GAIA AWARENESS

awareness of the animate qualities of the Earth

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As the ecological and social crises bite deeper and deeper into the fabric of our lives, there is an urgent need for an education that addresses the question of how we can develop lifestyles that are truly sustainable in the ecological sense of the word. A key idea that people will need to understand is the notion that our planet seems to have regulated its own surface conditions within the narrow limits that life can tolerate over a vast span of time thanks to tightly coupled feedbacks between life and rocks, atmosphere and water. This is the key insight of Jim Lovelock's paradigm-shifting Gaia theory. Students need a basic understanding of how to think in terms of feedback loops and of the surprising emergent properties that often appear when many such loops are linked together. They will also need to see how these concepts can help us to understand the possible consequences of our heedless lust for material growth that is now seriously disturbing the Earth, and they will need to use these ideas to think through possible solutions.

Wherever we look in the biological world we find astonishingly complex feedbacks, whether it is within the physiology of individual organisms, in the ecological interactions within ecosystems, or indeed amongst the interactions between rocks, atmosphere, oceans and living beings that constitute Gaia. Such complex systems can behave in unpredictable ways. Their precise behaviour will depend not only on which relationships are present, but also on their relative strengths. Invariably, non-linear relationships will be present, and if so the system will exhibit a range of behaviours, from predictable to chaotic, but with sufficient complexity even a system with linear relationships can give rise to all sorts of behaviours. Simply put, in a linear relationship, a component's response varies in direct proportion to a change it experiences, and in a non-linear system it does not. A good example of non-linearity is the stock market, where a slight change in consumer confidence can ripple through the system very quickly to bring about rapid and unexpected change. It is also possible for tipping points to exist in which a small disturbance triggers a sudden and unexpected change. Take a pencil and line it up parallel to the edge of a table, not too far from the edge. Now give the pencil a slight push towards the edge and nothing dramatic happens – the pencil has moved a little, and just as you expected, it is still on the table. Now give it another small push, and another. Again you observe a predictable response. Eventually, of course, another slight push equal to all the previous ones takes the pencil thorough a rapid tipping point as it falls over the edge and into a new 'stable state' on the floor. Non-linear systems are riddled with tipping points, but often a system is so complex that it is impossible to know exactly when these will be encountered.

Learners will need to discover that the earth is replete with self-regulating negative feedbacks that tend towards constancy as well as self-amplifying positive feedbacks that can propel the earth either towards cooling or warming. Without such an understanding, they might believe that half measures are enough, that every little carbon dioxide saving makes a difference, that weak targets are better than no targets. They are not. Artic sea ice is a clear example. If a little of it melts, dark ocean is exposed to the sun, which warms the region and thus more ice melts. This warms the region further, melting even more ice, and so on. The result is runway warming. Our carbon emissions are edging closer and closer to triggering a series of additional self-amplifying feedbacks with potentially catastrophic consequences for the entire planet. Once we push the earth beyond critical thresholds

these additional self-amplifying feedbacks will warm the earth by various means: burning the Amazon, melting the ice caps, and releasing methane from permafrost, are but a few. As a result, it seems increasingly likely that the earth will, by the end of this century, end up at least 4 degrees Celsius hotter than now, with dire consequences for our civilisation and millions of our fellow species.

To remedy the situation, if indeed this is still possible, we will need to stop emitting greenhouse gasses and remove carbon dioxide directly from the atmosphere. If implemented immediately, these measures would allow the polar sea ice to recover, they would prevent the Amazon from burning, and would ensure that marine algae continue to cool the earth by absorbing carbon dioxide and by producing planet cooling clouds. We have found physical ways of vastly reducing our emissions of carbon dioxide (if not political ones), but as yet there is no failsafe way of extracting directly from the atmosphere.

It is essential that learners understand the nuts and bolts of Gaian feedbacks if they are to understand the dangers of climate change as well as possible solutions. I have taught Gaia theory for almost twenty years and have found that students (apart from those with good scientific backgrounds) are not enlightened by the dry language of conventional scientific discourse normally used to describe these feedbacks. In my experience, storytelling works best. Like those few daring teachers of chemistry who have found that the difficult concepts of their subject come alive when they speak of chemical reactions *as if* they involved interactions between sentient, feeling *persons*, I have developed story-based explorations of Gaian feedbacks that often awaken within students a deep sense of embeddedness in the astonishing self-regulating processes of our breathing planet (see Harding 2006).

Scientific knowledge about the Earth as a complex system is gradually permeating educational initiatives around the world. But by focusing only on thinking (albeit in a more enlightened mode known as 'systems thinking') our scientific understanding ignores the equally vital contributions that our sensory experience, our ethical sensibilities and our intuitive capacities can make to a more holistic understanding of the Earth and of our place within it. The problem, more succinctly put, is that our current educational paradigm emphasizes quantities at the expense of qualities, and prioritizes facts over values. The result is that we promulgate a rather dry soulless approach to the world that is inherently dualistic and which leads us to believe that our Earth is nothing more than a vast machine which we can control as we wish by using the detached, 'God's eye' view of rational scientific analysis. Thus, as a society, we feel strangely disconnected from the Earth – it seems as if we were aliens from some other planet placed here to prod and poke this world with our scientific instruments whilst feeling no sense of meaning, belonging or closeness to her ancient crumpled surface or to her rich, teeming biodiversity. With this world view firmly in place in our minds, we engage in sustainable actions only out of fear, or if we are compelled to by law. It is essential therefore that learners both understand modern science's predilection for quantities and gain an awareness of Gaia that embraces both quantities and qualities.

The denigration of qualities was deliberately built in to mainstream science at its inception some 400 years ago during the 16th and 17th centuries. The great pioneering scientific geniuses of that period such as Galileo, Bacon and Descartes convincingly argued that only quantities have validity, that nature has no intrinsic value, that the whole cosmos is in essence a vast machine, and that we have the right to use rational analysis to ruthlessly control and exploit the Earth and all her other-than-human creatures for our own ends. Is it any surprise, then, that this world view has delivered us into the maw of a planetary crisis of such massive proportions that scientists talk about us being the cause of the sixth mass extinction and of the threat posed to civilization by the looming specter

of anthropogenic climate change? Is it any surprise that a culture that sees the world as no more than a dead object will eventually seriously perturb the web of life on which it depends? Modern science is perhaps the greatest cultural achievement of the Western world, but it needs to be seriously reformed and expanded if it is to contribute to solving the urgent problems of the 21st century. It is time for science to heal its self-imposed split between quantities and qualities and between facts and values if it is to become part of a tenable solution.

It was C.G. Jung who pointed out that we gain reliable knowledge by means of the four modalities we mentioned earlier, namely thinking, feeling, sensing and intuition. Perhaps the reunification we are seeking will take place when we educate our students to consciously cultivate their ability to think in tandem with their other three ways of knowing, for it is with these that we become sensitive to the qualitative aspects of our experience.

Our efforts to educate for a genuinely sustainable relationship with the Earth must therefore attempt to reunite quantities with qualities by developing the four ways of knowing in our students, an approach that we are pioneering on our MSc in holistic science at Schumacher College. When working with our students to give them the deepest possible sense of connection with Gaia, we use Gaia theory to teach them how to think holistically about the Earth in the way we have outlined above. We look at the consistencies or otherwise between Gaia theory and natural selection, we build mathematical models of the carbon cycle coupled to an active biota, and we look at how the Earth could respond to climate change as a fully integrated complex system consisting of life coupled to its abiotic 'environment'.

Then we go further. We use this rational knowledge to fuel our intuitive sense of connection to the whole of community of nature by engaging in rigorous meditative explorations and by recreating Gaia's long and complex evolutionary trajectory in our imaginations. We deliberately connect with the qualities of rocks, atmosphere, oceans, clouds, individual organisms and entire ecosystems by spending quiet time savouring their essences much as we would that of a poem or a piece of music. As we deepen our perceptual abilities, we find a remarkable degree of commonality in what we discover by means of this more phenomenological approach to nature. In addition, we work with exercises that help to shift our everyday perceptional frameworks. We lie on our backs outdoors, feeling how our planet's gravity dangles us upside down over the vastness of space, and we gain a palpable sensation of her great curving spherical body as it arches away beyond us in all directions. The deep experiences of connection and communion that arise out of this radical holistic approach lead us to conclude that the mechanistic metaphor that has so seriously misguided our culture during these past four centuries must now be replaced by the more ancient understanding of the Earth as a great psyche in which we are deeply immersed and with which we are in constant communication. This intuition enriches our sensory experiences, so that we no longer see the world around us as a set of isolated mechanical objects, but as a unified field of experiencing subjects.

Now, with our ethical sensibilities alive and awake, we become fully aware of Gaia and see why it is wrong to seriously harm the great turning world within which we have our being and which gave us birth. Our rational minds become the servants of this deeper sensibility by helping us to articulate our deep experiences of belonging to Gaia and to tease out to what extent our lifestyles are consistent with them. External compulsion or a sense of duty are no longer necessary to make us act correctly. The integration of our reasoning, feeling, sensing and intuition fill us with an inspiring sense of the mysterious personhood of the Earth. This unleashes tremendously powerful feelings of energy and dedication that lead us spontaneously into right action, wherever our own particular paths might lead us.

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