

But the possibility of such a science was part of the vision of early Romantic thinkers like f ex Goethe, Schelling and Novalis (McGrath, 2012; Seamon & Zajonc, 1998; von Engelhardt, 1992; Wood, 2014a). Their creative cultural impulse flourished for a few decades around the 18-19th century shift, and then dwindled, smothered by materialistic reductionism, technology, industrialism and brutal capitalism. Only a few thinkers kept the vision alive. One of them was Rudolf Steiner (1861-1925), inaugurator of a truly spiritual science (*Geisteswissenschaft*), which he called Anthroposophy. However, Steiner often pointed to the importance of the early Romantics as forerunners of his own (more elaborated, differentiated, and concrete) revelations of spiritual realities.

Purpose and rationale of this paper

The purpose of this paper is to highlight two essential (in my view) aspects of Steiner's spiritual science: its epistemology and its technology. The ideational reasons why the Western world has been dominated by a materialist science for the latter centuries lie, I believe, precisely in these two fields. Regarding epistemology, a (neo-)Kantian meta-paradigm has been more or less implicitly accepted in all scientific endeavours since the early 1800's and still rules today (Ergas, 2016). This paradigm tells us that in the field of religion/spirituality we can only *believe* but never *know*. In the field of nature and society we can know, but only in a relative sense, because the "thing-in-itself" is not accessible to our cognition. These two basic assumptions by themselves preclude any possibility to develop a *spiritual* science. In addition, the marvellous developments of

[4] Some of them also see a connection to Whitehead's process philosophy, f ex Gare (2011), who relates it to Schelling's *Naturphilosophie*. Schelling on his part was indirectly influenced (via Oetinger and Baader) by Jacob Böhme and Christian Kabbalism (Benz, 1983, p. 47ff; see also Faivre & Needleman, 1992).

scientifically based technical inventions during the very same timespan seem by themselves to prove the efficiency and therefore the rightness of the prevalent scientific approach. Therefore, if the subtle philosophical reasonings of epistemology eludes most ordinary people, the power of all technical applications of science to make life comfortable and even enjoyable provide reason enough to trust in the truth of materialist science. Technology itself works as a kind of indoctrination into scientific materialism.

School science is another indoctrinating factor. The general schooling of most if not all educational systems does not include epistemological or ontological reflections on the nature of science and the scientific view of the world. Since the materialist ontology of reductionist physicalism is implicit in most scientific theories, it becomes a "companion meaning" of much scientific knowledge taught in schools (cf. Hansson, 2018).[5]

As a result, it seems not implausible to assume that many people in the Western world have come to think that science has actually "proved" that there is nothing of a spiritual nature in existence. Considering this state of affairs, in order to get a larger hearing for any kind of spiritual or "post-materialist" science, the two main underpinnings of scientific materialism (epistemology and technology) have to be seriously questioned and deconstructed in order to open up new possibilities.

The following text is divided in two main parts. The first part deals with epistemological issues, based on a fundamental distinction between a spectating and a participating mode of consciousness or cognition. This distinction has been extensively elaborated by Ernst Lehrs in his book *Man or matter* (1985; orig. publ. 1951); a very rich but nowadays seldom acknowledged work. It brings Steiner's philosophy and anthroposophy into dialogue with mainstream science, highlighting in a lucid way where they meet and where they differ. For example, Lehrs makes it clear why mathematics came to be so highly appreciated by the inaugurators of modern science, making Kant claim that any field of knowledge is scientific only to the extent that it builds on mathematics. This leads us to the

[5] It may seem harsh to talk about science education as indoctrination when many or most science teachers surely do their best to make students understand science in a rational way. Nevertheless, indoctrination may be a non-intentional consequence of teaching; see further the intricate and well-informed discussion of Hansson (2018). For less indoctrinating approaches to science education, see Dahlin (2001a) and Dahlin, Østergaard, & Hugo (2009).

Romantic's critique of Kant, and the fact that some of them had their own view on the significance of mathematics (Wood, 2014b); a view that seems to agree with Steiner's notion of *imagination* as the first level of supersensual or spiritual cognition.

In the second part I deal with technology and the concept of causality. Causality is the crucial issue of any science-based technology. Science – whether classical (Aristotelian) or modern (Newtonian) – is about uncovering the causal laws that rule the processes of Nature, and science-based technology is about applying these laws to human needs and ends.[6] The very concept of causality is however different in materialist and spiritual science; the former having lost the Aristotelian notion of *formal* causes. This, I suggest, plays an important role in the devastating effects that modern science-based technology has on the ecology of Nature.

EPISTEMOLOGY

The spectating and participating modes of cognition

I remember from my high school years a particular experience I had in the physics lab. The temperature inside a small bag filled with tiny lead bullets was measured. The bag was then dropped to the floor from a particular height a large number of times. Thereafter the temperature was again measured. The bag was now warmer by some 10^{th}'s of a degree (kinetic energy had been transformed into heat). What made such a strong impression on me was that the increase of temperature could actually be *predicted* by a mathematical formula (involving, I believe, the weight of the bag, the height from which and the number of times it was dropped). The two things – the physical activity of measuring the temperature, dropping the bag etc, and the abstract mathematical formula written on the black board – seemed by nature so utterly different, as if from completely separate worlds. Yet there was obviously an intimate relation between them. How could this be? I was full of wonder at this.

The question that I then experienced, albeit subconsciously, was, dressed up

[6] Of course, not all technology is based on science; some of it is based simply on traditional know-how without insight into the underlying causality.

in philosophical terms: how come that mathematics can give us such an accurate grasp of physical phenomena? This is an epistemological question that is typical of modern consciousness ("modern" in the historical sense, emerging in the Renaissance and gradually spreading throughout primarily the western world). The mode of cognition characteristic of this consciousness is that of the spectating intellect. This "onlooker consciousness", so prevalent in modern science, has been amply described by Lehrs (1985), drawing on Rudolf Steiner and Anthroposophy.[7] For this onlooking, observing consciousness, there is a seemingly unbridgeable gap between the inner feeling of being a limited conscious subject, and the external world that is "outside" of this consciousness. From this experience emerges the vital epistemological question: on what grounds can I justify that my inner experiences, conclusions and judgments about the external world are *true*?

My experience in the physics lab did not however lead me into epistemological reflections of this kind. I implicitly accepted that the mathematical formula was true, since it "worked". I was just full of wonder over the fact that it did work. Thus, I remained in the passive, spectating mode. According to Steiner, this spectating intellectual mode of consciousness has gradually emerged in the evolution of mankind. The further back we go in history, the more predominant we find an opposite mode – a *participatory* mode of cognition. This mode has been noted and variously named by different thinkers, such as "mythical consciousness" (Wilber), animism (used by Piaget to denote the world-conception of small children), or the pre-axial period of religious history (Jaspers). It is an unselfconscious mode of cognizing the world, in which the sharp dualism between subject and object simply does not appear because one feels oneself to be one with whatever one experiences. Small children live almost entirely in this state. In the modern adult human being, this mode of consciousness has however descended into the unconscious levels of the soul. In Steiner's spiritual psychology (1983), this is the level where the *will* is working.[8] It

[7] Steiner, being a seer into super-sensuous worlds from a very young age, is a rare exception in this category of people in that he already in his youth began to study philosophy in order to come to terms with his spiritual experiences (Steiner, 2000). In Goethe's studies of Nature, he found an implicit epistemology which could at least begin to account for his own experience of spiritual worlds.

[8] *Thinking* is generally clear and conscious; *feeling* is more vague and half- or subconscious; see Steiner (1983).

is with our will that we participate in the world.[9]

For Steiner, in order to develop a spiritual science – i.e., a science for which spirit is real – we have to find our way back to a participatory mode of consciousness, but now with a fully developed self-consciousness. To achieve this, our will must join hands with our thinking. At first this might seem like squaring the circle: how can the conscious (thinking) and the unconscious (will) unite? But there is a field of cognition where this is already happening: mathematics. Nobody can do mathematics without bringing *will* into their *thinking*; that is why most people find (higher) mathematics hard and cumbersome. Mathematical thinking does not allow thoughts to wander off in any direction; it requires a stringency in which each thought connects to the preceding one in a lucidly clear and logical way.

The discovery of mathematics as a key to the science of Nature is ascribed to Galileo ("the book of Nature is written in the language of mathematics"). Why was this idea so powerful that it was soon accepted by all the prominent thinkers – Descartes, Newton and others – that contributed to the so-called scientific revolution? One fairly obvious reason is surely the certainty and objectivity of mathematical reasoning. Nothing personal and subjective is allowed in a mathematical proof, and if it is correctly carried out the result is certain beyond all doubt. The "clear and distinct" character of mathematical thinking made Descartes wonder why it was not applied in all science, including metaphysics. This is what he proposed to do in his own work, and the idea has influenced western philosophy until this day.[10]

Another, not so obvious but for our purpose more important reason, is the unconscious experience of the will participating in the phenomenon one tries to

[9] The French anthropologist Lévy-Bruhl, in his studies of aboriginal cultures, described it as a state of *participation mystique* (1985). Jung caught on to this idea and related it to the "mesmerism" of German Romanticism (Hanegraaff, 2015, p. 74). In mesmerism one speculated on two kinds of nervous systems in the human body, one "cerebral" and one "ganglion". The first correlated with consciousness, reason and logical thinking; the second with the unconscious and irrational depths of the soul. Similar to Novalis, Jung related them to the day and the night-side of human soul life. The latter was also the realm of what mesmerism called "animal magnetism", a "life-force intermediary between spirit and matter, permeating the planetary atmosphere and all organic life", as Hanegraaff puts it (2012, p. 261). This description matches rather well Steiner's conception of the etheric world. Yet the concepts are not identical.

[10] Take f ex the mathematical character of Spinoza's *Ethics* and the formal logic often applied in present day analytic philosophy.

explain (cf. Lehrs, 1985). The ancient participating mode of cognition has not vanished and been replaced by the new, spectating mode; it has merely gone "underground".[11] It has become unconscious but is still working in the depths of the soul. The gap between subject and object is unconsciously experienced as overcome, in that our will participates in the thinking-cognition by which the right mathematical formula is searched for and eventually found. "In mathematical cognition we live unmediated within all that is object for us" (Steiner, 1991, p. 18). Our 'I' then lives in the mathematical lawfulness of Nature (cf. Steiner, 1984, p. 139). We construct the mathematical objects wholly within our soul, but at the same time we have reconstructed an external natural process in our thinking. In so doing, Steiner notes, we experience a kind of "lightening up" of the phenomenon we study. However, at the same time we can feel a certain loss of the full reality of our original experience (the feeling underlying criticisms of reductionism). On the one hand we have lost the sensory fulness of the outer world, on the other hand we have established a connection between this outer world and something that we ourselves have constructed inwardly (the participatory aspect). The fact that the mathematical formula can predict the phenomenon observed is seen as an external confirmation of its truth. As a consequence of such experiences, Kant's famous dictum that all science (of Nature) must be based on mathematics was accepted by many scientists and philosophers.

Kant and some early German Romantics

Although Kant recognised the significance of mathematics for science, in his philosophy he seems to have remained for the most part locked up in a spectating mode of consciousness. His notion of a "Ding-an-sich" that is forever beyond human knowledge indicates that he did not see how mathematics would close the gap between subjective consciousness and the external world.[12] For some of the

[11] Most development psychologies, f ex those of Freud, Jung and also Piaget, recognise the fact that lower levels of mental development will remain subconsciously while higher levels develop on top of them. This is the basis for so-called regression.

[12] In fact, in the first edition of *Kritik der reinen Vernunft*, Kant gave to *imagination* an important role in bridging the gap between the intellect and the sense world (Dahlin, 2001b). But in the second edition he downplayed this idea because of strong criticism against it.

post-Kantian philosophers – such as Schlegel, Novalis, Hegel, and others – the idea that there are limits to knowledge was the most unsatisfactory trait of Kant's thinking. In Fichte, especially in his *Wissenschaftslehre* (1998), many Romantic thinkers saw a successful attempt to overcome these self-imposed limitations of Kant's epistemology (cf. Gjesdal, 2009).

Somewhat surprisingly perhaps, mathematics was actually of basic significance for Fichte, as well as for Novalis, albeit not in the calculative and quantitative sense, but in a qualitative one. For these thinkers, the essence of mathematics is its *cognitive method* (cf. Latin *mathesis*). As such it is actually applicable to all fields of knowledge, even philosophy.[13] Reflecting on his own work, Fichte put it this way:

> The *Wissenschaftslehre* is mathesis of the mind. In actual mathematics one only examines the products of construction; here [in the *Wissenschaftslehre*], one examines the [activity of] constructing itself. (quoted in Wood, 2014b, p. 264; additions in original)

To examine "the activity of construction itself" means to catch thinking in the very act of constituting a meaning or a concept. This is self-reflection in the highest potency, a completely free and unconditioned spiritual act. (Husserl based the whole of his phenomenology on this idea.) For Fichte – and also for Steiner (1977) – this is the kind of act in which the "I" constitutes itself. Fichte called the philosophers who lack this insight "dogmatists", because they simply *believe* that the "I" is conditioned by something external to itself, i.e., some social,

[13] The word mathematics derives from ancient Greek *manthanein* which, according to Lehrs (1985, p. 495ff), originally referred to an inner creative force that brings us into existence in a psycho-spiritual sense. The main consonants of the word, *m* and *n,* appear in many words from different languages relating to "*m*-i-*n*-d" or "*m*-e-*n*-tal" (Latin *mens*, Sanskrit *manas*). Contemplating the gestural meaning of the sounds *m* – *n*, we can feel the *m* as an inner vibrational force which in the subsequent *n* changes into "antipathic" rejection, which is also the quality of an objectifying cognition. This indicates that the most original meaning of mathematics can be understood as a spiritual force that pulses through a particularly penetrating kind of cognitive process (see further Lehrs, ibid.). This kind of analysis of the meaning of words is based on 18th century Scottish philosopher Thomas Reid's notion of *Natureal language* (see Lehrs, p. 125ff). Natureal language was an expression of the ancient participatory mode of consciousness, for which linguistic sounds were not mere abstract signs but living *gestures*, which were often accompanied and supported by gestures of the limbs. A similar notion of language can be found in the French phenomenologist Merleau-Ponty. Obviously, Steiner's movement art form, eurhythmy, has its roots in this experience of language and speech.

psychological, neurological, or biological fact over which they have no control. In other words, all reductionism is "dogmatic" in this Fichtean sense of the term.

Friedrich von Hardenberg, better known as Novalis, took up the mathematical thread in Fichte's philosophy, but in a slightly different mode (Wood, 2014b). For Novalis, mathematics is inherent in Nature itself, it is "the most complete and valid testimony of the *idealism* of Nature" (quoted in ibid., p. 260; my italics). When science applies mathematics to natural phenomena it "shows us Nature as a mathematician", Novalis said (ibid., p. 261). In other words, mathematics is *in* Nature, not something external added to it by the human mind. All this taken together with another of Novalis aphoristic expressions, that "[i]dealism is nothing but genuine *empiricism*" (quoted in Gjesdal, 2009; italics in original), leads us to the participatory mode of cognition that Novalis ascribes to mathematics. In mathesis the human mind participates in the mathematical activity of Nature: this is for Novalis the idealistic empiricism of a Romantic science of Nature.[14]

Novalis saw the Romantic philosopher as someone who studied Nature in full awareness of this view of the world and the human being's place in it. In contrast, the rationalistic Enlightenment thinkers misunderstand what is actually happening in their research activity and are therefore led astray into a mechanistic and externalist world view, in which human consciousness and Nature stand opposed and unmediated against each other. For Novalis, natural research and philosophy meant a "qualitative potentialization", which he called "romanticizing"; a mental operation which involves the researcher's self as much as outer Nature:

> In this operation the lower self becomes identified with a better self. Just as we ourselves are a qualitative potential series of this kind. (quoted in Wood, ibid., p. 261).

Thus, Novalis believed there was a qualitative kind of potentialization not yet discovered by natural science. This qualitative kind would give us a deeper understanding of ourselves and our place in the world, whereas the quantitative

[14] It is interesting to relate what Novalis says about idealism to Deleuze's notion of a *radical empiricism*, which for him is neither "a reaction against concepts nor a simple appeal to lived experience":

On the contrary, it undertakes the most insane creation of concepts ever seen or heard. Empiricism is a mysticism and a *mathematicism* of concepts… (1994; p. xx; italics here)

one deals only with the outer, sensible objects of Nature. In this perspective, science and religion, knowledge and belief, can meet and unite (contra Kant, who wanted to keep them separate). To prepare for such a remarkable fusion, Novalis wrote hymn-like aphorisms about the divine Nature of mathematics:

> The life of the Gods is mathematics.
>
> All divine messengers must be mathematicians.
>
> Pure mathematics is religion.
>
> One comes to mathematics only by a theophany.
>
> Who does not reach for a mathematical book with devotion, and read it as the word of God, he does not understand it. (quoted in Dyck, 1960, p. 81; my transl. from German)

Thus, it seems that for Novalis, doing mathematics in the study of Nature would or could actually be an act of Divine worship.

Now, Novalis very much admired the studies of natural phenomena carried out by Goethe, his older contemporary. Goethe was not a mathematician in the calculative sense; but he appreciated the qualitative aspect of its cognitive method.[15] What we must learn from the mathematician, he says, is the "circumspection of proceeding by only one step [of thought] at a time, or rather, of deducing one step from its immediate predecessor" (quoted in Hensel, 1998, p. 76). One may take these "steps" to refer to, for instance, the *order* in which Goethe arranged the specific observations of prismatic colours that he carried out in his theory of optics. (This ordering of observations may also be taken as a kind of potentialization in Novalis' terms.) The order of observations leads through a kind of "increasing ideality" (Bockemühl, 1998, p. 127) to the *Urphänomen*; the "archetype" of this whole realm of optical appearances: the *sunrise*. "Increasing ideality" does not mean increasing abstraction, moving further and further away from concrete experience. Remember that for Novalis idealism is "genuine empiricism". Therefore, the increase of ideality refers to the increasing "*degree of intensity* with which we participate mentally in the phenomena" (ibid., same page; italics in original). I suggest that this relates to what Novalis called "qualitative potentialization".

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[15] The quantitative aspect, on the other hand, he thought should be clearly separated from Natural science (Heitler, 1998, p. 57).

Goethe's observations of optical colours led him to the colourful display of the rising sun, in which – from his point of view – we can experience how the lightening of darkness gives rise to the blue half of the spectrum, and the darkening of light to the red half. Goethe summed this up as "the deeds and sufferings of light" (quoted by Bortoft, 1998, p. 290). The full understanding of this poetical expression presupposes that one has gone through the process of observations – i.e., carried out the same prismatic experiments – that Goethe did in his investigations. Thus, Goethe's theory of optical colour has to be *done* in order to be understood. Merely reading about it gives only a superficial acquaintance.

This "doing" aspect of Goethe's optics also points to the participatory nature of his research approach. Goethe considered the human being to be the most important research instrument, and the practice of research was for him a way to inner development. "Every new object, well contemplated, opens up a new organ of perception within us", he said (quoted by Amrine, 1998, p. 47). The transformation of the researcher and the development of new/higher capacities of perception was for Goethe perhaps the most significant aspect of research (similar to how "the lower self becomes identified with a better self" in Novalis' romanticizing). This requires, among other things, an awareness of the danger of falling into the habits of perception predominant in everyday life, which prevents us from seeing new aspects and "thinking outside the box". Each perspective or "paradigm" has its limitations and must therefore be applied *in full self-consciousness*, in order to avoid falling into its possible traps (cf. Amrine, 1998). This self-conscious inner activity is characteristic also of mathematics in its circumspect step by step procedure, as Goethe described it in the quote above.

Kepler's third law of planetary movement

Goethe considered himself the Kepler of biology (Lehrs, 1985). This may seem surprising, since Kepler is normally associated with Newton, Galileo, and other great names involved in the emergence of mechanistic science of Nature. The fact that he actually worked out of a Pythagorean vision of the "music of the spheres" and wished to establish the validity of this vision by mathematical means

is seldom mentioned, let alone understood.[16] Newton contributed to the covering up of Kepler's intention by demonstrating how Kepler's third law of planetary movement could be transformed into his own formula for gravitation, $F = m \cdot a$.[17] How this is done need not concern us here (see Lehrs, pp. 515ff). What does concern us is how Newton, by performing this algebraic operation, actually "killed" Kepler's law (as Lehrs expresses it). He turned it into a formula for mere quantitative calculations.

Kepler 's third law involves the radius of two planets' orbit and the times for their circulation around the sun (quite different variables than what Newton arrived at):

$$r_1^3/r_2^3 = t_1^2/t_2^2$$

The radiuses are raised to the potency of 3, which means that we are dealing with the volumes that these lines create in their movement through space. The times are squared. A squared period of time is difficult to relate to a concrete phenomenon. However, the right side of the equation can be also be expressed as

$$t_1/t_2/t_2/t_1$$

Now we see that this expression is about the relations of the planets' circulation times to each other, which is somewhat easier to imagine concretely. For example, if we take the planets to be Earth and Jupiter, the right side of the equation is about the circulation time of Earth measured in Jupiter years, related to the circulation time of Jupiter measured in Earth years. This holds for any two planets in the solar system, which means that all the planetary movements are related not by chance, but by an inner necessity. They move in *harmony*, as if they all considered each other's movements. Perhaps one could say that their movements are an expression of the very Idea of our solar system.

Lehrs provides a summary of the concrete meaning of Kepler's third law:

> [The] solar times of the various planets are regulated in such a way that for any

[16] Here and in the rest of this section I follow Lehrs (1985, pp. 441ff).

[17] Kepler's first and second law are as follows: 1) The orbit of every planet is an ellipse with the sun at one of the foci. 2) A line joining any planet and the sun covers equal areas during equal intervals of time. The third law describes the relationship between the distance of planets from the sun, and their orbital periods (see further below).

> two of them the ratio of these times, *measured in their mutual time units*, is the same as the ratio of the spaces swept out by their (solar) orbits. (p. 446; italics in origin.)

The concrete meaning of Newton's gravitational law is obviously something very different, and yet it can be algebraically derived from Kepler's equation. One of the "tricks" that Newton performs is the introduction of *m*, i.e., the mass of a material object. From the point of view of participatory consciousness this is quite an arbitrary move, which changes the scene of action completely: from the kinetic movement of abstract geometrical points to the *dynamic* movement of *matter*. However, from the point of view of onlooker consciousness there is no problem in this change, since it is algebraically possible.

Newton's law of gravitation has proved very useful for technology, whereas Kepler's third law has not found any such mechanistic application. Not surprising, since Kepler's interest was to demonstrate the aesthetic vision of Pythagorean cosmology, derived from ancient Egyptian wisdom. He introduced the section of his book *Harmonices Mundi* that deals with the third law, with a kind of warning to the reader not to overlook its message:

> I have stolen the golden vessels of the Egyptians from which to furnish for my God a holy shrine far from Egypt's confines. (quoted in Lehrs, p. 448)

But overlooked it has been. In the ancient world view of Pythagoras and the Egyptians (from which he learned some of his wisdom), the planets were divine beings with angelic intelligences. It's as if Kepler, with his mathematical genius, anticipated Novalis' poetic aphorism, that the life of the Gods is mathematics. In Kepler as in Novalis, mathematics and imagination join forces.

Steiner and imagination

If Nature for Novalis was a mathematician, for Steiner she is an *artist*; a painter, a sculptor, a musician even. Not that Steiner did not appreciate Novalis' perspective on mathematics, on the contrary (as we shall see). But mathematics belongs to the present state of human consciousness (which emerged in 15th century Europe) and Steiner was concerned – also – with the future development of consciousness. The spiritual science of Anthroposophy is a preparation for this future.

As for Novalis mathematics was at work within Nature, so for Steiner the *imagination* of Nature as an artist was immanently at work in all natural kingdoms;

in the forms and colours of the plant and animal worlds and in the evolution of living organisms. These are expressions of the creative function of Nature, which was of central importance also to the Romantics. Some of them (f ex Schelling, Coleridge) took up the term *Natura Naturans* from Spinoza and John Scotus Eriugena, to denote the informing spirit that works as imagination both in God and in the human mind (cf. Engell, 1981, p. 242). The early Romantics saw a crucial difference between imagination and fancy:

> In Germany almost every discussion of the imagination during the last third of the [18th] century contains either a direct or an implied distinction between "fancy" and "imagination". […] Most of them assume fancy (*Phantasie*) to be mainly an associative power that supplies the mind or the inner eye with numerous images, usually connected with some associative principle. But the imagination *fuses, combines, transforms, and orders* images so that they produce an artistic or aesthetic unity. (Engell, 1981, p. 176; italics here)

These fusions, combinations and transformations may be called *the mathematics of imagination*. They are not subjective phantasies, but cognitions directed towards a higher experience of order, beauty, and meaning. Shortly put, the Romantics strived for a spiritual knowledge of Nature. So, of course, did Steiner, who describes three stages of spiritual cognition, the first of which he labelled imagination; the other two inspiration and intuition (Steiner, 1993a). These stages of higher perception can be developed by inner, meditative exercises (Steiner, 1992). Mathematics is a preparation for this in that it develops the inner activity of "pure thinking"; i.e., thinking which is purely conceptual and not dependent on sense experience (cf. what was written above the entrance to Plato's Academy).

Steiner wanted to put his spiritual science "on an, in a mathematical sense, exact foundation" (1991, p. 11). This seems similar to what Descartes also wished to accomplish in his philosophy, as we noted above. Descartes' thinking is however very different from Steiner's. Why is this? Is it because Descartes could not really overcome the merely quantitative aspect of mathematics, as Guénon (2001) claims? Guénon uses the scholastic notions of form and matter, or *essence* and *substance*, in his comparisons between Medieval/Aristotelian and modern science. He claims that the latter from the beginning was focused only on substance, which is quantitative in nature, whereas essence or form is qualitative. Steiner, of course, was focused primarily on essence. It seems plausible that this is the reason why his spiritual science is very different from mainstream research.

Steiner desired to free the method of science from its limitation to sensory facts of the physical world; but in other respects to keep its characteristic way of thinking. In spiritual science one employs what has been acquired by this kind of thinking – by *mathesis* – to non-sensory realms. Many spiritually inclined people find this approach of Steiner's to be somewhat repellent.[18] We usually experience mathematics as dry and prosaic, but Steiner maintains that we can find ways in which this dry intellectual activity may be imaginary intensified and transformed into living images (1993b, p. 253). Great thinkers like Kepler and Galileo, the pioneers of a mathematical science of Nature, had this capacity. In their application of mathematics to the movements of the planets they experienced a remnant of the ancient star wisdom; the wisdom that led the three Magus kings to the newly born Christ child. Since that time, a kind of "crossing" has taken place, so that the ancient external knowledge of the heavens and the stars has turned into our present inner mathematical knowledge; and that which in old times was an inner instinctive knowledge of the spirit (represented by the shepherds and their angelic vision) has become our external sense knowledge. In our times, Steiner maintains, human beings have to find ways to transform mathematical cognition into the ability to understand imaginational representations of the spiritual world. This gives us a clue as to how we can work with the descriptions of spiritual worlds that Steiner so abundantly produced in his books and lectures.

TECHNOLOGY

Causality and the technological knowledge interest

In ancient times, technology seems to have been a relatively independent field of knowledge, its connection to science more incidental than essential. The ancient Greek word *téchne* referred to crafts of all kinds, artistic as well as more instrumental or technical in a modern sense. Technical know-how was sometimes guarded as secrets into which you had to be initiated in order to be allowed to

[18] In the west spiritual traditions and activities are often associated with emotionalism, not with intellectual stringency. This was often noted by Idries Shah in his efforts to introduce Sufism to the Western world (Shah, 1978).

apply them as a professional. However, with the development of modern science, its connection to technology becomes essential. This is clearly expressed by Frances Bacon (17th century) in his utopian vision of *The new Atlantis* (published posthumously in 1626). For Bacon, the purpose of science was to uncover the laws of Nature, and this knowledge should be used to invent various ways of alleviating "the miseries of humanity".

The natural laws sought for were of course laws of *cause and effect*. Knowledge of cause and effect enables the exertion of a certain control of things. Knowing that A causes B, if we want B we produce A – and B will happen. As Habermas (1972) pointed out in the 1960's, research may have different "knowledge interests", and the knowledge interest of modern research on Nature is, according to Habermas' analysis, primarily and precisely *control*. Control is the basis of technological know-how. That modern science has this technological knowledge interest of control was demonstrated by Habermas by comparing its logic of *explanation* with the logic of *prediction* – which turns out to be identical. The explanation that "A causes B" has the same logical structure as the prediction that "A will make B happen". To predict something on the basis of natural laws is to explain its future occurrence.

Habermas' demonstration of control as the knowledge interest of (natural) science was part of his critique of modern culture and society, which he – similar to Marcuse – saw as illegitimately dominated by a technological or instrumental rationality. Technological thinking does not develop an ethical judgment of values. It is a way of thinking where the means-end relation is central and is seen as objectively "given". The end that one tries to achieve is by nature a human value, which can only be "given" subjectively, and therefore falls out of consideration. The "rational animal" of Aristotle becomes a "technological animal" (Zhao, 2020).

Since the science of Nature became a sort of ideal for the further developments of social and human science, the latter also tended to assimilate its instrumental rationality. But if the knowledge interest of social science is control, it will create a potential threat to democracy. Politicians and social researchers in alliance would then rule society as a cadre of "social engineers". An interesting example of this possibility is how a combination of Freudian psychoanalysis and Watsonian behaviourism was used by leading personalities in the US in the early decades of the 20th century to successfully propagate a consumerist ideology

through advertisement and other media (Ewen, 1976).[19]

In our days, the possibility to engineer the views of the population regarding social or political issues has immeasurably increased by the potential availability of Big Data from digital social media. This is illustrated in HBO's drama-documentary about the Brexit campaign (Brexit, 2019). By a sort of pseudo-hermeneutic analysis of heaps of qualitative data from interviews and other sources the leader of the campaign, Dominic Cummings, came upon the slogan "Take back control", which became a successful sound-bite summing up the feelings of a large part of the population – but had little or no connection to the facts of the situation. This is also a good example of how a social-human pseudo-scientific application of hermeneutics to Big Data – which may seem like a search for understanding particular segments of the population – is actually based on a desire for control and manipulation. Social and human science are now easily hijacked by the instrumental knowledge interest of natural science, supported by digital technology.

In order to forestall such misuse of knowledge, Habermas emphasised that the overriding knowledge interest of social science must be *emancipation*, meaning liberation from unjustified social and political power structures. For Habermas, the main task of social research is to uncover such power structures. As for human science, its main goal is to widen and deepen the cultural and historical *understanding* of human beings for each other.

What then would be the knowledge interest of *spiritual* science? Without further ado I suggest it is *to serve the further evolution of humanity and Earth.* Is that not the motivation behind the activities of all the genuine "Masters of wisdom" (Bennett, 1977) throughout human history? In order to serve this process, one must of course have a deep insight into the direction and "goal" of evolution. In ancient times, the goal was expressed as *returning* to God, the Source of Creation (f ex in the parable of the prodigal son). Everything, human and non-human, has its origin in God and is consciously or unconsciously striving to return. Ancient science, in the forms of metaphysics and philosophy, was a conscious expression of these efforts, offered as support for the efforts of others (cf. Hadot, 1995). For

[19] Freud's psychoanalysis and Watson's behaviourism – an "unholy alliance" indeed. But the pragmatism of instrumental rationality is not too sensitive to such academic concerns.

Plato and Aristotle, the ultimate goal was the contemplation of the Absolute Good (Plato), or the Unmoved mover (Aristotle). More precisely, according to Potara (2020), for Aristotle it was the Unmoved mover's contemplation of Itself via the human heart-mind (*nous*). This idea may later have been taken up by Islamic Sufism. Sufi poets like Rumi and Ibn'Arabi made extensive use of a saying of the Prophet, a so-called *hadith*, in which God says: "I was a hidden treasure and I loved to be known, so I created the world in order to be known". In order to know Himself, God had to externalise Himself in the world and in the heart of humanity.

Another expression used in Sufism for the end of human evolution is *Insan i Kamil*, the Perfect Human. According to one master, the human body has presently reached its pinnacle of development; further evolution concerns the soul realm and this has to be engaged in consciously by each individual (Burke, 1973, p. 87). Eventually however, this inner soul development will also affect the physical body and make it develop further. Somewhat related to this, Steiner said that in our present age the brain is slowly developing an organ for remembering our previous incarnations (cf. how surveys show that about 20% of people in the West are prepared to accept reincarnation). But – and this is a vitally important remark – this organ will only develop rightly if we intentionally strive to develop our awareness of the spiritual world. If we don't, the organ will not develop properly and will in fact have negative effects on our health. In addition, having completed their work with our physical bodies, the beings of the spiritual world would lose their interest in humanity.

A deeper look at causality in Aristotelian science

The idea that the essence of science is knowledge of cause and effect was part also of the Aristotelian science developed in the Middle Ages. What changed with Bacon and his colleagues was the concept of causality itself. The instrumentalization of human rationality began with this change from Aristotelian or organic to Newtonian/mechanistic causality. Thereby, values gradually took on a more subjective character (Zhao, 2020). There was also a change in the very idea of Nature. With Bacon began a shift in focus towards inorganic Nature, whereas Aristotle was primarily interested in living Nature. In

his second volume of *Physics* Aristotle begins by making a distinction between things that *exist by nature* and things which have other causes of existence and are therefore artificial (Lear, 1995).[20] For Aristotle, a science of Nature was primarily a science of *life*. However, it included the four elements of earth, water, air, and fire, because these also have within themselves their own "principle of change" (ibid., p. 15). The scientific knowledge of a particular phenomenon of Nature meant insight into four "modes" of causality: the *formal*, *efficient*, *final*, and *material* causes (ibid.). These causes were not seen as distinct and separate "factors" contributing to the arising of the phenomenon, as we tend to think today. They were interrelated as aspects of one whole; they were "*fashions* in which we cite the cause" as Lear puts it (ibid., p. 27; italics in orig.). Among them, the formal cause was basic and most essential. It was the form that *in-formed* the phenomenon and gave it its essential nature. It also in-formed the efficient and the final causes and by doing so, it in-formed the very matter of a living organism. The material cause was a purely passive *potentiality*; a necessary condition for the physical manifestation of the phenomenon. For Aristotle matter as such, pure matter, does not *actually* exist, it is a pure potential. Its actual existence presupposes its in-formation by form. In the realm of organic life, this is obvious because when an organism dies, its matter starts to decay. The reason is that its formative power does no longer in-form it.[21] The matter of the organism "seems to be dependent on the form to be the matter that it is" (Lear, ibid., p. 18).

Hence, "form" in the Aristotelian sense is the *original agent* in all organic processes. It is a spiritual force.[22] What we ordinarily call "form", i.e., the shape

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[20] In the following, I will adhere to Lear's (1995) interpretation of Aristotle's concept of causality

[21] What I here call "in-form" may seem to have a parallel in the term "informare" as introduced by Hirst (2008, p. 87). Informare for Hirst means to be "formed within" and is a characteristic of living organisms. The growth and development of a living organism does not happen on the basis of information taken in by the senses from the outside world. The autonomy of the organisms means that it is "closed to information," Hirst says. I think this is going too far; I would not altogether preclude the role of external information in the formation of living beings. Hirst works from a Whiteheadian perspective of process philosophy and does not draw upon Aristotle. I submit however that the Aristotelian notion of form may contribute something to Hirst's reasoning.

[22] Adhering to Dionysus Areopagite's nine-fold hierarchy of spirits, Steiner labels the lowest spirits of the second triad – *exusiai* – "spirits of Form". (*Exusiai* is usually translated as "authorities" or "powers" but its meaning is debated by Biblical scholars.) Above *exusiai* are *dunamis* – spirits of movement – and *kyriotetes* – spirits of wisdom (again according to Steiner's nomenclature). Movement precedes form because the latter can be regarded as a "frozen" movement. Wisdom precedes both, since movement in the spiritual world is

or structure of something, is a secondary – but not insignificant – aspect of natural phenomena:

> A young organism's form should not be identified with its current organization and structure. In addition to the structural articulation which the immature organism has so far achieved, it has within itself a force for future growth and development. This force is the form, though at this stage Aristotle thinks that the form should be thought of as a potentiality or *power* (*dunamis*). (Lear, ibid., p. 19; italics in orig.)

This means that the "final cause" is really the full actualisation of the formative power, "the force for future growth". In all living organisms, the inherent or immanent form always strives to actualise itself to the fullest possible degree. This is how the formal cause in-forms the final cause. It is not a teleological view in the usual sense because the final cause is not externally related to the process of development. There is no mind directing the process from outside, "in order to…". The process is the actualisation of the immanent form, which is present throughout as potential and actual in varying degrees.[23]

Furthermore, the form also in-forms what has been called the efficient cause. However, Aristotle's expression for the efficient cause literally means "the primary cause of change". To translate this as "efficient cause" is anachronistic; it is to project the causality concept of modern science on Aristotle's thinking (Lear, 1995). Aristotle means by "primary" that which is immediately apparent in our experience. The form as such we can perceive only through our thinking cognition. It is not immediately present to our sense awareness, but it is nevertheless that which is truly active by in-forming the process of change. If I merely observe a group of craftsmen building a house I might conclude that the craftsmen's work is the real cause of the house being built. From Aristotle's point of view it is however the *form of the house* that expresses itself in all the craftsmen's

based on wisdom. According to Steiner, this second triad of spirits is further related to the second stage of spiritual cognition, called by him inspiration (Steiner, 1999, p. 13).

[23] The final cause can be equated with the so-called strange attractors of chaos theory. Karl Pribram remarks: "Attractors *pull* processes rather than push them as in efficient causation. Attractors are examples of Aristotle's final causation. [...] However, recourse to final causation in terms of nonlinear dynamics is not sufficient. As linguists have pointed out for decades, in any complex system search for efficient or final causes is ultimately not useful. Rather, *formal* causation and transformation become the instruments of understanding." (2006, p. 45; italics here)

actions.

Taking instead the example of an animal organism, we must consider its own life sustaining activities – such as eating, procreating, feeding its offspring, building its nest etc. – as the "efficient causes" for its existence; while not forgetting that all these activities are in-formed by the form of its species. Regarding eating, Steiner somewhat jokingly pointed out that a wolf eating a lot of sheep does not itself turn into a sheep. It keeps its wolf nature, because this nature *transforms* the matter of the sheep into the matter of a wolf.[24] The saying that "you are what you eat" is a materialistic misconception (which is not to deny that our food *influence* us in various ways).

When it comes to human beings, the "efficient causes" for our individual being and development include those common to all animals, but more have to be added. One of them is *learning* and its complementary activity, *teaching* (animals also learn, of course, but not to the same extent). Learning and teaching are vital activities not only for maintaining human individual and social life, but also for the spiritual evolution of mankind (cf. Shah, 1978). Thus, from the Aristotelian view point described above, it is the perfect human form that in-forms all truly evolutionary teaching and learning. This form has been given various names in the spiritual traditions of the world; we mentioned above the *Insan i Kamil* of the Sufis as the goal, or the "final cause", of human evolution. In Buddhism it would perhaps be our *Buddha nature*, except that this is shared with all beings, not only humans. In Daoism this "sacred man" is often described as our original spiritual state, and illustrated by the young infant as well as the developed adult (see Izutsu, 1983, p. 444f). In the Hebrew Kabbalah the name of the original cosmic human being is *Adam Kadmon*. In esoteric Christianity it would be *the Son of Man*, who by the early Christians was understood as the final fruit of human evolution (Welburn, 2004, p. 198ff). In an interesting passage in the Gospel of John, Christ says that the Father "have made him the creating power in all earthly human bodies" (John, 17:2; as translated by Madsen, 2000). This "creating power in the earthly body" is obviously very similar to what Aristotle calls the "form".

[24] What Steiner says here is virtually the same as what Schelling writes in his *Ideas for a philosophy of Nature*; viz. that a concept is the foundation of every organism, and "*this concept dwells in the organization itself* and can by no means be separated from it; *it organizes itself* and is not simply, say, a work of art whose concept is to be found outside it in the understanding of the artist" (quoted in Gare, 2011, p. 52; my italics).

The notion of form as a creative power, a spiritual force, is prevalent in Steiner's spiritual science. Steiner's ontology could very well be called a metaphysics of (spiritual) forces and powers. For example, in his main philosophical work (1977) he says:

> [W]hen we think, we are that all-one essence that penetrates everything. This is the deeper ground of our double nature: we see arising in us a simply absolute *power to be* [*eine schlechthin absolute Kraft zum Dasein*], a power that is universal… (p. 73; italics here, my transl.)

Being the expression of this "absolute power", Steiner's thinking has a dynamic and living quality. Nothing in existence is portrayed as rigidly and permanently fixed. Even though some of his descriptions, if not read with appropriate attention, appear to be presented as given facts, this is only a surface appearance. Steiner once suggested that the name Anthroposophy should be changed once a week in order to counteract the tendency to take it as something fixed and finished. Anthroposophy itself is a living spiritual being, *Anthroposophia.* It has a Form of its own, and behind all form stand spiritual beings of various kinds.

THE TECHNOLOGY OF SPIRITUAL SCIENCE

Anthroposophy has well known applications both in the natural and the social domain. My contention here is that these more or less technical applications are based on a causality of Form and derived from an Aristotelian conception of causality. In other words, it is a technology which differs essentially from that of mainstream physicalist science, because it reckons with the reality of the spirit. We have seen that the causal laws of mainstream technology focus solely on efficient causes and have no regard for "form" in the Aristotelian sense. The relation of cause and effect is implicitly modelled on the example of one billiard ball hitting another. This is a paradigmatic example of *impact.* It is also an example of how the relation between cause and effect is basically conceived as *external* in nature.[25] In external relations, things are what they are independently of one

[25] Here the distinction external/internal has a more complex meaning than simply "outer" versus "inner". It is part of f ex Whitehead's process philosophy, in which "external relations treat the self-identity of a thing as the first, analytically given fact, while internal relations treat it as the final, synthetically developed result" (see https://iep.utm.edu/whitehed/; accessed 21-05-04).

another. The self-identities of the two billiard balls do not change by the event of one hitting the other. In contrast, Aristotelian causality is based on *internal* relations between cause and effect. The basic nature of the effect depends on the nature of the cause. As we have seen, the formal cause *in-forms* the other causes. The effect, or the final cause, is not what it is independently of the formal cause. For Aristotle, all *natural* causality has this internal relationality.[26] A causality of external relations can be found especially in artificial, mechanical, and basically *unnatural* things. Ancient peoples seem to have had an instinctive resistance against such phenomena. For example, the Greeks knew already in the 1st century A.D. how to construct a steam engine (the so-called aeolipile invented by Heron),[27] but for some reason they abstained from developing steam engine machinery. Perhaps like Aristotle, they worried that such development would transgress the moral limits for technology.[28] Similarly, the Daoists of ancient China generally disliked technology (Zhao, 2020). Well, in those days they had slaves and therefore no need of machines, some people say. The real reason may however have been a feeling, that what is artificial and unnatural goes *against Nature*, and going against Nature is *not good* (Hegge, 1993). Considering the ecological disasters that has followed in the wake of industrialisation one may appreciate the wisdom of this feeling.

It is perhaps the same feeling that makes many people today look with suspicion on GMO. To appreciate this point of view one may have to overcome the tendency to assume that "all causality is external causality" (Brady, 1998; p. 89). One must realize that how we understand what we see in Nature is conditioned by what is known in phenomenology as our *intentionality* (ibid., p. 84ff). In the mechanistic approach to Nature all interactions between things are seen as indifferent to the individual nature of those things. It is dominated by a contexting intentionality of external causality, whereas in spiritual science and technology, things are seen in the context of the internal causality of Form.

The first law or basic assumption of Newtonian physics (mechanics) – the law

[26] This is similar to the Buddhist notion of the dependent origination of all things, which is one aspect of their "emptiness", i.e., lack of self-identity.

[27] See https://www.popularmechanics.com/science/energy/a34554479/heron-aeolipile/?fbclid=IwAR3T77cel_q7eHM95wBjoTnGQ-NDAGFohiR-YU7XD2Ecym4oZgffBBqHpCg.

[28] According to Tabachnick (2013, p. 18), Aristotle warned that technology, being amoral in nature, could not be left unregulated but needed the guiding principles of ethical standards; otherwise it could turn very harmful.

of inertia – says that a physical object is by nature either in a state of rest or in *constant* movement. In order for the object to change its state, a force has to act on it *from outside*. Thus, external causality is built into the basis of mechanistic science. When it comes to phenomena of life, this first law of Newton runs into trouble because it seems obvious that living organisms have their cause of movement inside themselves. This problem is solved by reductionism; i.e. the assumption that "behind" the appearance of self-induced movement there are after all causes of a mechanical kind. These causes may be contained in the organism itself but they act on other parts of it in mechanical ways. Originally, the action of genes was conceived in this way, but things have turned out not to be so simple. Perhaps the relation between the DNA molecule and the growth of the organism is better understood if modelled on the relation between the types in the printer's press and the *meaning* of the poem that it is printing.

To sum up, the causality of a spiritual science, and therefore its technology, is based on three principles. The first two are

1. All natural processes are based on Form as a spiritual power;
2. all causal relations in organic Nature are internal and essential.

The third principle we have not discussed so far:

3. The purpose of technology is to support a Form actualising itself.

What this means in practice is that we must always strive for an understanding of a being's "inner nature" or spiritual form, before we develop a technology for dealing with it. The being's form must always be respected in our interactions with it. The reason is that wherever beings are allowed to develop according to their essence or form, they become healthy. This is so not only for humans, but also for plants, animals, whole ecosystems and even for social communities. Conversely, wherever a being's inner form is misused or in other ways maltreated, social and natural catastrophes, illnesses, and other miseries will arise.

In contrast to these three principles of spiritual technology, materialist and mechanistic technology is grounded in the following assumptions:

1. All natural processes are functions of one-dimensional causal relations between efficient causes and their effects;
2. All causal relations are conceived as external and material; and
3. The purpose of technology is to enhance the material conditions of human life.

To the extent that present technological developments aim to improve the state of Nature and its ecological systems, it seems to be done mainly out of necessity, because human welfare is ultimately dependent on a sound ecology. It is hardly done out care for Nature as such (of course there are exceptions on the level of individual persons).

It is often said that technology is *neutral*, it is just a tool, which can be used for good or for evil ends. Heidegger (1993) is one of the few thinkers who has questioned this view.[29] In his search for the "essence" of technology he comes upon the idea of *das Gestell*. The *Gestell* is both subjective and objective, or rather beyond both; *it is a particular way in which Being as such reveals itself to itself*. No revelation of Being is ethically neutral. Every revelation of Being *does* something to or with us, and in doing it to humans it does it to the rest of the universe. One aspect of the *Gestell* is its turning every existing thing, Nature as well as human beings, into a source of exploitable raw materials. This is a threat not only to human dignity, but more importantly, to the perception of the unique role of human being as the "place" where Being can be revealed to itself (Feenberg, 2002). However, the technology that Heidegger talks about is of course only the conventional, mechanistic one. He does not consider the possibility of a technology based on spiritual science. In such a technology, Being is revealed in a different way.

Aristotle may have been aware of these – or similar – issues. For him, technology is good only when it is subordinated to higher virtues (Healy, 2020, p. 367f). To pursue what he calls *eudaimonia* means to choose a way of life that brings the optimal realization of those abilities that are essential for being human (ibid.). We have a certain responsibility to recognize and act out of our *daimon*, our "true self", as Waterman (1990) puts it. The *daimon* is an ideal, a perfection toward which we ought to strive, and this gives meaning and direction to our life. Hence, *eudaimonia* simply means living in accordance with one's *daimon* (ibid.).

What are the essential abilities for being human? Do they include the higher virtues of love and reverence for the nature of all things, especially all forms of life? If we admit that they do, Aristotle's idea of technology comes close to my notion of spiritual technology. It is a technology based on the Aristotelian

[29] Marcuse is another; a student of Heidegger's but less pessimistic than his teacher (cf. Feenberg, 1996).

conception of causality, in which the actualisation of the ”form” or essence of a thing is supported, loved and cared for.

In the following I will present some illustrations of the three principles of spiritual science and technology. They are taken from applications of Anthroposophy in the fields of water cleansing and education. However, a *full* account of all the aspects of these two examples would expand the frames of this paper beyond their limits. It would sometimes also presuppose a deeper knowledge and understanding of these fields than I myself possess. I can only provide rough sketches, in the hope that they may be sufficient to evoke an intuition of the Idea of a spiritual technology.

Example 1: the flowform technology of water purification

> Water is H2O, hydrogen two parts, oxygen one, but there is also a third thing that makes it water and nobody knows what it is.
>
> D.H. Lawrence

For conventional science water belongs to inorganic Nature, it is simply a chemical substance. But water is a mysterious thing. It “stores and transmits information, self-organizes, self-purifies, and exhibits some of the properties of an organism” (Bartholomew, 2010, p. 211). In a way, water is part of Nature’s own technology, in that it helps the form inherent in the seed to actualize itself:

> The desert’s irrigating water carries information that reminds the sleeping potentiality [of the seeds] that it can actually come to life according to its own template. The water’s kiss of life is a reminder to the seed of its potential to become a plant according to universal cosmic laws. (ibid., p. 115)

Science still does not understand all the anomalies of water, f ex why ice floats on water (Lo Nostro, 2014). If you google on this question, you find explanations like “the density of ice is less than that of water because in ice the molecules are at a greater distance from each other”. This is a good example of how popularised science sometimes tricks people by pretending to explain something, while really just providing a string of words with no thought content. A substance with greater distance between its molecules has *per definition* a lower density than a substance with molecules more tightly packed. But *why* are the molecules of ice further apart than those of water, even though the very logic of *solidification* would imply the

opposite? Science does not know.[30]

Our ancient forefathers had another approach to the water mysteries. Newgrange is one of the sacred sites of Ireland; a "tomb" built of large rocks, probably a Druid initiation centre. It is perfectly oriented to the winter solstice. When the first ray of the midwinter sun shone into the complete darkness of the tomb it struck the surface of water, contained in a suitably placed stone bowl. In the pattern of reflected sun light the high priest read a prophecy for the coming year. Similarly (but centuries later), the famous prophetic visionary Nostradamus used a bowl of water as a skrying tool to help him make predictions (Bartholomew, 2010). This points to the "information" aspect of water.[31] Water seems to have a "brain" aspect that can "remember" the molecular structures of dissolved substances; this would be the basis of homeopathy (ibid., p. 216f).[32]

The planetary recycling of water follows a pattern of expansion and contraction. As water flows out through a river delta into the sea it starts its expanding phase, which continues when it is lifted into the air by the sun's heat. In higher altitudes it starts to contract into cloud formations, which contracts further into rain falling on the Earth, forming rivulets and mountain streams, and finally full blown rivers flowing out to the sea. It is like a cycle of in-breath/expansion – and out-breath/contraction.

Water actually has three inherent properties that are similar to living organisms. It has a "brain" that can "remember" molecular structures; a "digestive" property that dissolves almost all substances and gases, and transmits heat well; and it has a "rhythmic" property, it always wants to move in a rhythmic way, in meanders and whirlpools (regarding meanders, see Chown, 1995).

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[30] This is an example of how scientists themselves are almost the only ones who know that they do not know; whereas people at large are kept in the illusion that science *does* know. Is this a way to maintain the public's trust in science? What would happen if schools taught things that science does not know?

[31] See Bartholomew (2010, p. 216f) for the story of Jacques Benveniste's research on antigens, which seems to support this homeopathic principle. Luc Montagnier, another French researcher, has in his own way continued and confirmed Benveniste's studies; see f ex "Informative water structures in diseases: from quantum physics to homeopathy", at https://youtu.be/61bFMo-SxMc. Both Benveniste and Montagnier are Nobel prize winners in other areas, but both have been rejected by mainstream scientists for their views on this question. For conventional science, with its one-dimensional and mechanistic causality concept, the total absence of *matter* simply cannot be a cause of anything.

[32] The Phoenician word for water is *mem*, the root for "memory". This points to the ancient belief that water can record and transfer information (Bartholomew, 2010).

The technology of *Flowforms* is based on the rhythmic qualities of water. Flowforms are vessels by means of which flowing water is brought into rhythmic, lemniscatory movement; a movement of a figure-8 character. The significance of this movement for water was discovered in 1970 by John Wilks (see Riegner & Wilks, 1998). The lemniscate also has an expansion/contraction pattern, contracting towards its center and then expanding outwards, away from it. The form of the movement is reminiscent of the meandering form that rivers take when they flow through a landscape, as well as that of a drop of water running down a window pane. In case of a river, this natural movement also has an ecological significance, because the sediments of waste are evenly distributed on the inside bend of the many curves that the water makes. They are then not gathered in one place, which tends to happen if the river is forced into a straight canal.

Water treated with flowforms has proved to be highly oxygenated, suggesting this treatment would be good for the improvement of wastewater (Riegner & Wilks, 1998). Also the coliform bacterial concentration in treated water was generally below accepted levels for public swimming pools (ibid.). Further studies comparing flowform-treated with non-treated water (but allowed to simply flow down a stair of steps) showed no consistent differences in the *chemical* constitution. Plant growth in the two kinds of water was however very different. The non-treated water stimulated vegetative growth (leaf development), characteristic of shaded areas. The treated water in contrast stimulated floral and seed development to a higher degree, comparable to how plants develop in well-illuminated open rapids. The macrofauna gathering around and in the non-treated water were those preferring darker habitats and whose life cycle includes a winged stage, such as midgets. In contrast, those gathering around the treated water had a fully aquatic life cycle, such as crustaceans and water mites.

> All these observations together suggest that water having run through the stair of lemniscatory flowforms acquires a more "sunlike" quality; the sun being related to the more generative parts of the plant (flower and seeds). These are also the parts in which the etheric power of form works more intensely compared to the leaf part, which is relatively more dominated by the principle of matter. (Plants getting the sunlight they need actualise more of their floral potential than plants who get less than they need.) It is also interesting that the chemical constitution of the two kinds of water was apparently not affected. The observed differences did not touch the purely material level, only the etheric level of form.

The polarity of the qualities of the two kinds of water – flowform treated and not so treated – points to the "neutrality" of water; it dissolves nutrients and pollutants alike. It is therefore easily degraded, so "we need to understand how to help water retain its life force" (Bartholomew, 2010, p. 24). It seems that the flowform technology of water treatment supports the essence of water to actualise itself. The lemniscate form is not a mechanical cause for the improvement of water; it is rather that the essence or form of water "incorporates" the lemniscate movement, and in doing so, it recovers its original life force. That is why the flowform technology is highly useful in conjunction with water treatment plants, where it plays a crucial role at the end of the purification process. It is also used in fish farms, reed bed sewages, and other biological treatments.

Example 2: Pedagogics – the technology of teaching

Pedagogics is the art and craft of teaching. It is a social process of causing learning to happen. Our everyday understanding of this process is that the teacher's teaching causes the child to learn. This understanding is modelled on the mechanical causality of "impact". The good teacher has a deep impact on the child's mind, impressing it with knowledge or information. Comenius – the 17th century Czech educator and philosopher – compared his system of didactics with a printing press, which effectively printed knowledge onto the children's minds (though the analogy did not play a very important role in his thinking).

Aristotle presented a very different view. To him, teaching is all happening in the student. Education means that the form of the human individuality in-forms the learning that is taking place. This implies that all education is basically *self-education* (cf. Gadamer, 2001).

> Self-education must above all consist in this, that where one perceives one's shortcomings, one strengthens one's own resources (*Kräfte*)[forces] and that one does not relinquish this responsibility to the school. (ibid., p. 535)

If the teacher is seen as the one who "makes me learn" then, if I have difficulties, I expect the teacher to increase her efforts to teach. Only secondarily do I expect myself to reflect on my shortcomings and how I can strengthen my forces. Primarily, as a student, I expect the *teacher* to teach me. Parents may also primarily expect "the school" to teach their children, not the children themselves.

It would be a mistake to make Aristotle's view of teaching/learning a

justification for not taking the work of teaching seriously. On the contrary, teachers should give the best support they can to the children's learning efforts. From the spiritual point of view, it is really a source of great joy for the teacher to participate in her students' self-education.

In Steiner/Waldorf teacher education, great emphasis is put on understanding the phases of child development from birth until around 20 years of age (at least).[33] Steiner gave detailed descriptions of these stages and what they implied for practical pedagogy. From an Aristotelian point of view, Waldorf pedagogy could be described as a social technology for supporting the self-actualisation of the individual human "form" or essence. This process of self-realisation is to begin with less individual and more general in character, having to do with the proper maturation of the various instruments (bodily organs and soul functions) that the individual spirit needs for its manifestation in the physical world. This *relatively* unself-conscious process normally ends around the age of 20, when the individual 'I' is considered to reach its normal stage of self-awareness. From this time on, the process of self-actualisation may turn into a conscious process of self-cultivation, should one make this choice. It means that the spiritual members of the human "form" – what Steiner called spirit self (*manas*), life spirit (*buddhi*) and spirit man (*atman*) – can begin to actualise.

Steiner actually wished to base the various techniques of Waldorf pedagogy on a profound understanding of the whole of individual human development from birth until old age and death. Teachers should not only care for the children as they are "at present", but also for what they may become much later in life, because what they go through at a young age may have consequences many decades later. As a background to this understanding Steiner also wanted teachers to be oriented in the history and the future of humanity, and its connection to the planetary development of the Earth. The grandiose character of this pedagogical vision is only matched by the astounding task that the human spirit performs when incarnating into a physical body. The spirit descends from a world so different from our earthly existence, and it has to overcome so many

[33] Similarly, development psychology was an *essential* part of conventional, mainstream teacher education for a major part of the 20th century. It is still part of general teacher education but unfortunately it seems to have lost some of its significance (cf. Dahlin, 2013).

obstacles and resistances in adapting to and trying to take control over the physical body (Steiner, 1995, p. 8ff). So-called "difficult children" are often the ones whose spirit revolts against its new conditions, protesting with kicks and screams against the fetters and chains of physicality. Knowing this, parents and teachers can look with more empathising eyes and reverend hearts on their little "troublemakers".

Each step of childhood development is a further step taken by the spirit into the physical world. The "form" of the child's spirit is the agent in this process. The teacher's job is that of a gardener, providing good conditions for the "plants" to grow. Friedrich Fröbel's *Kindergarten* – a garden of children – is based on a similar vision. For him, the self-activity (*Selbst-thätigkeit*) of the human spirit, as expressed in free play, is the supreme way of growth and development for young children (Berger, 2000).

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