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The political economy of nature *

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Economic systems and modes of analysis confront several reinforcing boundaries when considering the environment. These include physical limits to growth, the laws of thermodynamics, social limits to growth, the extent to which Nature can be regarded as a commodity, environmental ethics and philosophical divergences from utilitarianism. The consideration of environmental pollution emphasizes how individual choice and social good can be separated; suggesting the need for a decision-making structure that can incorporate a wide range of values. However, economic and political structures seem to be locked in to narrow paths of development. The way in which a dynamic path can be selected by historical accident and then only changed with extreme difficulty is explained by individual preference formation, increasing returns to scale, and the allocation of rights. The result is to recognize that the requirements for advancing current understanding of how Nature and the economy interact are similar to the tradition of Scottish political economy.

I Introduction

Economic discussions recognizing the importance of the environment and natural systems have slowly been evolving. The resource economists of the 1950s tended to regard Nature as a source of materials that required some specialized management due to characteristics that differentiated these materials from manufactured goods. These economists can be viewed as within the neoclassical school and as having strong associations with agricultural economics. In the 1960s, environmental economics appeared as a discipline concerned with the growing pollution problems that were evident to the general public, even if ignored by academia. Together, resource and environmental economics explained how neoclassical models were flawed and how corrections could be made to achieve efficiency gains (at least this is what they claimed, and still claim, to do).

However, critics of the neoclassical school regard extension into such areas as the environment as farcical and offering little insight (Bird, 1982).

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Within the field of environmental and resource economics discontent with the policy relevance of prescriptions is often evident, but neoclassical theory still seems to maintain a dominant role. That was true until the late 1980s when ecologists and economists started to talk in a more formal fashion. The result has been the formation of ecological economics, which is attempting to take a fresh look at how economic systems interact with Nature. The methodology of this newer approach is still refreshingly open, and part of the thrust of this paper is to suggest the direction that it should take.

In this paper, the problems confronting the neoclassical approach are outlined. Several types of limits to economics are shown to exist. The welfare of future generations is discussed in some detail as one of the main concerns of environmentalists and, presumably, a prime reason for economic growth. The representation of future individuals raises the issue of including a variety of values and opinions in the economic and political decision-making process. The free-market liberal-democratic approach is argued to be dangerously flawed in its all-inclusive consumerism. Next, the ability of economic systems to switch from their current trend is discussed. This suggests several requirements for the study of environmental problems and economic interactions with the environment. These requirements are noted with some reflection upon the ability of the economics profession to achieve them.

II Environmental limits to economic systems and reasoning

A common concern raised by environmental problems, as expressed in the late 1960s and early 1970s, has been that there are limitations to economic growth and more subtly the form of that growth. Most recently, this has lead to an extensive literature on sustainable development. The realization of physical limits to growth was popularized by Meadows *et al.*'s (1972) study, which earned the reputation for being in the ecodoom school and resurrecting the memory of Thomas Malthus. However, prior to the rise of this popular literature, the introduction of the first law of thermodynamics, within rigorous neoclassical models, occurred with materials balance theory (e.g. Kneese *et al.*, 1970).[1] Essentially, introducing the laws of thermodynamics began to define the limits on production, which were sorely neglected by general equilibrium models with their assumptions of resources as the 'free gifts of Nature' and 'free disposal'.[2] Although, in his

[1] The first law concerns the conservation of matter and energy. This states that energy, like matter can neither be created nor destroyed, and is constant between a system and its surroundings. The second, or entropic, law states that energy flows from available (free) forms to unavailable (bound) forms. Thus, a closed system becomes less organized as energy becomes bound.

[2] The 'free gifts of nature' assumption is also made by Marx in Capital (Perrings, 1987: 5).

treatment of general equilibrium, Debreu (1959: 39) places 'free disposal' near the end of a list of assumptions, the ranking of which is stated to correspond approximately to decreasing plausibility. Yet the laws of thermodynamics still appear to be neglected by mainstream economists, despite renewed attempts to emphasize their relevance (e.g., Perrings, 1987).

The recognition of physical limits was followed by the identification of social limits to growth by Hirsch (1977). Just as economic growth is limited, due to resource and assimilative capacity constraints, so is mental satisfaction limited, due to the scarcity of social goods. The limits to market-based transactions, which Hirsch describes, are directly relevant to the environment. One particular aspect of his argument concerns the characteristics of goods in the social context and how individuals behave so as to be governed by more than their own calculated advantage. That is, the selfish motivation to action in one's own best interest ignores important aspects of human psychology. This is an argument made simultaneously by Sen (1977).

Sen regards *homo oeconomicus*, the rational individual operating to maximize personal gain, as a rational fool. He describes the following conversation between two such individuals to illustrate his point.

> 'Where is the railway station?' he asks me. 'There', I say, pointing at the post office, 'and would you please post this letter for me on the way?' 'Yes', he says, determined to open the envelope and check whether it contains something valuable.

In Sen's view the economics of motivation based upon rewards and punishments neglects the whole issue of 'commitment' and the social relations that surround it. The concept of commitment is, simplistically, one of duty without the intention of personal gain. The concern under commitments is for ethics, since moral reasoning influence's individual action, but in a broader sense these are matters of culture, of which morality is a part.

Morality might be viewed as the definition of limits to action. Thus, if economics is regarded as having no limits to trade-offs it can be regarded as immoral, or at least lacking in a moral code. However, this would be exaggerating the extent to which economics lacks moral roots. In fact, the moral roots are firmly planted in the utilitarian school. This means actions are limited by the balancing of pain and pleasure (to use Bentham's words), which has been modified in to the balancing of costs and benefits in net present value terms. The argument over the importance of commitments can therefore be regarded as a challenge to utilitarianism. This issue is considered further below in the context of duties to future generations.

III Intergenerational limits to economics

Concern for future generations due to economic activity arises from the reduced opportunities that might result from resource extraction and the creation of long-term damages, e.g. due to pollution.[3] Intergenerational efficiency allows for the violation of human rights because any two states generating the same welfare values must be treated in exactly the same way. Standard objective functions in economics make the relative merits of social states depend upon the welfare characteristics of those states. However, on grounds of justice, even if a future individual is richer, enjoys a higher welfare level, and the marginal utility from a consumption gain is less for this person than the marginal welfare loss of a current individual, intergenerational transfers may be required to avoid uncompensated effects of pollution (Sen, 1982).

However, the extent to which compensating future generations for damages is acceptable is smaller than might be suggested by this view, where changes in units of welfare are assumed to be equivalent regardless of their direction. The standard approach of economists, in this regard, can be traced at least as far back as Bentham (1843: 438)

> ... To the individual in question, an evil is reparable, and exactly repaired, when after having sustained the evil and received the compensation, it would be a matter of indifference whether to receive the like evil, coupled with the like compensation, or not.

Bentham believed harm was reversible by good. On the contrary, harm persists despite doing good, and good fails to justify harm. If an individual pays to have a road straightened and saves two lives a year, they cannot shoot one motorist a year and simply calculate an improvement (Barry, 1983).

This argument is most apparent where the right to life is involved, but can be extended to other areas where rights are accepted to exist. For example, assume individuals of a nation are accepted to have a right to live in their own homeland. A sea level rise due to global warming floods the Maldives and violates this right. Of course the Maldavians can be relocated and compensated, but this approach is unacceptable given the previously stated right (Spash, 1994). However, there is an implicit argument over who makes the decisions going on here, and free-market economists would be concerned about the paternalism of central government. In political systems where the individual is their own best judge of welfare changes there are no bounds to trade. If the Maldavians believe they are better-off

[3] The problems of discounting long-term environmental damages has been described elsewhere (Spash, 1993), but some aspects of the issue are worth reflecting upon to illustrate how political judgements must be incorporated. An application of some of the arguments put forward here can be found in Spash (1994), using the greenhouse effect.

in their new homeland then who is to deny the acceptability of this exchange.

The difficulty in the intergenerational context is that the individuals who will be impacted are unavailable for comment. The protection of these individuals from active harm requires that they are represented in the political process, and rights seem to offer one way to achieve representation. In fact, this approach would define harm as a violation of the rights adopted by society. More generally, the economic process of exchange can be viewed as the transfer of goods and services within a framework of established rights. In this case, rights are only valid in so far as the institutional setting allows them to exist. This is a position also expounded by Bentham.

Bird (1982: 592) has argued that, using the ecologist's judgement, certain aspects of environmental quality must, given current scientific knowledge, be treated as 'immutable constraints'. Presumably, this constraint could be relaxed if knowledge improved. Similarly, the appeal to the 'safe minimum standard' can be viewed as an example of constraining economic trade-offs by introducing rights. This standard advocates the protection of species, habitats and ecosystems unless the costs of doing so are unacceptably large (Bishop, 1978). However, in this case, the withdrawal of the right of, say, a species to exist at some cost implies a basis of the right within utilitarian morality. Both views could therefore conflict with rights in the context of a deontological philosophy, and the existence of a right of future generations in the sense of a natural-right.

A natural-right can be defined as a right based upon intrinsic value and would be valid regardless of legislation in a particular society at a particular time that recognizes such a right (on natural rights see Nash, 1989). There are many instances where intrinsic human values are recognized by 'free-market economies' and such rights are protected from violation by contractual agreement. Examples of these rights include the right: to freedom of speech, to freedom from torture, to sue another party, and to be free from slavery. Freely contracting children are protected from working in coal mines despite the potential economic gains. These rights are maintained despite the fact that there are those who would accept the loss of their rights given enough money, or societies in which these rights are denied.

The economists' appeal to cost-benefit analysis attempts to take losses and gains of controlling harmful activities directly into account. In doing so the rights of future generations are violated when the costs of control are deemed to exceed the benefits of that control. The use of cost-benefit analysis therefore denies the existence of inalienable rights. Reliance upon the potential compensation principle prevents compensation while the welfare of a subgroup of individuals is reduced. Even the Pareto criterion allows harm to be inflicted but at least this harm must then be compensated

for by resource reallocation. That is, harm and good are seen as equivalent. However, harm is recognizably different from good and the deliberate infliction of harm is morally objectionable, as recognized in modern democracies.

If rights which protect future individuals from long-term environmental damages are accepted to exist the scope for trade-offs commonly assumed in economics will be drastically reduced. The practice of comparing estimates of compensation payments with control costs to determine whether pollution is permissible would be stopped. Neither potential nor actual compensation payments can be taken to allow society to pollute just because the damages created are estimated to be less than the amount of the estimated compensation. However, where irreversible damages are recognized due to previous actions there would be a role for compensation. In order to protect the future from potential infringements upon this right, actions with uncertain intertemporal consequences would have to be avoided, and environmentally benign production and consumption processes encouraged. This can be viewed as a stricter definition of the Pareto criterion preventing harm rather than allowing harm and actual compensation.

IV Economic and political decision-making

The previous section has raised the issue of representation for future generations in the political process. Similar arguments have been put forward to support the consideration of non-human animals, trees and ecosystems as entities in their own right. An eloquent and early example of such arguments is Leopold (1949). The representation of these various concerns is discussed here in a liberal-democratic political system concentrating upon future generations and the impact of long-term environmental pollutants; e.g., radioactive wastes, stratospheric ozone depletion, greenhouse gases.

Ignoring future voters is problematic even without questioning the efficiency criterion. Policy decisions are encouraged that impose costs upon the future to benefit the present and may later have to be reversed. For instance, the construction of Hetch Hetchy dam adjacent to Yosemite valley, in California, flooded an area that is now highly valued in its former pristine state. In this case strong representations are being made to have the dam removed and attempt restoration. Unfortunately, once long-term pollutants are created and released they are almost entirely beyond our control; i.e., the action is irreversible.[4] Yet the future has asymptotically decreasing economic power due to discounting, and only indirect political

[4] Such irreversibility is discussed by Spash and d'Arge (1989) for the case of greenhouse gas emissions.

power through the altruistic motivations of individuals.

While environmentalists, among others, express deep concern for our descendants' claim on natural resources and environmental quality, taking account of the benefits to unborn generations of pollution abatement may be considered to widen the concept of democratic voting in an unacceptable way. That is, those who are alive today constitute the proper electorate and the government's social welfare function should reflect only the preferences of present individuals (Marglin, 1963). An altruistic counter argument can be made in as far as individuals identify with a community extending over time. In this way, posterity gains a voice and a kind of vote due to the influence of this voice on actual votes (Boulding, 1966: 260). However, this vote, while perhaps extending the concept of democracy, is still quite limited.

Part of the reason for neglecting future generations, and the wider social and environmental concerns, may lie with the political and economic emphasis upon individual preferences conforming to egoism. Neoclassical economics places individual preferences at the centre of resource allocation decisions, although no one individual is able to influence the market price. The political corollary is a decision-making process where everybody has an input to the outcome but no one person determines the outcome. This links the free-market ethos directly to the liberal-democratic political system.

Much of the traditional justification for capitalism lies with its assumed ability to protect individual liberties. Individual freedom lies behind the concern to see pollution taxes rather than regulation. Yet, the debate is conducted in efficiency terms that are viewed as positive rather than in terms of how far individual liberties are actually infringed or protected. The efficiency case has been a part of 'scientific' economics, because it has appeared to rely only on uncontroversial moral premises, while the argument in terms of freedom has appeared more 'philosophical' (Hausman and McPherson, 1993: 693).

Now, consider how government decision-making institutions have encouraged the use of market prices to determine the outcome of resource allocation choices. In the environmental area, institutions of government, such as the Ministry of Agriculture Fisheries and Food, the Forestry Commission and Scottish Natural Heritage (among others), have been investigating how market prices can be used to value non-market environmental 'commodities'. The assumption is that efficiency will increase as a result while individuals have some say in the outcome of policy, ostensibly via their willingness-to-pay.

A requirement of this approach towards using market prices to allocate resources is that the environment be a well-defined commodity. This is something of a self-fulfilling expectation, which relates to what Hirsch calls the consumerist approach. He uses the example of sex and marriage to

show how the market can destroy values it cannot control (e.g., romance and trust). As Hirsch (1977: 101) states:

> The highly specific marriage agreement proposed in *Ms.* magazine is a precise parallel to this consumerist approach. This explicit arrangement sees marriage as a narrow commodity, rather than embodying characteristics that include unspecific social ethos. So this calculative approach, with its determination to secure fair exchange, risks losing the antithesis of exchange. Orgasm as a consumer's right rather rules it out as an ethereal experience.

There is a striking resemblance between this legalistic definition of consumers' rights and the citizens charters touted by the British government, as the supposed solution to any difficulties in the drive to privatization. The unfortunate prospect for Nature is that cost-benefit analysis is being taken to the extreme of trying to value its very existence.[5] This is an ongoing situation. Existence value is seen as a positive recognition of Natural values (some, such as David Pearce and colleagues, even regard it as a measure of intrinsic values in non-humans). However, there are those who see the consumerist approach in action. In fact, approximately 25% of people have been observed to reject the market valuation of Nature, in two independent studies, on grounds which appear to show lexicographic preferences (Stevens *et al.* 1991; Spash and Hanley 1994).

When individuals are found to reject the decision-making process, because it regards the environment as a commodity, and they refuse to participate in the process of forming environmental values, the political economy is in trouble. The danger is that these individuals will be disenfranchised. Thus, some might claim that 'the individual is irrelevant to the judgement of what is best for society'. So, when asked their willingness-to-pay to preserve, say, an endangered species, individuals are only making an input to the cost-benefit analysis, rather than actually conducting one on an individual basis to decide what society should do. Therefore, if some refuse to participate in the process, the revealed preference procedure can continue, although perhaps the indifference mapping is complicated.

However, if individuals act so as to reject a particular trade-off, they cannot be compensated, even potentially. The implications of one individual showing lexicographic preferences is that when interpersonal comparisons of welfare are avoided by employing the Hicks–Kaldor criteria, no conclusion is forthcoming. The methodology fails because of the implications of lexicographic preferences, rather than because of an explicit weighing-up of the decision that is best for society.

Thus, the issue now arises as to the necessity that the individual's

[5] Here, I am referring to the practice in environmental cost-benefit analysis of calculating existence values from people's willingness-to-pay or willingness-to-accept compensation under the contingent valuation method. The common classification of values in such studies is in the use of benefits, and non-use benefits (option, existence and bequest values).

decision-making process corresponds to that of society. The case of lexicographic preferences shows that some correspondence is essential unless those who are outside of an adopted approach are to be excluded. In the performance of the contingent valuation method, to find environmental benefits, a category of bids is typically defined as protests and rejected from further consideration in the calculation of hypothetical market value.

The treatment in economics of the need for social and individual philosophies to correspond seems to be rather circular in its historical path. Bentham's type of utilitarianism assumes society is aiming to maximize pleasure for the greatest number, and that this motivation applies to the individual. Yet, as Sen (1977) notes, Edgeworth, Spencer, Sidgwick and others were concerned over the extent to which egoistic behaviour could achieve general good. The process whereby individuals are allowed to maximize their individual selfish utility functions implies some mechanism to achieve the social goal; i.e., overall a correspondence between individual and social motivation is maintained. However, reliance upon the apparent correspondence has allowed the social decision-making process to be largely separated from the consideration of individual decision-making. This can be seen in the split of economics into positive and normative, and the divorce of economics from politics. The result is that social decision-making and individual decision-making need bare no correspondence.

Now, reflect upon the environmental government agencies adopting the free-market ethos. This consumerist approach imposes a system of decision-making that is assumed to be a reflection of individual psychology. This would seem to return the political economy to a situation that was deemed to be desirable by classical economists, namely the correspondence of the individual and social decision-making processes. However, individuals operate in ways other than this fundamentally utilitarian, egoistic process suggests. A contrasting philosophy is the deontological, while the psychology of the individual could operate in many ways, as suggested by lexicographic preferences.

So, a decision-making process is required that allows for a plurality of values and beliefs. That is, potentially incommensurable choices are derived from divergent philosophies; i.e., deontology versus utilitarianism. More than this, the very nature of the environment denies the representation of all its aspects in the form of commodities, or goods and services. In the same way as Hirsch describes the loss of ethereal in commercializing marriage to a legal contract, so the environment loses the ethereal when reduced to the products that can be extracted without excessively endangering the survival of the human species. Ancient forests regarded as board-feet of timber or willingness-to-pay for recreation is just such a loss of the spirituality, romance and love for Nature. The process of enforcing universal value systems upon society and its members is flawed, and the

current form it takes of making Nature a commodity has unforeseen dynamic consequences.

V Lock-in and dynamic processes

The concept of becoming locked-in to a certain dynamic path can be viewed from both the consumer and producer perspectives. In the former case, a hierarchy of wants can create future wants. In the latter case the role of increasing returns to scale can override optimal choices. The implications of such lock-in are reduced opportunities and false perception of an efficient outcome, as illustrated below for the case of pollution externalities. Furthermore, the methodology of economics will need to change to address the issue.

Consumer tastes are rather simplistically regarded as given and non-evolving. This position has been attacked on many occasions. Veblen (1899), for example, pointed towards a dynamic cycle of conspicuous consumption, which we today call 'keeping up with the Jones's', as the path down which society was going. This desire for consumption is also part of Adam Smith's thesis, where rich men purchasing trinkets gives the poor man his bread, and thus takes on an acceptable and essentially moral characteristic. The acceptance of tastes as given was seen by Boulding (1969) as an illusion that distracted economists from investigating the preference formation process. Hirsch (1977: 61) picks up on some of the neglected writings of Knight and Marshall to show how tastes can grow in a hierarchical manner. He describes how the fulfilment of given wants generates new and higher order wants. Thus, a dynamic process of preference formation is a neglected but essential part of understanding why society ends up going along a certain path. Demands today for computers and CD-roms are essentially linked to previous developments in preference formation.

The satisfaction of wants in a dynamic context undermines the tools of welfare measurement set-up to aid in decision-making processes, such as environmental cost-benefit analysis. Measurement of changes in micro-economic theory rely upon stable preferences. If new commodities are rapidly appearing on the market, preference functions might change faster than if the same set of commodities was available throughout an individual's lifetime. This, as far as I know, untested hypothesis suggests how asking individuals to make choices on the basis of stable preferences could be particularly flawed in modern economies.

Much of the concern for environmental degradation requires a fundamental change in human behaviour. Belief in the need for that change is one of the defining characteristics used by Milbraith (1984) to identify environmentally concerned citizens. Thus, the process of preference formation and the extent to which society is locked-in to a set of tastes is essential

to understanding how far an environmentally benign economy can be achieved within a liberal democratic society. Tastes become a part of human culture and society, and determine how the individual achieves satisfaction. This implies a degree of restriction on where society goes next and how far changes in lifestyle can realistically be expected. Thus, a decade or two of emphasizing material satisfaction will lead to an increase in environmental degradation (remember the laws of thermodynamics) and the need for further material satisfaction to compensate.

The options available to society can also become limited from the production side of the economy. Arthur (1989) argues that lock-in by industry results from increasing returns to scale. This means the historical precedence of choices has determined the dynamic path along which the economy is heading. Early adopters of a given technology impose externalities on later ones by rationally choosing technologies to suit only themselves. The technology adopted can be inferior to alternatives and, once the path is chosen, reversing the process (i.e., choosing another technology) can become extremely difficult.

A third type of lock-in concerns institutional structure and property rights. This is found in Mishan's (1971) article describing the flaws in common arguments on pollution as portrayed by the fictitious Dr Pangloss. The situation of laws that allow pollution, unless the polluter is bribed, can result in excessive externalities, just as laws that prevent pollution, unless compensation is paid, result in lower than optimal levels of pollution. The central point here is that society can end up in either position depending upon historical precedent. Once industry and individuals are allowed to pollute, the transaction cost to reducing that pollution can create a barrier preventing hypothetical Pareto improvements. This will be reinforced if there is a divergence between willingness-to-pay (WTP) and willingness-to-accept (WTA) compensation due to positive income or welfare effects, because the allocation of pollution rights affects welfare. Thus, your noisy neighbour may refuse a bribe, which is your maximum WTP under pollution permitting laws, while you may refuse the same amount as a compensation payment (WTA) under pollution preventing laws.

The concern for being locked-in to a polluting society leads to an argument along the lines of justice for reasons why this state might be undesirable. That is, once society ends up on one side of the barrier, economists arguing purely on efficiency grounds seem helpless to show why society should cross back over. Mishan however gives three good reasons for making that journey. First, future generations are neglected from the selfish calculations of the pollution permitting society; i.e., there is a missing market. Secondly, increasing levels of environmental risks are associated with new innovations but the innovators are ignorant as to the nature of these risks. This in turn connects with Arthur's lock-in problem. Thirdly, there is a distinction between the 'active' and 'passive' agent

where a conflict of interest arises. In many cases an ethical consensus can easily deal with a conflict and help attribute culpability by circumstance. For example, there would be little sympathy for someone complaining of indecent exposure in a brothel or noise at a rave. Thus, apparently rigorous arguments on efficiency grounds are easily rejected on moral grounds.

VI Political economy and the environment

The arguments so far put forward for the consideration of the human relationship to Nature reflect several of the features which Dow (1987: 342) has given as defining Scottish political economy. A summary of those features is:

(i) an acceptance of the limitations of theory;
(ii) a recognition of the sociological and psychological aspects of theory appraisal;
(iii) a concern with practical issues;
(iv) a consequent preference for breadth of understanding of the background to these issues, over depth of isolated aspects;
(v) a preference for arguing from first principles;
(vi) a preference for approaching a subject's first principles by discussing their historical development;
(vii) a specification of first principles in terms of a non-individualistic representation of human nature, with a consequent emphasis on conventional behaviour.

In the early sections of this paper I have argued that the study of Natural systems requires the recognition of limits to economic theory ranging from thermodynamics to philosophy. The social limits to growth and flaws of economic approaches to psychology become central issues when topics such as sustainable development and environmental cost-benefit analysis are raised. The consistent driving force behind the study of economic interactions with Nature has been the practical problems that society keeps confronting. The problems created by lock-in suggest the importance of historical precedent in driving both the technology and the type of externalities that result from the modern economy.

However, from a methodological viewpoint, economists need to start worrying about the ability of the profession to switch into a political economy of Nature. Frey and Eichenberger (1993) describe how the incentives offered to American economists, to produce widely cited, academic, journal articles has driven them to concentrate upon abstract issues defined within the profession itself. This contrasts with their view of the European approach, where professors have a strong incentive to be recognized and gain influence outside academia, and especially in politics. As Frey and Eichenberger (1993: 187) state:

> Economics professors are induced to invest their human capital in specific knowledge of local economic problems and institutions, which is helpful for a political career and getting various appointments.

In which case, European economists are far more likely to be practising political economy. (Although, they note, this fails to be reflected in the journals.) Unfortunately for political economy, the American mode of 'publish or perish' is becoming dominant in Europe; resulting in a movement away from concern for historical and institutional frameworks, and the neglect of policy relevance. The danger for economists concentrating on formalized, abstract and institution-unspecific research is that, while the self-defined standard of professional work seems to rise, the outside demand for economists' output will decline. In the area of environmental research this is particularly worrying as environmental problems seem to increase with time.

VII Conclusions

In order to allow for an open approach to environmental problems, the need to maintain options is essential. The numerous limitations to current neoclassical approaches suggest a cautious approach by practitioners. Those who refuse to recognize the boundaries will end up running into them at full speed. Unfortunately, if policy is based upon the advice of such people, serious errors will be made in environmental management, and many of us may end up being unwitting passengers with neoclassically drunken pilots. Economic systems seem to be susceptible to getting locked-in to a particular dynamic path due to historical accident. If ecological economics is to help us understand our environmental predicament, and what can be done about it, the need is for a movement towards institutional processes whereby a plurality of values can be expressed in the decision-making process. This suggests how the new approach to environmental problems by economists will have to be a political economy of Nature.

VIII References

Arthur, W.B. 1989: Competing technologies, increasing returns, and lock-in by historical events. *Economic Journal* 99, 116–31.

Barry, B. 1983: Intergenerational justice in energy policy. In Maclean, D., and Brown, P.G., editors, *Energy and the future*. Totowa, NJ: Rowan and Allanheld.

Bentham, J. 1843/1954: The psychology of economic man. In Stark, W., editor, *The economic writings of Jeremy Bentham, volume 3*. London: Allen and Unwin, London 421–450.

Bird, P.J.W.N. 1982: Neoclassical and post Keynesian environmental economics. *Journal of Post Keynesian Economics* 4 (4), 586–93.

Bishop, R.C. 1978: Endangered species and uncertainty: the economics of a safe minimum standard. *American Journal of Agricultural Economics* 61 (2), 376–79.

Boulding, K.E. 1966: The economics of the coming spaceship Earth. In Jarrett, H., editor, *Environmental quality in a growing economy: essays from the sixth RFF forum*. Maryland: John Hopkins Press, 3–14.

—— 1969: Economics as a moral science. *American Economic Review* 59, 1–2.

Debreu, G. 1959: *Theory of value: an axiomatic analysis of economic equilibrium*. New Haven: Yale University Press.

Dow, A.C. 1987: The Scottish political economy tradition. *Scottish Journal of Political Economy* 34, 335–48.

Frey, B.S. and **Eichenberger, R.** 1993: American and European economics and economists. *The Journal of Economic Perspectives* 7 (4), 185–93.

Hausman, D.M. and **McPherson, M.S.** 1993: Taking ethics seriously: economics and contemporary moral philosophy. *Journal of Economic Literature* XXXI, 671–731.

Hirsch, F. 1977: *Social limits to growth*. London: Routledge and Kegan Paul Ltd.

Kneese, A.V., Ayres, R.U. and **d'Arge, R.C.** 1970: *Economics and the environment: a materials balance approach*. Washington D.C.: Resources for the Future.

Leopold, A. 1949/1987: *A Sand County almanac*. Introduction by R. Finch. Oxford: University Press.

Marglin, S. 1963: The social rate of discount and the optimal rate of investment. *Quarterly Journal of Economics* LXXVII, 95–111.

Meadows, D.H., Meadows, D.L., Randers, J. and **Behrens, W.W.** 1972: *The limits to growth: a report to the Club of Rome's Project on the Predicament of Mankind*. New York: Universe Books.

Milbraith, L.W. 1984: *Environmentalists: vanguard for a new society*. New York: State University Press.

Mishan, E.J. 1971: Pangloss on pollution. In Bohm, P. and Kneese, A.V., editors, *The economics of environment*. London: Macmillan.

Nash, A.R.F. 1989: *The rights of Nature: a history of environmental ethics*. Madison: University of Wisconsin Press.

Perrings, C. 1987: *Economy and environment: a theoretical essay on the interdependence of economic and environmental systems*. Cambridge: University Press.

Sen, A. 1982: Approaches to the choice of discount rates for social benefit-cost analysis. In Lind, R.C., editor, *Discounting for time and risk in energy policy*. Maryland: John Hopkins Press Limited, 325–53.

—— 1977: Rational fools: a critique of the behavioral foundations of economic theory. *Philosophy and Public Affairs* 6, 317–44.

Smith, A. 1759/1907: *The theory of moral sentiments*. London: Bell.

Spash, C.L. 1993: Economics, ethics, and long-term environmental damages. *Environmental Ethics* 15 (2), 117–32.

—— 1994: Double CO_2 and beyond: benefits, costs and compensation. *Ecological Economics* 10, 27–36.

Spash, C.L. and **d'Arge, R.C.** 1989: The greenhouse effect and intergenerational transfers. *Energy Policy* 17 (2), 88–96.

Spash, C.L. and **Hanley, N.** 1994: Preferences, information and biodiversity preservation. Ecological Economics Discussion Paper 94/1, Environmental Economics Research Group, University of Stirling 41 pp.

Stevens, T.H., Echeverria, J., Glass, R.J., Hager, T. and **More, T.A.** 1991: Measuring the existence value of wildlife: what do CVM estimates really show? *Land Economics* 67, 390–400.

Veblen, T. 1899: *The theory of the leisure class*. New York: Macmillan.