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Ecological Economics 000 (2001) 000–000

ECOLOGICAL ECONOMICS

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Book Review

***Human Natures: Genes, Cultures, and the Human Prospect*, By Paul R. Ehrlich, Island Press, Washington DC, 2000. ISBN 1-55963-779-X; p. 531,**

Paul Ehrlich's latest book is a 'must read' for anyone claiming even a passing interest in ecological economics. It is far and away the clearest, most comprehensive, and most compelling synthesis of what is known about the co-evolution of humans, their cultures, and the rest of nature currently available. As such, it forms a necessary knowledge base for understanding human behavior in its complex and evolving context. The title subtly reflects the important distinction between human *nature* and human *natures* — the plural implying that our species has many and varied *natures* — not a single unitary *nature*. This pluralism is in stark contrast to the stilted and unrealistic assumptions about a singular human nature embodied in both the reductionist biological model and the conventional economic model. The biological reductionist idea that all the human behavior can be reduced to a genetic basis is clearly insufficient in light of the massive importance of cultural evolution in shaping human behavior. Likewise, the all-knowing, perfectly rational economic utility or profit maximizer of the conventional economic model may be convenient for mathematical tractability, but it is so far from the reality of human natures that it is laughable. The only mystery is why, given what we know about human natures, more economists are not laughing.

The case of Phineas Gage, described by Ehrlich in the book, serves to illustrate the size of the chasm between the conventional economic model and reality. Gage was a railroad worker who had a large portion of his frontal lobe removed when a 1.25 in.-thick tamping rod shot through his head in a freak railroad accident in 1848. Amazingly, Gage survived and was not even knocked unconscious by the accident. But he was a changed man. He had lost the part of the brain that we now know is dedicated to emotional responses. A surprising result was that while he could think, talk, and calculate perfectly well — he was completely 'rational' — he simply could not make a decision. It turns out that rationality without emotion leads to swamping with details and the inability to make any decisions at all, even ones so trivial as what to eat for dinner. That emotions are necessary for decision-making is an interesting part of real human natures, but is in direct contradiction to the conventional economic assumptions about decision-making, which considers emotions to be a hindrance to 'rational' decision-making. But as Ehrlich points out: ''Human emotional capacities evolved along with our cognitive capacities. Without the ability to respond to stimuli with appropriate emotions, critical decision making becomes impossible'' (pp. 121–122). The challenge is to build economic models that incorporate the realities of human natures, rather than to assume them away.

The weakest aspect of the book is the imbalance between its treatment of genetic and cultural evolution. While Ehrlich takes pains to acknowledge the large and growing importance of cultural evolution in shaping human natures, he gives very little space in the book to the details of how cultural evolution works and does not attempt to synthesize the research in this area in anything like the completeness with which he treats human genetic evolution. For example, he notes that cultural evolution has several unique characteristics relative to genetic evolution. Most importantly, learned behavior can be passed on through the culture to genetically unrelated individuals and changes in culture can

PII: S0921-8009(01)00157-4

occur with light speed relative to genetic evolution. But how does this work and what does this mean for human natures and for the future of our society? This and several other key questions about the details of the relationship between genetic and cultural evolution are hinted at in passing, but are left largely unaddressed in the current volume.

For example, conventional biological evolution theory is largely circular and descriptive, not predictive (Holling, 1987). It is one thing to describe how alligators evolved, but quite another to be able to predict the emergence of alligators. To do this one would need to know the underlying criteria for success in evolution that can be specified before the fact. From a predictive point of view, it does not help much to say that those individuals that reproduce best will survive, unless one can say *why* particular individuals will be able to reproduce better than others in particular situations. Most human evolutionary ecologists work on time scales that make this question moot, but it is essential for understanding cultural evolution, the results of which are observable in units of years rather than thousands of years. To use the evolutionary paradigm in predictive modeling, we require a quantitative measure of fitness (or more generally *performance*) that can be specified before the fact, in order to drive the selection process (Costanza et al., 1993).

Several candidates have been proposed for this function in various systems, ranging from expected economic utility to thermodynamic potential. Thermodynamic potential is interesting as a performance criteria in complex systems because even very simple chemical systems can be seen to evolve complex non-equilibrium structures using this criteria (Prigogine, 1972; Nicolis and Prigogine, 1977, 1989), and all the systems are (at minimum) thermodynamic systems (in addition to their other characteristics) so that thermodynamic constraints and principles are applicable across both ecological and economic systems (Eriksson, 1991). This application of the evolutionary paradigm to thermodynamic systems has led to the development of far-from equilibrium thermodynamics and the concept of dissipative structures (Prigogine, 1972). An important research question is, therefore, to determine the range of applicability of these principles and their appropriate use in modeling human systems.

Another important question has to do with the 'reflexive' nature of cultural evolution because we are capable of at least some degree of conceptualization and foresight, we can exert at least partial control over our own selection environment (Arrow, 1962). The process then becomes one of conscious design and tinkering with the cultural evolutionary process rather than passive response to externally determined criteria. How does this process work and what are its limits? Devising policy instruments and identifying incentives that can translate foresight into effective modifications of the short-run cultural evolutionary dynamics is the key research challenge (Costanza, 1987). In cultural evolution, we have the unique potential to first envision our goals and then modify the selection criteria in order to achieve them (Costanza et al., 1993, 2000).

Ehrlich's book provides a solid basis for addressing these and countless other questions that are critical to understanding our human natures and how we can actively participate in changing them. Adequately understanding and controlling our complex human natures is essential for the continued survival of our so far exceptionally successful species.

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