1. Celestial affairs have always captivated the human minds. Even after the Copernican revolution great scientists as well as prominent philosophers have not ceased to be interested mainly in what happens "up there" - as did Tycho Brahe, Kepler, Galileo and, above all, Newton. As late as the turn of the twentieth century Pierre Simon de Laplace, then the towering mind in physical sciences, was praised even by Napoleon for his *Mécanique Céleste* expounded in five thick volumes! (1799-1825). But while on the Continent most scholars continued to plow the same furrow as their forerunners, in Britain scholars, skeptical empiricists as British have usually been, became interested in some pedestrian problems they considered to be far more important for the human welfare than the celestial affairs. Prodded by a practical issue, they began to study the properties of a gas or a vapor enclosed in a vessel. As we shall see in due time, that issue pertained to the depletion of forests everywhere for a long time and at a growing rate so that by the end of the seventeenth century the availability of wood - at that time the only source of heating fire - was seriously menaced. The situation was so critical that not only in Great Britain but even in a country such as Norway cutting trees from the woods had to be restricted by legal decrees.

2. No one then and, as it seems, no one ever since, perceived the profound reason for what happened during that historical episode. Why do humans need fire so badly? All other living creatures, even the warm-blooded animals, survive without fire. This may seem a silly question, yet it is highly fit to guide us to a deeper understanding of our own nature.

So, to begin let us observe that while we are one of the species on this planet, we differ from all others in a fundamental way. All species, ours included, become fitter for life when some of the organs with which every individual is endowed by birth become more efficient for their proper roles. As these organs belong to the individual's soma they have been labelled *endosomatic*. It is by biological mutations that each species may become better (occasionally worse) fit for survival, with stronger muscles, sharper claws, better vision or hearing, more comprehensive brain, and so on down the line.

But this manner of becoming fitter for life is both fantastically slow and completely uncertain. Our species, however, at a moment in its long past transgressed the purely endosomatic adaptation. Instead of waiting for some favourable mutations to occur in the unpredictable haphazard sequence as mutations not provoked by some artificial excitation always come off, some of our biological ancestors initiated a highly valuable procedure of evolutionary advancement. They began using detachable organs, *exosomatic* organs: at first, a club picked up by chance from the woods with which those protohumans must

wings of a swift, nor the claws and fangs of a tiger [16,17,19].

To be sure, many other creatures also use exosomatic organs. The beav bees "manufacture" their exosomatic organs from elements found in their en A fascinating Galapagos woodpecker finch, *Cactospiza pallidus*, tailors a ca just right to reach each worm inside its crack [26]. However, we are the only c this planet to produce exosomatic organs by which to produce exosomatic c progressive sequence. As Joseph Schumpeter used to put it wittily, we make m make machines, to make machines, ... which is the quintessence of the econom

3. The fact that I have contrasted the two modes of evolution and pointed o endosomatic evolution occurs in a haphazard way, as I have just done, should n to suggest that the exosomatic evolution occurs with a stochastic frequency, th way which analytically is called random risk [16, 17]. Both endosomatic and e mutations are subject to true uncertainty. Therefore, the superiority of e evolution rests only in that it supplies living creatures with *new and more power*, not in that they are under some control by us. Yet some economists have sus innovations cannot only be predicted stochastically for the need of decisions, b be forced to sprout, so to speak. Apparently, they had never had any contact with to learn of the latter's racking about the succession of endosomatic mutations

Biological mutations and technological innovations are not only simi individually they are not predictable. Between them there is a deep dialecti which has transpired in a historical event that has arrested the attention of nc celebrated volume of 1912, a young economist, Joseph A. Schumpeter [43], sc theory according to which economic evolution consists of the sustained se innovations, not of all but only of the palpable ones, that is, not of those so ins that they could be simply reversed - a new kind of window dressing, for exan

The point I can hardly overemphasize is that about thirty years later a biologist, Richard Goldschmidt, startled his peers by arguing in a perfectly anal with Schumpeter that the biological evolution is not the result of imperceptible en changes as the Neo-Darwinism then preached. Schumpeter elucidated his remarking that "Add successively as many mailcoaches as you please, you will a railway [engine] thereby". Goldschmidt in turn argued that since biological is irreversible it is carried on by the emergence of a "successful monster" [19

It is common knowledge in economics that long before Schumpeter it w Marshall who preached that "The Mecca of the economist lies in economic biol than in economic dynamics", but in contrast with Schumpeter he did not use th intuited for an articulate vista of the economic process. So, it was from the gre Joseph Schumpeter, that I got to my bioeconomic perspective which, I cl recognition of the existence of that particular domain over which thermody