Reflections by Tom Lovejoy

Peabody Museum of Natural History

Dinner in the Hall of the Dinosaurs

Journey of the Universe Film Premiere at Yale

March 26, 2011

As we reflect on the two day contemplation of the *Journey of the Universe*, it is more than fitting that we do so at Yale – Yale, the college and then the School of Forestry of Aldo Leopold who contributed so much to thinking about land, nature and the human role. And at Yale, the University of G. Evelyn Hutchinson, the Founder of Modern Ecology. It is even more fitting that we do so now in the Peabody Museum of Natural History which Evelyn held in such high regard. Indeed, one of the things that truly excited him about coming to Yale in 1928 was the presence in this museum of the toothed birds, *Ichthyornis* and *Hesperornis* the important early fossil evidence for what we now understand much more fully with respect to the origin of birds from dinosaurs.

Here we are in the museum that has been characterized as the Sistine Chapel of Organic Evolution at a time E. O. Wilson has labeled as one of great irony because now that evolution has reached a point where it can understand itself, it (we) are busy destroying the evidence. Hutchinson was concerned similarly that the loss of biological diversity is constraining the ability of all the life sciences to grow from study of the multiple forms of functioning biological systems produced in the course of four billion years of natural selection.

This is a hugely important point and one almost always overlooked. The Millennium Ecosystem Assessment did an impressive job of categorizing the goods and services that benefit humanity but completely missed what I now term “Knowledge Services”.

This is not an ethereal concept. Consider the polymerase chain reaction which most people -- if they are even vaguely aware -- know as “PCR”. Its ability to replicate genetic material very rapidly has revolutionized forensic medicine, diagnostic medicine, enabled an enormous amount of research, and made the entire human genome project possible. When described to Pavan Sukhdev who has done such a brilliant job on The Economics of Ecosystems and Biodiversity (TEEB) Project, his off the cuff estimate was the total human benefit had to be on the order of a trillion dollars. Without the heat resistant enzyme from a bacterium from a Yellowstone hot spring, *Thermus aquaticus*, it would be a reaction but not a chain reaction.

The point is that the diversity of life on Earth represents an enormous living library on which the life sciences can build. Humanity should value biological diversity in the same way that all societies value libraries.

Hutchinson, whose inquiring and encyclopedic mind could range from considering “Exobiology” – the study of life on other planets, and whether somewhere life might be built around silicon instead of carbon, its neighbor in the periodic table – to many aspects of Medieval manuscripts and their marginalia, himself provides an inspiring example in thinking about the matters of this symposium.

There is no question when one reads Nancy Slack’s superb new biography, *G. Evelyn Hutchinson and the Invention of Modern Ecology*, and the companion anthology volume *The Art of Ecology*, that he did indeed invent modern ecology through both his own work and his almost magical inspiration. The reason he was successful and why so much of his work stands up to this day, is that for him theory had to fit nature not the other way around. That process was informed by his insatiable curiosity and appreciation of natural history. When he would encounter interesting bits of natural history, or when things all fell into place in a robust synthesis, he would pronounce them “marvelous”. Some unusual bit of natural history might elicit “most peculiar”. When asked what his favorite animal was, he said “The giraffe – most improbable”.

I raise the above because he clearly had a sense of awe and wonder about, and rejoiced in, the world of nature. This must also relate to Hutchinson, the devout Episcopalian, practicing his faith at Christ Church on Broadway. In other words, he had two independent ways of looking at the world to which the principle of competitive exclusion did not apply.

That example must be why I had no hesitation in announcing to the World Wildlife Fund staff one morning 25 or more years ago, that we could think about what we did as “saving the Creation”. Some staff immediately recoiled thinking I was becoming a creationist, but most came to understand that rather than a negation of science, it was a way of looking at the mission of saving life on Earth from a different but non-conflicting set of values. I did mention it to E. O. Wilson who has developed and enriched that way of thinking very considerably.

As an undergraduate I had a dream opportunity of being part of an expedition to Egypt in 1962-1963. While the expedition was focused around prehistoric artifacts that would be flooded by the High Dam at Aswan, my responsibility was to do biological collecting in case biological remains were found associated with the artifacts. Within days of arriving in Cairo I was sent along with a group of zoologists from the U.S. Naval Research Unit Number Three (NAMRU-3) to do collecting at night – since most desert animals are nocturnal --in the Western Desert west and south of Alexandria. Our jeeps first took us to find the Bedouin guides who knew the area.

When we reached the Bedouin camp we first participated in an age old ceremony of drinking tea while seated on rugs laid over the sand. The clear night sky was brilliant with stars, much as in the *Journey of Universe* film. It provided a pale blue light in a landscape, which calls people to think about who we are and where we are going. It is no surprise this landscape has inspired multiple religions.

As I gazed up at the magnificent fretwork of the heavens, one of the first satellites sped by overhead. In e.e. cummings’ words, it was “the world of the born and the world of the made’”rushing apart – a herald

of the terrible tensions we face today between humanity and the nature from which we both came and on which we depend.

The Director of the Peabody at that moment was Dillon Ripley who went on to become one of the two greatest Secretaries of the Smithsonian of all time. He opined that every biologist with a conscience should spend some time on conservation. I came to more fully understand the significance of that statement first at the World Wildlife Fund and in my subsequent professional journey along the interface of science and public policy. In many ways it was like looking through a lens, focused first on endangered species, and then ever widening to encompass habitat and protected areas, the socio-economic matrix in which they lie, the role of government, and then finally to the great biogeochemical cycles with which all life is intertwined.

The film, The *Journey of the Universe*, gives us a wonderful sense of how the universe and, most recently, humanity came to this point. It highlights how this is a living planet in which life has played and continues to play a huge role, including why this planet is "not too big, and not too small" is "not too hot or not too cold".

The stark reality of the moment is that through disturbance of these cycles, biologically active nitrogen is twice the normal concentration, and the disturbed carbon cycle has already produced global temperature increase of 0.75 degree. While the nations of the world discuss stopping short of two degrees, there is mounting evidence that two degrees is too much for many ecosystems, with tipping points already widespread: coral reefs bleaching, pine bark beetles causing massive die-off in Western North American coniferous forests, and potential dieback in the southern and eastern Amazon only a couple deforestation percentage points away. Furthermore, the last time the planet was two degrees warmer, the oceans were four to six meters higher. What more does anyone need to know?

And yet to stop at two degrees, global emissions have to peak in 2016. In the meantime population and total resource use continue to grow. Early 2012 the human population will reach seven billion people – literally double what it was when I was born. If we are lucky it may peak at nine billion.

The conclusion is clear. We must proactively manage our planet on the scale of our combined impact. That of course means we have to manage ourselves and do so with great sensitivity to issues of ethics and inequity. For example, it is reasonable to think of ecosystem restoration at a planetary scale so that in half a century 50 parts per million of CO2 can be removed from the atmosphere. There is no need to detail the planetary management agenda here.

We, in fact, mostly know what has to be done, including to address issues such as David Tilman's question: how to feed nine billion people without further destruction of natural ecosystems. The question is whether we will do so or whether we will continue in self indulgent mutual grooming. The crisis of the planet is, in the end, a crisis of values.

Laid out in plain view from 35,000 feet as I flew over New Haven on the way to Hartford this afternoon, was evidence of how people can change what seems inevitable. Interstate 91 heads straight north toward West Rock, one of the pair of magnificent reddish basalt formations that inspired the Dutch

name “Roteborg”, before it became New Haven. I-91 then veers abruptly right to avoid the park. That it does so was the consequence of efforts of Yale faculty and staff including David Challinor (once Assistant Director of the Peabody). There is every reason to similarly alter the course we have initiated with the living planet. What a journey that would be. And the *Journey of the Universe* will be a significant part of that process.