Chapter 9

Falling down the time shaft : The case of the incredible shrinking planet

The light at the end of the tunnel
Is the light of an oncoming train
Robert Lowell

The Earth today is a shrinking island adrift in the sea of time.

Maybe you find that sentence somewhat mystical for a science book. OK, I apologize. But it is not really mystical. It is thoroughly scientific. This chapter has the job of explaining it. In what scientific sense is the Earth shrinking? And what makes it an island adrift in time?

By saying ‘shrinking’, I do not mean some added consequence of global warming! It’s not as if the Earth were made of wool or cotton, and we returned to the galactic laundromat to find a pea-sized planet in its dryer. But, for most species, that might as well be the case. Most forms of life survive only in natural environments. And we are shrinking those environments pitilessly. We convert them — square mile after square mile — to our own purposes. Moreover, whatever we take for ourselves, we change so radically that almost none of the other species in the world can still live in it.

So far, we have taken over about 95% of the Earth’s land surface and refashioned it according to our own specifications. For most species, then, it must seem indeed as if we left the hot water setting of the washer much too high. Their planet no longer fits them. They have naught to cover their nakedness, to shield them from the dispassionate harshness of nature.

Does the shrinkage matter? Does it matter if only 5% of the world’s natural areas remain? Why not just swear to take good care of the 5%? That’s a lot of planet for wild things! We will live in the 95%; they will live in the 5%. It’s a hell of a lot more space than Noah gave them in the ark.

Well, maybe so. But Noah did not expect his charges to remain on the ark very long. As we shall see, canny old Noah was taking advantage of a little known fact. Extinction is a process and it takes time — sometimes a very long time — from start to finish.

An Earth reduced to 5% of its size becomes a set of miniature continents like New Zealand or Hawaii. In chapter 8, we already looked at the sustainable diversity of such continents. They were depressed in proportion to the smallness of their areas. A continent with 30% of the area of South America, say, will have about 30% of her species diversity. A continent with 10% of her area will have about 10% of her species diversity. So, things do not look too good for our shrunken Earth. With only 5% of her area she will be able to sustain only 5% of her species.

Our natural world is a time island, not a space island. It could never by itself have produced the diversities it has today. Where did it get them? From a larger world that existed centuries ago. But those continents of centuries past are totally cut off from us now. They can contribute nothing else to our world. We are on our own. What we squander, we will lose forever. There will be no immigration rate to supplement whatever meager speciation rate we have. No species that becomes extinct today can immigrate from the past to restore itself to the future.

Although our shrunken world will gradually lose more and more species in the fullness of time, she is not going to lose everything. She will still be very large, even when nature occupies only 5% of the Earth's area. So, every long once in a while a new species will evolve. Eventually, there will be so few species left to suffer accidents that the rate of extinction will be no more then the trickle of speciation. The mini-Earth will rest at a new sustainable diversity. It will rest on an intercontinental line like the one connecting New Zealand and Oceania.

Because that line's slope is approximately 1, we can predict this new diversity. It will be very nearly the same as the proportion of the original natural area that remains. So, for example, with the mini-Earth at 5%, diversity will also be at 5%. In other words, we stand to lose 95% of all species diversity. There will be no bargains. We'll get what we pay for.

In addition to all the area patterns that support our predictions, the fossil record actually records the history of an experiment that Nature herself accomplished over the past quarter of a billion years. It seems that Nature likes to play the accordion with the surface of the Earth. At times she floods major fractions of the continents with inland seas. The land area of the Earth shrinks. Then she dries the waters up and the land grows. Shrinks and grows. Shrinks and grows. Does diversity follow the music? Yes indeed.

Paleobiologists studying fossil trees have discovered the dance. Using geological techniques, they estimate the positions and extents of the world's land surfaces at various times in the past. Then they count up the tree fossils from each time to see whether area mattered to diversity. Not only does it, but the pattern is linear. That means that the slope in log-space has a value of 1 — just what we expect. And just what we base our predictions on.

Thus, the natural world seems destined for trouble — long-term, very serious trouble. In fact, 'an island adrift in a sea of time' really does not quite describe Nature's current predicament. There's no drifting here at all. It's more like a free-fall. Nature is falling into a black hole. As all sci-fi fans know, when falling into a black hole, you pass two event horizons. And so it is with Nature. It reaches the first horizon when all its sink species are gone — when it has as many species as it would have if it were an island and the world of a thousand years ago were its continent. It reaches the second when finally it descends to its new sustainable diversity — when speciation and extinction again balance each other because only 5% of biodiversity remains.