Encounter-Based Science:

From Learning About to Learning Through

CRAIG HOLDREGE

The following article appeared in the Spring/Summer 2020 issue of Renewal, A Journal of Waldorf Education*, Vol.29, Number 1*.

Some time ago I was working with Waldorf high school juniors and seniors at a weeklong conference in Germany. Our topic was human evolution, which circles around deep questions: Who am I? Where do I come from? What is humanness? Here I want to discuss just one part of our explorations to highlight some of the issues that I believe matter in education.

Many of the students had already learned about Darwinian theory and some knew a little about hominid fossils that preceded modern humans (*Homo sapiens*). Using teaching materials I have developed to explore human fossil history[1], the students worked in small groups with a packet of drawings depicting 30 different fossil skulls, all in some way related to human evolution. They did not know where the skulls came from, the time period, or the species names. They only had what they could see.

My directions were simple: Order the skulls in the way you think makes most sense evolutionarily. There was lots of discussing, ordering, and re-ordering (see Figure 1). They were startled and at times a bit overwhelmed by the diversity of forms. Each group presented to the others the criteria by which they ordered: Overall shape, the size of the braincase in relation to the face and jaw, the degree to which the jaw jutted forward, tooth form and size, or massiveness of the eyebrows. The students had looked, discerned, and ordered. They had formed clusters of fossil drawings with similar characteristics and arranged the clusters in what they thought might be the temporal order. They had many questions.

Figure 1. Students work at ordering skull sketches evolutionarily

As a next step I gave them additional information—a table that expresses the tip of the iceberg of work that thousands of scientists and technicians around the globe have carried out during the past 150 years or so. The table indicates where each fossil had been found and also the geological time period in which scientists currently think the fossils had been deposited.

The students worked again and re-ordered. There were many new surprises. Some fossils that look quite modern are in fact quite old, and some "primitive-looking" skulls are more recent than others that look more "advanced." At certain time periods there can be an astounding variety of fossil forms (see Figure 2). Through this process the students understood for themselves why researchers argue about the relation of fossil discoveries to the human lineage. They experienced what scientists encounter in the process of research. The fossil record is rich and intriguing, but it does not provide simple, clear-cut answers to deep questions about the origins of humanity.

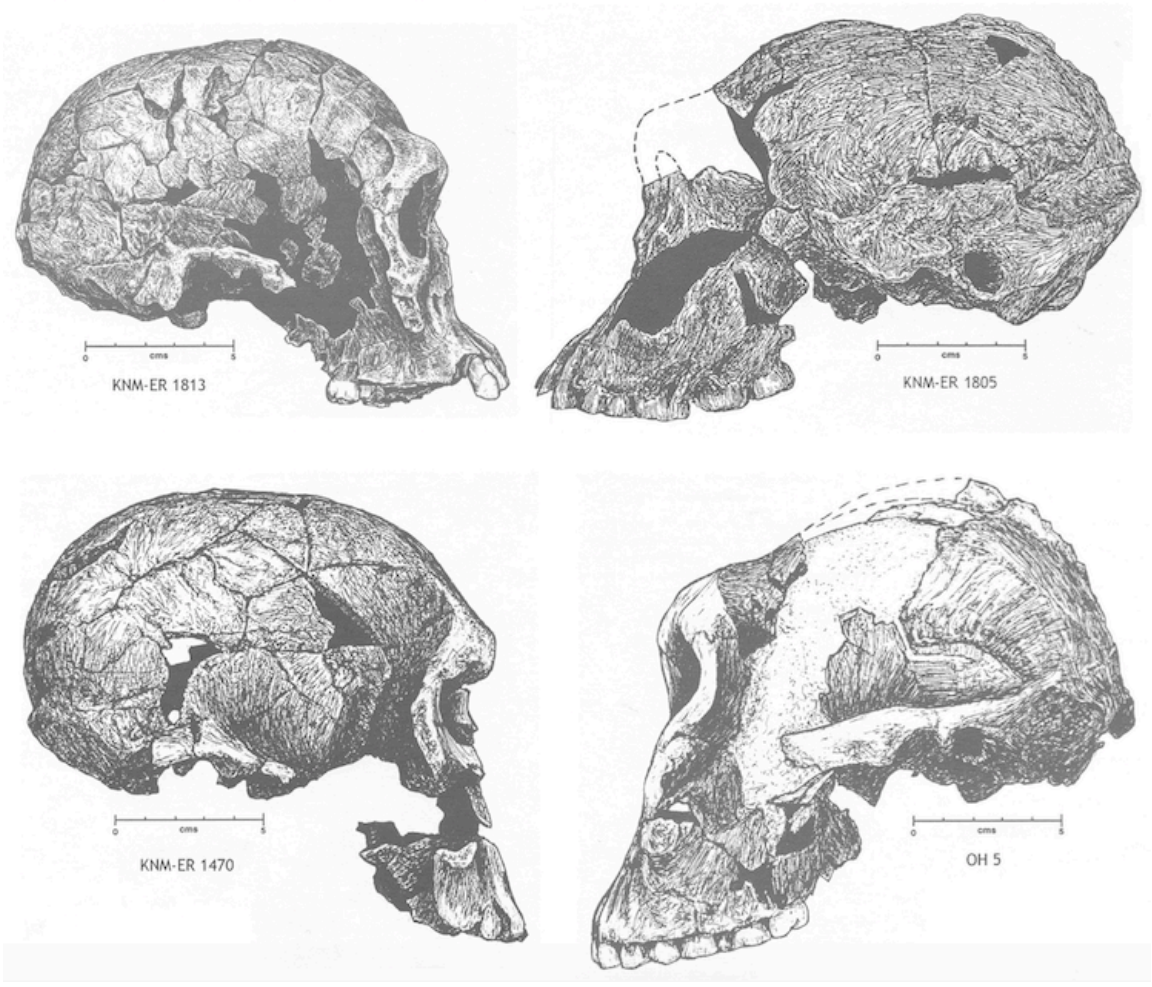

Figure 2. Hominid skulls from East Africa. All are about the same geological age—around 1.8 million years ago according to current dating methods. Note the variety of forms.

Many of the students had expected that the fossils would line up in a straightforward order, since they all had seen depictions of an ape-like creature turning step-by-step into the modern human being. Through delving into the complex reality of the fossil record, this schematic, oversimplified but very suggestive of human evolution, was shattered. The students' eyes were opened to riddles that the world offers—something that is all too easily ignored in science education.

By encountering the diversity of fossil forms, the students could track the coming appearance of humanness in evolution. They discerned overriding trends that were not linear. This work was the entryway into further considerations in which we held back speculating and theorizing in order to stay as close to the observed phenomena as possible. This is the heart of a phenomenological approach. What became clear is that evolution is not an unfolding of what is already there, but rather a creative process in which new qualities of being emerge. Many stimulating conversations and explorations followed.

I want to highlight through this example the difference between *learning about* a topic and *learning through* experience and exploration. In *learning about* something, I am separate from the object of knowledge. I take in what is presented and then I "know." I can memorize—the names of fossils, their age, location, and maybe I can even remember their shape. All this can be important. But when school emphasizes *learning about* and involves testing whether students "know" the material, this "knowing" has little life. You can tell when the students have succumbed to this form of education when they say: "Just tell us what we have to know for the test."

When students *learn through*, they engage. They don't know where their activity will lead. They are in a process of discovery. This is, I think, particularly important in our times and for the coming future. Information is literally at all students' fingertips through the internet. And they will likely find the information more readily than some of their teachers. But it is another matter to learn through discovery, where students make decisions and explore in different directions, and where they can see: the world is big and deep and I can engage with it. That is encounter-based learning and it is, in my view, crucial in teaching science (and any other subject!).

Information does not provide grounding in the world. Engaging does, by discovering things and connections that matter. When students have experiences, gain insights, and reflect on the processes they go through, they can rely on what they have learned. They know what they know and what they don't. This will help them to navigate through the thickets of opinions, generalizations, and half-truths they encounter. In our unsettled times, experiential grounding is more important than ever.

Encounter-based science education can take a variety of forms, and there are no recipes. But as an educator I can ask myself a number of guiding questions: Am I offering the students mainly pre-packaged concepts? Will the students have the opportunity and challenge to discover? What fields of life touch their innermost questions? Is the work inviting the students to enter a quest that may lead to deeper and broader questions?

Imagine the topic of climate change crafted as learning experiences. Not just learning about it, but learning through encounters with carbon, CO_2, fossil fuels, weather dynamics, economics, and more. What a great challenge for educators and what an opportunity for students who want school to be alive.

Educators are often hemmed in by the idea that they are to prepare the students—for college, to be good citizens, for life. Often this mandate is understood as learning content *now* that they will need later. But this is a static view of life, since later intrinsically means that both students and life situations will be different. As John Dewey pointed out long ago, only by letting students engage with experiences in meaningful ways now, will they be able to do the same later in life.[2] In this sense, education, as Rudolf Steiner put it, should "be life."[3] When education helps young people respond creatively to what comes towards them and to develop initiative and perseverance in the face of challenges, then it sows viable seeds that can come to life in surprising ways in the future.

~ ~ ~

Craig Holdrege, Ph.D., is co-founder and director of The Nature Institute in Ghent, NY (*natureinstitute.org*). He was a Waldorf high school science teacher for 21 years and is active in teacher education programs. He is deeply interested in the interconnected nature of things and how we can understand life in truly living ways as a basis for responsible human action. His studies of plants and animals, as well as his commentaries scientific thinking and new developments in the biological sciences, aim to stimulate a transformation in human thinking and perception and a deep respect for our fellow creatures. In addition to courses at The Nature Institute, he gives talks and workshops in the U.S. and abroad. Craig is the author of many articles, monographs, and books, including *Thinking Like a Plant: A Living Science for Life; Do Frogs Come From Tadpoles? Rethinking Origins in Development and Evolution;* and the upcoming *Seeing the Animal Whole: And Why It Matters.*

References

1. Holdrege, Craig. *Diversity in Human Fossil History: A Teaching Unit on Hominid Evolution* (New York: The Nature Institute, 2017). To purchase, visit *natureinstitute.org/store*
2. Dewey, John. 1938/1997. *Experience and Education*. (New York: Touchstone Books).
3. Steiner, Rudolf. *The Younger Generation* (Spring Valley, New York: Anthroposophic Press, 1967), lecture 2. Available online: https://wn.rsarchive.org/Lectures/GA217/English/AP1967/YunGen_index.html