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## COMMENTARY

How to be an ecological economist<sup>☆</sup>Malte Faber<sup>\*</sup>

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## ABSTRACT

To answer the question “How to be an Ecological Economist”, we must start by defining the field of Ecological Economics. Mainstream Economics altogether lacks the concepts required to deal adequately with nature, justice and time. It was the absence of these three concepts in this otherwise great social science that led to the establishment of Ecological Economics. The interest in nature, justice and time is its defining characteristic. The main thesis of this paper is that our field is a fragile institution and that the professional existence of an ecological economist is no less fragile. However, this very fragility also represents freedom, scope for free thinking, conceptualising and research. Nevertheless, to be able to really use and in turn enjoy the full scope of this freedom, an ecological economist needs certain specific characteristics, in particular what is termed in the German philosophical tradition “Urteilkraft” and in English “power of judgement”. A description of these characteristics is developed in this paper, providing an answer to the question “How to be an ecological economist?”

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## 1. Overview of the lecture

This lecture is based on my personal experiences. I became an ecological economist over the course of four decades. I started my academic education by studying mathematical economics and statistics. From the start of my professional career, I was unsatisfied with the way Mainstream Economics dealt with the concept of time. For this reason, I turned my attention to Austrian capital theory, which takes the temporal aspect as its focal point.

I was also unsatisfied with the manner in which political and natural aspects were treated and therefore decided to focus on questions of political economy and of physics. However, it took another decade before I dared to apply elements of political philosophy and thermodynamics in my approach to fundamental questions of Ecological Economics. Since I had a chair for economic theory at the University of Heidelberg, I was teaching Ecological Economics and hardcore Mainstream Economics topics at the same time. I also began to experience more and more the difficulties of being an ecological economist. How to be

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an ecological economist? I would like to approach this question from the starting point of Mainstream Economics.

The field has three fundamental deficits, and I know what I am talking about, because I was and to certain extent still I am a mainstream economist. The three deficits are, first, the lack of an adequate conceptualisation of nature, second, a failure to handle the question of justice and third, a failure to deal with the dynamics of time. These three deficits gave rise to the establishment of Ecological Economics and explain how Ecological Economics differs from Mainstream Economics. In my understanding two constitutive elements of Ecological Economics are normative in character: these are the dignity of nature and justice. From a methodological point of view I shall argue that the temporal dimension, i.e. time, is of great importance in our field.

To sum up: interest in nature, justice and time are the essential characteristics of Ecological Economics. These three issues are central to the main task of an ecological economist; it is above all the task of advising society and government. However, Ecological Economics is not able to deal with these three demands in a purely scientific way. This statement by no means implies that Ecological Economics stands outside all science. On the contrary, I believe that the term “Ecological Economics” constitutes a field of fruitful ideas and approaches to research for experts in various disciplines – from natural sciences to social sciences and from philosophy to theology. Research in this direction profits if scientists are willing to enter a genuinely interdisciplinary dialogue which is also open to non-scientists. The scientific qualities of an ecological economist must be supplemented by personal ones. Beside a high degree of scientific professionalism, ecological economists require four qualities: first, the conviction that their task is highly important, second, the confidence that they are able to develop ideas and solutions for the seemingly unsolvable questions they are confronted with and third, the patience and perseverance to withstand setbacks and failures. Over and above these qualities comes a fourth, which we find in everyday life, but which is rarely mentioned in scientific discourse. A successful politician, a wise judge, an effective manager and a good scientific adviser all have in common that their decisions and counsel cannot be deduced entirely from scientific concepts. What distinguishes them is the quality termed in the German philosophic tradition “*Urteilkraft*”, in English “power of judgement”, “prudence” or “practical wisdom”. An ecological economist requires a generous portion of this quality of power of judgement.

## 2. How does Ecological Economics differ from mainstream economics?<sup>1</sup>

After this overview, I would now like to turn to the question: how does Ecological Economics differ from Mainstream

Economics? While the representatives of ecology have few, if any, difficulties with Ecological Economics, the relationship between Mainstream Economics and Ecological Economics is not quite so harmonious. Why is this? The answer is: the mainstream economist views nature as a subsystem of the economy, whereas the Ecological Economist takes quite the opposite view. To explain how this state of affairs came about, it is revealing to look back over the last three centuries, during which we can observe steady economic growth in many countries, at least in the long term: Material shortages have disappeared to a significant extent in developed countries and material welfare, which was available only to a few in earlier times, is within the means of many today. The collapse of the planning systems in socialist countries has demonstrated the extent to which economic growth depends on the organisation of a market economy. It is to the credit of Mainstream Economics that it has recognized the dynamic efficiency of market systems and revealed the deficiencies of socialist planning societies. However, the undreamt of innovativeness and strength of market economies has come hand in hand with undreamt of difficulties. Environmental problems have taken on enormous dimensions and inequality of income distribution is on the increase. As mentioned above, Mainstream Economics has three fundamental weaknesses in handling environmental and resource issues satisfactorily: (1) the lack of an adequate conceptualisation of nature and (2) of justice and (3) the failure to adequately deal with time.

### 2.1. Conceptualising nature in modern times

To be fair to Economics, the criticism that it fails to conceptualise nature in an adequate manner can be said to apply to all modern sciences. The natural philosopher [Friedrich Wilhelm Joseph Schelling \(1809\)](#) put it this way at the beginning of the 19th century: “All modern European philosophy since its beginning with Descartes (i.e. since the seventeenth century, M.F.) has one common failing in that nature is not present in it.” (My translation)<sup>2</sup> At first glance, one can only wonder at this statement, for since the time of Francis Bacon (1561–1626), all philosophies and natural sciences placed nature at the centre of their explanatory systems. What does it mean then to say that nature does not appear in this philosophy and this science, where on the other hand it is omnipresent?

To answer this question we have first to clarify what does nature mean in this context? In everyday life, nature is understood as the part of the world not made by human hand. In our normal experience, nature is something independent. This independence of nature led some philosophers and poets, particularly those belonging to the Romantic Movement, like Goethe, Wordsworth, Novalis, Schelling and Thoreau, to perceive nature as the independent basis of life in all its forms. In their view nature has an aim in itself and is constantly at work developing higher life-forms, so that beings are ultimately able to reflect on themselves. The experience of nature as a fountain of life and development beyond human planning

<sup>1</sup> I deal in the following not in detail with the criticisms of conventional economics addressed by ecological economics, but only on very general level. Some readers might consider this approach as too broad and with insufficient detail. I refer those readers e.g. to the book by [Baumgärtner et al. \(2006: Chapters 1 and 6\)](#) and the papers by [Becker et al. \(2005\)](#), [Bromley \(2007\)](#), [Gowdy \(2007\)](#), [Norton and Noonan \(2007\)](#) and [Roepke \(2005\)](#).

<sup>2</sup> “Die ganze neu-europäische Philosophie seit ihrem Beginn (durch Descartes) hat diesen gemeinschaftlichen Mangel, daß die Natur für sie nicht vorhanden ist.” ([Schelling, 1809/1997: 28 f.](#))

led these thinkers to an attitude of universal gratefulness. In contrast, as Schelling noted, the representatives of modern science in their majority seemed blind to this independence of nature. These sciences were concerned with the task of searching for laws that determine nature, in order to command natural processes. For them, nature was no longer something independent in its own right. Instead, nature is nothing more than material for humans and their wants.

This approach still forms the basis of modern natural sciences as well as Economics. For example, let us consider the founder of modern economics, Adam Smith (1723–1790). He assumed that nature would not impose any limits on the endeavour to increase productivity further and further by division of labour and technical progress. Karl Marx followed on from Adam Smith in his hope that material wealth could be increased indefinitely. In the communist economy, Marx expected to find an economy that is able to give everyone what they want. It never occurred to either Smith or Marx that nature, which provides the raw material for this wealth, might resist this human striving for continuous growth. Today, nature is viewed in Mainstream Economics solely as a provider of resources and services. Nature as such does not appear. [Bertram Schefold \(2000\)](#) one of Germany's leading economists, said:<sup>3</sup> “As an editor of a series of hundred classics of economics I have not found any single (economics, M.F.) book, in which nature is at the centre of political economy...” (My translation).

## 2.2. The dispensability of considerations of justice<sup>4</sup>

I will now proceed to show that this neglect of the constraints of nature has implied that the consideration of justice is also dispensable in Mainstream Economics. Generally speaking, from a philosophical point of view, justice relates to the idea of a good life of society: a just society is one whose members are able to live a good life, which also implies that a good life is in harmony with nature. The notion of a ‘good life’ is a holistic concept, which pertains to all important dimensions of social development, i.e. to politics, culture, education, the economy as well as to human interaction with nature.

Early on, the classical economists narrowed down this wide notion of justice by reducing it to a question of income distribution. On this basis, it was logical to neglect the problem of justice increasingly over time. Their argument runs as follows: if the social income is high enough and distributed in such a way that all humans can satisfy their wants completely, i.e. if we are in a state of affluence, then justice as an issue vanishes. Such a state of affluence seems to be feasible, if one presupposes the possibility of indefinite growth, i.e. if one assumes that material wealth can be increased arbitrarily. In the 18th century, this vision was formulated by the Scottish philosopher David Hume (1711–1776) with wonderful clarity. Hume wrote about a state of affluence: “It seems evident that, in

such a happy state, every other social virtue would flourish, and receive tenfold increase; but the cautious, jealous virtue of justice would never once have been discussed of.” ([Hume, 1777/1975: 183f.](#)). 200 years later, in 1930, [John Maynard Keynes \(1963: 366\)](#) wrote: “...the economic problem may be solved, or be at least within sight of solution, within a hundred years. This means that the economic problem is not – if we look into the future – the permanent problem of the human race.”<sup>5</sup> (Italics from the original) Hume, Marx and Keynes all thought: if sufficient goods are available, then the problem of justice no longer exists.

In contrast to this view, Mainstream Economics considers non-satisfaction to be an essential human trait. Hence, this discipline does not expect a communist land of milk and honey, but operates with the constitutive concept of scarcity. But scarcity means that there are not enough goods in relation to the demands of present human beings.<sup>6</sup> Hence, modern economics by no means promises a land of milk and honey that eliminates scarcity. Nevertheless, there are parallels between the Mainstream Economics approach and Karl Marx's view.

Mainstream economists do not view overcoming scarcity as the ultimate goal of history, as it was for Marx, but it is given a dynamically essential role: what is scarce today is not scarce anymore tomorrow thanks to the constant growth of an efficient economy. Tomorrow there will be new wants and new scarcities, only to be overcome the day after tomorrow. Since everyone will receive enough of everything in the course of time, inequalities in income are ultimately deemed to be of no relevance and thus, not to constitute a problem. The notion that expresses the hope of overcoming this dynamic scarcity is economic growth, the magic word in politics. It is for this reason that economists as political advisers place the focus of their counsel on growth as the remedy to all problems of justice. If nature does not impose constraints on economic growth, then everyone can be promised increments of future economic growth. It follows that problems and conflicts relating to the justice of income distribution can be ignored. In this way, Mainstream Economics has been able to rid itself of the bothersome notion of a good life.

## 2.3. Conceptualising time

I turn now to the third deficiency of Mainstream Economics. Some of the best economists have noticed that their method of modelling time is inadequate. The well-known neoclassical capital theorist [Robert Solow \(1985:330\)](#) even wrote ironically: “There is a single universal model of the world. It only needs to

<sup>3</sup> The quotation continues as follows: “Nature` is no concept of economic theory. It is only viewed as something like other economic concepts such as production, consumption, land, labour, utility, which supply us a restricted relationship concerning nature.” (My translation)

<sup>4</sup> The argument in this section was developed at length in [Faber and Petersen \(2006\)](#).

<sup>5</sup> [Keynes \(1963: 365–6\)](#) made this statement under the following assumptions: “I draw the conclusion that, assuming no important wars and no important increase in population, the economic problem may be solved, or be at least in sight of solution, within a hundred years.”

<sup>6</sup> In the language of [Robbins \(1932: 15\)](#) the definition of modern economics is: “The economist studies the disposal of scarce means. He is interested in the way different degrees of scarcity of different goods give rise to different ratios of valuation between them, and he is interested in the way in which changes in condition of scarcity, whether coming from the demand side or the supply side – affect these ratios. Economics is the science which studies human behaviour between ends and scarce means, which have alternative uses.”

be applied. You can drop a modern economist from a time machine – a helicopter, may be, like the one that drops money – at any time, in any place, along with his or her personal computer, he or she could set up in business without even bothering to ask what time and which place.” Path dependency, invention, technical innovation and irreversibility are not handled sufficiently. For example, Paul Samuelson (1983:36) noted: “In theoretical economics there is no ‘irreversibility’ concept, which is one reason that Georgescu-Roegen (1971) is critical of conventional economics.” All the various attempts of Mainstream Economics to get a grip on time were commented by one of the leading economic theorists of the 20th century, John Hicks (1965:47), who remarked: “The more precise capital theory became the more static it became....” This is why John Hicks turned away from Mainstream Economic capital theory and became one of the cofounders of neo-Austrian capital theory, where time is at the forefront of the analysis. After having explained the three deficits of Mainstream Economics, nature, justice and time, I shall now turn to Ecological Economics.

### 3. What is Ecological Economics?

Let me first summarise my view of Ecological Economics. In doing this, I am aware that my emphasis on normative issues in Ecological Economics can be debated. From my perspective, the interest in nature, justice<sup>7</sup> and time constitutes the defining characteristic of an ecological economist: this interest forms a unifying bond between ecological economists. The central goal of Ecological Economics is to contribute to justice in the wide sense as defined above. For Ecological Economics, justice means the idea of a good and sustainable life not only for humans, but for all beings. A just human social order includes the stipulation that it preserves itself and its natural foundations of its existences. If we are interested in justice, we should also be prepared to act to bring about justice in the real world. It is for this reason that Ecological Economics is by its very essence not only research — but also action-orientated. Therefore, ecological economists should be willing to give advice to government and society. The question of sustainability requires that particular attention be given to time. This is a specific characteristic of Ecological Economics: different time horizons, short-, medium- and long-term perspectives as well as irreversibility must be reckoned with in nature, economy and politics.

From a normative perspective, Ecological Economics views nature and justice are closely connected: Ecological Economics is an attempt to consider economics and nature according to the prerequisite that besides the dignity of humans an independent “dignity of nature” has to be respected (Huber, 1990: 233). This idea that the dignity of humans and the dignity of nature must simultaneously be respected can be considered the defining

norm of Ecological Economics. There does not exist a trade-off between the dignity of nature and anything else: there does not exist a price for the dignity of nature. Viewed in this way, the task of Ecological Economics seems at first sight to be simple: Take care of nature and justice when giving advice and be sure that time structures are taken into account.

However, this rule of thumb leads to great complications; for Ecological Economics has norms which go much further than those of Mainstream Economics so that Ecological Economists are confronted with a much more complex world. The world of Ecological Economics deals explicitly with the constraints of nature, for it acknowledges that in reality there are limits to the growth of real income. Hence, questions of just income distribution can neither be dispensed with by attaining boundless affluence, as the philosopher David Hume suggested, nor can they be diffused by unlimited economic growth as Mainstream Economics proposes, because growth is definitely limited by the constraints of nature. From this follows: increasing environmental degradation and scarcity of resources on the one hand and increasing conflicts regarding income distribution on the other hand seem to lead an adviser into a veritable minefield of insurmountable obstacles: hence, questions of sustainability seem to be unsolvable.

#### 3.1. The fragility of Ecological Economics as a field<sup>8</sup>

How is Ecological Economics as a field prepared for these challenges? Emphasising nature, justice and time opens a broad field of research, which is so far-reaching that no single scientific discipline is able to deal with all its tasks. It is therefore not surprising that a generally accepted theoretical framework or methodology for Ecological Economics has yet to be defined. Issues, methods and results give often the impression of a certain arbitrariness. As Inge Roepke (2005: 285) recently summarised: “The knowledge structure of the field as such is obviously not well structured and systematically organized.” Roepke (2005: 286) concludes that “...the identity of the field is relatively weak.” Obviously, Ecological Economics as a field of research is a fragile one.

#### 3.2. A second fragility: excessive challenges to an ecological economist

The fragility of Ecological Economics as a field augments the difficulty to which ecological economists are exposed, i.e. to face up to the great challenge of contributing to the good and sustainable life of humans and nature. They have to deal with very far-reaching norms, which have to be applied to large areas of uncertainties and ignorance. This goal is so complex and encompassing that it seems to demand a super-science, but instead ecological economists can not even rely on a well founded knowledge structure in their own field.<sup>9</sup>

<sup>7</sup> Some may find it surprising that besides the interest in nature, I have given interest in justice such a predominant role in determining Ecological Economics. And, as a matter of fact, we find many more publications dealing with nature than with justice. But we should be always aware that studies on the environment without considerations of justice, at least in the motivation, do not belong to Ecological Economics. Of course, the opposite also holds true: papers on justice without a relationship to nature do not belong to our field.

<sup>8</sup> A paper published recently in this journal by Brian G. Norton and Douglas Noonan (2007) presents a rather different assessment of the “fragility” of Ecological Economics.

<sup>9</sup> I want to mention in passing that ecological economists are not the only academics who are burdened with their challenges of their endeavours. This is for example, the case for many who work in developing countries.



To summarise the implications of the two fragilities: the combination of a research field that is not well organised and the extensive demands of the task could easily cause an ecological economist to despair. This conclusion brings me back to the question of my lecture.

#### 4. How to be an ecological economist?

I have proposed that there are two reasons why it is not easy to be an ecological economist.

- (1) The identity of the field is not well defined and
- (2) the task of an ecological economist is very demanding.

##### 4.1. Freedom of research

At first sight, these two difficulties seem to present a bleak outlook. However, if our perspective was really so depressing, would so many of us have travelled to this 7th International Conference of the European Society for Ecological Economics in Leipzig? What is it that keeps a firm hold on us as ecological economists? We obviously sense that there is more to it. And as a matter of fact, the two disadvantages mentioned above have flip sides. For the two disadvantages open up a tremendous scope of freedom. Our interest in nature, justice and time widens our horizon of recognition beyond the narrow boundaries determined by the questions and methods of single disciplines. In my view, ecological economists enjoy a unique freedom in their thinking, creative conceptualising and research. However, to really make use of this freedom, ecological economists need confidence and conviction: confidence that the problems and tasks that Ecological Economics poses are really worth supporting and the conviction that they are willing to walk a long and sometimes lonely way to solve them.

This attitude is supported by the recognition that the central questions of Ecological Economics are central questions for society and the sense that by simply doing their work, the scientists are contributing to an important goal for the whole of humankind. This insight releases motivational energy and satisfaction, which enables them to overcome apparently insurmountable difficulties. One does not gain fundamental insights like this once and for all. In the course of time they get lost in swells of doubt and anxiety. Ecological Economists therefore need a way of life that consistently renews these insights and allows them to regain them again and again. To summarise: to walk the path of an ecological economist, one needs an attitude of confidence and of courage to face all kind of discouragements. But the longer one travels this path, the more one experiences that one's confidence and courage is growing. We can see many examples of this if we look to the pioneers of Ecological Economics.

##### 4.2. Pathfinder: power of judgement

All of what I have said concerns the motivation, willpower and strength required to walk the path of an ecological economist. However, if Ecological Economics is primarily an action-oriented field, we need more than just these. First, we need

orientation. Here the three general guidelines: nature, justice and time give us a general direction. However, these are only rules of thumb and so abstract that they are of little help in concrete situations. There is a big gap between our general guidelines and the concrete challenges of everyday life. This state of affairs is particularly awkward because the ecological economist has to act as an adviser. From a purely scientific point of view, this results in a depressing outlook, for purely scientific politics is not possible in Ecological Economics. Does it follow from this that an Ecological Economist's advice is arbitrary? This is by no means the case; for the problem that confronts Ecological Economists is not as new as it looks: it has been known in the field of philosophy for more than 2000 years and thinkers from the Greek philosopher Aristotle to the political philosopher Hannah Arendt have examined it at length.

From their philosophical perspective, situations dominated by complexity, uncertainty and ignorance can be tackled using a skill that is particular to humankind. This ability is termed *Urteilskraft* in German and in English 'power of judgement', 'prudence' or 'practical wisdom'. Power of judgement is the source of practical wisdom and adequate judgement in concrete situations. Thus, adequate judgement leads to good decisions. In political philosophy, power of judgement is seen as the key capability to develop responsible and successful solutions even in situations dominated by complexity, uncertainty and ignorance. As the philosopher Immanuel Kant (1787/1982: 177) noted, the ability to make adequate judgements is a particular talent, which cannot be taught but only exercised. As Kant explained, a judgement is found not only by using the mind, but also by imagination and sense. It is for this reason that good judgements cannot be arrived at by simple deduction. What power of judgment is and how it operates cannot be explained generically, but can only be demonstrated in concrete cases. This implies that good judgements cannot be developed using special methods.

In real life, good physicians, competent judges, good homemakers, truly successful politicians and good scientific researchers exhibit power of judgement. Justifications for their actions can never be derived solely through analytical reasoning. Their expertise derives from personal experience, learning by doing as well as from some general guidelines. Good judgement is required in order to ensure that openness does not turn into chaos and that freedom does not turn into arbitrariness.

Different aspects exist pertaining to the activity of power of judgement in different areas and disciplines. What does this mean in Ecological Economics? I propose that there are two prerequisites and two specific skills. The first prerequisite is professionalism. It is very useful to have been exposed to a good education in one discipline and subsequently gain a reputation in one's own field. This ensures that one has at one's command the ability to apply the methods of one's discipline professionally. Further, it enables one to distinguish what one knows from what one does not know. This is important, for otherwise there is a considerable danger of amateurishness. So much for professionalism.

I would now like to turn to the first skill of power of judgement. This is the capability to engage in transdisciplinary dialogue and interdisciplinary cooperation. A certain familiarity

with the disciplines of one's co-workers is necessary for truly interdisciplinary work. Since the available knowledge is often insufficient, interdisciplinary research cooperation demands teaching and learning on both sides. Compared to joint research within one area, interdisciplinary work is cumbersome, because it is one thing to lecture students, another to give an elementary introduction to a specialist in another field, and still another again to be taught perhaps by someone who is much younger than oneself and sometimes not yet even established in their own discipline. Only when the economist has mastered the relevant area of ecology and not simply read an introductory text, and only when the ecologist is familiar and comfortable with the relevant economic theory, can fruitful dialogue take place (cf. [Faber/Manstetten/Proops, 1996: 200](#)). Such a dialogue often allows researchers to take into account various aspects that help identify solutions that might otherwise be overlooked by one representative of a single discipline.

The second skill of the factual 'power of judgement' in Ecological Economics is sensitivity to different temporal structures. We not only need to be able to analyse problems under stationary or quasi-stationary conditions but also under truly dynamic circumstances. The relationships between different time horizons in ecosystems and economic systems are of central importance. When dealing with time, one must always use concepts that address how to deal with risk, uncertainty and ignorance, because the concept of time makes one sensitive to the limits of one's own knowledge. In addition, ecological economists become aware that the time dimension includes a normative element, since one cannot avoid making, at least, implicitly evaluative decisions: how many generations shall be taken care of, i.e. what length of time horizon should be selected? Should a social discount rate be applied or not? And if so, how high should it be?

To deal with time in Ecological Economics we can learn a lot from [Georgescu-Roegen \(1971: Chapter 9\)](#). He showed how it is possible to get to grips with time. He used a thermodynamic perspective and employed the concepts of stocks, flows and funds in a congenial manner ([Wodopia 1986; Faber et al., 1999, 2005](#)). Finally, I want to remark, that ecological economists can learn about time from *Evolutionary Economics*.<sup>10</sup>

I now turn to the second prerequisite of 'power of judgement'. I call it the quality of attentiveness. Scientists are used to thinking in abstractions and models. We select and filter reality. This ability is an essential part of our professionalism, but as ecological economists we cannot restrict ourselves to only this kind of activity in developing our perspective. Complementary to our professionalism, which forces us to abstract, we need the ability to experience unfiltered what we see, feel, smell, hear and taste in nature. This unfiltered awareness is what I mean by attentiveness. For only if we are attentive to the dimensions of real life can we make

sure that our choice of scientific lens for observing the world does not altogether obscure our true problem of caring for nature and justice.

## 5. Summing up

To sum up: Interdisciplinary studies broaden our horizon, time further expands our perspective. However, we must be aware that this broadening involves a risk of arbitrariness. Here, the power of judgement protects Ecological Economists. While it is an important aspect of judgement, professionalism alone runs the risk of fostering narrowness. Sensitivity to time not only expands our perspective, it also reinforces humility, by forcing us to face up to our own ignorance. Attentiveness to the Gestalt of Ecological Economics problems leads to openness, safeguarding against narrowness. If all these qualities are truly cultivated by ecological economists, then the two fragilities of the institutional structure and of the excessive demands of the task of an Ecological Economist can be turned into strengths: Ecological Economists will blossom and Ecological Economics will flourish.

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<sup>10</sup> Evolutionary Economics is a heterodox branch of Economics, which has developed since the fifties of the previous century. It employs a microeconomic approach using a population of heterogeneous individuals. The pioneering forerunners were T. Veblen and in particular J. A. Schumpeter. A pathbreaking book on Evolutionary Economics was written by [Nelson and Winter \(1982\)](#). For the relationship between Evolutionary Economics and Ecological Economics see [van Bergh \(2004\)](#).

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