Climate chaos

Before we go into the details of climate change it is it is worth briefly considering some of the links between our psychological and physical climate. This is perhaps best done by comparing some of our previous observations on cosmology and our current understanding of the Earth itself.

In science, the Earth has been studied by disciplines related to four different areas of the planet: the atmosphere, the hydrosphere, the geosphere (or lithosphere) and the biota. These spheres constitute the traditional dividing lines between the Earth sciences. The lines of division have become increasingly unclear as our knowledge of the interaction between these spheres has developed. It appears that soils, rocks, water and organisms interact in ways that in many cases render such differentiation useless, e.g. organic matter accelerates rock weathering, it plays a crucial role in cloud formation, and regulates the chemical composition of the atmosphere. The insights uncovered by the Earth sciences have themselves been crucial in assisting the shift in paradigm mentioned above. We no longer imagine that there are two kinds of evolution, one for mountains, oceans, and atmosphere explained by geology, and one for organisms explained by Darwin. Instead, we understand the Earth to be evolving *as a whole* and we study its various subsystems. The Amsterdam Declaration of 2001 states that: ”The Earth System behaves as a single, self-regulating system comprised of physical, chemical, biological and human components. The interactions and feedbacks between the component parts are complex and exhibit multi-scale temporal and spatial variability.” This is old news.

Briefly, a system is an entity which is composed of parts (components) that function as a whole. Components can be material, an attribute of the system, or a subsystem. Examples of relations between components and system could be those of molecules to cells, organs to the body, or members to an organisation. Components are interlinked so that any change in the state of the system is felt throughout (the state of a system is described by the attributes that characterise the system itself). The existence of such links allows for the regulation of the system's attributes so as to keep it in a stable state. At the level of the whole qualities emerge that don't manifest at the level of parts. Think of the way your body reacts to a change in temperature. If the temperature changes noticeably, say it gets warmer, there is interaction between various components (e.g., receptors in the skin, the brain, sweat glands) so that the body releases heat faster to maintain a temperature conducive to the well-being of the whole system. The system is self-regulating (in this case to maintain a temperature of just below 37 °C). This regulation operates via feedback between the system's components.

So the Earth is a self-regulating system that currently is keeping the planet at an average temperature of about 14 °C (millions of subsystems are involved, and we only know some of them). But the mean temperature hasn't always been 14 °C – the system is dynamic and it evolves with time maintaining a stable state. When we try to predict the evolution of the Earth system we find that our calculations are extremely sensitive to initial conditions because the state of the system at one point is dependent on the state of the system at a previous point. Tiny differences in starting point can produce very different results, and with so many variables there can be massive differences in predictions (which is why the meteorologists are sometimes wrong about tomorrow's weather). Climate is chaotic. We get a simplified picture of the evolution of the Earth system by observing a pattern in the geological record: the Earth currently appears to have at least two 'stable' states, glacial and interglacial, between which it switches periodically. Feedbacks keep the Earth in one state until it becomes 'unstable' and perturbations push the system toward another stable state. The switch is rapid and we are not sure at what point a switch becomes inevitable, but we know

of the existence of certain thresholds for subsystems beyond which they change or disintegrate.

This is our worry about climate change: we have altered the composition of the atmosphere to a degree that has pushed important subsystems past the threshold where they will move to a different stable state. In that case the climate system might move towards a third, much warmer state. In other words, maybe we have spoiled the Earth's capability to self-regulate to a temperature comfortable to us. When we view the problem from this perspective two things are clear: 1) we (unknowingly) caused the problem, and 2) to solve the problem we will have to stop causing it. Firstly, it is clearly our thinking that has brought us in trouble: our cosmology has led us to believe in a world of progress where energy is limitless. A world that has no limits to economic growth and where the natural world is an inexhaustible resource to be exploited. Secondly, we are not going to get out of the trouble by using the same thinking that created the problem. 'Untouched' nature is not valuable in economic terms, it is an invaluable part of the Earth system that helps it to keep at a stable state that we like and benefit from. If the Earth has the ability to self-regulate to comfortable temperatures we will have to *not interfere* with the system to keep it doing so. We will have to make a shift in paradigm to appreciate that the natural world does not fit into linear models of time, economic 'growth', and progress.

Now we see that it is not an objective world 'out there' that is wreaking havoc on our orderly world, it is our order that is straining to fit unto reality. We are indivisible parts of this great system, and we will have to start thinking of ourselves as such if we don't want it to break down. To avoid climate chaos (in the campaigner's sense of the word) we will have to facilitate the health of the Earth system by all means. The Intergovernmental Panel on Climate Change concluded in 2007 that ”warming of the global climate is unequivocal” and predicts a temperature rise in this century of between 1.1 and 6.4 °C. We still hear of 'climate sceptics' in the news. And some scientists believe it is already too late to avoid catastrophic warming. Whether it is too late or not, climate change is surely the one topic of our time we cannot avoid (however much we try to). If we want to know the real story and escape the many dead pictures we face on a daily basis we will have to enquire for ourselves. Because the discourse that takes as a starting point the false belief that we own the Earth no longer holds.