

Human Learning and the Development of Mind in the Anthropocene: Reflections against the Backdrop of Big History.

Jan Visser

Learning Development Institute & Stellenbosch University

ABSTRACT

Human Learning in the Anthropocene (HLA) is a new initiative by the Learning Development Institute (LDI) aimed at researching, conceptualizing and creating the conditions for learning called for by the challenges humanity faces in the current geological epoch, the Anthropocene. HLA comes in the wake of a prior ten-year long initiative that focused on Building the Scientific Mind (BtSM). This paper marks the start of the HLA initiative. It is meant to be an invitation to reflective dialogue on the issues presented in it. In line with earlier work by the Learning Development Institute, it calls for critical reflection on the meaning of learning, the settings in which learning evolves along the lifespan, the conditions that allow learning to happen, and its importance for the development of mind. Such reflection is an acute necessity in the Anthropocene, the geological epoch in which human activity has begun to impact significantly on our planetary environment.

PERCEPTIONS OF SPACE-TIME

My earliest encounter with a view of history bigger than the one I was brought up with in school was through Arthur Koestler. Two sentences in his 1967 book *'Ghost in the machine'* have been among my favorite quotes in papers (see e.g. J. Visser & Berg, 1999) and at conferences. They are.

- “The uncanny properties of exponential curves reflect the uniqueness of our time—not only the population explosion, but also the explosion in power, communications, and specialized knowledge” (p. 317), and
- “Our imagination is willing to accept that things are changing, but unable to accept the *rate* at which they are changing and to extrapolate into the future. The mind boggles at an exponential curve as Pascal’s mind boggled when, in the Copernican universe, infinity opened its gaping jaws: *‘Le silence éternel de ces espaces infinis m’effraie’*” (p. 319).

Those two sentences and a couple of other readings and considerations led me to henceforth look at the world in the perspective of timeframes such as the 12,000 years during which humanity had evolved since the first Agricultural Revolution, a transitional event in the cultural evolution of our species marked by the emergence in the so-called Fertile Crescent in the Middle East of

primitive farming practices, the domestication of animals, the development of crafts (such as weaving and pottery), and the making of stone tools. It created the conditions for dramatic change in the patterns of human inhabitation of planet Earth. I have written elsewhere (J. Visser, 2012, pp. 229-230) about the upside and downside of the developments emanating from this Neolithic (or Agricultural) Revolution. An extensive quote follows.

Quote: *It created the conditions for growth of the human population beyond the bounds nature sets to any species. This, as so many later innovations, has profoundly changed the world. After it had taken the entire evolutionary history to populate the earth with three billion people by the year 1959, a mere four decades were needed to double that number by 1999 to six billion, and no one yet knows how we'll feed sustainably and equitably the more than nine billion people we expect to be alive by 2050. Our actions have led to depletion of resources; gross inequality within and between geographical regions; extinction of species and thus reduction of biodiversity; climatic effects we may only partially understand but that look serious enough to suggest that profound changes in the way we live may be required; and increased risk of pandemic disease, to name but a few of the problems of planetary dimension and import with which current generations grow up. That's just for the downside.*

*On the upside it is noted that we liberated ourselves from the burden of merely caring for our biological survival. We created 'free' time, allowing rich cultures to emerge and future generations to interact with and build on the heritage of the past, an essential feature of human learning. It made us fantastically clever. We now possess unprecedented computing power and other technological means. We created communication and information sharing networks that span the globe, accessible by increasingly large proportions of humanity, allowing global communities to emerge across geo-political and cultural boundaries. We found the key to understanding our genetic makeup and hereditary past. We understand better than ever the relative value as well as the frailty of our home in the universe and we finally know, and know it for sure, that the sustainability of human life on earth, beyond the mere 200,000 years since *homo sapiens sapiens* emerged, is more than ever in our own, collective, hands. That realization calls for a serious look at what we actually mean when we say we are learning. It also calls for seriousness in our pursuit to develop learning for everyone, not just those who read these lines and thus live in parts of the world where books are available (J. Visser, 2012, pp. 229, 230). **End of quote.***

Having made a small step back in time of only 12,000 years, one is better prepared to make subsequent steps, such as by contemplating one's existence in the perspective of the almost three million years over which the genus *homo* evolved (Vilmoare, 2015) or the 3.8 billion years long history of life on earth, or, why not, by placing it in the context of the evolution of the entire universe, going back to the beginning of time, which is what David Christian proposed in 1991 and what the Big History Project (<https://www.bighistoryproject.com/>) aims at facilitating.

But the story is incomplete if we merely consider the dimension of time. We live in a four-dimensional world and awareness of our home in the universe should reflect both the

temporal and spatial aspects of where we are. The following composite graphic¹ is a modest attempt to visualize this.

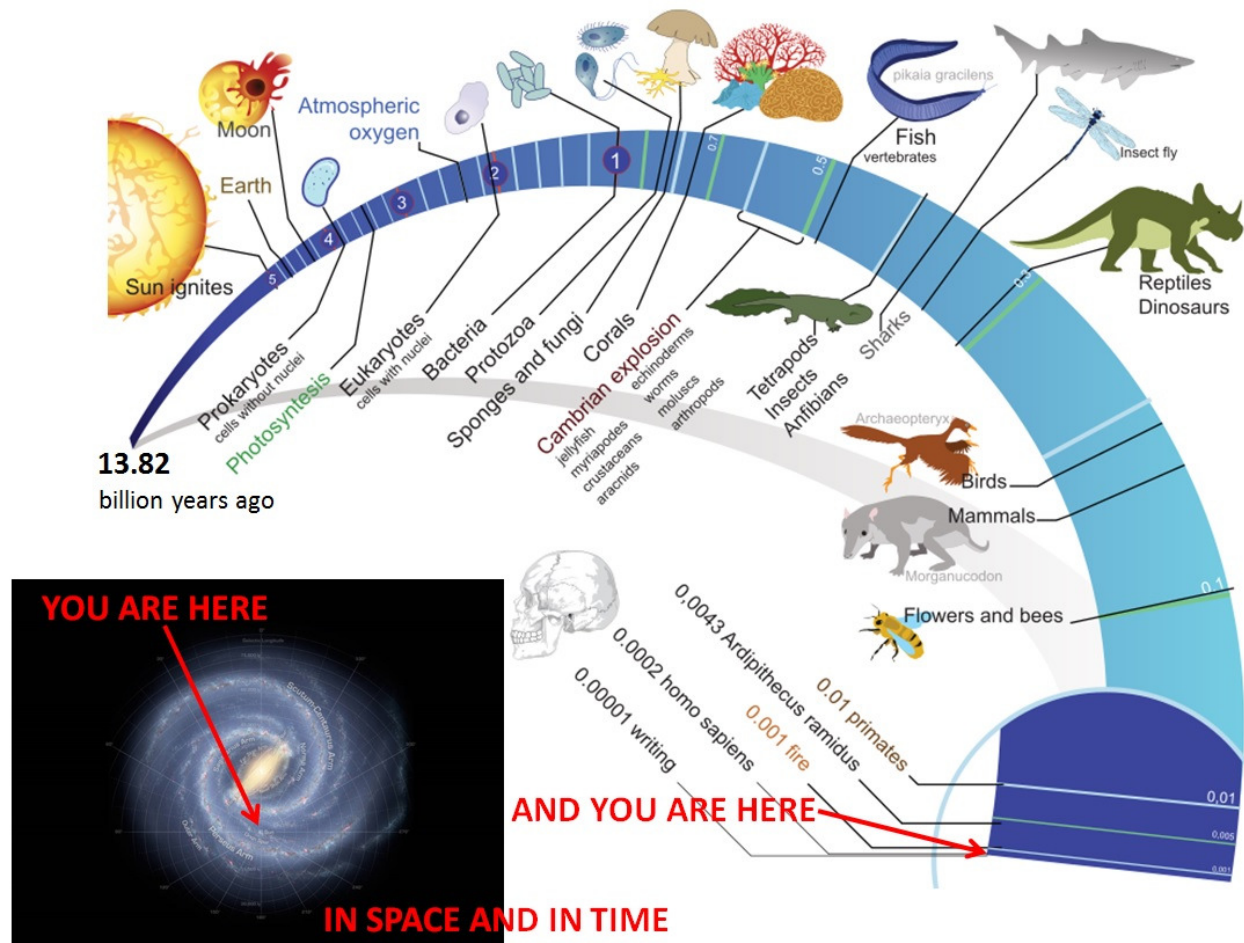


Figure 1: Our location in space-time.

Obviously, such a two-dimensional prompt to raising awareness of the four-dimensional nature of our being-in-the-world² is still extremely limiting. It's also inadequate in that only one single galaxy—ours, the Milky Way—can be graphically represented whereas there are at least 100 billion (10^{11}) galaxies in the known universe. However, this is as far as we can go when entrusting words and images to flat sheets of paper or a display screen. The point I am trying to make is that the work undertaken under the aegis of the Universe Awareness project (UNAW, n.d.), founded in 2005 by the Leiden astronomer George Miley, is a necessary complement to Big History.

¹ Credits for the two separate images used for this composite graphic:

(a) Timeline graphic: https://en.wikipedia.org/wiki/Rare_Earth_hypothesis#/media/File:Timeline_evolution_of_life.svg.

(b) Graphic view of the Milky Way Galaxy: http://www.nasa.gov/mission_pages/sunearth/news/gallery/galaxy-location.html.

Credit: NASA/Adler/U. Chicago/Wesleyan/JPL-Caltech.

² I'm deliberately using this concept, so rich in meaning, as it was coined and developed by Martin Heidegger in 1927 (2008, for the English translation) in his magnum opus *Sein und Zeit*.

MULTIPLE SPACE-TIME FRAMES

It is the multiplicity of possible space-time frames within which one can contemplate one's existence that makes life interesting. We are not just part of Big History or the entire universe; we also pertain, and do so with different emotions, to smaller—even very small—space-time frames. The crux is to learn to explore them all. Learners—and please accept that we are all learners in the sense that there is not an instant in our lives when we do not learn—should be allowed to shape their mind within a 'learning universe' in which they can create relevant experiences from which to learn in multiple space-time frames. The learning context afforded by the traditional school environment at any level is particularly lacking in this regard. Space is enclosed by the walls of classrooms and time is chopped into segments of 45 or 60 minutes for classroom work; a couple of months for a school term; and a couple of years for the duration of a program. This is probably one of the most effective ways to provoke asphyxia of the mind.

Michel Alhadeff-Jones notes (Hodeck, 2008) with respect to the temporal dimension of space-time: "As soon as you start exploring the multiplicity of temporalities, you discover fascinating dimensions of our life" (p. 4). Obviously, this same observation applies to the multiplicity of spatial frames of reference. An important hurdle to overcome for developing Human Learning in the Anthropocene is that the prevailing learning culture does not encourage people to explore these spatio-temporal multiplicities. Such explorations are essential, though, when it comes to developing a deep understanding of who we are and how we see ourselves against the backdrop of all that came before us, envisioning the roles we may play in creating and shaping disparate futures. UNAWE (n.d.) focuses particularly on young people, in the age bracket from four to 10 years, recognizing the importance for children to start shaping their mind at a very early age. Hopes are, according to UNAWE's vision statement, that "considering the vastness and beauty of the Universe and our place within it provides a special perspective that can help broaden the mind and stimulate a sense of global citizenship and tolerance."

In a similar vein, Giovanni Abrami (2016) argues that Big History "can provide a global insight in the transformational processes acting . . . on our planet" (p. 10). This may help "to envision the possible connections between the past and the future evolution of reality" (p. 10). Awareness of such connections between knowledge of where we come from and visions of where we may be going are particularly relevant in the current geological epoch, the Anthropocene.

If it is not already too late, urgent action is required, and radically different human behavior must emerge, if we wish to avoid that our own species will be among those that we currently see disappearing at rates up to 100 times faster than the normal rate between mass extinctions, the so-called background rate (Ceballos *et al.*, 2015). Similar concerns emanate

from an earlier review by Barnosky *et al.* published in 2011 in the journal *Nature* and several books on this issue (e.g., Kolbert, 2014 and P.R. Ehrlich & A.H. Ehrlich, 1981). If indeed we want to avoid our early demise as a species, pertinent questions arise about the kind of creatures we currently are and how we should transform ourselves. What is necessary to turn us into an animal species that lives in ecological harmony with all other organisms in the earth's biosphere while pursuing, taking advantage of our supposedly superior intelligence, our human mission to contribute constructively to a permanently changing world? That latter question can be phrased differently: How must we transform our mental disposition and seek to understand and become wise? In other words: What, how and when must we learn?

THE MEANING OF LEARNING

The simple question, 'What is learning?' when asked, usually causes embarrassment. While everyone knows the word and uses it frequently, people generally have difficulty explaining what they mean by it. Most responses to the question refer to the experience of having been (or being) in school or some other deliberately designed and organized setting where learning is supposed to take place. But what about the world outside the boundaries of those prearranged learning environments? Does no learning take place there?

A gentleman of fairly advanced age whom I had met for the first time at a conference in 1993, which he had organized on behalf of a non-governmental organization concerned with issues of sustainability, once told me that he had never learned anything. I was surprised. At the time he ran a bookshop, selling used as well as new books. He was very well read himself, had authored books, played the cello, and had made significant contributions to the art and craft of building musical instruments of the past, such as harpsichords and clavichords. Besides, if I remember well, he was once also a child psychologist. When I asked him to clarify what he meant he said that school had had no impact on him whatsoever. He had never learned anything in school. What this gentleman told me was a strong expression of what most people think: learning is what you do in school.

The above anecdote occurred during the early years of the current century at a time when the Learning Development Institute was involved in efforts to clarify the meaning of learning through dialogue among researchers in the learning sciences (the Meaning of Learning project) and by doing research itself, particularly in the context of the Learning Stories research project. The latter project demonstrated that individual learners of all ages, from different cultural backgrounds, whose levels of literacy in diverse areas ranged from illiterate to the highest levels of academic accomplishment, locate their most meaningful learning experiences in life mostly outside the school context (see e.g., J. Visser & Y.L. Visser, 2000; J. Visser, Y.L. Visser, Amirault, Genge, & Miller, 2002).

Clearly, human learning and the development of mind are complex phenomena. Yet, interest and concerns at the socio-political level in the development of human learning focus on formal learning environments in which learning is equated with behavioral change that can be measured in quantitative terms. Thus, serious reflection on the rich meaning of learning, the settings (formal and informal) in which learning evolves along the lifespan, the conditions that allow it to happen, and its importance for the development of mind is in order. Such reflection is an acute necessity in the Anthropocene.

CONSTRUCTIVE INTERACTION WITH CHANGE

I have written extensively on the need to reconceptualize learning in ways that move us beyond the limiting perspectives inherent in current definitions (e.g. J. Visser. & Y.L. Visser, 2000; J. Visser, 2001; J. Visser, 2012). Learning being a complex phenomenon, it is not surprising that an alternative definition of learning that reflects such complexity is itself also complex. Below is a definition of learning, developed on the basis of my work during the 1990's in the context of UNESCO's *Learning Without Frontiers* (LWF) program (UNESCO, 1999). The alternative definition was proposed in 1999 and published in 2001. It states that

“Learning is the disposition of human beings, and of the social entities to which they pertain, to engage in continuous dialogue with the human, social, biological and physical environment, so as to generate intelligent behavior to interact constructively with change” (J. Visser, 2001, p. 453).

The vision embedded in this definition served my needs as director of the LWF program as well as those of my team members in conceptualizing what to focus on when it came to responding to the 21st century learning (not just schooling) needs around the world.

Note the following points regarding this definition:

- Learning is a disposition, a mood of openmindedness, which expresses itself in a permanent attitude to be open to one's environment.
- Learning is something that not only individuals, but also social entities (a family, professional community, country, Internet based group, etc.), engage in.
- Learning is lifelong, not only in the sense that people may, from time to time along the lifespan, engage in formal learning pursuits, but particularly because one interacts continuously with one's human, social, biological and physical environment, questioning it, exploring it, and learning from and with it.

- The purpose of learning is to allow us to become better and better at interacting constructively with changes in our environment while being aware that we are often ourselves the originators of such changes.
- This definition contrasts with traditional definitions of learning which focus on learning gains expressed in changed abilities to perform. By contrast, in the above definition the focus is on learning as a process.

A further difference lies in the fact that traditional definitions are neutral in regard of what one does with the new skills one has acquired. Contrariwise, the proposed alternative definition recognizes that learning has a direction; it can be positive or negative.

PREPARING THE MIND TO UNDERSTAND THE WORLD IN DIVERSE WAYS

The above definition will not replace existing ones. Rather, it will be complementary to traditional definitions that focus on more narrowly delineated aspects of human learning, such as the development of measurable skills. There is plenty of reason and opportunity for work in that area of interest to continue, but it is a limited area of interest from the perspective of Human Learning in the Anthropocene. It is limited, because it does not foresee a connection between the skills that are being developed and an outcome in terms of constructive interaction with change. Nor is there any recognition of the fact that we spend more time learning outside the context of deliberately designed learning settings than inside such environments. Human Learning in the Anthropocene must be seen in a different light.

Because of the misconceptions about learning, the discourse and practice surrounding it have for a long time had a strong, almost exclusive, focus on the development of relatively uncomplicated skills in the cognitive and/or motor domains. Kieran Egan (2008) sees education as a "process in which we maximize the tool kit we individually take from the external storehouse of culture" (p. 40). Though Egan is in the first place interested in the school, I take the term 'education' to comprise any kind of learning, whether deliberately self-chosen, culturally expected, state enforced or facilitated, or accidentally engaged in. Egan's affirmation then makes sense. The accelerated evolution of our species at its current stage of development is to a much greater extent determined by our ability to interact with the cultural legacy to which our ancestors contributed than by the genomic heritage they left behind. This sets us apart from any other species in the animal kingdom. It is the reason why the particular development our brains have undergone is the greatest gift we owe to evolution.

The tools Egan refers to are cognitive tools, the kind of mental faculties that "enable the brains to do cultural work" (p. 40). In fact, these tools are themselves part of the cultural heritage of humankind. One acquires the tools and the abilities associated with their usage by interacting with that cultural heritage. Hence Egan's above cited notion of education. He identifies these

Kind of understanding	How it works
Somatic	Bodily experience.
Mythic	Awareness of the known as embedded in the unknown; mystery; awe; metaphor.
Romantic	Identification with heroes; association with the transcendent qualities the heroes embody.
Philosophical	The world of ideas; conceptual frameworks; abstractions.
Ironic	Recognition of different meanings through different kinds of understanding; humor; ambiguity.

tools in the context of five different kinds of understanding, i.e., somatic, mythic, romantic, philosophical, and ironic understanding. The adjacent table provides a quick overview of these five kinds of understanding. A much more elaborate rationale can be found in Chapter 3 of Egan's book.

We develop the cognitive tools in these five domains successively as we grow more mature in our understanding of the world. However, as we become mentally more sophisticated, we mustn't throw out prior ways of understanding as we develop the cognitive tools associated with new ways of understanding. As we progress through life we need them all. We must keep the prior tools in our tool kit as we are continually in need of understanding the world in complex ways and from multiple perspectives.

Egan's idea of 'cognitive tools that allow the brains to do cultural work' leading to different kinds of understanding is based on a conception of the mind as "an ambivalent thing, made up of culture drawn from outside the organism and of cognition within" (p. 84). It creates a framework for thinking about educational reform based on a scheme that "combines epistemological, psychological and emotional characteristics together" (p. 84).

Contemplating my own history as a lifelong learner in different domains of personal growth, I can clearly see how these different modes of understanding played out in my life. Currently, as over the past 23 years I walked three times around the earth and am well on my way to do it again for the fourth time (J. Visser, n.d.), I am sometimes surprised by how my bodily awareness of the small size of our planet has grown. It has had a tremendous impact on my thinking about and emotional engagement with matters of ecology and sustainability. I have flown millions of miles in my life and must have rounded the earth countless times using that means of transport, but it left no impression. One needs to walk and do other bodily things to learn in the flesh and understand one's world from a somatic perspective.

BIG QUESTIONS

To feel the full brunt of what it means to be alive and learn in the Anthropocene, such somatic experiences as I just described may be essential to bring about the required fundamental change in our way-of-being-in-the-world. Such experiences all of a sudden give a differently felt meaning to the questions we ask, big question such as the ones that I wish to share with my readers in this section.

It takes time for the really big questions to start driving scientific research agendas. Before that happens they may be part of philosophical and religious questioning and they may

inspire the arts: music, poetry, painting, literary prose, graphic art, photography, videography, cinematography, theatrical art, digital art, etc. The question ‘What is life and what does it mean to be alive?’ only became a prompt to serious scientific research when it was raised by Erwin Schrödinger in his 1943 series of public lectures delivered at Trinity College in Dublin (Schrödinger, 1944). The beginning of a serious and rigorous scientific pursuit to not only understand life but to understand as well how and under what circumstances it may emerge, on earth and elsewhere, is even more recent (Hazen, 2002).

The probably most intriguing, most overwhelming, most all-encompassing and most important brief series of questions that drive members of the human species to seek understanding—*Where do we come from? What are we? Where are we going?*— can be found inscribed (in French) at the top left hand corner of Gauguin’s 1897 painting with that same long title (Fig. 2 below).



Figure 2: Paul Gauguin's 1897 painting "D'où Venons Nous? Que Sommes Nous? Où Allons Nous?" (Source: Wikimedia Commons)

These are questions so big that they appear to be timeless. They have always, one way or the other, been present, as in the scenes depicted in Gauguin’s painting, in the minds of people as they go about their business as usual. Thousands and thousands of years prior to Gauguin’s masterpiece, we find similarly intriguing representations of our human ancestors going about their business as usual (Fig. 3 below – next page). No other symbol system being available at the time, we can only imagine the questioning that was on the mind of the rock artists who produced these works. The invented title that captions the work is therefore mine.

We—our present generation and those we identify with from the two or three generations that went before us and the few that we can still envision coming after us—also go on with our business as usual. But it can’t go on like that. The question ‘*Where are we going?*’ is no longer

timeless. Instead, it's the timeliest question we should ask in the Anthropocene. It's the question to be put on the table *right now*! It's time to start doing business as unusual.



Figure 3: Who are we, among all that lives? Rock art from the Serra Da Capivara, Piauí, Brazil. (Photo credit: Author.)

NOT BY BIG HISTORY ALONE

To more deeply understand where we are (or could be) going, Big History, as it is currently formulated, taught and learned, has made important inroads, but it is not enough for the full understanding of our being-in-the-world. Other histories, embedded in diverse space-time frames, remain equally important. In fact, as argued above, it is through the exploration of the multiplicity of space-time frames that fascinating dimensions of our existence come to life. In that sense, the history of Big History, the exploration of how our views about our home in the universe have changed over time, particularly, for instance, over the past century (see e.g. Kirshner, 2013), may provide as important an insight as Big History itself. In general, the exploration in diverse spatio-temporal contexts of human thought, of religious perceptions of being, of philosophical questioning, of scientific pursuit, of technological development, of artistic expression and of different ways to inhabit space and explore resources, to name but a few alternate histories of importance, can open one's eyes to unknown horizons. So, while you are here, and if you have the time, don't forget to explore the art works displayed in the Rijksmuseum, the Stedelijk Museum, and the Van Gogh Museum. Don't leave this city before you have explored and bodily experienced the unique concentric urban organization so typical of this city. Read in Albert Camus' novel *La Chute* (The Fall) a literary description and

interpretation of that particular urban organization. Explore Amsterdam's beautiful architecture and feel it in the flesh. Preferably, do all those things walking so as to enhance the impact of the experience. Then take a train ride to the city of Rotterdam (less than an hour away) and experience the beauty of modern architecture in a totally dissimilar spatial context against the backdrop of starkly different historical events that marked that city's way of being. And while you are there, don't forget to visit the Museum Boymans-Van Beuningen.

I could go on and on, but rather leave it to your imagination to engage in such explorations. As we are all different, have different histories and come from different cultural backgrounds, our footpaths to understanding will be different as well. Ah, that makes it even more interesting! It is thanks to our interaction with such diversity that new things emerge.

A BOUQUET OF WILDFLOWERS

Deep understanding of where we come from and where we currently stand is an essential condition for envisioning our futures. These possible futures lie in the Anthropocene, an uncertain spatio-temporal context. As far as human learning is concerned there are clear signs that we have arrived at the frontier of yet uncharted terrain—*terra incognita* on the map of the learning universe in which earthlings live. Since I first thought of Human Learning in the Anthropocene as an interesting new area of exploration for the learning sciences, I have been trying to get an initial glimpse of this unknown land and scouted the terrain. While doing so, I came across some interesting wildflowers. I think they are worth looking at. I am therefore arranging them here for you in a small bouquet. They have the following names:

Transdisciplinarity; Multiplicity of spatio-temporalities; Order of magnitude; Mathematics; Metaphor; and Sense of beauty. Here they are.

Transdisciplinarity. This flower invites us to consider the magnitude and complexity of problems humanity is facing. They are various. The most acute ones are those that affect the entire planet. Some of them, like the existence of war, lack of mutuality in relationships between diverse groups of humans, exploitation, and unequal sharing in the benefits of humanity's achievements are as old as humanity itself. Others, such as the explosive growth of the world population, depletion of the earth's natural resources, loss of biodiversity, human impact on the toxicity of the environment, and human induced climate change are recent ones. Yet other problems such as the occurrence of hunger epidemics, the emergence of terrorism, pandemic outbreaks of diseases, and spontaneous mass migrational movements across geopolitical boundaries are usually transient, but they keep coming back, now here, then there. Usually, these problems interact with each other as they are part of a complex web of occurrences. Attempts to bring problems under control one at a time fail in such cases. Complex thinking is needed to

interact with the complexity of the problem situation. One needs to look at problems from a much broader perspective, often trying to forget for a while what one knows in a single area of concern so as to free the mind to open up and become creative at a higher, more all-encompassing, level of concern. Progress in this area is already being made at the level of higher education in different places around the world, including the university with which I am affiliated, Stellenbosch University in South Africa. In the area of sustainability studies, doctoral students may choose to work on complex, also called wicked, problems that require the collaborative involvement of university departments that are traditionally starkly separated (Muhar, J. Visser, & Van Breda, 2013). Considering the kind of problems humans will increasingly have to interact with in the Anthropocene, there is every reason to start creating a transdisciplinary mindset much earlier. In fact, that mindset is already present when humans are born. However, it is discouraged from further evolving in most formal education settings.

Multiplicity of spatio-temporalities. We met this flower already. It invites those who stand in awe of its beauty to contemplate their existence, and thus develop their way-of-being-in-the-world, aware of the rich multiplicity of spatio-temporal contexts in which their being is embedded. Note that this does not come automatically. It requires the development of a disposition of openness, a general willingness, even eagerness, to explore the things one is not yet familiar with.

Order of magnitude. This flower brings us back to Koestler's remarks cited at the beginning of this paper. Thinking in terms of orders of magnitude comes natural to the physicist. Variation that can be expressed in terms of units may be of interest, but one considers to be possibly looking at developments of a different order when variation occurs at a rate that is expressed in terms of tens, or hundreds, or thousands. In other words, the "uncanny properties of exponential curves" (Koestler, 1967, p. 317) can be made to appear as less eerie as soon as one can switch one's mind to viewing the world from a logarithmic perspective. The difficulty to develop that mental skill was well recognized by Dutch reformist educator Kees Boeke. His book *Cosmic view: The universe in 40 jumps* (Boeke, 1957) was an attempt (with limited success) to instill this way of looking at things in relatively young children (5th grade and higher). More work on how to best develop this habit of mind is needed. It will involve taking a serious look at how mathematics is being taught and learned in the formal school environment. It will equally involve the exploration of opportunities to acquire and consolidate such mental habits in daily life.

Mathematics. This flower looks threatening to many people, in part because mathematics isn't an easy subject, but in part also because the way in which it is being taught in schools to unmotivated youngsters leaves much to be desired. Richard Feynman (1964) refers to the

immense value of mathematics as a unique means for people “to get across a real feeling as to the beauty, the deepest beauty, of nature.” It’s the language nature speaks. Appreciating the beauty of nature for those who do not know the language she speaks is as difficult as discovering the beauty of music for those who haven’t become accustomed to the language of music. Over the years the Learning Development Institute has made a modest attempt at providing learning resources for those who want to appreciate the beauty of nature as it is expressed in mathematical language. A full series of ‘*Basic Books in the Physical Sciences*,’ books that start at the beginning, authored by Roy McWeeny, emeritus professor in theoretical chemistry at the University of Pisa, is freely accessible via the Web site of the Institute (McWeeny, n.d.). Another interesting development in this area is the work of the Khan Academy (n.d.).

Metaphor. The seeds for this flower must have found fertile soil in our *terra incognita* after having been carried there by the winds from our known world. They were generated by George Lakoff and Mark Johnson (1999) who stress that the mind is embodied and that the nature of our thought processes, the structure of how we think, emanates from bodily experiences that find expression in unconscious metaphors. Bodily experiences are the foundation on which we stand when we understand.

Sense of beauty. This is a tiny flower, which was difficult to find because the sense of what is beautiful (aesthetics) and what is valued (ethics) has hitherto not been recognized enough for how, when it is present, it may keep us from doing the wrong things. Without the sense of beauty present in us, it will be hard to feel the pain when, for instance, one sees underwater video footage of the damage gradually but irreversibly done to the Great Barrier Reef or when one realizes that one does no longer hear the sounds of silence but instead the sounds of motorized traffic.

This is just a handful of wildflowers I was able to pick during a hasty exploration of the land I want to know better. But I had to finish this paper in time to present it. Further exploration is needed.

In haste, a final remark.

WE LIVE IN INTERESTING TIMES

Human Learning in the Anthropocene looks like a forbidding area of exploration, research and development. However, unless one wishes to deny the reality of what determines our current epoch, anything we now do takes place anyway, whether we wish to recognize it or not, in the context of the Anthropocene. This may sound like a somber remark, intended to scare

the reader. It is not. My intention with this paper is to invite you to embrace the times in which we live and recognize that few, if any, people during human history have met challenges of a magnitude we are now facing. These are interesting times. The magnitude of the problems we are facing is difficult to imagine. However, for those adventurous enough to engage with such problems, the magnitude of the challenge is often proportionate to the pleasure one experiences in meeting it.

REFERENCES

- Abrami, G. (2016). Perspectives of a new periodization for Big History. *Origins*, 6(7) 4-10.
Retrieved from http://ibhanet.org/Resources/Documents/Origins/Origins_VI_07.pdf.
- Barnosky, A. D. *et al.* (2011). Has the Earth's sixth mass extinction already arrived? *Nature*, 471, 51-57.
- Big History Project. (n.d.). Retrieved from <https://www.bighistoryproject.com/home>.
- Boeke, K. (1957). *Cosmic view: The universe in 40 jumps*. New York: The John Day Company.
Retrieved from <http://www.vendian.org/mncharity/cosmicview/>.
- Ceballos, G. *et al.* (2015). Accelerated modern human-induced species losses: entering the sixth mass extinction. *Science Advances*, 1(5) e1400253. Retrieved from <http://advances.sciencemag.org/content/1/5/e1400253.full>.
- Christian, D. (1991). The case for 'Big History.' *Journal of World History*, 2(2) 223-238.
- Egan, K. (2008). *The future of education: Reimagining our schools from the ground up*. New Haven and London: Yale University Press.
- Ehrlich, P. R. & Ehrlich, A. H. (1981). *Extinction: The Causes and Consequences of the Disappearance of Species*. New York: Random House.
- Feynman, R. (1964). Messenger Lectures on "The Character of Physical Law" (video). Retrieved from <http://www.cornell.edu/video/playlist/richard-feynman-messenger-lectures>.
- Hazen, R. M. (2002). Emergence and the origin of life. In G. Pályi, C. Zucchi, Caglioti, L. (Eds.), *Fundamentals of life*. Paris: Elsevier, Éditions scientifiques et médicales.
- Heidegger, M. (2008). *Being and Time*. New York: HarperCollins Publishers.
- Hodeck, M. (2008). "Every Moment Is a Learning Time": Conversation with Michel Alhadeff-Jones, Teacher Writers for a Public Voice. *"Inter-View" Bulletin*, 3(3-4), 3-7.

- Khan Academy (n.d.). Web site of the Khan Academy offering free resources to learn anything. Retrieved from <https://www.khanacademy.org/>.
- Kirshner, R. (2013). The Beauty of the Accelerating Universe (Video). In *AAAS Annual Meeting 2013 Plenary Lectures*. Retrieved from <http://www.aaas.org/page/2013-plenary-lectures>.
- Koestler, A. (1967). *The ghost in the machine*. London, UK: Hutchinson & Co.
- Kolbert, E. (2014). *The Sixth Extinction: An Unnatural History*. New York: Henry Holt and Company.
- Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh: The embodied mind and its challenge to western thought*. New York: Basic Books.
- McWeeny, R. (n.d.). *For the love of science*. Web-based repository of a series of *Basic Books in Science: "Science as a Creative Adventure of the Mind."* Retrieved from <http://www.learndev.org/ScienceWorkBooks.html>.
- Muhar, A., Visser, J., & Van Breda, J. (2013). Experiences from establishing structured inter- and transdisciplinary doctoral programs in sustainability: a comparison of two cases in South Africa and Austria. *Journal of Cleaner Production*, **69**, 122-129.
- Schrödinger, E. (1944). *What is life? - The physical aspect of the living cell*. Cambridge, UK: Cambridge University Press.
- UNAWA (n.d.). Web site of the Universe Awareness project. Retrieved from <http://www.unawe.org>.
- UNESCO (1999). *Learning Without Frontiers*. Retrieved from <http://www.unesco.org/education/lwf/>.
- Vilmoare, B. *et al.* (2015). Early Homo at 2.8 Ma from Ledi-Geraru, Afar, Ethiopia. *Science*, **347**(6228), 1352-1355.
- Visser, J. (2001). Integrity, completeness and comprehensiveness of the learning environment: Meeting the basic learning needs of all throughout life . In D. N. Aspin, J. D. Chapman, M. J. Hatton and Y. Sawano (Eds.), *International Handbook of Lifelong Learning* (pp. 447-472). Dordrecht, The Netherlands: Kluwer Academic Publishers.
- Visser, J. (2012). Developing learning to meet complex challenges for an undivided world. In R. A. Reiser & J. V. Dempsey (Eds.), *Trends and issues in instructional technology* (3rd ed., pp. 229-238). Boston: Pearson Education, Inc.

- Visser, J. (n.d.). *Walking: A way of being*. Personal Web page. Retrieved from <http://www.learndev.org/People/JanVisser/Walking.html>.
- Visser, J. (2012). Reflections on a Definition: Revisiting the Meaning of Learning. In D. N. Aspin, J. Chapman, K. Evans, & R. Bagnall (Eds.), *Second International Handbook of Lifelong Learning* (pp. 163-180). Dordrecht, Heidelberg, London, New York: Springer.
- Visser, J., & Berg, D. (1999). Learning without frontiers: Building integrated responses to diverse learning needs. *Educational Technology Research and Development*, 47(3), 102-114.
- Visser, J., & Visser, Y.L. (2000). In search of the meaning of learning. *TechTrends*, 44(3) 18-21.
- Visser, J., & Visser, Y.L. (2000). On the difficulty of changing our perceptions about such things as learning. Paper presented at the Presidential Session on *In Search of the Meaning of Learning* (J. Visser, Chair) at the International Conference of the Association for Educational Communications and Technology, Denver, CO.
- Visser, J., Visser, Y. L., Amirault, R. J., Genge, C. D., & Miller, V. (2002). *Second order learning stories*. Paper presented by at the Annual Meeting of the American Educational Research Association (AERA), New Orleans, Louisiana, April 1–5, 2002.