Futurology and Metabletics

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In J.H. van den Berg's second volume of Metabletics of Matter*, titled* Gedane Zaken*, he focuses on changes at two critical junctures in history, 1700 and 1900. Shortly before 1700, there were major changes in the fields of music and mathematics. An emphasis on mood in music and the appearance of infinitesimal calculus in mathematics appeared at the moment in history when respect for authority and the infinite were being replaced by a belief in human beings who were capable of everything. Great feats were to befall humanity during this period, but the downside of omnipotence would also leave an impact. The period around 1900, in contrast, was a time announcing discontinuity, of less belief in progress and in the capacity to dictate what the world is about. This shift in history signals a psychological transformation which introduces a psychological sense of magic and the uncontrollable.*

The appearance of Van den Berg's (1975) second volume of *Metabletics of Matter*, entitled *Gedane Zaken*, was astounding. The book is certainly as voluminous as the first one, which largely dealt with the parallel developments in geometry and architectural church styles in our Western history. In this book, Van den Berg focuses on two major changes in our Western world around the years 1700 and 1900. As always in his work, these changes are visible in various areas and cannot be summarized in a brief introduction of this work. The aim of this article is merely to indicate what the nature of the transformations were and the impact they had in subsequent periods. The effects, for instance, of the change in the belief in authority and the tendency to equalize human strata around the year 1700, had an impact, which was visible in two subsequent periods.

The first effects of this change were obvious in the period between the years 1733-1749 and the second set of effects became visible in the period 1780-1800. In the same way, the almost opposite changes in the years around 1900 were first noticeable in the period of 1945-1960, and Van den Berg places the next period of palpable effects in the years between the years 1995-2015.

Since this book was written in the 70's, Van den Berg speaks of changes that were yet to come about and which actually relate to our present time. Van den Berg always looks at the changes in the substrate between man and his world, which make it possible to have expectations about the future, even though Van den Berg emphasizes that we cannot predict the future. His study does not predict the future, but it is possible to have expectations based on major changes, which took place in recent history.

Janus Head, 10(2), 485-503.

To trace the changes, the author describes them in terms of the change in the mind and spirit of Western man as they manifest themselves as changes in the perception of matter, in the things which surround us and in the way in which they appear to us. The way things and the world are lived and experienced is the fundamental and primary structure of our relationship to the world. The objective, secondary or conditional structure of the world is not essential in terms of our experience of the world. Van den Berg has always given the example of water as H_2O to describe the difference between these two structures. H_2O is a scientific formula and does not say much about the water as we experience it. The formula makes all water the same, rather than doing justice to the many ways in which water appears in all its richness and variety. Restricting the phenomenon to this scientific formula is therefore an act of equalization. To use this formula to describe (rather than 'explain' in the context of a scientific argument) is to restrict it to one particular way of perceiving it, and this can literally (in the first structure) change the water once we assume that this one description actually "is" water.

Since there are many areas which van den Berg covers in this book, it is not possible to do justice to its full richness and scope, and it is especially difficult to do so since so many of his works are interconnected. This is a major problem whenever something of his work has been translated into English, as only a fraction of his works has been translated. A further complication is the fact that, although the major emphases lie in the changes in the history of music and mathematics, there are also many social and political expressions of these changes, which van den Berg discusses.

Much of his work deals with the crucial issue of "equalization," this tendency to make everybody equal whereas in reality this is not the case. Van den Berg was very much aware (in the 70's at least, if not well before) that the changes in our society over these last few centuries were preparatory to terrorism, which ultimately could lead to a cataclysmic ending around our present time.

The title "*Gedane Zaken*" refers to a Dutch saying and these two words are the beginning of that saying. These two words literally mean "Done Deals" or "Matters Done" and are part of the saying "Matters once done cannot be reversed." It means that there is not much we can do about certain matters that once initiated, will lead to their own conclusions, fatal as they may be in the end.

The major changes around the time of the beginning of the eighteenth century, just prior to 1700 form the opening scenes of the book, so let us turn to that moment.

Around 1700

The book starts with an opening scene with King Louis XIV, who was the last ruler to govern with such absolute authority that his saying *"L'état ç'est moi*" ("*I am the State*") still rings of that time where authority was absolute. Van den Berg tells how Louis XIV had to go through some painful surgical interventions towards the end of 1686. By the New Year, his recovery was celebrated with a special session of the Académie Française, during which Charles Perrault, supervisor of the palatial buildings and author (for instance, the famous *Tales from Mother Goose*), read out a poem full of praise of the king. He was the first who publicly praised the modern thinkers in a way that placed them above the classical scholars. It was, however, risky to be so critical of the classical scholars whose authority was also beyond doubt.

It was not very much later that the battle between the modern and classical scholars would begin seriously. It was Fontanelle who pronounced the word "*Progress*" in the context of this modern movement. These scholars would use the work of classical times but they went well beyond classical thinking. This was an unusual thing to do and brought about a significant change of atmosphere in France. In England, John Locke went so far as to doubt the principle of innate abilities when he wrote that there are no innate principles of the mind in his *An Essay Concerning Human Understanding*, which appeared in 1690. This book had an enormous impact , which can be summed up with the idea of the *tabula rasa*, the empty cabinet of soul and mind, or 'clean leaf' that could be written on.

John Locke was also critical of the conviction that the King could rule by divine right (*jure divino*) rather than by consent of those being ruled. The new idea that there was no room for authoritarian governance and that man was by nature free, equal and independent (as Locke dared to write) took hold. These initiatives cancelled the authority of the old world and introduced faith in the progress of humanity and its abilities, taking away the old belief in the authority of royalty and the God(s) of the classical world. It is therefore of metabletic importance that such a phenomenon as the death of tragedy came about during that time. This too is, in essence, a cancellation of authority and hence of that which influences our existence from beyond (and which ultimately rules our fate and us).

During these last years before the end of the 17th century, the tragedy, which is about the reign of god(s) over humanity, ends. This death of tragedy and the role of fate in our existence do have consequences in terms of the

loss of a future perspective and the loss of boundaries of what is actually human. A certain kind of containment is lost without these boundaries and without them what belongs to the realm beyond. On the one hand, this actually leads to a new kind of freedom and belief in our ability to make progress, but, on the other hand, it happens at the cost of human beings becoming too courageous or arrogant.

Around the same time as the change in the meaning of authority was occurring, Leibniz's principle of general order, which he later called the *Law of Continuity*, was introduced. This principle was not only applicable to physics, it also included all reality and the field of mathematics where he first applied the principle. In other words, it came to be applied to all reality.

The principle is about the slow and regular change from one state to the next where the difference is only a matter of degree. The difference between a circle and an ellipse is then just a matter of degree: if you bring the two foci of an ellipse closer together, they will end up overlapping each other, and we then have a circle. It is all a matter of continuity and degree, and the difference between a human being and an animal were conceived along similar lines. Leibniz even literally said that, in nature, all happens according to degrees and nothing changes by way of a jump. It also implies that there is no essential difference between rest and movement: just allow the velocity of a movement to decrease, and the state of rest is reached without a jump. This thought contains the theory of evolution in a nutshell, which was, of course, another major change (Van den Berg has written a separate book about our attachment to the theory of evolution).

These ideas of Leibniz were, of course, crucial in the development of the theory of calculus in mathematics. The principle itself, no matter how useful in calculus, nevertheless rests on an impossibility, as no matter how small the difference between different states, they cannot completely replace each other or be identical.

Equal Temperament in Music

Van den Berg's metabletics points out how we can perceive and experience reality differently from one era in history to the next, which he demonstrates in terms of the perception of music. Music therefore features in this study on the changing nature of reality around the crucial periods that are under investigation. So let us turn now to some important changes in the field of music during these periods.

The German musician Andreas Werckmeister introduced the most crucial change. He introduced the *principle of equal temperament* just prior to 1700. Andreas Werckmeister invented the measure needed to make musical scales sound harmonic, even though, with the introduction of the non-chromatic scale in music, something unusual happened. The first and basic scale in music, that is, the usual five notes, can be played by using the notes C D F G A on the piano, and these notes apparently are natural to the human ear. In the West, the diatonic scale of music was developed by adding the E and B and the five half-interval notes (the black ones on the piano).

The combination of notes, which make up chords, can sound consonant or dissonant. The distance between the notes or intervals has its own frequency number, which consists of the ratio between them. This determines whether a chord sounds consonant or dissonant. The human ear is capable of hearing so finely that a slight deviation from a certain frequency number can be sufficient to make a significant difference and make it sound false. The laws underlying the difference between consonant and dissonant notes have been an enigma throughout the history of music. The difference at the physiological level can be described with precision, but the way it is heard by human beings would depend on the context of the culture and the time. The third interval, for instance, which we would nowadays call consonant, was perceived as dissonant before the thirteenth century, i.e. before the time of high gothic church styles, but has been perceived consonant ever since the gothic style was introduced in the West.

The addition of intervals in music comes down to multiplying the ratios between the frequency numbers. Addition of two consonants leads to a good chance of obtaining a dissonant. In other words, let two people sing together and allow them to sing together with a third person and the chance is high that the sounds become dissonant. Singing in harmony means, therefore, that the singers have to adhere to certain rules to prevent it from sounding dissonant. Polyphony, as it is called, has to obey certain rules in order to remain consonant. Van den Berg transfers this principle to the way we do things together in a democracy, where people can speak in harmony only if they do adhere to certain rules if they are not to fall victim to dissonant talk.

There is a well-known difficulty in tuning an instrument, let us say the piano, which Andreas Werckmeister managed to deal with by his introduction of equal temperament. It has to do with the fact that, adding intervals,

in order to arrive at fitting and tuning a series of octaves, is not the same as the pure operation needed in terms of physics. The one has to do with adding intervals to arrive at all the notes of each octave, whereas the laws of physics demand the multiplication of ratios of frequencies to do complete justice to the operation.

The contribution by Andreas Werckmeister was to tune the piano in such a way that there would be no falseness, and he did this by introducing *equal temperament* (see the Appendix, notes on music for a more detailed and technical explanation). Basically, Andreas Werckmeister evened out the difference of one-eighth interval across the scale of all twelve fifths by introducing a slight change in the fifths, making it possible to arrive exactly at the seventh octave after the twelve fifths have been added. The result is the fact that all intervals are really slightly false by making all half-interval notes equal. This principle of equalization fits the time where "making equal" was a major theme.

Van den Berg argues that this principle of equality, introduced into society, makes this society false. He quotes Max Planck, physicist around 1900, who had written on the subject, saying that non-false, pure, tonality will appeal once again if and when a genius arrives who can express himself or herself better in that new tonal scale than in the 'false' one. That would become a major breakthrough in the new era around 1900, but it did not actually happen, even though new initiatives were taking place. Most of the new initiatives made visible in that era did not actually lead to the usual, expected, major changes and that is where Van den Berg saw great difficulties, because the old effects still held up in the 20th century, even though new initiatives took shape. Progress, continuity and the principle of equality would still rule or dominate even though new initiatives were introduced around the year 1900. The suspension of these changes could eventually lead to an explosive situation where the new initiatives could come about only in revolutionary ways.

Van den Berg also shows how the changes in music led to a new intention in music, which came to have an impact in the affective sphere. Composers became more and more intent on appealing to the affect of human beings, and in songs this meant to make sure that the listeners could actually hear the words clearly, which until that time was not the case. To hear the words clearly became a topic and to move the listeners emotionally became all the more important**.** In those early days, there were protests about this from such groups as the Camerate dei Bardi. They wanted clarity

and moved away from, say, Palestrina's polyphony. They wished to speak musically and developed the "*stilo affetivo"*, the affective style of music. This new narrative style was meant to be an expressive style. There is more aim and direction in the later music than earlier kinds, just as everything else came in to motion and found new directions.

The major issue here is the fact that in this period just before 1700, some falsity was added to the scales in music and that the measure was one of 'equalization'. As stated earlier, polyphony or singing together is difficult and it is easy for three or more people singing together to get out of harmony or to produce dissonant effects. One, therefore, has to sing together with caution and according to certain rules. Van den Berg compares this with democracy where people are equal, but it still requires a 'singing together' according to rules, and dissonances are easily produced. Terrorists are dissidents or 'dissonances' in a society where some kind of harmony is difficult enough to find in the first place**,** just as in music one might have to tune everything slightly false in order to reach this ability to 'sing' (speak) together. The cost, however, is that one does this by artificially making everybody equal. That had advantages in music, even though it meant tuning the piano slightly false.

So both 'equalization', making equal as a principle and the idea of movement come into being and led to 'progress', albeit at some cost. Van den Berg subsequently deals with the major changes of this kind in mathematics as well, to which we shall now turn.

Mathematics as Science of the Infinite

The early beginnings of the major changes around 1700 and 1900 began at the start of the previous century as will become clear in this section on mathematics as a science of the infinite. The beginnings were visible in the period around 1600. John Napier brought movement into arithmetic calculation with his discovery of logarithms. This discovery almost coincided with the same discovery by the Swiss mathematician Jobst Burgi. Napier published his findings in 1614 and Burgi in 1620, although Burgi actually discovered it earlier, before his publication. Kepler had been waiting for the publication, and it was clear that there was a new interest in calculating relationships between, say, points on two lines. It was the *fluxus*, the flow, rather than something static that became the subject matter.

To calculate by means of logarithms is to calculate within a relationship that is in flux, in motion. This relationship of mutual dependency between two points on two lines is called a *function*, which in turn can be described as a relationship between two changeable variables (the dependent and the independent one). A movement from numbers to the relationship between numbers is a movement from the static towards movement, from that which is undirected to that which has a direction.

Logarithms in mathematics are like the new music of moving affects. At this junction, Van den Berg goes on to stress how this fits in the context of all those discoveries around that time that were about movement, whether this is the discovery of the circulation of the blood or otherwise. This discovery and publication by William Harvey coincides almost completely with the publication of the Briggian tables of logarithms in 1628. In addition, this movement, this flux in music, physiology and mathematics also corresponds with other significant events in the Baroque, including its church styles.

This thrust carried on well into the 17th century and a number of mathematicians changed from the static to the dynamic aspects of calculus. Mercator, a famous 17th century Dutch mathematician, was one of these mathematicians who worked on series and transformed static equations into series, which were developing (see Appendix, Notes on mathematics, note 1).

A finite value transforms into a dynamic process! A state of rest equals a dynamic series or a development. Rest changes into movement and thus it becomes possible to determine what was indeterminable before. The mathematician obtained power and control over that which was indeterminable. This highly relevant operation paved the way for the discovery of calculus. This kind of dynamic mathematics was part of the 17th century and led to the discovery of infinitesimal calculus or calculus of that which is infinite. Every important use of mathematics in science in that era between 1600 and 1900 is closely related to differential and integral methods of calculus. The little jump from something very small to zero features is once again in this treatment of calculus. Two sides of a rectangle, for instance, can depict the ratio of time or distance. This ratio can get so small that the difference or differential quotient becomes the velocity at one definite point.

Van den Berg again points out how this most important step in mathematics nevertheless rests on an impossibility in reality. Both Leibniz and Newton discovered this move from difference to differential quotient in the time of the late 17th century. Newton discovered it in the winter of 1665-

1666 and Leibniz in 1673, although he published it only later in 1687 in his major work. In this move from the very small to zero, something very significant has taken place and the boundaries or the whole concept of boundaries has changed. A change where boundaries are less clear is also an essential aspect of what happened in the rococo building styles. The boundaries became invisible or became smooth transitions rather than clear ones.

This imposition by the mathematicians on the essence of where boundaries are and where they can be was shifting in favor of the mathematicians and is an essential aspect of the way in which the people of that time were serving "Progress." New ideas abounded and yet, at times, they overshot what is possible. The many beautiful consequences of such progress cannot go without a shadow lurking in the corner. One of those is the way in which thinkers dictated what the world is and what it is not. Thinkers like Kant would come up with enormously important and yet one-sided ideas about nature and our world. In mathematics, it culminated in the way the concept of 'infinity' was treated.

Gauss, according to Van den Berg possibly the greatest mathematicians who ever lived, would develop his ideas along those lines where the mathematicians dictate how the world is structured and could rule in the realm of infinities. This was possible in the midst of this period between 1700 and 1900, i.e. in 1799, when Gauss published his famous work on the fundamental theorem of algebra (see Appendix, Notes on mathematics, note 2). This is where the mathematician and with him, all of us, start to dictate with full sovereignty what could also be described as impossible.

In the case of Gauss, Van den Berg notices that it is not possible to place an infinite number of radicals on a limited circumference. Even Gauss, however, did not see it that way, because infinity was something one could just work with as if it were something limited. All this happened only just around 1800, and it might not be such a coincidence when we realize we are in the time of Napoleon, where such rulership over the world, including scientific dictates, were characteristic of this period. It was the time of Progress and even infinity was under scientific control. It was as if human beings could do everything, although such omnipotence is usually shown to be wrong, and the opposite comes forward to destroy this sense of omnipotence. In mathematics around this time, this destruction of omnipotence enters in the form of another, unsuspected factor called *the transcendent number*.

In the late 19th century the great mathematician Georg Cantor showed that the transcendent numbers would not obey the rules imposed by Gauss.

They do not find a place on the circle (see Appendix, Note 2), and this would be the beginning of the disturbance of illusory omnipotence. Until 1800, it was thought that all numbers can be radicals of an algebraic equation, although Leibniz did express some doubt in 1684 and called those numbers transcendent numbers. Gauss did not even mention the transcendent numbers, which ultimately annihilated his demonstrable omnipotence. Irrational numbers such as π can find a place on the so-called "circle of unity," but cannot be a radical of an algebraic equation. Georg Cantor proved that the transcendent numbers were actually far greater in number than any of the other numbers. Although Leibniz already expressed doubt in 1684, this was not mathematically proved until this much later period shortly before 1900. This is the new era, whilst in the period before, in spite of some doubt by Leibniz, the mathematicians worked with infinities as if they had some kind of power or control over infinity.

This sense of power and control over infinity is what did not fit any more in the period just prior to 1900. It all fits with the spirit of the time where disrespect for infinity (including the "Infinite One") abounded. Only early in the 20th century did one start to look at infinity in mathematics in a way that allowed for uncertainty as to what can be inferred.

Mathematics *as a science of the infinite*, and its emphasis on movement and progress, were part of this period, but as such it had to come to an end, just as any omnipotent enterprise will have to fail in the end. That is what Georg Cantor announced with his work on transcendental numbers, when a new view of infinity came about.

The Two Major Changes

Shortly before 1700, there were major changes in the fields of music and mathematics. In music, the emphasis shifted towards the evocation of moods and being moved and this aspect of movement became thematic in monody. Similar changes were visible in mathematics and calculation with logarithms, which led to the infinitesimal calculus just prior to 1700. Respect for authority and the infinite were replaced by a belief in human beings who were capable of everything and this was explored during this time of progress. Great feats were to befall humanity during this period, but the downside of omnipotence would also leave their imprint and impact.

Van den Berg devotes an entire chapter in this book to the transcendent number, as this is a crucial issue in the development towards a less closed and

definite world where there was hardly any room for faith and mysticism. The omnipotent human beings could not rule the world completely after all.

The major changes around 1900 would indicate there are other possibilities and that infinity is not so easily managed and used for calculations as was thought. The boundaries of the world started to open up again and there was possibility for new magic and contact with the transcendent world. Van den Berg relates these possible changes, but at the same time judges that these changes have not had a huge impact yet.

Georg Cantor's great work on the transcendent number brought about a revolution in the time around 1874. He emptied the line that had been made closed and solid by introducing the concept that there are many more transcendent numbers on a line (or circle) than other numbers. This is quite different from the mathematics of the time in between when Gauss worked and when a line was closed and solid. Mathematicians could rule in their field and decide on how closed and fully 'knowable' the character of a line was. This was going to be broken up with Cantor's ideas and by other mathematicians who would work with different concepts of infinity. This period, then, would be a metabletically significant time, and so we must ask what else happened then.

In this context, Van den Berg refers to the revolutionary change in the conception of consciousness by Brentano, the father of phenomenology and teacher of Husserl, who published his book *Psychology from an Empirical Standpoint* where consciousness is immediately connected and directed to the world via this concept of intentionality. Consciousness is always consciousness of something and is not present as something independent of the world or something that rules over the world. In introducing this idea of consciousness, the world itself responds and the artists, such as the impressionists, show us the new world as much more open. The impressionists depict a world full of openness, mobility, broken lines and pointillist impressions of the new world. Things started to emit images when Brentano's arc of intentionality (its direct connection to the world) made our consciousness move towards the world, rather than placing it on an isolated throne from which we governed the world.

Van den Berg refers here to the human body as becoming more of a neutral area between man and world. The neutrality allows the body to be objectified, and this objectification was evident in that same year of 1874 when two independent discoverers of the knee jerk reflex, Erb and Westphal, published their findings in the same journal.

Subject and thing were separated in the period between 1700 and 1900, but they started to come closer to each other in the 20th century. This new and changing world outside showed us where the world is not solid and closed, but where ungraspable phenomena and open spaces can manifest themselves. This world showed itself again with the initiatives around 1900, about which we shall say more in a moment. Van den Berg gives us a whole number of examples, which show that the world might change, but at the same time, he notices that these changes did not really take hold.

Cantor showed us that the transcendent number devours and empties the solid line, leaving it with open and ungraspable infinities. It was as if things could show their magical qualities again. Things are again like windows through which new light and qualities can reach us. Things would then no longer be completely under control of the scientific eye, compact and safe, but reality would once again be able to seep through the portals with all its mysterious qualities. This transcendent world would have the capacity to move through the gaping openings, seep and gush towards us. Let us turn to the some of these major initiatives around 1900, which Van den Berg summarizes as follows.

Max Planck and his theory of quantum physics initiated the introduction of discontinuity in physics. Energy is emitted in packets, in quantities no longer divisible, and the underlying principle is that of discontinuity. In biology the theory of mutation by Hugo de Vries, just prior to 1900, argues that new species do not evolve gradually, but come about in leaps. Again, the principle of discontinuity applies. Evolution as a gradual, continuous process is no longer the only valid theory. André Gide, the French author, introduced the theme of the spontaneous act, the *acte gratuit*, which is a sudden act or deed without motive. This is unique in literature, as most acts had some history or causal connection to the overall story line. It is an abrupt, disconnected deed and unconnected in terms of motive or causation. The continuously evolving progress makes room for other, new possibilities. This kind of thinking, which introduces discontinuity into what was once dominated by the theme of continuity, also came from social scientists, such as Max Weber. It is then no longer necessary to believe in the theory of the *tabula rasa*, the unwritten leaf or empty cabinet, but instead it is possible to conceive of our mental and psychic life starting with a certain quantum, with a given possibility to give meaning.

All these shifts occur at the time of Husserl's anti-empiricism and his defense of a new kind of idealism, which was actually closer to a new form

of realism. All these new initiatives are potentially opening up new doors, such as spirituality outside of religious institutions and artistic expression of a world with new things in them. At the same time, there were some dubious developments or initiatives, such as Oscar Wilde's idea of "allowing pleasure to dominate," rather than enjoyment and pleasure as being recommendable. The sovereignty of lust, which also fits well with Freud's theories of that time, introduces an amoral principle (as does Gide's *acte gratuit*).

Another possible factor on a large scale was the introduction of Einstein's *law of the equivalence of mass and energy*. This finding ultimately led to the production of enormous nuclear energy and its ultimate consequence in the form of the atom bomb.

This period around 1900, then, is a time announcing discontinuity, of less belief in 'Progress" and in the capacity to dictate what the world is about. There would then be less omnipotence and omniscience, but more room for magic and the uncontrollable.

Periods of Visible Impact of the Major Changes.

These major changes and initiatives around 1700 and 1900 have their first impacts in definite, small periods after them. The initiatives of the period around 1700, for instance, show their effects in the two periods afterwards, both in the eighteenth century. To sum them up ,Van den Berg uses the analogy with the triple jump: First the years around 1700 with the end of authority; the introduction of the "tabula rasa"; the principle of equality (not equality before the law, but an unrealistic principle that one cannot live up to); progress; empiricism; the end of tragedy; separation between adults and child; law of continuity; rococo style etc. Then, a period of early effects, most noticeable between 1733-1749: democracy; nationalism; theory of evolution; industry; explosive population growth; association psychology; neurosis; inauthentic church styles and the coming into being of adolescence. The third period, or jump in the triple jump is to be located in the era between the years 1781-1800: the French Revolution with the boundaries of social equality; the theme of the doppelganger and the boundaries of personal equality; critical philosophy and the boundaries of reason; transgression of boundaries of matter.

The next triple jump, starting around 1900, is followed by two periods. First, around 1900, there is the introduction of discontinuity in physics, biology and mathematics; the end of the "tabula rasa" theory; the end of

empiricism; a new spirituality (non-institutional); the mass-energy law; sovereignty of lust and the re-introduction of the child into the adult world; the immoral unconscious.

The second period, where the first effects became visible, is during 1945-1960. Many of these effects cannot be dealt with in the scope of this paper, but here are some of the themes Van den Berg deals with in this section about this period between the years 1945-1960: the end of the population explosion; other-directedness in society (Riesman); power of the media and its impingement on individual freedom; the end of democracy as such (hidden so-called e*xpertocracy;* hidden theocracy); end of self-confidence and courage of Western man with its results in the form of permissive education; the generation called "children of futility"; the beat generation; counter culture; MacMillan's "Wind of Change"; abdication of the white man; reversed racism; end of the theory of evolution; restoration of genetics; new kind of mysticism; end of psychology of continuity; recovery of things as portals to other worlds; new matter that may be destructive (atom bomb).

In this summing up of changes, there is also the most controversial aspect of Van den Berg's writings. He argues how the white man has weakened his courageous stance that was part of his progressive explorations. Van den Berg's ideas on equality have always been partly misunderstood in the sense that when he speaks of 'reversed racism', he actually means to say that it is unjust to make out that everybody is equal and that a lot of trouble can come about if we pretend this is true.

The third period considers the possible late effects during the period of 1995-2015, as seen from the perspective of the 1970s when the book was written. Van den Berg lists a number of possibilities and some of them appear to be more likely to him than others. We shall just focus on the few major, general ideas and indicate which would seem more likely to occur.

First, the following facts, which confirm the end of the two centuries between 1700 and 1900, will disappear: population growth, parliamentary democracy, theory of evolution, associative psychology, belief in progress, whilst it remains difficult to say what will happen to the courage of this revolutionary time around 2000. The events around 1874**,** which looked so promising, did not appear to lead to major changes and might have led to more positive developments if they had somehow coincided with the events around 1900, but even here Van den Berg is careful and argues that what started so positively in 1874 did not quite follow through after 1900. The effects of the events around 1900 did have their period of observable consequences in the period of 1945-1960.

The possibilities of these positive effects developing are always present. If they do, there would be a new sense of spirituality and mysticism**,** and human beings would develop a sense of a new interior. One can expect a new building style, which distinguishes the exterior from the interior realm. Architecture is capable of expressing this difference between our interior and exterior. Van den Berg (1968) has shown this in the first volume of these works on the changing nature of matter, which is called the *Metabletics of Matter, Volume 1.* Here in the second volume he describes how there could be new things and new matter as well as a new idealism. This summing up of new things to come might not come about and then we would see no new spirituality or new things or anything of the above.

Also, Van den Berg mentions the persistence of the effects of what happened in these previous centuries. This would include the possibility of the use of nuclear violence and intolerance of difference. This could well lead to the most disastrous ending of the world. Another option in this scenario is the possibility that all will come to an end and the changes, which started the 20th century, would have their effects in a way that would lead to tolerance of differences. This period of time would also end the nuclear weapons period (not necessarily nuclear energy). Perhaps here would be room for the return of the exiled God, who might return from a few centuries of exile since the death of tragedy and our disrespect for the transcendent world.

Van den Berg's pessimism lies in the fact that, in his view, both in the field of mathematics and music not much has been initiated that really promises a positive outcome. In another chapter, Van den Berg has explored the modern contributions in music, i.e. the atonal music of Schönberg is the central major initiative, and he indicates that it is most unusual and unpromising if the music of a century cannot be sung. This music of the 20th century contains many dissonant notes, and there was even a consonant prohibition in the atonal music, which leads one to doubt whether one can expect much of these contributions to music. Noises of all kinds have become part of this modern music, which can range from traffic noises and hissing to pop-cacophony. All this music befits the time, according to the modern musician Cage. The servant, the dissonant in music, would be there to support the melody, but no longer in the 20th century, where the dissonant became dissident and did not accept a master above it in the form of melody. Those who know Van den Berg's book *Hooligans* can see the connection with the development of terrorism. He was certainly right in foreseeing this development a long time ago.

The return of the exiled God could well be preceded by the return of the Devil, who was also exiled (even before God was) and might well return in this era, but most likely this will not be in a calm and pleasant way.

The closing chapter deals with another initiative, which changed certain tactics in the game of chess. Van den Berg says the initial move from white to black in the period between the years 1945-1960 might reflect a corresponding move in society. This could then mean that another people, not the white man, would take the new initiative and attempt to win. In my personal opinion it could well be so that what we have seen in recent years since 9/11 relates to this sudden new initiative. In addition, we have also seen a shift in the application of democracy to the modern 'top-down' democracy, where the leaders hardly consider their people to be 'equal', which might also be an expression of this new initiatve

Van den Berg speaks of the possibility of cataclysm, which could well mean a disaster where wars would lead to large-scale destruction and decimation of the world population. After this world disaster, a new world might again get a chance to establish itself. A new respect for difference and a chance to carry on in smaller numbers might yet be realized. That world would have a new spirituality, so that which was initiated earlier in the 20th century might get a chance this time. This is the crucial time we live in today and only time will tell us which of the options he foresaw will occur on the basis of this metabletics of matter.

References

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Appendix

Notes on the history of music

The technical background of the chapter of music contains some of the essential information of how Andreas Werckmeister arrived at what is nowadays called *Equal Temperament*. This is the reasoning that Van den Berg follows, which the informed reader might enjoy.

The addition of intervals in music comes down to multiplying the ratios between the frequency numbers: the ratio of the fifth interval (C to G), is

three to two and that of a fourth is four to three. If we add this, we obtain 'two', or, in other words, add up two consonant intervals and the result will be another consonant, the octave.

When we add two fifths (intervals), we arrive at the ninth interval or, when subtracting the octave, the second interval. If one continues to add the fifths in this way and subtracts them by an octave, one obtains all the intervals (five whole ones and two half ones), which is a total of six whole intervals. Twelve fifths contain twelve times three and a half whole note intervals, that is, forty-two whole note intervals. Seven octaves contain seven times six whole note intervals. In other words, adding twelve fifths leads to the seventh octave.

The well-known difficulty comes about when we add these intervals in this particular way, because adding intervals should actually consist of multiplying ratios of frequencies and is not identical to adding intervals. There must then be a difference between the two operations where. On the one hand, we add intervals in order to arrive at a concrete layout of all the notes on a musical instrument. On the other hand, we need to be multiplying frequency numbers to come to the true ratios.

Again, the ratio of the fifth is three to two and in the case of the ratio of the octave, it is two to one. The so-called Pythagorean comma is the difference between 12 just perfect fifths up and 7 octaves up (the ^ character standing for the "power to"):

$$\left(\frac{3}{2}\right)^{12} = \frac{531441}{4096}$$

$$\left(\frac{2}{1}\right)^{7} = 128$$

In this kind of multiplication the number at the top, the 3 to the 12th, is 531441, is not equivalent to the outcome of the multiplication of 2 to the 12th times 2 to the 7th (being 2 to the 19th), which would have been the case if the above reasoning were correct where the adding up of intervals equals the operation via the multiplication necessary. There is therefore a slight difference between the operations, which amounts to about 1/8th of an interval taken across the whole series of seven octaves. This difference is: 531441/4096 x 1/128 = 531441/524288, which is the Pythagorean comma.

Notes on the history of mathematics:

Note 1

Mercator was one such mathematician who tried to calculate the surface of an area bordered by a curved line (part of an area of a hyperbola). He started to apply division to the formula of a hyperbola, for which the standard formula is:

$$y = \frac{1}{1+a}$$

Mercator went ahead and started to divide and arrived at the following equation:

$$\frac{1}{1+a} = 1 - a + a^2 - a^3 + \ldots.$$

Mercator produced an infinite convergent series and in so doing converted the static equation into a developing series. There is another series that can be developed out of this one and then we come to the Naperian logarithm of $(1+a)$:

$$a - \frac{a^2}{2} + \frac{a^3}{3} - \frac{a^4}{4} + \ldots.$$

No matter what it is that one is trying to calculate, using this method would arrive at the precise calculation with relative ease (one logarithmic operation as opposed to long addition and subtraction processes).

Note 2

Regarding Gauss Van den Berg follows his mathematical argument and illustrates how Gauss comes to his conclusions. The general algebraic equation is:

$$x^n - 1 = 0$$

Gauss used this to illustrate his findings. The radicals of the equation can be positioned on a graph made up of the x-axis and the *y*-axis. When n=2 the first radical of the equation would be –1 and +1 and both can be put on the x-axis, where this unit 1 can be used to depict a circle with radius 1. On the side of the y-axis we would find the imaginary numbers, which are also part of many radicals. When *n*=3, for instance, the radicals are: -1; $-\frac{1}{2}+\frac{\sqrt{3}}{2}.i$ and $-\frac{1}{2}-\frac{\sqrt{3}}{2}.i$, where the symbol i indicates the imaginary number which is the square root of minus one. The graph would therefore contain both imaginary and real numbers, making up so-called "complex" numbers. All the real numbers, Gauss reasoned, would find a place on this "circle of unity" with origin O and radius 1, whilst the imaginary numbers would be depicted as lying on the y-axis with the imaginary symbol $+i$ and $-i$. Gauss did argue that no matter how high the number *n* reached, it would always have its radicals on the limited circumference of the circle.