

# Design for Human Learning in the Anthropocene

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*Pristine earth*

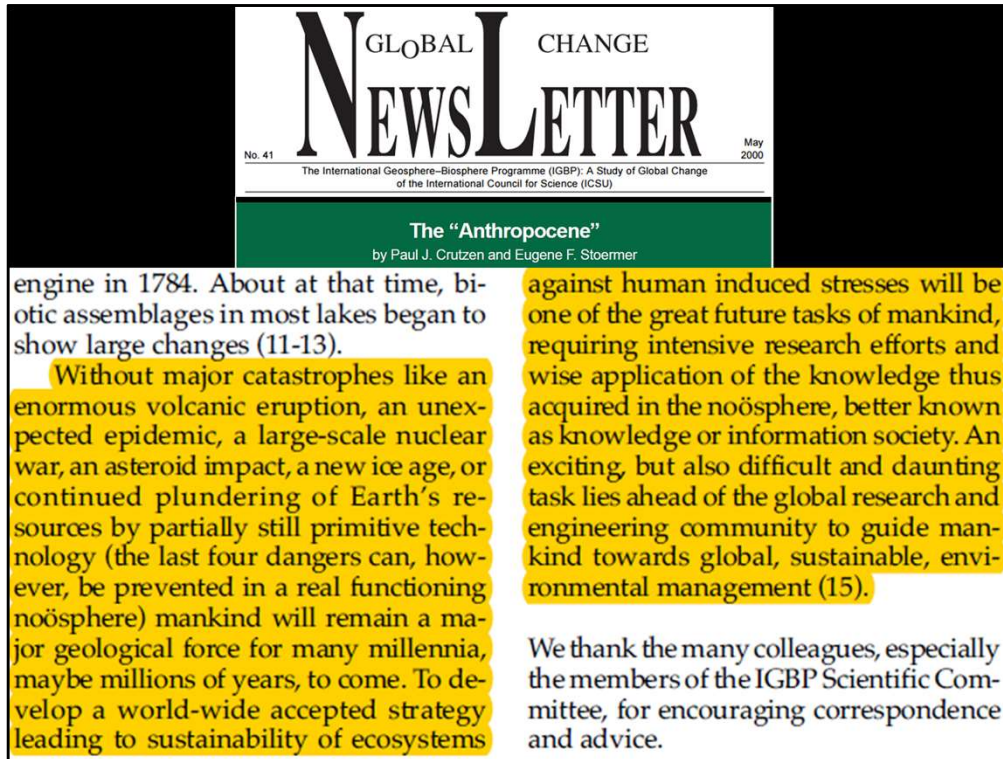
Photo credit: Jan Visser

Presidential workshop and panel session at the Annual Convention of the Association for Educational Communications and Technology, Las Vegas, NV, October 17 to 21, 2016.

Earth started to come into being almost 4.6 billion years ago. Cooling down and formation of a more or less reliable crust still took hundreds of millions of years. Emergence of earliest forms of life may date back to 3.8 Ga, marking the beginning of the evolution of life. Only some two to three million years ago the first members of the genus *Homo* appear on the scene. Human history as we know it, as it relates to the colonization by *Homo sapiens* of the different continents, goes back to some 50,000 years ago. It changed the face of Earth dramatically.

Consequently, Earth didn't always look like what we see now. One is reminded of this long ago past when, while being alone, one stands in awe of geological formations like the ones depicted in this slide. I took the photograph at the southernmost tip of Africa, the continent from where we are believed to have originated.

More detail at [https://en.wikipedia.org/wiki/History\\_of\\_Earth](https://en.wikipedia.org/wiki/History_of_Earth) and [https://en.wikipedia.org/wiki/Timeline\\_of\\_the\\_evolutionary\\_history\\_of\\_life](https://en.wikipedia.org/wiki/Timeline_of_the_evolutionary_history_of_life).



May 2000: Paul Crutzen (atmospheric chemist, Nobel Laureate Chemistry 1995) and Eugene Stoermer (biologist) propose the term 'Anthropocene' in the Global Change Newsletter of the International Geosphere-Biosphere Programme (IGBP).

GLOBAL CHANGE  
**NEWSLETTER**  
 No. 41 May 2000  
 The International Geosphere-Biosphere Programme (IGBP): A Study of Global Change of the International Council for Science (ICSU)

**The "Anthropocene"**  
 by Paul J. Crutzen and Eugene F. Stoermer

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 leading to sustainability of ecosystems

To develop a world-wide accepted strategy leading to sustainability of ecosystems against human induced stresses will be one of the great future tasks of mankind, requiring intensive research efforts and wise application of the knowledge thus acquired in the noosphere, better known as knowledge or information society.

We thank the many colleagues, especially the members of the IGBP Scientific Committee, for encouraging correspondence and advice.

Some lines stand out.

## Anthropozoic concerns: Not new

The name Holocene (“Recent Whole”) for the post-glacial geological epoch of the past ten to twelve thousand years seems to have been proposed for the first time by Sir Charles Lyell in 1833, and adopted by the International Geological Congress in Bologna in 1885 (1). During the Holocene mankind’s activities gradually grew into a significant geological, morphological force, as recognised early on by a number of scientists. Thus, G.P. Marsh already in 1864 published a book with the title “Man and Nature”, more recently reprinted as “The Earth as Modified by Human Action” (2). Stoppani in 1873 rated mankind’s activities as a “new telluric force which in power and universality may be compared to the greater forces of earth” [quoted from Clark (3)].

Stoppani already spoke of the anthropozoic era. Mankind has now inhabited or visited almost all places on Earth; he has even set foot on the moon.

The great Russian geologist V.I. Vernadsky (4) in 1926 recognized the increasing power of mankind as part of the biosphere with the following excerpt “... the direction in which the processes of evolution must proceed, namely towards increasing consciousness and thought, and forms having greater and greater influence on their surroundings”. He, the French Jesuit P. Teilhard de Chardin and E. Le Roy in 1924 coined the term “noösphere”, the world of thought, to mark the growing role played by mankind’s brainpower and technological talents in shaping its own future and environment.

‘Noösphere’ is the name for a postulated sphere or stage of evolutionary development dominated by consciousness, the mind, and interpersonal relationships (frequently with reference to the writings of Teilhard de Chardin).

‘Anthropozoic’ = Of the time of the existence of man.

## Proposed beginning: Late 18<sup>th</sup> century

This is "...the period when data retrieved from glacial ice cores show the beginning of a growth in the atmospheric concentrations of several 'greenhouse gases', in particular CO<sub>2</sub> and CH<sub>4</sub>."

"Such a starting date also coincides with James Watt's invention of the steam engine in 1784."

From EPA Web site <https://www.epa.gov/ghgemissions/overview-greenhouse-gases>):  
**Carbon dioxide (CO<sub>2</sub>)**: Carbon dioxide enters the atmosphere through burning fossil fuels (coal, natural gas, and oil), solid waste, trees and wood products, and also as a result of certain chemical reactions (e.g., manufacture of cement). Carbon dioxide is removed from the atmosphere (or "sequestered") when it is absorbed by plants as part of the biological carbon cycle.  
**Methane (CH<sub>4</sub>)**: Methane is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices and by the decay of organic waste in municipal solid waste landfills.  
And there are other greenhouse gases, such as **Nitrous oxide (N<sub>2</sub>O)** and **Fluorinated gases**.

## Sixth mass extinction:

A question of life and death, also for us, as a species.

- Barnosky, A. D., *et al.* (2011). Has the Earth's sixth mass extinction already arrived? *Nature*, 471, 51-57.
- Kolbert, E. (2014). *The sixth mass extinction: An unnatural history*. New York: Henry Holt and Company.
- 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>.

Should we care? Should the Anthropocene last long or be short-lived? Are there reasons why we should be concerned about the preservation of intelligent life? If so, what are such reasons? What can we do if we want to do anything at all?

Just the tip of the iceberg of increasing evidence that we may be in trouble.

Pertinent questions must be asked.

## Complexity

- Not just difficult, but convoluted.
- Essential problems can no longer be approached in a linear fashion.
- The brain is self-organized to deal with complexity. However, most deliberate learning practices focus predominantly on the development of its cognitive functioning. The brain is itself a complex organ.\* It constitutes an integrated whole, which in turn is part of a complex integral human organism.

\*The order of magnitude of neurons in the brain was long thought to approach that of the number of galaxies in the universe or that of stars per galaxy ( $10^{11}$ ). However, recent findings (<http://www.nature.com/news/universe-has-ten-times-more-galaxies-than-researchers-thought-1.20809>) suggest that the number of galaxies in the universe is much higher.

“Complexity results from the inter-relationship, inter-action and inter-connectivity of elements within a system and between a system and its environment. Murray Gell-Mann, in “Complexity” Vol. 1, No. 5, 1995/96, traces the meaning of complexity to the root of the word. Plexus means braided or entwined, from which is derived complexus meaning braided together, and the English word “complex” is derived from the Latin. Complexity is therefore associated with the intricate inter-twining or inter-connectivity of elements within a system and between a system and its environment.” (See <http://web.mit.edu/esd.83/www/notebook/Complex%20Adaptive%20Systems.pdf>; the quote is referenced to Eve Mitleton-Kelly, “Organisations as Co-evolving Complex Adaptive Systems,” British Academy of Management Conference, 1997).

A recent study (<https://www.theguardian.com/science/blog/2012/feb/28/how-many-neurons-human-brain>) puts the number of neurons in the brain at 86 billion, thus challenging the long-held belief. Nonetheless, the number of brain neurons remains impressive.

## Complex Adaptive Systems (CAS)

Problems that are complex in the sense we defined can no longer be addressed if we disentangle the internal relationships. They need to be addressed in a complex manner. They are sometimes called 'wicked problems' (Rittel and Webber, 1973). They call for complex thinking (Morin, 1999).

CAS 'learn' (interact adaptively) through contact with other CAS.

Individual human beings are CAS. So are the social entities (groups, corporations, communities, societies, etc.) they constitute.

A Complex Adaptive System (CAS) is an "Entity consisting of many diverse and autonomous components or parts (called agents) which are interrelated, interdependent, linked through many (dense) interconnections, and behave as a unified whole in learning from experience and in adjusting (not just reacting) to changes in the environment. Each individual agent of a CAS is itself a CAS: a tree, for example, is a CAS within a larger CAS (a forest) which is a CAS in a still larger CAS (an ecosystem). Similarly a member of a group is just one CAS in a chain of several progressively encompassing a community, a society, and a nation. Each agent maintains itself in an environment which it creates through its interactions with other agents."

"Every CAS is more than the sum of its constituting agents and its behavior and properties cannot be predicted from the behaviors and properties of the agents. CAS are characterized by diffused (distributed) and not centralized control and, unlike rigid (mechanistic) systems, they change in response to the feedback received from their environment to survive and thrive in new situations. In inanimate world many phenomenon (*sic*) behave as CAS, such as fashion trends, stock markets, traffic jams." (See <http://www.businessdictionary.com/definition/complex-adaptive-system-CAS.html>.)

### References:

- \* Horst Rittel and Melvin Webber (1973). Dilemmas in a General Theory of Planning. Policy Sciences 4 (1973), 155-169. Retrieved from [http://www.uctc.net/mwebber/Rittel+Webber+Dilemmas+General\\_Theory\\_of\\_Planning.pdf](http://www.uctc.net/mwebber/Rittel+Webber+Dilemmas+General_Theory_of_Planning.pdf).
- \* Edgar Morin (1999). Seven complex lessons in education for the future. Paris, France: UNESCO. Retrieved from <http://unesdoc.unesco.org/images/0011/001177/117740eo.pdf>.



## Learning redefined for the Anthropocene

*“Human 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).\*

\* See for original publication: 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. (Pre-publication draft available at [https://www.researchgate.net/publication/227022245\\_Integrity\\_Completeness\\_and\\_Comprehensiveness\\_of\\_the\\_Learning\\_Environment\\_Meeting\\_the\\_Basic\\_Learning\\_Needs\\_of\\_All\\_Throughout\\_Life](https://www.researchgate.net/publication/227022245_Integrity_Completeness_and_Comprehensiveness_of_the_Learning_Environment_Meeting_the_Basic_Learning_Needs_of_All_Throughout_Life).)

See also:

[https://www.researchgate.net/publication/308612239\\_Human\\_Learning\\_and\\_the\\_Development\\_of\\_Mind\\_in\\_the\\_Anthropocene\\_Reflections\\_against\\_the\\_Backdrop\\_of\\_Big\\_History\\_-\\_Published\\_version\\_in\\_%27Origins%27\\_VI\\_09\\_October\\_2016](https://www.researchgate.net/publication/308612239_Human_Learning_and_the_Development_of_Mind_in_the_Anthropocene_Reflections_against_the_Backdrop_of_Big_History_-_Published_version_in_%27Origins%27_VI_09_October_2016).

The vision embedded in the above 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 21<sup>st</sup> 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.

## Science once again seen as the pursuit to understand, and do so deeply

This requires a mindset, the scientific mind, the building of which is

*a lifelong process of human development to acquire a way of being in and of the world, inspired by the heritage of the millennia-long history of the human pursuit of knowledge (scientia) for the advancement of understanding and wisdom, comprising*

- *habits of thinking and dispositions in approaching the world, as well as*
- *values, ethical concerns, aesthetic considerations, and attitudes, alongside*
- *mastery of a complex array of skills and mental capabilities in select domains, with such 'select domains' depending on an individual's interests and prospective needs and desires, which are different for, e.g., a carpenter, a theoretical physicist, or a musician.*

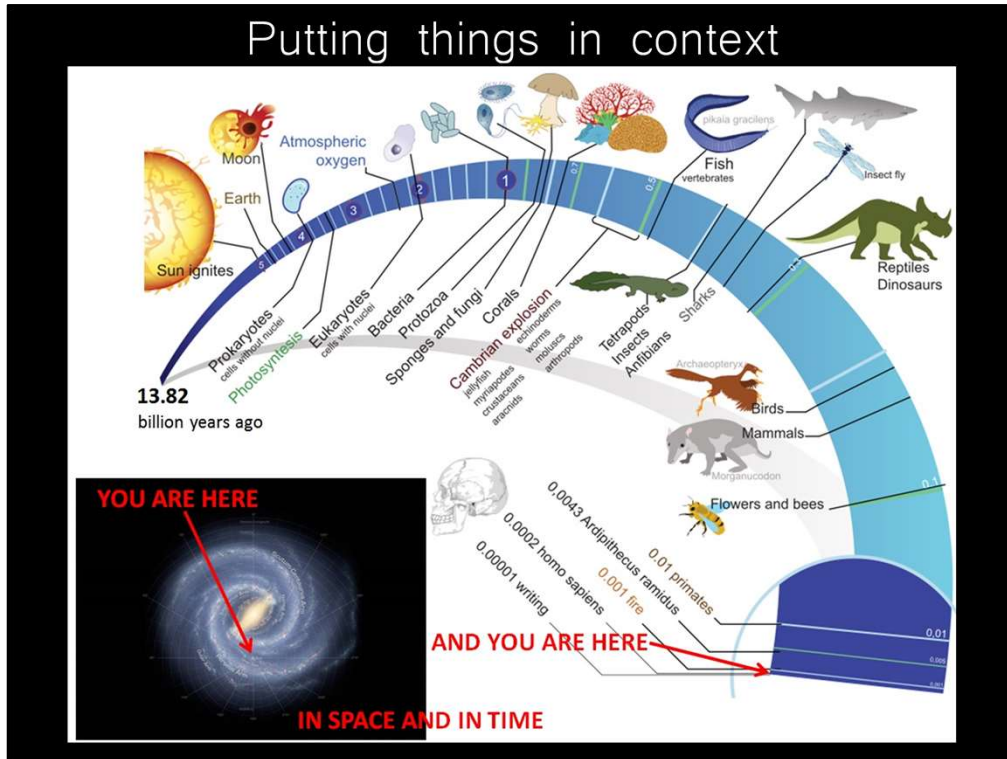
See: [http://www.learndev.org/dl/BtSM2015/Two%20things%20commanding%20attention%20\(J.Visser\).pdf](http://www.learndev.org/dl/BtSM2015/Two%20things%20commanding%20attention%20(J.Visser).pdf)

The description of what is involved in the lifelong effort to build the scientific mind reflects the 10-year long transcultural and transdisciplinary dialogue the Learning Development Institute promoted around the world.

See: <http://www.learndev.org/BtSM%202005-2015.html>.

Note that in the above description:

- I avoid using the word 'mind' as it is too easily interpreted in the Cartesian sense of the term. Instead, I have replaced it with the phrase 'way of being in and of the world.' This formulation emphasizes the intimate relationship between us as human beings and the world of which we are an inseparable part.
- I avoid the word 'science' as it is too easily interpreted in terms of its too narrow reference to the body of knowledge pertaining to disciplines such as physics, biology and chemistry. Such narrow interpretation of the word 'science' should probably be attributed to the coining by Whewell in 1833 of the term 'scientist' to designate professionals working in these areas. Consequently, building the scientific mind is then seen as a concern limited to reform in science education and relevant to those who eventually become scientists.
- I refer to mastery of skills not as an autonomous goal of the building of the scientific mind but as an important means in the process of shaping the envisioned 'way of being in and of the world.'
- I also refer to the building of the scientific mind as a continual process, which, just the same as in the case of learning, evolves along the lifespan.



We live in a four-dimensional world

## Temporalities of different orders of magnitude

Time frame in years	Object of evolution
1	US presidential campaigns
10	Recent financial crisis
300	String quartet
6,000	Urbanization
40,000	Religious practices
200,000	Homo sapiens
3,000,000	Genus Homo
200,000,000	Mammals
3,800,000,000	Terrestrial life
13,820,000,000	Universe

“As soon as you start exploring the multiplicity of temporalities, you discover fascinating dimensions of our life.” Michel Alhadeff-Jones in an interview (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.)

Alhadeff-Jones, M. (2017). *Time and the Rhythms of Emancipatory Education: Rethinking the temporal complexity of self and society*. London, UK: Routledge (forthcoming).

During almost four billion years things on Earth have been changing at an evolutionary pace (which is very slow). With the emergence of Homo sapiens sapiens change became no longer exclusively determined by the speed of evolutionary processes. In addition to inheriting genes, next generations started to inherit the cultural heritage of the past, which changes much faster.

## The changing rate of change

Change in the rate of change has long gone unnoticed. Arthur Koestler drew attention to it in 1967.

*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)

Source: Koestler, A. (1967). *The Ghost in the Machine*. London: Hutchinson & Co.

## The changing rate of change

Slightly earlier the urgency to change with change (adaptive interaction) had already been noted in a major literary work:

*Come gather 'round people  
Wherever you roam  
And admit that the waters  
Around you have grown  
And accept it that soon  
You'll be drenched to the bone  
If your time to you  
Is worth savin'  
Then you better start swimmin'  
Or you'll sink like a stone  
For the times they are a-changin'.*

Source: Dylan, B. (1964). *The times they are a-changin'*. New York: Columbia Records.

## What can we do? What should we focus on?

**Main focus: Design for learning.**

We must thus ask ourselves questions about

- the nature of design,
- current design practice in our field,
- tendencies (if any) to change,
- the desired focus of design (learning or instruction or whatever else), and
- prospects for our adaptive involvement.

## What can we do? What should we focus on?

Derived foci:

- 1) Meaning of Learning, and
- 2) Transformative Human Development.

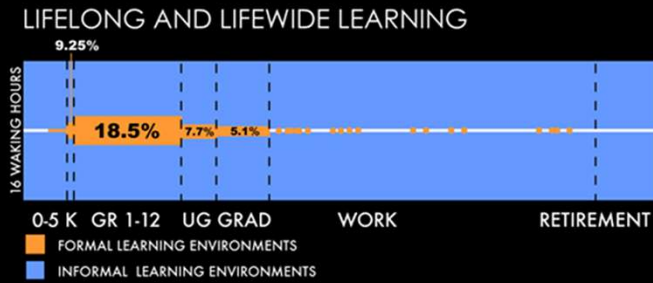
Detail: See next two slides.



# Meaning of Learning:

What can we do? What should we focus on?

- **Consider** my earlier suggestions regarding the (re)definition of Human Learning for the Anthropocene and about Building the Scientific Mind.
- Consider the views of the LIFE Center. (University of Washington)



- **Consider** that learners of all ages, from different cultural backgrounds, with levels of literacy in diverse domains ranging from illiterate to the highest levels of academic achievement, locate their life's most meaningful learning experiences outside the school context. (Learning Stories Research project, Learning Development Institute)

Credit for graphic: LIFE Center's Lifelong and Lifewide Diagram ([http://life-slc.org/img/life\\_longwide\\_vr2009\\_500.gif](http://life-slc.org/img/life_longwide_vr2009_500.gif) - CC-by-no-nd).

# Transformative Human Development:

What can we do? What should we focus on?

- **Consider** that human development is a lifelong process [e.g. Kegan, R. (1982). *The evolving self: Problem and process in human development*. Cambridge, MA: Harvard University Press].
- **Consider** the tradition/literature about the German concept 'Bildung' [Lene Anderson's forthcoming book with Tomas Björkman (<http://www.nordicsecret.org/>)].
- **Consider** the role of diversity in the experience of temporal, rhythmic and spatial frameworks while learning in a context of complexity [Alhadeff-Jones (2017)]. *Time and the Rhythms of Emancipatory Education: Rethinking the temporal complexity of self and society*. London, UK: Routledge (forthcoming); Visser, J. (2016). Human learning and the development of mind in the Anthropocene. *Origins*, VI (09) 3-12].
- **Consider** the need for transformative strategies in learning and the need to overcome our immunity to change [Alfonse Montuori to suggest sources; Kegan, R. & Lahey, L.L. (2009). *Immunity to change: How to overcome it and unlock the potential in yourself and your organization*. Cambridge, MA: Harvard Business School Publishing Corporation].
- **Consider** the need to focus on complex and critical thinking and skepticism [Morin, E. (1999). *Seven complex lessons in education for the future*. Paris, France: UNESCO; Literature overviews at <https://nodesci.net/blog/2015/05/13/literature-on-skepticism-critical-thinking-and-meta-cognition/> and <http://images.pearsonassessments.com/images/tmrs/CriticalThinkingReviewFINAL.pdf>].

