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UNIVERSAL PURPOSE, TERRESTRIAL GREENHOUSE

AND

BIOLOGICAL EVOLUTION

RICHARD SYLVAN



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WINDOWS ON SCIENCE IV

As to the Purpose of the
Universe

WINDOWS ON SCIENCE V

Gaeon Greenhouse,
Nuclear Winter, and
Anthropic Doomsday

WINDOWS ON SCIENCE VI

Illogic and Illusion
in Biologic Evolution

by

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INTRODUCTION

The book continues the WINDOWS ON SCIENCE series, which is intended to offer glimpses, often from less familiar viewpoints, on elements of science, its theory and practice, and what it leaves out or tries to omit or avoid. Among the items mainstream science, still of a heavily reductionistic and mechanistic cast, tries to leave out, so far as it cannot reduce them, are the following: things teleological, such as purposes, ends, goals, intentions; things holistic, such as wholes which are more than mere sums of their parts, communities, Gaea and its cosmological analogues; things animated and intentionally endowed other than humans, such as the rich variety of "higher" animals; and things inconvenient. Consider one of the things not discussed in what follows, skilled animals. Of course, while animals can be exterminated or zombized, both proceeding at breakneck speed, they can hardly yet be hidden entirely from view, even in the most sanitized cities. So meanwhile their intentional features, skills and abilities, are downplayed or removed from view; they are reduced to almost automata-like status, with as much intentional behaviour as possible explained through conditioned reactions, pattern responses, mechanical biological maximizing, and similar demotions and dismissals.

The investigation begins with purpose, especially purpose as coupled with larger holistic objects. There are, without doubt, many purposive objects in our universe; you and I are among them. The thrust of mainstream science, has been to reduce, progressively and drastically, the extent of such objects, until perhaps there are none – or at worst none but subjects like sufficiently fit humans. The reduction has accompanied the trenchant replacement of earlier sciences, Aristotelian science with its "final causes", more recently Cartesian science with its intensional spooks associated with humans and their theologies. A main area where teleological items were imagined to lurk was biology; a mechanistic biology of Darwinian form is widely supposed to have despatched those items.

Although the essays are substantially independent islands of theory thought, argument and speculation, and are intended to admit of independent perusal and assessment, there are major bridges between them. One arises from the familiar complaint that reductionism has proceeded much too far, both in theory and in resulting practice, especially in treatment of holistic items such as environmental objects and systems. Reductionism may be seen as but part of a more pervasive and depauperating minimization, for instance of intellectual richness.¹

¹ Human thought has characteristically operated with far too few models. It has characteristically attempted to explain too much with too little, especially too little decent logical apparatus, and has accordingly regularly failed. Minimization is of course but an upsidedown form of *maximization*, a prime objective in the modern Western intellectual ethos. It is a purpose critically assessed in the Green series, a main drive impelling the

But while rejecting and criticising reductionism,² the way is forward, not backward. No return is sought to pristine nonreductionistic times when worlds were full of agents and spirits, which caused, explained, induced things. The old pure-material vs minds-or-spirits dictotomy is like many related dichotomies, a false one. There is an intermediate way, of much philosophical significance.

A very important, but immensely slow, step in intellectual progress has been the deanthropomorphisation of worlds, the removal of agents, especially human or humanlike agents, from a great many processes. Agency theses, which require agents, are denied by detachment theses, which will figure large in some of the essays which follow – especially in purposive happenings where there are purposes without purposing agents. But similarly there is organisation without organisers, selection without selectors, causations without causers, values without valuers, propositions without proposers, and so on. Things happen, and can be evaluated and explained, even purposively, without invocation of agents.

It has been said that the great achievement of classical Greek scientific philosophy was the removal of agents from many happenings for which explanation was sought. It was realised that worlds could evolve by natural processes without the constant intervention of agents to make processes happen. Of course, invocation of agents would lead to a vicious regress; for unless agents themselves were *self-explanatory*, *their* actions would require explanation through further agents, without end, and so also without explanation of the approved type. The Greek step in deanthropomorphization was exhibited most conspicuously in the procedures of those inclined towards atomism. But, in fact, the agency-freeing of even quite basic notions such as that of cause has been a very protracted business.

The detachment theses advanced, such as that of purposes without purposers, can be seen as constituting another important stage in the de-anthropomorphising of this universe. Indeed, one might use the term 'anthropomorphic theses' for what the detachment theses deny; for, although there is strictly no ground for thinking that the valuers, assumers, proposers, perceivers and purposers involved are human, they have commonly been assumed to be human – in the basic

excessive human industrialization that has produced such terrestrial environmental problems as the Greenhouse effect.

² This is done at length in the noneism of JB. For *noneism* means, as well as self-referentially 'none of this standard *ism* stuff', also nonreductionism.

cases at least, other cases being added by extension for the most part. Even God has usually been fabricated in Man's image (the gender restriction is relevant here, of course).³

An interesting parallel case, where detachment has been completed concerns the concept of cause, where we now accept the idea of causes without causers (or willing agents) – so much so that the earlier connection has been largely forgotten. But Russell remarks on the way the traditional concept of *cause* was derived from the will in his 1912 essay 'On the Notion of Cause' (in *Mysticism and Logic*). Moreover, the view of cause he then adopted, as a neo-Hegelian, was conational (causal influence being due to the self-assertion of monads). This earlier view of his was held by many Hegelians and was one of the things Russell was reacting against in his break with idealism.

The anthropomorphic theses are typically of the form 'For every F there is a G ...' where G's are agents, persons, minds, etc. When *prima facie* evidence in the form of counter-examples (i.e. cases of an F without an associated G) begins to mount against a thesis, there are various ways in which the evidence and counter-examples may be turned:-

- the liberal anthropomorphic response, extends the range of admitted G's (there are now hidden G's, or new types of G – God in Berkeley's philosophy, Gaia in New Age thinking, are obvious examples);
- the conservative anthropic response, denies that the counter-examples are genuine (the counter-example F's are not genuine F's);
- detachment. Whether the second or third response is adopted seems to depend largely on how firmly the conceptual links between F's and G's are embedded in our language, theories or ideologies. To a considerable extent (but by no means entirely), the matter is one of conceptual refinement and choice – do we restrict talk of purposes to cases where there are purposers, or not? A main issue is as to what extent *features* of design, for example, mean design, and this in turn designers; to what extent *features* of purpose mean purposes and these purposers; and so on.

In general, there appear to be three broad stages of escalation in goal-oriented description and explanation:

- (a) phenomena which are naturally described teleologically
- (b) phenomena which are naturally described in terms of purposes
- (c) phenomena which are naturally described in terms of a purposer.

It is clear that there is no warrant for passing to (c) in every case of (a), but a break could be made either before or after (b). What favours the one over the other turns upon how much goes into purposes and how little into teleology. For present purposes, it is hardly necessary to insist upon a

³ These observations, and most of the page that follows, I owe to Nick Griffin.

break after (b) – we could break before (b) but after (b-) phenomena which are naturally described in terms of purposes, as is duly explained. But, for the present, it needs emphasizing that we do not have to insist on breaking after (b). This is a way to disarm a lot of irrelevant criticism. As for the need for a break between (a) and (c), some of the most striking evidence comes from control mechanisms and other cybernetic devices. The awful alternative is, in crude terms, to endow thermostats with souls.

Evolutionary theory can be seen as taking a similar middle path: teleological selection without selectors, adaptations with active adaptors. Darwinian theory itself is sometimes seen in this way:

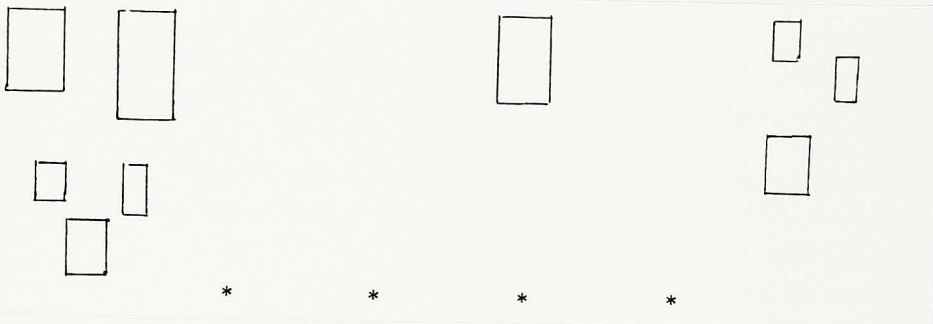
The Darwinian explanation showed that although adaptations are not the result of design, they are nevertheless purposive. They serve certain ends and must be so studied. Thus a scientific concept of teleology can be admitted at the same time that theological and metaphysical teleology are rejected.⁴

There is, in short, purpose, direction to certain ends, in the shape of improved adaption to given environments, without a purposer. Natural selection *sans* selector replaces a purposer, or designer. Rather environmental and other constraints are what account for the selection, as the following simplistic picture helps indicate:

The process is like that of moving rigid objects, such as refrigerators, through fixed doorways.

Constraint doorway, (opportunity or survival gateway).

The results selected are what fit through.



The essays do not pretend to some sort of bogus completeness (something unobtainable in the present precarious state of information). Still worse, they remain preliminary, and are, in

⁴ T.H. Goudge, 'Evolutionism', *Dictionary of the History of Ideas* (ed. P.P. Weiner), Volume II, Charles Scribner's Sons, New York, 1973, p.181. But as many will be aware, this type of middle way is controversial. Many are those who would remove purpose, and even signs of purpose, altogether from evolutionary settings.

significant respects, far from satisfactory. But they advance the issues virtually as far as I presently can. They do take their subjects a little further, I hope, than has hitherto been done, while leaving *much* to be achieved. In the future, if all goes well, more comprehensive and systemic treatments will be provided.

The first essay, on purposes of this universe, makes a further contribution to Griffin and Sylvan's grand project, *Provisional Answers to Ultimate Questions*. Other very preliminary parts of this work have also appeared in these series; namely essays on nihilisms, meanings of life, and cosmological syntheses. These essays represent but the tip of an iceberg of unpublished manuscript, primarily by Nick Griffin, much of it addressing issues linked to the "Why does anything at all exist?" question and the large surrounding territory. A prime reason for this slice of advance publicity is that we should welcome quality input on this project.

The second essay overlaps with products of another series (the Green series, primarily on environmental topics) where, among many other topics, the nasty business of war is addressed. But, as modern technological warfare is very much a product of advanced science (most scientists are after all engaged in its improvement, and even fulfilment), war too offers a big window on science. War has become as much an issue for reflection on science as upon the environment. With environmental issues like those deriving from greenhouse gas accumulation and ozone depletion, much again is a matter of science and technology monitoring, as of trying to fix what science and technology have enabled to be out-spewed.

The Greenhouse essay is primarily concerned with decision making under uncertainty, and critical values and probabilities involved therein. The essay does not aim to give a full picture (to the limited extent that that can presently be supplied) of the inputs and outputs of an increasing Gaean greenhouse. Other inputs include, for example, water vapour enhancements of Greenhouse gases, outputs include more extensive and intense cyclones and other environmental effects.⁵ The second essay is in dynamic tension with the first, because Greenhouse effects appear likely to diminish prospects for value enhancement upon the Earth, whereas the first looks to value enhancement throughout this universe and on the Earth in particular. A route to resolution and synthesis is evident enough: terrestrial reorientation and readjustment.

The second and third essays form part of what I like to call *investigative philosophy*. The commonly applied terminology, "applied philosophy", not only does not get the flavour of the

5 For an entertaining discussion of some of these further issues, see B. McKibben, 'Reflections. The End of Nature' *New Yorker*, September 11 1989, 47-105. However McKibben manages to blend into his discussion some controversial (and substantially ridiculous) themes as to nature and its end, such as: 'We have deprived nature of its independence, and that is fatal to its meaning. Nature's independence *is* its meaning' (p.73)!

enterprise (compare “applied journalism”), but in certain respects is misleading. For it is not simply a matter of applying received methodology, standard philosophical distinctions and techniques; it may well be a matter of adjusting or forging such things, new methods for instance, on the job and of junking chunks of what is received. More generally, investigative philosophy may amount to a frontal attack upon the philosophy that applied philosophy would apply. Deep environmentalism, which rejects the shallow received ethics that applied ethics would apply, provides a good example. The essay on evolutionary theory is intended to afford an illustrative example of *investigative philosophy at work*, in this case an example where one topic in a science, biology, is chosen and a detailed critical investigation, using characteristic philosophical techniques, is attempted.

As for philosophers attempting, in their investigative work, some amateur science, not only is there no reason why not, but there is positive reason to make the attempt given that scientists process some of the theory so poorly (e.g. the dominant idealistic interpretation of quantum theory). In a way, furthermore, venturing into science is merely tit for tat, a useful intellectual strategy. Scientists increasingly think nothing of attempting their own amateur and often appalling philosophy, and therewith lambasting philosophers.⁶

My thanks to Frances Redrup and Debbie Trew for production of these essays and to David Bennett for research assistance.

⁶ We shall have more to say about the philosophical remarks of such luminaries as Hawking and Gould, among others, in a subsequent exercise.

AS TO THE PURPOSE OF THIS UNIVERSE

In a shallow sense my purpose is not that of this universe (in a deeper sense there is, as will emerge, a certain convergence). My present humble purpose, in inquiring into the whys and wherefores of this universe, is primarily to highlight the philosophical tangle of issues involved, and suggest improved lines of approach in order to disentangle issues (rather than to try to resolve them all). For this important tangle has tended, especially in recent post-positivistic times when the tangle has been neglected or dismissed by philosophers, to fall into less philosophically desirable hands and company. It is no doubt bad news for reductionists that there is no sealed Pandora's box into which teleological entelechies have been satisfactorily locked away. But outside the sort of narrower philosophy too many of us professionals practice, the eschatological box has been open all along. My purpose is then in part to try to separate and rescue issues in this neglected tangle. As it will turn out, while I believe we can get a much better grasp of the issues and options than has hitherto been available, there is little doubt but that we presently lack sufficient information, especially about what this universe is *like*, to resolve main issues in a full and satisfactory way. So I not only address unfinished business; I inevitably leave unfinished business.

Now, to begin at the beginning. The **big question** raised is:

What is the purpose of things? – everything?

or, in more amenable form for present purposes

- What is the purpose [point] of this [the] universe?

The question is often conflated with various other major, existentially agonised-over but positivistically dismissed philosophical issues, from which we first try to separate it. In particular, the question is often confused with – or asked *through*, hence the confusion – the different, but not unambiguous, question

- Why does anything at all exist?

The interrogative *Why* means not only: how is it that, for what antecedent reason or cause? – whence the question (already examined in CS)

- + How is that anything at all exists?

– but also : for what purpose?

– and generally then, embracing both: for what Aristotelian cause? (with Aristotelian causes widely construed).

The “How is it?” question can be answered, in rough outline, by explaining how the universe came into existence, from nothing (or, less satisfactorily, because *not explaining* existence, always has existed: see CS). A passable story can these days be told of catastrophic fluctuations in a quantum vacuum (one sort of nothingness), with a giant explosion, intricately followed by inflation. But even when this *sort* of story is filled out (of course it can't be

decently pushed very far at present), it does not begin to address or unravel the (further) issues raised by the first question,●, as to purpose.

No doubt the logically separate questions of existence and purpose can be brought together under various difficult and rather unlikely hypotheses. For instance, it remains, within humanistic paradigms, an extremely appealing hypothesis that there is some intentional thing “outside” the universe (or even, with scant regard for intelligibility, “within ” it) which brought the universe *into existence for some purpose* it has or had; for example, that perfection is necessarily enhanced by an existent universe instead of a non-existent one, an astonishing assumption that stood for almost 2000 years substantially unchallenged. Fortunately such assumptions have now run out of credibility.¹

Another logically separate notion that gets entangled with purpose, and also with existence, is that of *meaning*. But it is not difficult to see that there is something odd about inquiries as to the meaning of this universe; in an effort to achieve satisfactory significance such inquiries get rephrased, for instance as queries into the meaning of *life* in the universe, or even into the meaning of existence. Moreover, it is easy to see in local cases, such as that of a human life, that purpose differs from meaning. A dedicated entrepreneur may have as purpose continuing maximization of monetary profit on enterprises; but the entrepreneur may in the course of admirably fulfilling that purpose lead rather meaningless life (a life largely replicable by a super-computer), as well as inflicting degrading, demeaning or damaging lives on many other creatures. Meaning accordingly, like existence, will be set aside, until the end; purpose is the primary issue.²

Crucial to the present enterprise is the meaning of the term *purpose* and allied terms, which include, in a very wide sweep: intention, objective, aim, end, destination, final cause, reason, *raison d'être*, design, ambition, project, undertaking, motive, predetermination. Many of these allied terms will have to be separated off in order to come to grips with the main issues intended. For instance, reason in the form of *reason for existence*, though allied to purpose, is a distinct and differently answered issue from that of purpose. For, as already observed, in explaining the existence of the universe through inflation of a quantum vacuum effect, we give a reason (of a standard sort) for its existence, but leave the question of purpose partially open – a fraction open, for we also thereby prepare the way for rejection, of one kind or another, of the ascription of (a

¹ When the ontological bubble was finally broken, it went through the erroneous assumption that existence is not a predicate or quality (in one sense), not that it is not a perfection. While existence may or may not enhance value or quality, depending on what is involved (recall e.g. the Christian Devil), it is no general guarantee of perfection, but very commonly the opposite, as any craftsperson who works from plans appreciates.

Of course, medieval philosophers had what seemed to them impregnable defences against such counter-instances; in particular, under the privation theory of evil, there just were no intrinsically evil things (see further Leslie VE, section 5.17).

² In another sense of ‘meaning’, that of intention, meaning cannot be quite so readily set aside.

higher) purpose, e.g. of a Maker or other super-Agency³. Conversely, in presenting the purpose of some life or creature, we may very well not give a reason for the existence of that life or creature. Reasons for existence tend to be backward-looking, tied to past origin or genesis; purposes tend to be forward-looking, tied to future developments.

So much we can glean from the origin of the word 'purpose' itself: 'pourpos' meaning 'set or placed before'. Now what is *set before* – an item admits of variation along several important dimensions:–

- whether it is locally or internally supplied, or imported from elsewhere or externally supplied. Criss-crossing with that is the issue of
- whether it is intrinsic or instrumental. A creature's purpose may be *self* supplied, it may even be self-sufficient and, unlike most humans, little effected by outside (largely local) influences. But a machine's purpose (what's the purpose of that motorised wheelbarrow you're riding in?) is characteristically externally supplied, by designers, makers, operators or others (*other-ors*). Machines have purposes alright, or *uses* if you insist, but instrumental ones not intrinsic ones of the sort designers have. In a cheap sense this universe has an instrumental internally supplied purpose, that of (*some* vector of) the purposeful creatures within it.

The long-prevailing Western view has been, of course, that the purpose of the universe, such as it is (still typically instrumental), is externally supplied; it is an emanation or reflection or product of something else, a over-abundant Absolute or Good or a perfect Demiurge or Designer. Even where the "purpose" has been internalized, the *actor*, Good or God, has not been completely removed, whence for instance pantheism, with a super spirit pervading Nature, or the like.

- The *extent of intentionality* involved. A "creature" or system (an ecosystem or homeostatic system) can have something set before it – its own maintenance, stability, or continuance for instance – without anything very demanding in the way of *intentionality* being involved, such as mind, or rational deliberation on alternatives. Intensionality, with an *s*, does not require intentionality, with a *t* (see JB). It is of the first importance, for what follows, to observe that the ordinary language notion of purpose, as reflected in English dictionary senses (such as those of the OED), caters for intrinsic internal purposes which do not demand inflated levels of intensionality, exalted grades of intensionality such as spirituality.

The relevant⁴ non-obsolete 'simple senses' of *purpose* given by the OED are as follows:

³ Certainly, though it is not to the main point at issue, a Maker is not thereby necessarily excluded. A Maker could have set up tidy laws which ensured that this universe would fluctuate into existence. That such a Maker is creationally otiose is also a separate issue.

⁴ Of the simple senses, the interesting sense 4 ('That which one propounds; a proposition, question, or argument; a riddle; *pl.*, a game consisting of questions and answers') is obsolete, while the relevant sense 5 is not relevant: '5 That which forms or ought to form the subject of discourse; the matter on hand; the point of issue'.

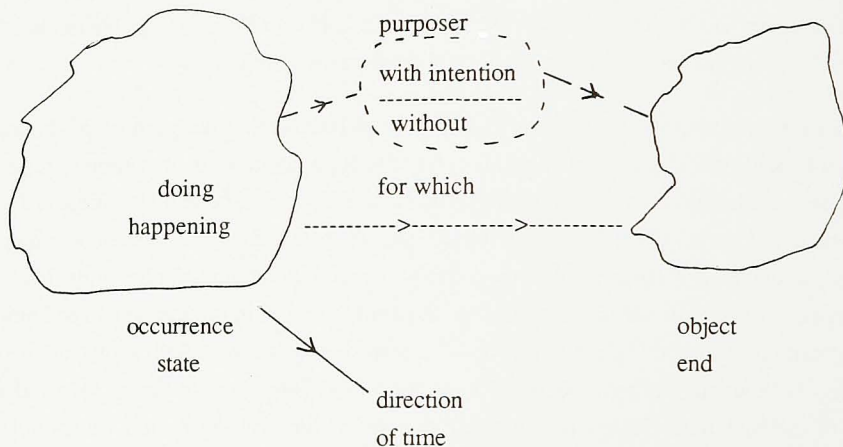
- '1. That which one sets before oneself as a thing to be done or attained; the object which one has in view, ...
- 2....The action or fact of intending or meaning to do something; intention, resolution, determination, ...
3. The object for which anything is done or made, or for which it exists; the result or effect intended or sought; end, aim,...

Part of so-called sense 3 has been set aside; the remainder can be combined with sense 1, as

- 1/3. The object [that] for which anything is done or happens - whether involving an agent or purposer or not.

A *purposer* is of course one who, or that which, purposes. It is that which intends or plans or organises or directs; it may or may not act, or operate with intention. It may, or may not, enter into a purposing scheme, as now diagrammed.

Diagram 1: Relational Schema for Purposing.



Although purpose familiarly incorporates a 3 term relation – involving an occurrence or state, an object or that-for-which, and a purposer – it is evident from sense 1/3 that the purposer can drop out and the relation reduce to a 2-place one (as depicted in the bottom horizontal line of the diagram). That is, *there are purposes without purposers, detached purposes* if you insist, much as there is *organisation without organisers* (natural) selection without selectors, and *causation without causers* (or willing agents).⁵ Alternatively, if a purposer *has* to be retained, it is absorbed in the state. That is, from the less satisfactory absorption angle, there are purposes with internal

⁵ The reworking of traditional philosophical puzzles in terms of object-theory is pleasantly productive of such detachment theses. Some of you will recall such themes as those value without valuers, assumptions with assumers, propositions with proposers, (nonexistent) objects without per/conceivers. *These themes constitute part of the on-going de-agentization, typically de-anthropocization, of maturing philosophy.*

purposers; self-purposing states, rather like self-organisation. But the important shift for the present exercise consists in the removal of any residual factotum, any purposer, whether an agent or quasi-agent or not. Such ancient middlemen are no longer required, they do no real work, but complicate explanations, and accordingly serve no purpose.

Now it may be contended against purposerless purposes, that even if the dictionaries should let such senses and apparent examples⁶ of such uses through, they ought not to, because the notion is unintelligible, makes no sense, or some such. If the notion were not already available⁷, it would need to be made available (selected from *Aussersein*): let it be called *purrpuss*. As to intelligibility, firstly systems and states with *direction* are intelligible, just as intervals with direction, vectors are. So similarly are systems directed *at* something, some object. (Nor, contrary to Brentano, does *direction at* necessarily indicate mental features; vectors are not intrinsically mentalistic.)⁸ Secondly, purpose, or *purrpuss*, can be sensibly inferred from evidence of teleology, signs of purpose, without going so far as to invoke a purposer.

We are now in a position to classify the range of positions as regards the purpose, if any, of this universe:

A [Assertion]. There is some sort of purpose;

A* [Rejection]. There is not any sort of purpose (or sense thereto). The latter bifurcates again:

B [Straight denial]. There is in fact no purpose. This atheistic, old positivist, scientific, position tends to accompany the picture of the universe as a brute fact, which does not need such explanation and lacks purpose. The answer does not do enough. There is a demand for explanation, which “brute fact”, i.e.? *unexplained* fact, does not meet. If there is something wrong with such a demand, then that needs to be spelt out, and in fact leads to the next option.

⁶ The examples are interesting but not entirely solid data. Purposers are all too easily introduced and all too easily alleged to be understood.

⁷ As it may not be in some, earlier, languages. At one stage I pompously conceived of a Latin title for the essay. The trouble is that the evident Latin word for ‘purpose’ is this context, *anima*, all too evidently carried excess conditions much as those of intention.

⁸ Curiously Hegel, while providing an initial picture of purposerless purpose, and thus conceding that it makes sense, went in the opposite wrong direction, proceeding to argue that a conscious agent, a purposer, must also be involved. To set the scene:- According to Hegel, there is a complex and self-perpetuating Project, in terms of which concrete objects and facts obtain their content. The Project could be called (according to Elder p.33) the *getting-realised-of-particular-Ends*. The ‘Project has what could be called a “second-order” end; its end is a purpose about first-order purposes, and it is realised in the pursuing of this first-order purpose and of that and that, in an open-ended series’. So far then there is a Project without a project-manager or even perhaps an active observer. Now Hegel ‘wants to argue ... that this Project ... can be realised in objects and material laws, or in objects and material ends, only if also realised in a third element or content as well, namely the activity of conscious subjects’ (p.33). Elder is inclined to suggest that no argument is really needed, but admits that Hegel had pointed out that there may be purposive work and finite Ends with no conscious agent, who intends that end, present. Hegel has however a further partial argument on which to rely, that from Life to Cognition. But the argument, such as it is lacks cogency; for instance, the transition may be interrupted, by catastrophe or otherwise, it may fail to reach the Life stage. Moreover, a main step in the argument, which begs the question in its assumption of conscious second-order purposes, can simply be denied; purposive activity need not “indicate” ‘linguistic and conceptual behaviour of conscious agents’ (p.34).

B* [Undermining]. The attribution of purpose does not make sense, or cannot apply, because requisite significance or presupposition conditions are not met. For instance, the presupposition condition might be that there exists a [an evident] purposer (cf. the usual existential conditions put up as presuppositions for questions to arise, e.g. the existence of wives for their mistreatment). But it has already been suggested that ascription of purposes does not require [the existence of] purposers. More generally, the existential presupposition line deserves little credence; it would too arbitrarily and without warrant cut off much legitimate discourse about nonexistent objects (see JB). The quite different significance approach, pushed hard by logical positivists, looks at sentence-frames of the form

(Q) '... has such and such purposes', and enquires as to the conditions under which the dotted expression can be significantly filled in. It appears to be extremely tempting to imagine that the requisite superpredicate, specifying significant fill-out, is something like '... is an intensional agent' (or even 'the sort of agent that can have purposes' to make it near-analytic). It also appears extremely doubtful that the term *the universe* satisfies the superpredicate. Unless some unlikely hypotheses are infiltrated, such as that the universe *itself* is some sort of spiritual organism, the universe is not even an agent, still less a purposeful or intentional agent. The significance approach is therefore decidedly appealing. It was where I used to put my support; it is where I still would put it, for what it is worth, *if* the notion of purpose did necessitate (highly) intentional purposers. But with purposes without such purposers or without purposers at all, all that changes. Then we can enquire as to whether this universe has some purpose or other, without violating significance requirements.

As A*, rejection, ceases to be such a promising option, let us revert to A. A classification of A, assertion, types can be made, exploiting the location relation of the purpose-giver or purposer to the purposive system, as follows:—

Subclassification of A.

Z. There is a purposer:—

C. purposer external to system (e.g. Demiurge or Super crafts person who fashions it)

D. purely external of some substantial sort

E. not of the same substantial sort (e.g. a purely spiritual substance, such as a Holy Spirit)

D*. not purely external, but for instance overlaps (e.g. The One, from which the Universe emanates)

E provides a version of neither external nor internal, as D* does of both external and internal.

C*. purposer internal to system, and quite proper part(s) of it.

F. remote (e.g. unmoved movers)

F*. local, to Earth *par excellence*

G. distributed (e.g. biocentric, anthropocentric, anthropic)

G*. local but concentrated (e.g. Jesus Christ, Christ and certain followers)

C**. purposer integrated with whole system

H. identified (e.g. pantheisms)

H*. not identified with, but e.g. purpose “suffuses” the system (e.g. self-purposive).

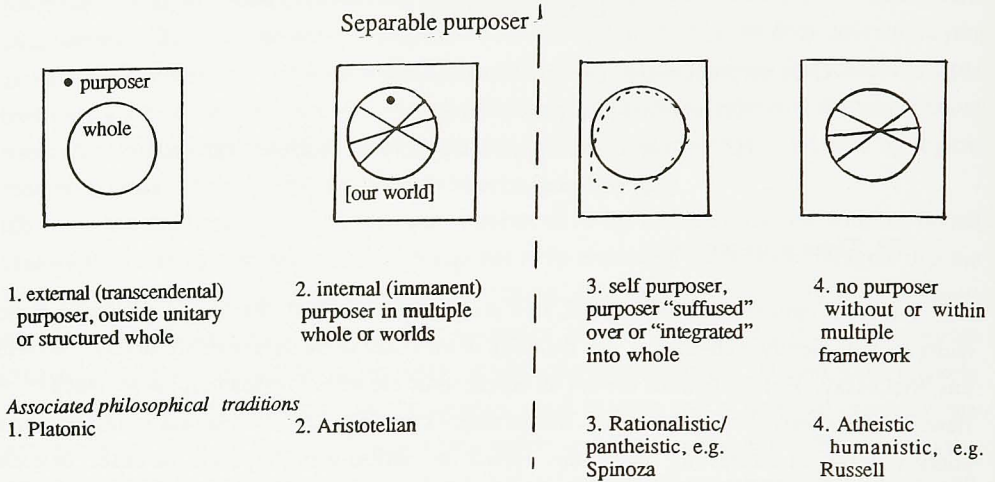
Z*. There is no purposer.

All the Z options are badly flawed, so it is commonly claimed. Because, furthermore, these faults are sufficiently well-known, due detailing of the claim is not unreasonably largely evaded in this brief essay. But the options are not all equal; some are more important, some are much more flawed than others. For instance, the fashionable examples of F* cited appear to incorporate a confusion, but an interesting one. They appear to confuse with purposers *purposes* or goals *themselves*, such as the production of life or humans on Earth (if this can with any plausibility be represented as a purpose of the Whole universe, instead of just hubris).⁹

It is worth picturing some of the main options from a different perspective. As regards macro-wholes, such as the universe, there are several different cases relating purposing state to purposer, some shading into others, certain main ones of which we can depict as follows:–

⁹ The confusion is like that with anthropic “explanation” which switches relata of the explanation relation, in the anthropic case *reverses* them. The fallacious reversal of explanation and causality in recent physical explanations has been widely observed. As Gould remarks, in his review of Dyson, ‘the current utility of a structure or institution does not specify the reason for its origin. Brains did not evolve so that Bach might write the Prelude in E-flat minor Dyson then shows how we could not have fit into a different world. If the strength of physical forces were ordered differently, stars would not burn and life dependent upon solar warmth would not exist. ... But again, our modern Dr. Pangloss has his causality reversed. The universe was here for whatever reason (if any) and we fit in much later. It seems the height of antiquated hubris to claim that the universe carried on as it did for billions of years in order to form a comfortable abode for us’ (p.206).

Diagram 2: Prominent interrelations of super-purposer with possibly purpose-driven wholes or worlds



Key: outer box – universe of discourse and
inner orange – many-worlds or universe or whole

The main traditional explanations of purpose ascribed to this universe take broad forms 1 or 2, usually 1, with the purposer invested with high to maximal levels of spirituality, knowledge, power and like traditional virtues. Super-high levels of these attributes are no doubt required if the purposer is to do what purposing it does – an ordinary human purposer could hardly exercise much influence over the universe as a whole either physically, psychophysically or spiritually, as for instance by pure contemplation. But such high levels of the attributes vastly increase the already extreme difficulties of pictures 1 and 2 (in the limit, paradoxes of omnipotence, omniscience, etc.). Form 1 raises the standard problem as to how there can be something outside what is all-encompassing. Form 2 raises the difficulty as to how there could be something like that within that universe. (Multiple universe theory offers some interesting new slants on form 2. God and, for this matter, Heaven could be neatly tucked away in other universes making up the whole. The connection between universes could be like one-way glass, or one-way "interference", with the Heavenly world viewing and "influencing" the others, but not in general vice versa. Of course there are severe difficulties, both conceptual and evidential, with such speculation.) Even if the purposer is of some different higher kind (*better* that typically means) and so can stand "outside" the total systems, form 1 appears to induce a regress, and likewise form 2. For we can always proceed to ask what is the purpose of the total system *plus* purposer? From an explanatory angle, the purposer is not merely otiose, but an embarrassment.

In addition, there are other severe, and fairly well-known, difficulties with all of the Z positions, those with a purposer. These include

- what the purposer is *like*, its characteristics, its uniqueness;
- how it *effects* its purposing, if it is successful. (Appeals to humans – too late on the scene to amount for, or amount to, much in this universe – falls down badly on such a score. Even with all humans pulling, or praying, together, itself an unlikely scenario, the impact on most of this universe would appear to be vanishing slight.)
- what *evidence* we have for any such hypothesis, and for one such against another. What evidence we have is primarily rationalistic; the very tenuous more empirical evidence contains a large speculative element. The evidential problems, to which we shall have to return, effect all hypotheses in this area (including, but obliquely, the significance approach).

A sweeping problem, which touches all A hypotheses – and perhaps constitutes (along with the paucity of clearcut evidence) the strongest negative argument for A*, no purpose, hypotheses – revolves around issues concerning the supposed purposes operating, issues in Z cases as to the purposes of the hypothesized posers. What is or was the purpose? Consider, for example, this problem as regards God. After more than a thousand years of debate and speculation, we are remarkably short on satisfactory information even as to what God's purposes were in creating His universe. The problematicness of the issue was and is enhanced by rather conspicuous shortcomings of local creation, such as apparent shoddiness in the job, the widespread presence of evil, the apparent conflict of freedom with the mechanistic design, and so on. Some of the most acute problems go back to Plato; crudely, if the system of forms is so damn good, so perfect, why bother with the production of a new recognisably inferior material world? Enter principles like the principle of plenitude, and associated difficult principles such as that God's or the One's goodness and fullness was bound to overflow, in emanations such as the universe, – making it look unfortunately as if God *had* to create the universe, contrary to His supposed freedom of choice and to the contingency of this universe.¹⁰

A stock, near platitudinous, answer did emerge to God's purpose: to increase glory. It was in these terms that Fontenelle could cleverly argue that if creation of the world added to God's glory, how much more must creation of a plurality of worlds add to that glory. While such glory is evidently a highly exalted *value*, a top value or maximal mix of values (such as magnificence, contentment, beauty, beatitude, etc.), it remains unclear what it amounts to, or for that matter, how the universe can realise it. It is not for nothing that Humpty Dumpty lit on the word 'glory' to mean what he chose, nor that he selected a top philosophical value for what he meant: 'a nice

¹⁰ On these principles, and some of their manifold deficiencies, see the classic exposition of Lovejoy. Nonetheless, several such principles are still maintained, for instance by Leslie (in the steps of Leibniz); see VE section 11.24.

knock-down argument' ¹¹ Edwards, often nominated as America's first philosopher always forgetting sundry wise Indian chiefs, devoted part of his *Dissertation Concerning the End for which God Created the World* to agonising about God's purpose. Among the ends Edwards appeared to suggest was an environmental end of great value: a full plentiful Nature.¹² The idea of the end of creation as that of *enhanced value* also has a substantial neo-Platonic history (and has modern advocates, such as Leslie). Evidently, these ends can be amalgamated; for a full beautiful rich Nature is part of enhanced value – contrasting with present human activities, many of which are running natural value down. But there are obvious difficulties with such an overarching end.

It will be immediately objected that such a purpose as enhancing value, or supplying the conditions therefore, rules out option Z*, purposerless purpose. It does not. For a purposive structure directed at an end *need not know* that end. It may not even be the sort of thing that can. But, as with other types of growing evolving order, *we* or others may be able to recognise, or surmise, the end. Naturally such arrangements presuppose ends without end-givers, values without a value-maker or valuer for instance. But such detached items we can already help ourselves to (courtesy e.g. of deep environmental theory).

More telling is the objection that there are severe problems with value, with its terrestrial and extra terrestrial estimation, with evidence for its increase, etc. As economists realise, for once on a right track, these problems are not insurmountable. For make their assumption that everything has a price – or at least a fragile or shadow price – which reflects its value; then observe how real prices have increased. For instance, terrestrial real estate values have increased, by and large, and continue to increase (in rough correlation with increase in human population, and the chauvinistic source of economic value); and a similar future appears in store for extra terrestrial real estate. It is worth inserting examples of a less degenerate character, that point to accumulating value: analogies from art and science, and negatively, culture. Art objects with value have, by and large, accumulated over time, thereby increasing the net worth of all art objects. Similarly for music; similarly for books in modern times (notwithstanding the continuing intolerance of book-burning bishops, generals and empiricists). But it is all very contingent, and constantly threatened on Earth by fundamentalism of one sort or another, and (prospect of) grander and grander wars. Apart from wars, under modern cultural hegemony, there have evidently been serious losses in any case: most strikingly, cultures themselves, and the cultural objects they would go on producing (a heavy opportunity cost of cultural destruction or assimilation). Intangibles such as knowledge and science have a better historical record of increase; but insofar as it is knowledge *held* that counts, these things too are liable to erosion or loss under a range of contingencies.

¹¹ *Through the Looking Glass*, chapter 6.

¹² On Edwards' Berkleyan position, Nature consisted, in any event, of ideas in the mind of God, so such Glory does not extend beyond God's own.

The value increase assumption – it is no more than an assumption – is accordingly a somewhat shaky, and readily challenged, one. Even locally, on Earth, the losses in value (e.g. through environmental destruction and degradation) have been severe enough to shake the acclaimed march of progress; the potential losses could easily cancel all gains. And, off the Earth, well, information is scant: we don't know, may never know, how many progressive civilizations vanished in nuclear or comparable catastrophes; we don't even have respectable probability estimates. These are but some of the problems with enhanced value as end direction. The problems can be significantly reduced, however, by concomitantly making enhanced value an *indirect* direction, an end perhaps travelled towards or reached through indirection (as pleasure we were told was not to be obtained directly, but as a product of pursuing a good life), and by replacing value by the *conditions for* value, i.e. syntactically substituting 'conditions for (realisation of) value' for 'value'.

There are alternatives ends to glory and value, and conditions therefore, that are worth listing, and investigating, ends that some have wanted to secure: organisation is one, order another, complexity may be another; and differently, security, release, salvation. Many of the preferred ends are however *value determinates*, getting what is supposed right or warranted or measurable out of value, such as gross world product or no doubt even grosser universe product. Furthermore, many ends that may look rather more independent of value turn out not to be; for instance, what is expected of organisation or order is *improved* organisation, or *superior* order, not a run-down of order such as a poor explication of order like entrophy would offer. Even so, it is important, for present purposes to *value neutralize*, at least upon organisation and organised complexity.¹³ Thus *increased organisation* carries no positive value connotation. As is regularly alleged, through such terms as organised crime, more organisation may make matters worse. Organisation may, like science, be put to evil ends.

The organisational complexity of the universe has, undoubtedly according to prevailing theory, increased enormously; the trend is even presented as a general law¹⁴. The early universe contained only a relatively few kinds of elementary particles, and perhaps only single force, little of present richness. There was no carbon, for example, the basis of terrestrial life; there were no metals, stable ones of which were to forged only later in stars that eventually evolved. There is

¹³ Value neutralization is a procedure that can be pushed through, with greater or less success, on most of the ends in the list started; salvation in certain forms is an exception.

¹⁴ Thus e.g. de Chardin and recently Davies p.112. Davies also formulates the key principle thus: there is a *predisposition*, or propensity, to organisation in (natural) materials and structures, as we may say, to *natural* organisation. Perhaps the "law" is explained through general evolution, in terms of the occupation of new niches by new suitably complicated "organisms"; otherwise, should evolution fail to explain the trend, it becomes decidedly problem-making for that theory. Of course the purposive picture offered does fall under *evolution* widely construed: that 'the universe and some or all of its parts have (in fact) undergone irreversible changes such that the number, variety, and complexity of the parts have increased' (Goudge p.174).

excuse at least for supposing that such an increase in organisational complexity is a *direction*, an organisational direction of the evolution of the universe.

Now (increase in) organisational complexity is linked to (increase in) value, in several interrelated ways. Firstly, such complexity is directly tied to diversity and variety, both defeasible values (more exactly, defeasible *value making* characteristics¹⁵). Thus such complexity contributes to value. Secondly, organisational complexity makes possible the *very conditions* for value. Consider such developments, as complexity increased, as these: of gold (for metal working), of pigments (for art) and of life forms. As well these basic conditions for value of various sorts – some of them interestingly coupled to the fine tuning of this universe – are valuable in themselves.

Although such objects as organisation could be assimilated, then, under a value umbrella, it helps, and is important to carry them as separate notions, for comparative purposes. In particular, we may favourably compare an organised and fine-tuned universe, for which there is now some passable evidence, with a purposive universe. In any case, organisation and its associated features, such as design and pattern, order and adjustment, are not independent of purpose. Organisation, while it does not establish purpose, is indicative of or perhaps even evidence for purpose. For organisation, of the right sorts, can set a future agenda, on-going purpose. Moreover, organisation can evolve within a system from negligible or zero beginnings, without an organiser, as many recent examples, especially of far-from-equilibrium and symmetry-breaking systems, show (see e.g. Davies ch.6). For all these sorts of reasons, organisation provides a useful model for purpose. So it is also for the main hypotheses now to be tentatively advanced, hyper-Gaea hypotheses.

Hyper-Gaea hypotheses stand to the whole universe, the cosmos, as Gaea hypotheses stand to the whole Earth (sometimes itself called *Gaea*). In fact these two different classes of hypotheses are commonly conflated, not merely historically, but in contemporary elaborations of these.¹⁶ Gaea hypotheses come in astonishing variety of forms, too many of them extravagant (see the Appendix); but the core, from which all the organic and spiritual excrescences can be removed, is that the Earth itself is a regulated system where, against expected disturbances favourable conditions, for plants for instance, are maintained. A standard example of (self-)regulation concerns the Earth's surface temperatures, which have not risen significantly despite an increasing solar flux that would be expected to raise temperatures substantially. Other examples are provided by chemical cycles, for example, the nitrogen cycle.

¹⁵ There is a slippage in value, esp. in the plural *values*, between the parameter itself, and the characteristics that make for it or supply it.

¹⁶ Goldsmith is one good example. Evident historical reasons for the "functional equivalence" are spelt out in Hughes 83 p.57.

It may seem rather harder to say what the Universe is doing than what the Earth is doing; it is much larger, much remoter, etc. However enough scientific detective work has now been accomplished to make a promising start on the question. Very briefly, many of the considerations that have been put up in favour of a strong anthropic principle, for instance the fine-tuning arguments can be remarshalled to suggest a modest hyper-Gaea hypothesis (see Appendix 1).

It is often said, on the same sorts of bases, that these systems are *self*-regulated or *self*-organised. But then “self-regulated” says no more than regulated without an external regulator, and certainly not enough to imply a *self*; similarly with such marginally misleading terms as ‘self-organised’, no *self* is implied. The trouble is that what ‘it is self-organising’ means is ‘it organises itself’. Even if this does not imply a self, except by an illusion of grammar, it does suggest that the subject is that sort of thing that can *do* organising, rather than to which organisation *happens*. It suggests an active subject not a passive one (organisation by commission rather than omission, so to say, to hint at a semantical modelling). Mere quasi-spontaneous organisation *without* an organiser, external or other, self or other – what might be called *natural* organisation – does not make any such commitment, to a doer or agent or active subject. No doubt *self*-organisation was fine for philosophers like Leibniz, who gave the notion currency, and Whitehead, as they imagined that intelligence, mind or the like was distributed everywhere; but outside such implausible settings it is not fine. To stress the absence in natural organisation of any commitment to a self-aware agent, let us refrain from proceeding from ‘there is a purpose’ (which is ‘the purpose of this universe’) to ‘it has a purpose’ (‘this universe has a purpose’).

While low intensionality versions of Gaea and hyper-Gaea hypotheses will be seriously and sympathetically contemplated, high intentionality options will be discarded, for instance those involving spirituality, minds, etc. While it is perfectly possible that such extensive physical systems should have minds (as Hoyle’s “Black Cloud” did), there is so far, science fiction notwithstanding, precious little evidence of it. What data there is to explain can be accounted for by low intensionality formulations. Equally important, high intensionality hypotheses rest on two extraordinarily durable mistaken assumptions: first, an ancient mistake, already recognised as such in ancient times, that such explanation must involve agency; and secondly a more modern mistake, typical of conceptualisms, that all intensionality must involve high intensionality, the working of minds. Contemporary world analyses of modality, entailment, conditionality and much else would (and should) have put an end to the second mistake, were it not for connected ontological hang-ups as to worlds.

A hyper-Gaea hypothesis, corresponding to that concerning the Earth’s regulation and organisation, is this:

HO. The universe is an organised and regulated system, that is, it is a relational structure

exhibiting some – enough – organisation and regulation.

The fuller argument makes use of a dynamic elaboration of HO which we shall suppose adjoined to HO, namely the “law” already indicated,

HO+. Thus far, the organisational complexity of the universe is increasing.

Despite the new title, HO (as elaborated) is rather an old hypothesis. A broad picture of this sort, which is ancient, appears in Epicureanism: ‘An initial disordered rush of atoms through the void had been followed by a natural aggregation of material objects, then by the appearance of living creatures on the earth, and ... by the establishment of human societies. At each stage, some qualitatively new principles of organisation entered into the operations of the world. ... Atoms and the void alone remained throughout the whole of cosmic history: everything of order and value ... was a product of historical change. Preserved in the traditions of Magna Graecia and transmitted to the scholars of seventeenth century Naples, the historical cosmology of the Epicureans was to surface again ... (with) Vico early in the eighteenth century’ (Toulmin¹⁷ p.263). With modern philosophers like Vico and Leibniz a rival historical-evolutionary model to static mechanical model of ‘nature as a mechanical system governed by external laws’ (re-)appeared ‘of nature as a self-organising system functioning in accordance with inner dynamic forces’ (Goudge p.177). Rather similarly, the French *Philosophes*, generally seeking ‘to derive the world from naturalistic principles, elaborated evolution doctrines implicitly or explicitly, employing the scale of increasing complexity as an explanatory device’ (Reese p.162)¹⁸ It used indeed, before philosophers like Bradley got to work, to be claimed that the universe was an organised and *coherent* system. Too often of course they thereupon inferred it was designed, so ipso facto there must be a designer. Certainly as organised and regulated, it has *features of design*; but if design entails a designer, then such features of design do not entail design, any more than features of an invisible economic hand entail a hand. Exit an automatic argument from design. Exit therewith also associated cosmic blueprints.

While it may be, obviously *is*, difficult to quantify the extent of organisation, complexity, and regulation, and of increase of organisation and complexity, there is little genuine room for doubt about their extent at an impressionistic level:– At a macro-astronomical-level, there is a remarkable amount of organisation – of matter into galaxies, solar systems, exotic astronomical objects such as comets, quasars, pulsars, and so on, the movements of which are strikingly well regulated, conforming to relativistic adjustments of Newtonian laws of motion. At a micro-level too there is an astonishing amount of organisation and (differently) regulation. Moreover, on

¹⁷ Toulmin sees the Epicureans as precursors of contemporary “Whites”, not of “Greens”, whom he compares with Stoics. His comparison, since repeated (and even applied as an instrument against Greens), is of decidedly limited applicability. For contemporary evolutionary ecology shares much with Epicureans.

¹⁸ But it was generally coupled with a theme of progress, which can fortunately be detached. Progress was assumed to be the goal of historical development; in the *temporalised* Great Chain of Being, there was assumed to be ascent to ever greater perfection.

current scientific theory, the extent of organisational complexity has increased markedly, remarkably, over time. Evidence accumulated over the last century indicates that generally simpler systems existed before more complex – for a wide range of sciences, from biology to cosmology. It is still a commonplace, for instance, that paleontology roughly confirms an order of development from less to more complex. What is more, the whole system is organised and regulated without an organiser or a regulator. A sketchy story can now be told as to how the organisation arose and evolved – for the evidence is that it has *increased* significantly – how adjustments were made, and so on.

Such a preanalytic story, nowadays oft repeated, is appealing, and stands. But the story is not at all easy to elaborate analytically. A main problem is that we so far lack satisfactory explication of either *organisation* or *complexity*, which we have been lumping together as organisational complexity, and which many simply equate. But it is at least clear from administrative theory that organisation and complexity differ. Organisation may be simple and without complexity, it may be improved by reducing complexity of a structure; organisation and complexity though interrelated can vary separately. Complexity, in the relevant sense, has to do with the *extent of intricacy*, which can in turn be approximately estimated in terms of the amount of information required to describe or communicate a structure. This at least renders the familiar distinction between complexity and complication straightforward; for complication simply involves repetition of information. The trouble lies in the next steps, obtaining suitable measures of information. Thermodynamic measures are decidedly unsatisfactory, though they continue to appeal to reductively-inclined physicists¹⁹; probability measures are perhaps marginally better, and relevant semantic measures better again. But there is a major problem with measures of the latter kind, problems which help indicate why explications like those for effectiveness of a procedure (by recursiveness) may never be forthcoming, namely that a linkage between structures and symbolism or language is required, for instance by way of minimal descriptions. But these are hard to pin down with exactitude and guaranteed minimality. Whereas complexity leans toward numerical measurements in terms of amount of information, number of basic bits or properties involved or the like, organisation inclines towards geometrical assessment in terms of connection and co-ordination of parts. Organisation increases rather with network size and levels of hierarchy. But, despite organisation theory, there is again no satisfactory characterisation. Fortunately that does not matter too much for present investigations. But there is an ambiguity in the notion of organisation (going back to the organic origin of the terms) which does matter. For organisation typically amounts to more than mere structure, it is structure as part of some process

¹⁹ Even Davies, less reductive than most, tries to make the distinction between *order* (which he assumes is given by entropy) and *organisation* (which he equates with complexity) in terms of *quantity* versus *quality* of information. But the latter notion, which has evaluative overtones, is left substantially in the dark, though his whole *Blueprint* text turns crucially on the notion and on the order/organisation distinction.

or function, or even more for some purpose. It is the latter connotation that is now commonly pruned off; certainly it is assumed that it has been excised in what follows, otherwise circularity would ensue.

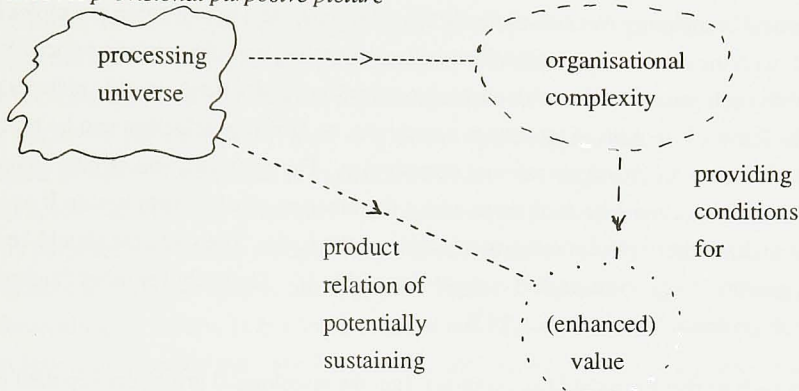
The first hyper-Gaea hypothesis HO takes us some way towards, but does not quite establish the basic hyper-Gaea hypothesis under consideration, namely HP. The universe is a [basic] purposive system, or, in more traditional terms, is a *telic* system. For the system could be organised, and increasingly organised, without any requisite direction or end. Much turns on the assigned end. For the basic thesis, let us propose as end, what we claim to discern, conditioned organisational complexity itself. That is, under HP it is supposed that this evolving universe is so far *directed at deliving such organisation itself*, nothing more. Because it is a matter of satiscing on such organisation, not maximizing it, familiar paradoxes confronting orthodox maximizing cosmologies through suboptimal aspects of the universe, are straightforwardly avoided.

As it happens, the organisation resulting appears overall to have been enhancing value and, rather more pertinent, the *conditions* therefore. But there appears to be but little evidence that this is what the total process is directed at. Thus, perhaps contrary to expectation, the following stronger hyper-Gaea hypothesis is *not* being advanced, namely HPV. The universe is a [strong] purposive system directed at (enhancement of) value.²⁰ The case for HPV is wanting. For the linkage between organisation and value is contingent, and may fail. Indeed several linkages that are necessary on theologic and anthropic cosmologies become contingent (though not merely so, as the linkages may be nomic). For one thing, the end is not necessary; the universe could have remained elementary, static. For another, at a certain stage the direct end will presumably cease to operate. Before the heat-death of this universe, when borrowed energy is finally repaid and nothing remains, organisation will have ceased to increase, being dominated by the increase of thermodynamic disorder. Then the contingently supplied direction will disappear.

²⁰ Something like this theme too had, of course, occurred to previous philosophers, Lotze for one (as I found after I had produced the essay). Lotze's intention, in his propagation of materialistic ideas in Germany, was to show '*how absolutely universal is the extent but at the same time, how completely subordinate the significance, of the mission which mechanism has to fulfil in the world! For 'all the laws of this mechanism ... are but the very will of the universal soul'; they are 'nothing else than the condition for the realisation of Good'*' (for the quotes from Lotze, see Parssmore p.48; bold face added). But the general dualistic setting of Lotze's "anticipation" is entirely different from that of the main text, and contains *much* that I should wish to contest.

Rather the purposive picture being tentatively proposed is as diagrammed:

Diagram 3: A provisional purposive picture



In short, what the total process is so far directed at provides the *condition for* value maintenance and increase. It *can* bring value in its train, but it may not. The product relation supplied between the total process and value integrity is accordingly not one of direction, but a weaker linkage of potentially *sustaining* (or some such); and (enhanced) value is a result of (increased) organisation together with opportunity, supplied by conditions, taken. This universe sustains the conditions for the realisation of great value; by and large, the *opportunity* for value enhancement is available. But much depends on the organisation and organisms that do evolve, as to whether that opportunity is taken, or whether, in one way or another – by inadvertence, mismanagement, deliberate greed or otherwise – the opportunity is given or thrown away, whether also hitherto accumulated value is destroyed, in the way that on Earth it is now being degraded and destroyed. □

An alternative ending returns to the alternative beginning, to the convergence of my or your purpose with that of this Universe. The convergence is this: this Universe's purpose is increased organisation which sustains the conditions for enhanced value; and your purpose, so far as your pursue a fully good life, is enhancement of value. So your purpose is directed at part of what this universe provides satizing conditions for: enhanced value. (Ethical realisation of little *u* is included in what big *U* provisions; this is part of what the obscure recipe, *self-within-Self*, with full identification with the Whole, should say.) Moreover, a meaning to your life fits within the same framework; for it lies in the summation of moments of value.*

APPENDICES

* Thanks for ideas, suggestions and corrections to Nick Griffin, John Leslie, Jack Smart, Arthur Witherall, and members of the audiences at a first discussion of the essay at a mini-conference, organised by Don Mannison, held at the University of Queensland, May 1989, and at a final reading of it at the University of Auckland, November, 1989.

1. *Organisation and substitute anthropic principles, programming and invisible hands, and the Great Chain of Being* .

Organisational complexity can substitute for *life* (*humans*, etc.) in anthropic principles both global and local, with the result that more intellectually respectable, non-chauvinistic principles can be obtained. With such principles in hand, excessive selection (under many worlds pictures) can also be reduced. For the direction of process is now given, so arbitrary selection can be replaced by guided selection directed at organisational complexity. For example, the strong anthropic principle, 'The universe ... must be such as to admit the creation of observers within it at some stage', becomes an organisational complexity principle of the form, 'The universe should be such as to admit the growth of organisation and complexity within it'. Similarly for other "anthropic" principles (e.g. those formulated in CS c.p.163).

Principles such as that formulated are stronger than the teleological principles supplied in the main text, for instance a significant contingency, is elevated, unnecessarily, into some sort of deontic requirement on the universe. But *unmandated* growth in organisation and complexity of certain sorts can serve to explain everything anthropic principles have been introduced to explain, fine tuning and so on, in a much less assumption-costly way. Increase in organisational complexity (such as it is so far; in view of catastrophic intrusions it has not been altogether uniform) can also help to explain some of what is correct in the hoary doctrine of a Great Chain of Being, a doctrine that came to impose a heavy direction on change (see Lovejoy, later chapters).

The direction of organisational complexity can make it *look* as if the universe were programmed, had a program. You can even say if you like that it is *quasi-programmed*, or with Hegel that there is a kind of *project* – providing you remember that quasi-programming, like invisible hands, does not require a programmer or organiser, something whose guiding hands these are. But with such *as if* stories, anthropocentrism and accompanying chauvinism are all too likely to reintrude, so they are better avoided. It is one thing to say that this universe is organised, structured, fine "tuned", or even that it is as if it were, and were designed; it is quite another to say either that there must therefore be an agent²¹ or that it is such *for us humans*. Such an insertion of agents or humans is unnecessary and illicit.

Obnoxious anthropocentrism, which is not easily confined or removed, comes in various forms and disguises; it is certainly not confined to value theory, ethics and their surrounds, though those are prime areas for its manifestation. A particularly pernicious form is the metaphysical doctrine that

- The universe somehow supplies a system of rewards and punishments for individual humans.

²¹ Likewise thing-orientation thing-hypostatisation even, is one thing; *agency* ascription quite another. But Rescher in his study of Kant, perhaps following Kant, proceeds to muddle them up (pp.144-5).

in accordance with their performance or desserts.

There is scarcely a skerrick of sound evidence in favour of this doctrine, which has distorted or even helped in destroying innumerable lives. (So one can select against it, i.e. choose actual worlds which falsify it: this is a pluralistic alternative to verificationism.) Of course robust anthropocentrism extends, no less offensively, to epistemology.

- The universe exists for our, human, knowledge and edification. 'Nature is a system *designed* to admit cognitive penetration by men' – a direct epistemic analogue of recent ontic anthropic principles, presented by Rescher in exposition of Kant. But in Kant's philosophy what operates is an *as if* epistemic anthropic principle. 'We are bound to look on nature *as if* being-known-by-us were its purpose', and 'it is as though "nature specifies its universal laws according to the principle of purposiveness, for the sake of our cognitive faculty ..."' (Rescher, quoting Kant pp.118-9). Or less demanding of nature, it is human imposition: 'Kant's fundamental thesis [is] that human reason insists on viewing the "world of experience" as the product of a productive and ordering intelligence that endows it with systemic unity' (p.143). But none of these extravagant themes, exhibiting excess hubris, are required to account for what needs to be accounted for. The reason is that much more modest world selection and hyper-Gaea themes will serve and serve better.

2. *Alleged problems with purpose and purposive explanations.*

Although purposive explanations meet liberal requirements for explanation, which match ordinary expectations as regards explanations, and although such explanations are often satisfying, still they are resisted and resented by many philosophers and scientists, who are uncomfortable with such explanations, which do not fit into the reductive scientific paradigm they have grown up with and go on propagating. There is an almost fanatical drive to trade in all purposive explanations for nonpurposive ones, for instance to explanations involving cybernetic feed-back mechanisms which supply (the illusion of) purpose without purpose. As with proposed phenomenistic and operational reductions, it is extremely doubtful that this can be accomplished in a comprehensive way. More important, for my purpose it would not matter if it could. More explanation would simply be added to the organisational story offered; purposes themselves would simply be explained, not eliminated. Certain other advantages would also accrue; in particular, *direction* towards the given end could be more decisively vindicated. No doubt all this would be impressively accomplished in a non-reductive cybernetics, which could offer worthwhile examples of purposes, their operations and directions, without purposers, and of organisation with organisers (i.e. of "invisible hands" of *various* sorts).

3. *As to the astonishing variety of Gaea hypotheses.*

In a way typical of human intellectual production as regards any fashionable theme, "the" Gaea hypothesis appears in a variety of different forms, which are nonequivalent and only loosely related. But, in this case, the diversity is in large measure due to the main manufacturer of modern Gaea hypotheses, Lovelock himself. We list some of the forms, proceeding roughly from less to more extravagant, drawn from a *single* article (Lovelock 88):

- Core form: The Earth is a regulated system where relatively stable conditions, in fact favourable for various life forms, are maintained against expected disturbances.

In an effort to show how testable and “scientific” this sort of hypothesis is, Lovelock has recourse to simple cybernetic models, which show how stability of systems can be maintained through negative feedback procedures and adjustments. Such is the “Daisyworld” model and elaborations thereof (p. 58). But what these partial models could well do, if they succeeded more generally, is to reduce the core hypothesis to the framework of orthodox scientific engineering.

The further forms can be seen as making additions of one sort or another to the core form:

- “Earth as home” addition: ‘The Earth has remained a comfortable place for living organisms, for the entire 3,500 million years since life began’, despite a range of possibly deleterious changes (p.57). Thus, for instance, the constancy of the atmospheric mix, to *suit* the requirements, to meet the needs of the Earth’s organisms, despite the atmosphere’s being composed of an unstable mix of reactive gases.
- Anthropic addition: The terrestrial system is fine-tuned for Life. But by contrast with the local (or weak) biocentric (or anthropic) principles pulled out to explain local fine-tuning in terms of what thereupon eventuates, where the that-for-which elements (life or humans) are passive cargo, life here is active.
- Active Leibnizian addition: ‘... we live in “the best of all possible worlds” with living organisms actively and right from the beginning keeping the planet fit for life’ (p.57). But more, the Earth itself actively modifies and controls the environment, in an optimal way. Plainly this addition introduces two components: an activity theme, and a maximal fitness theme (it couldn’t have been better tuned). Both components are further embroidered.
- Holistic evolutionary addition: ‘... together with their physico-chemical environment living organisms constitute a single and indivisible evolutionary process’ (p.57). Davies explains the holistic part of this complex addition thus: ‘the activities of the biosphere cannot be untangled from the complex processes of geology, climatology and atmospheric physics’ (p.131). But, more straightforwardly, the Earth is a nonadditive system, the whole not reducing to a single sum of material parts. The evolutionary part is less interesting and less controversial: for the Earth is no doubt an evolving thing.

Lovelock explicitly combines holistic and energetic additions – the Earth is an active integral object, an active ecosystem, not a merely *passive* mechanism – and proceeds to draw the following *implication*: ‘life is beautiful and rich not simply because it has luckily found a suitable planet but because it has used the special resources of the Earth to *create* a planet capable of harbouring living forms’ (p.57 italics added)..

The Lovelock-Margulis definition of *Gaia* depends upon several of these additions: ‘We have since defined Gaia as a complex entity involving the Earth’s biosphere, atmosphere, oceans

and soil; the totality constituting a feedback or cybernetic systems which seeks an optimal physical and chemical environment for life on this planet’.

- Organic and superorganism additions: The system is not merely active but organic (holism is thereupon fortified by evocation of the old image of organic unity). It is an organism even; it is, to take a further giant stride, even *alive* (thus e.g. Hughes 85 p.57, who also appeals to a large contingent of ancient authorities from Plato on). It is, that is, as Plato maintained, a living organism. Or rather, ‘Earth is a superorganism, and its proper study is physiology’ (p.60). Lovelock reaches these results through the following sorts of analogies:– The ‘flow of essential nutrients through the system is promoted and regulated through the activity of living organisms’; thus ‘the entire Gaia system has many features in common with the physiology of warm blooded animals...(with the) atmosphere as global lungs, water system like blood in a circulatory system’ (p.60). It is a centuries-old analogy, variously filled out in incompatible ways.
- Spiritual addition: The system is not merely organic and alive, a creature, but it exhibits spiritual features. It is intelligent; it is responsive. While Lovelock stops just short of this final addition, his more enthusiastic followers have not (thus e.g. Pedler p.11); nor did the ancients, such as Cicero: ‘The world is an intelligent being, and indeed also a wise being’ (quoted in Hughes p.57).

The additions become progressively much less plausible and much less supportable as they deviate from the less exciting core form. As a consequence, *Gaea* is not particularly well defined. Lovelock and others have proceeded to draw a striking variety of (incompatible) “implications” out of the Gaea hypothesis. An early dangerous clanger (produced by Lovelock himself at a Montreal conference) was this: ‘Thank to Gaia, our fears of pollution-extinction may be unfounded’!²² But recently, as Lovelock has begun to appreciate where his real support lies, Gaea has become a positive force for environmental care. ‘... as the ancient Greeks and other earlier civilizations realised full well, our own well-being depends first and foremost most on how we treat the Earth. Gaia would reward mankind with her bounty when treated well, but equally she would revenge abuse’ (p.64). No caveats, no *as ifs*, nothing ... – but an undoubtedly environmentally useful pagan religion.

4. *As to the purpose of a purposive universe* (Lamb’s inquiry, questing, in the steps of Kant). The end is the same as the previous indirect objective: further value. While that brief answer undoubtedly requires elaboration, it does serve to make it plain that the answer to the original question neither leaves gaping gaps nor induces a damaging regress.

²² This and other awfulness is discussed, rather too kindly, in Hughes 85. For anyone inclined to give Lovelock a high credibility or environmental rating, a glance at his reply to Hughes, p.95, should prove worthwhile. As Sagan and Margulis reveal (p.73), Lovelock was really no friend of environmentalism; but, like many, he has recently shifted ground, substantially.

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GAEAN GREENHOUSE, NUCLEAR WINTER, AND ANTHROPIC DOOMSDAY?

... climate change, like no other issue, calls the whole notion of human progress into question. The [ever promised] benefits of newer technologies, more efficient economics, and improved political systems could be overwhelmed by uncontrolled global warming.

... the pace of climate change will soon overwhelm natural variability in the earth's climate. Indeed, it can be compared with nuclear war for its potential to disrupt a wide range of human and natural systems, [severely] complicating the task of managing economies and coping with other problems. Irrigation works, settlement patterns, and food production [among others] would be tragically disrupted ... (Worldwatch 89, p.11, p.10)

There are many approaches to the *Greenhouse problematique*, the cluster of problems upon which this philosophical investigation focuses. These approaches range from playing the issue down entirely, dismissing it as not a problem, not something anyone should worry about, at the one end of the range, to playing it up at the other. Those who play it up may even foresee the demise of the human race, unless substantially new socio-economic arrangements – with restructured cities, revitalized lands, rejuvenated oceans - soon eventuate.

There is certainly plenty of room for different approaches (see Diagram 1), and for some eclecticism. For what is being relied upon, in every case, comprises shaky and contestable arguments, from flimsy forecasting models lacking many apparently relevant details. No one of sound judgment, aware that weather reports for twelve hours ahead can be wildly astray, would place a very high level of confidence on climatic forecasts for fifty years ahead down a very hazardous track. Nonetheless there is enough information to act; and there is information rationally requiring action.

For things in the future are not going to be the same. It is very doubtful that they are going to be any better (though much important economic theorizing presupposes as much, such as the monetary discounting of the future). They are not going to be similar even, because so many parameters important to life are changing, several at exponential rates. Significant in these changes are likely climatic changes. The Greenhouse effect is among these, a result of the increases of “greenhouse” gases, especially carbon dioxide and methane, in the Earth's atmosphere, which have followed exponential paths since the high-energy phase of industrial culture (see Diagram 7). The growth in gas concentration produces, what it is lagged by, but is now apparent, a significant increase in mean global temperatures. This has major implications for much of life on Earth.

Diagram 1. Spectrum of approaches:

<u>Course of action</u>	<u>Reasons offered</u>	<u>Short response</u>
No action ¹	No problem	Refutable
	No certainty	Irrational
Moderate action	Adaptive capacity	Exaggerated
	High-tech resolution	Wishful thinking
Considerable action	Severe dislocation otherwise	Utopian
	Individual survival	Pointless

These very condensed responses will be expanded and explained as we proceed. In accord with an esteemed philosophical tradition, a medical analogy is first deployed; it serves to throw main points into high relief. Consider the possible illness of the Earth, for instance as a result of brutalisation and poisoning. Look on the Earth then as a patient², who exhibits some symptoms of a possibly disabling illness; for instance the patient's system is overloaded with troublesome trace elements and her temperature appears to be rising. Compare rational medical practice where a human patient gives indications of possibly disabling illness, for instance the patient shows signs of hypertension. Now consider some of the spectrum of approaches. Suppose the advice is to take no action, to do nothing but monitor the situation until further information comes in, until even (to take a worst case) it becomes evident that the patient indeed has hypertension and suffers a severe consequence. That would be regarded as irresponsible practice. To say that there is no problem when symptoms are there, would be regarded as utterly irresponsible, and medically refutable. To say that no action should be taken until certainty as to the complaint is established would be seen as incompetent medical practice.

¹ Taoist no-action would be different. It would not have undertaken excessive industrial action in the first place.

² This is precisely *not* the way less modest Gaean hypotheses regard the Earth. For there the Earth is active, actively participating in co-evolutionary developments. But the health analogy does of course go right back to ancient chthonic view, systematically presented in Plato, according to which 'the Earth is a living being of whom humans are only a part. Right relationship with the Earth means that the total organism is in good health; so environmental problems are seen as illness, as a failure of one part of the organism to interact supportively with others' (Hughes, p.60). For Gaean themes in other ancient philosophies, both before and after Plato, see Hughes p.57.

A responsible practitioner begins recommending some remedial action straight away. Naturally there are various options open as to what may be prescribed. These include, at the one end, high-tech procedures, such as, what would be ridiculous simply for hypertension, full medical engine-and-gearbox replacement (heart and kidney transplant), or, a little less ludicrous but ridiculously commonplace, a whole-remaining-life course of pharmaceutical products, e.g. tablets. At the other end, lifestyle changes are proposed, such as more exercise, weight loss, stress reduction, and an improved diet with less sodium input. Reasonable advice would not include pure adaptation, that the patient went on living as before in the expectation that her system would adapt to the situation. Nor would it be reasonably suggested, except in somewhat unusual circumstances, that the patient entirely change her lifestyle, abandon her work, house and so on, and live somewhere else. Even so unusual circumstances, which might include residence in a very polluted environment or work in a nuclear plant, are no doubt on the increase.

Like all analogies, the medical analogy has limitations. One feature it does not capture concerns the holistic aspects of the Earth's sickness, and why accordingly an individualistic survival approach, egotistically rational enough for hypertension and perhaps even for a localised nuclear war, cannot succeed. The reason is, of course, that holistic problems are too extensive for individuals, or even small collectives, acting on their own to be effective or to make much difference. Some are too big even for large collectives or states, but would require whole regions of the Earth acting in concert. But of course some state players, such as the superpowers as regards nuclear winter, can make a substantial difference, or even all the difference.

The medical analogy also indicates the outcome of further investigation of approaches. Briefly, as with a chronic illness, the conclusion is that there is no very easy path; future humans should expect a hard landing.

1. Investigative philosophy, argument and rational decision as applied to climatic problematiques.

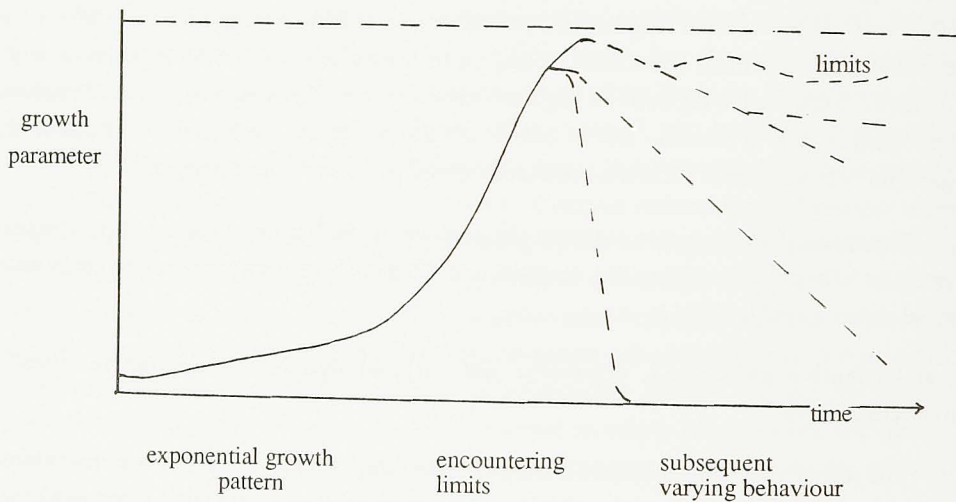
The role of philosophy in such a complex problematique as that of Greenhouse effects is not difficult to state briefly. Philosophy, Anglo-American philosophy especially, is concerned above all with *argument*. Investigative philosophy resembles *applied* philosophy, except that it may upset the philosophy it applies; it investigates arguments, their features - assumptions, reliability, etc. - and their generalisation to rational processes and methods, but *outside* normal philosophical topics. The generalisation to rational processes comprehends a wider range of philosophical throughput than the orthodox narrow range of argument typically addressed in logic courses; to probabilistic and plausibilistic reasoning, to decision processing and making.

A main objective in this piece of investigative philosophy is to consider certain *arguments* pointing to probabilities of severe dislocation as a result of Greenhouse effects, and the resulting

impact on *rational decision* formation and action. There are certain arguments of particular interest for radical decision and action: various neo-Malthusian arguments, catastrophe arguments, and doomsday arguments.

A main run of arguments to considerable action are limitative in character. Such *limitation* arguments are sometimes alternatively called 'neo Malthusian', since Malthus presented a very elementary, very controversial, argument of this general type. But such is the hostility, especially in Marxist-influenced quarters, to Malthus's associated themes (some of them admittedly repulsive) that merely to associate an argument terminologically with Malthus is thereby likely to condemn it. To avoid such fallacious condemnation-by-association, the graphic term 'neo-Malthusian' is largely avoided in what follows. The general form of these limitation arguments is simply this: growth in some parameter over time encounters limits, typically with severe, even catastrophic, effects; for seldom is the transition to severely constrained behaviour smooth. A characteristic graphic representation is as follows:

Diagram 2. Growth encountering limits



The limits are often imposed just by finitude, for instance finiteness of a resource or a sink. But other limits can be important, for instance where new phenomena or thresholds come into play. General limitation arguments loom in the background in what follows, where we shall be arguing on a double front:

A. Significant disequilibrium of the Earth's systems is a real possibility, and accordingly must be reckoned with in decision procedures. Though the probability of such an outcome may only be modest, the case has to be taken seriously because the result (arrived at by a limitation argument typically) is so bad. Suppose, for instance, the outcome is that the Earth ceases to be

habitable in present terms, to be able to carry its present demanding load. Such an outcome would have an extremely high negative value, so it would tend to dominate other alternatives. (But it need not be an entirely worst case, where perhaps the dominant terrestrial species becomes extinct, or the Earth becomes devoid of “higher” life. Under the bad result contemplated some better-off humans in special circumstance may subsist for a while.) Such sufficiently bad cases *should* be taken account of in decision making; they have to be taken account of in *rational* decision procedures.

A*. Significant disequilibrium not only has a non-negligible probability, but set in the proper content has a sizeable probability; so it cannot be ignored or discounted as too low to bother about. For such an argument *less* has to be established at the outset than for a rational decision theory argument.

Such a different argument, of especial concern as regard climatic changes, is the following *anthropic doomsday* argument:-

- There is some probability that the Gaean “greenhouse effect”, generated by human activity, will get out of control, that Gaean control mechanisms will fail, and that the Earth will, for example, overheat (Runaway Greenhouse, or *Lesser Venus Prospect*, premiss).
- That result would be disastrous for human activities, and indeed for humans (*Catastrophe Prospect*).
- Because of the unusual, and unusually precarious, position of humans (of certain critical anthropic parameters), such a probability of disaster is not in fact small but decidedly large. As a consequence then, the human species will probably sharply decline, and even become extinct (*Catastrophe Probability*).

That is, by a rectified version of Murphy's law - that if something can go wrong then in appropriate unusual conditions, it very probably will - an incrementally small probability is inflated into a very large probability.

It would be a mistake to conclude that because the argument itself looks an unlikely one, everyone can stop worrying. The argument is but *one* of a substantial raft of arguments, suggesting that we are already in deep trouble, that *should* have everyone worried; it is but a final intellectual sting, so to say, from the previously inconspicuous cosmological tail.

Such a doomsday argument no doubt puts together, in one more exact form, some of the sorts of considerations that are troubling many people, especially concerned youth, about the Greenhouse business: that humans (including themselves) are on a decline or extinction path. It is no doubt not the only consideration that should be troubling them or us. For whether or not doomsday warnings are warranted, there are other matters that should be sufficiently worrisome, to anyone of moral integrity:-

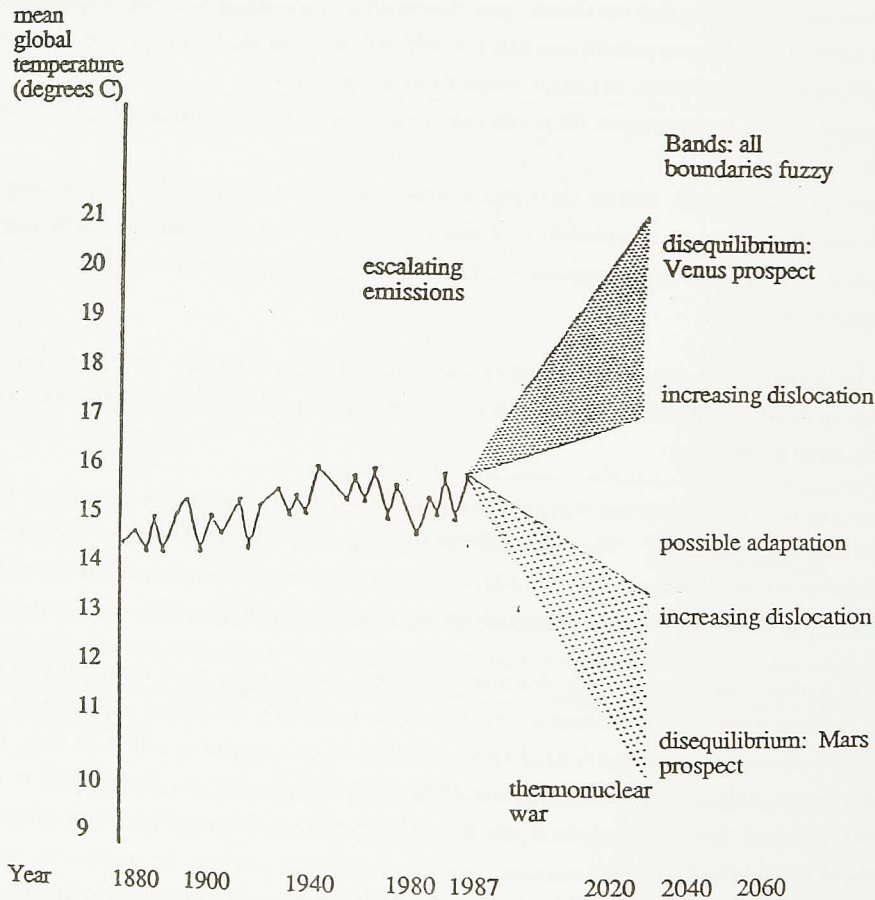
- Future times are likely to be exceedingly uncomfortable for very many creatures, as habitats are

destroyed, food producing regions are eliminated, and environments seriously impoverished. (Many of these creatures are nonexistent, mere future existents, i.e. creatures that do not yet exist or participate in market or voting rituals, but nonetheless they *will* exist and may participate. But, despite their presently unfavourable ontological status, they are entitled to fair and decent treatment.)

- Given such future prospects, present practices which do nothing or vanishingly little to ameliorate these prospects, are decidedly irrational. Indeed a main message that will emerge from the present exercise is the *moral irrationality* of critical large-scale human practices.

The irrationality, morally-weighted-down irrationality, of present large-scale human practices is already conspicuous from the wintry downside of climatic prospects of which Greenhouse warming is the upside.

Diagram 3. Macro-climatic setting and prospects.: Observed global average temperatures, 1880-1987, with forward projections (historic data from Worldwatch p.10).



The apparatus for conducting a world-wide nuclear war is entirely in place and indeed on alert. The probability of such a war, even if small, is not zero. Among the many awful effects of a large nuclear war is that of nuclear winter, which would probably bring about the demise of present human civilisation, and would at the very least mean enormous dislocation for most surviving humans and other creatures. A sufficiently diabolical chemico-nuclear war, reaching into all inhabited parts of the globe, could indeed drive the human species close to extinction.

The decidedly dubious rationality and morality of these general nuclear arrangements - both through what they are in themselves for what purposes, and through their moral opportunity costs - are widely appreciated. The thesis that the arrangements and practices are immoral, irrational, and ought to be dismantled - already much argued, and also contested³ - is not the present concern. The thermonuclear downside is, by comparison, a very easy case to examine philosophically, and argue, as compared with the greenhouse upside.⁴ For there is, for instance, a case of sorts for much increased use of greenhouse gases, such as CFCs in refrigerators, a case that hardly extends very plausibly to nuclear weapons. It is a case heavily pressed by some "developing" nations, for polluting devices already in widespread use in more affluent places, as necessary for local standards of living. These nations want, or are heavily encouraged, to extend the war against Nature through the habitats they have gained control over, in the name of economic progress.

War also joins Greenhouse summer and nuclear winter. For the barely-analogical rapacious war against Nature is a major contributor to Greenhouse gas emissions, for instance, in the domestication of wetlands for rice paddies, through the heavy pillaging of forests, and the like, typically carried on with swords and bayonets reforged to jump ploughs, chemical weapons turned to herbicide guns, and tanks converted to bulldozers. The protracted war against Nature⁵, carried, it had been supposed, to a victorious conclusion with the rise of science and technology and the ubiquitous advance of industrialisation, seems however to have backfired. For it is turning the Earth, Gaea herself, into a patient, with crippled life support systems, thereby endangering the sustained future even of the victorious. Yet another Pyrrhic victory.

Greenhouse and nuclear winter are more intricately connected than through war and as the upside and downside of meteorological phenomena. One of the high-tech solutions suggested for atmospheric overheating, involves the generation of wintering effects - to cool things down - by flinging enough dust up into the atmosphere, a piece of technuttery no doubt most easily achieved on the requisite scale by nuclear explosives. Needless to say, like backburning against out-of-

³ For my very small contribution to this, see the War and Peace series in *Discussion Papers in Environmental Philosophy*, RSSS, Australian National University.

⁴ Global warming, by no means entirely certain, is assumed to be the outcome of increasing greenhouse gas build up. Of course though some mean temperatures will rise, cooling will probably occur also in some localized regions.

⁵ A war incited and applauded by illustrious philosophical forebears.

control fires, artificial winter would be a pretty desperate and, given present expertise, dangerous expedient.

2. The Greenhouse debate, main policy responses, and irrational decision.

The Greenhouse debate, as to what to do, if anything, about forecast Greenhouse effects on Earth, is intellectually disturbing. For it has revealed, as we shall soon see, that many of those who have spoken, worse than *many of those who matter*, who have some role in decision making (including both experts and politicians), *lack a firm grasp on decision making in conditions of uncertainty* or possible risk.⁶

The main canvassed policy approaches to the Greenhouse problematique lie firmly within the dominant social outlook, the high-tech growth and development ideology.

Diagram 4 Broad policy responses to the Greenhouse problematique.

<u>Dominant paradigm options</u>	<u>Alternative ecological outlook</u>
Procrastination (wait-and-see)	Soft energy paths and alternative regulation
Adaptation (sink-or-swim)	Socio-economic transformation
Regulation	
Intervention (star wars)	

We will briefly outline, and find wanting, *all* the dominant approaches.

- *Procrastination*, the prevailing response.

In fact the main governmental and conservative response thus far has been procrastination, or "wait-and-see" as it is more benignly known.⁷ The approach makes much of the uncertainties, of the shortcomings, in even the most elaborate general circulation models for future climatic change,

⁶ Certainly a few scientists, outside main policy making reaches, do have a sound intuitive appreciation of these problems, and of the deficiencies of prevailing practices, e.g. Pittock 87. There is little excuse for prevailing ignorance of or ignoring of decision theory: for the elements of the standard theory are readily accessible and very elementary. In the present essay a modification of standard decision theory (as expounded e.g. in Jeffrey) is assumed as background; for details see Sylvan.

Following Knight, many economists (try to) distinguish between uncertainty and risk. Risk is said to obtain when some more or less objective numerical probabilities can be assigned to outcomes, a situation not obtaining as regards global greenhouse effects. Bayesians, who can always assign subjective probabilities tend to eschew the distinction, e.g. Cyert and DeGroot, who say that 'decision making under uncertainty refers to situations in which the outcome of the decision is not precisely predictable' (p.3). Either way, Greenhouse involves uncertainty – to which rational procedures should be applied.

⁷ There is significant rhetorical art in the choice of classificatory labels, a rather philosophically neglected art. A PR person must have been hired to produce the Greenhouse adaptation of 'adaptation'.

of the high noise-to-signal levels. On such bases it contends that it is too early to do anything, except staging some meetings, organising some review committees, undertaking some monitoring, and funding a little more “research”. It obviously does nothing to rock the growth ideology boat.

There is the pretence that we do not know enough to act.⁸ But it is known that carbon dioxide, methane and other greenhouse gases are fast increasing. The main causes and enough likely enough consequences are also known. Theoretical considerations have already been partially confirmed by rising temperatures in the eighties. Outcomes of rising temperatures are also known in broad outline: rising sea levels, and so forth. In addition, there are partial small-scale models of Greenhouse effects in action. For example, a city such as Mexico City, which is situated in the bowl-like valley, is placed in an environment which traps heat as well as pollution. The ecological effects, like the human effects, are pretty dramatic even at this small level, and hardly to be sought, or emulated elsewhere.

There is a pretence, fostered also by many scientists, that Greenhouse difficulties have only just been discovered; a date commonly set for that watershed event is the Villiers conference and statement of 1985 (e.g. Pittock 87 pp.2-3). Actually there have been Greenhouse warnings for more than a decade, and there has been a corresponding decade of inaction. Nor is any action of much significance presently seriously contemplated.

Back in 1979 Bernard wrote at length about and reported the substantial concern of climatologists about Greenhouse effects. Even the magazine *Nature*, not then noted for its green sympathies, recorded that ‘the release of carbon dioxide to the atmosphere by the burning of fossil fuels is, conceivably, the most important environmental issue in the world today’ (May 3 1979). Bernard quotes many other concerned scientists, several asserting that ‘the government must start dealing with this problem now’. They meant the United States government. “The” government didn’t take the hint. For more than a decade then, scientists have been emphasizing that the Greenhouse threat is a major environmental problem, and that action should be taken immediately. Over 10 years nothing of real significance to counter the effects has happened. There has been more than *a decade of inaction*, during which matters have got worse, and the time frame for evasive action disturbingly shorter. It is already evident that requisite decision making under uncertainty is not taking place. On straight inductive grounds, it would be reasonable to expect nothing will be done. While there are theoretical grounds to back up such an assessment, still it is only just beginning to get through to a much wider public (which can exercise a marginal influence

⁸ Part of the problem is that scientists have been caught out (e.g. crying wolf) and have become ultra-cautious. With the advent of thermodynamics, for instance, scientists began ‘threatening mankind with a rather swift “heat death”’ as the universe ran down. Thus M. Alier, on ‘blatant ideological use of science even by scientists themselves’ (see Bernard p.9). More recently, many rang alarm bells prematurely concerning an impending mini-ice-age. The past predictive failures of scientists have been used as evidence for scepticism concerning greenhouse effects; see Mc Kibben p.8. It is an unsatisfactorily selective argument; interestingly it is not used in a similar way against economists, whose predictive record is significantly worse.

on what politicians say) that there is - or *may* be, as some more reactionary modal-mongering academics would have - a problem or two.

Many scientists have joined the wait-and-see queue, with their begging bowls, hoping for more hand-outs for research. They assume, rightly enough, that more information would assist with rational decision-making, and also, quite wrongly, that "scientific certainty" is required for action to be taken. Physical scientists are not alone in their misapprehension of rational decision methods.

Although there is a good deal of practical experience available of statistical-type decision making under uncertainty, for instance as regards insurance coverage and engineering projects, decision theory, especially as regards unrepeatable situations, has not penetrated very far into standard scientific methodology or much into mainstream parts of social sciences. 'Economists in particular have shown a talent for bringing every problem back to a world of certainty where all solutions are known or can be easily found.' Natural scientists including climatologists are, for the most part, on the same erroneous reduction-to-unattainable-certainty trip. 'This is not to say that economists have not worked on uncertainty. ... however ... uncertainty is introduced and then taken out by assumption' (Cyert and DeGroot, continuing, p.1). But there are several classes of problematic situations, where decision and action may be required, where uncertainty *cannot* be removed or discarded by fiat, reduction stratagems or otherwise, notably:-

- inherently probabilistic situations, such as those of indeterminacy in quantum theory;
- essentially unpredictable situations (which may be deterministic) such as those now under investigation in chaos theory;
- presently uncertain situations and outcomes, which may eventually resolve into certain cases, or may turn into some of the above classes, where there is not time to wait for resolution.

The Greenhouse problem is regularly put into the latter class, a standard assumption being that with enough money and research effort thrown at it, it will resolve to decent certainty. But it may well not. Climate is now a prime arena for applications of chaos theory (in any case initial conditions for application of meteorological equations are seldom very accurate and are now shifting with the accumulation of Greenhouse gases). There are grounds for supposing that critical parts of climatology will fall into the essentially unpredictable class, that the sought certainly is unattainable. If so the standard begging-bowl posture of too many research scientists: Supply more funding so we can go on researching until we obtain certainty, is misguided.⁹

⁹ Or, less charitably, downright dishonest. Nor does it seem to have occurred to most research scientists demanding more money that an important reason why they are not obtaining the funding they expect, or even enough to run complex modellings on expensive computers, is because their research results could, if unfavourable, act as a serious drag on the industrial establishment. *They are hardly going to be well funded to delegitimize modern industrial society.*

There are thus some severe problems with this prevailing response. Firstly, it is irrational. Certainty, *if* achieved, may be achieved too late. What was required for rationality was decision making in advance of certainty. Secondly, certainty may be unobtainable. The meteorological equations may be non-linear (nonadditive) and so incapable of delivering firm results given slightly fluctuating initial data. Not only are many experts and decision makers only comfortable about acting in circumstances of relative certainty; almost as bad, where some uncertainty is involved, only what is considered *likely* gets genuine consideration. Rational decision making has however to take account of what may not be very likely at all, but may be quite disastrous should it occur (e.g. a nuclear accident with full meltdown). In this respect too, the standard response is methodologically unsound.

- *Adaptation*, learning to live with and love the Greenhouse.

The policy 'that tends to be favoured by most economists' is an adaptive strategy: "Let society adjust to environmental changes without attempting to mitigate or prevent the changes in advance" We could adapt to climate change for example, by planting alternative crop strains [themselves] ... more widely adapted... ' (Schneider p.8). Observe, however, that it is a decidedly *restricted* "adaptation" that is being proposed, that humans adjust to the results of present economic and industrial practices, rather than adjusting *them*. It is *assumed* that economic growth comes first, that we do not change (e.g. through decent regulation) high energy industrial practices. A fuller and smarter adaptation would adapt *these* practices. The policy is like a pernicious agriculture policy that says, "Let farmers adjust to the results of soil erosion, salination and so on, without attempting to mitigate or prevent these deleterious changes in advance." Such "adaptative agriculture", the present predominant practice in advanced agriculture, is anti-environmental, but is given a spurious air of evolutionary inevitability and evolutionary redistributive justice; you can't buck natural evolution, which is entirely natural, can you? Let us condense such far-from-inevitable and highly artificial mal-adaptation in the neologism *badaptation*. Greenhouse adaptation, like nuclear adaptation, is badaptation (some, less kind, would say *madaptation*).

There is a pragmatic, if cynical, political argument for badaptation, namely, that *unilateral* action to prevent a warming is unfeasible and requisite international cooperation is unattainable. Both contentions are open to doubt. Unilateral action by the USA, by far the Earth's heaviest resource and energy consumer (per capita and on several other relevant dimensions), could make a major difference, especially when backed up by pressure (familiar from other settings, such as the narcotics war) on other nations and through the United Nations. Unfortunately the USA is also the world's largest supplier of influential growth economists. In any case, international agreements such as those on whaling and concerning Antarctica, are attainable, and sometimes effective. The ozone protocols, limiting production of CFCs, show that results can be achieved to limit trace gas emissions.

The adaptation proposal is presently compatible with wait-and-see; both mean little or no hauling back on trace gas production. Indeed procrastination will force societies towards badaptation. Typical of adaptation, like procrastination, is an (over-)emphasis on the uncertainties of Greenhouse forecasts, and on the decision-theoretic paralysis such uncertainties are alleged to produce. Characteristic of adaptation too is a minimisation of the *extent* of Greenhouse modification. No doubt the impression that things won't be so very different, or far removed from what has already been experienced, is important in getting adaptationism more readily accepted, as a rational course of action (instead of the seemingly irrational course it is). Thus badaptation tends to play with figures at the low end of projected ranges of temperature increase, such as 1.5°C for 2050, when in fact present data indicates something rather in the vicinity of 4°C - in a setting, furthermore, where fractions of a degree centigrade may well be linked to macro-physical and macro-biological change. Recent modellings deliver, on average, an increase in 2°C attributable to carbon dioxide, and it is widely thought that other trace gases will double the CO₂ effect¹⁰, thus yielding a 4°C temperature increase around 2050.

The colossal extent of future human dislocation has correspondingly been deliberately underemphasized. The adaptive capacities of human arrangements, when humans are living at the margin, to massive natural shifts, has been grossly exaggerated. Consider agriculture alone - set aside flooded cities, sunken atoll islands, and all the rest. Some of the Earth's major grain producing regions - upon which famine relief projects depend - could be pushed substantially out of business. The conditions which prevailed during the American dust-bowl experience of the nineteen-thirties were benign indeed compared with those which threaten with mid twenty-first century Greenhouse conditions. The mid-continental summer temperatures were only 1-2° C warmer than the present average; under greenhouse conditions they could well be more than 3-4° C warmer. In the dust-bowl rainfall only slipped at critical growing times (e.g. July for northern corn) to 80% of the contemporary norm; but under Greenhouse conditions it could be significantly less again (only winter precipitation increasing). A super dust-bowl is not improbable (for much more detail, see Bernard). Similarly for other similar latitude Northern grain producing regions. But the high-energy industrial superstructure is crucially based upon sufficient cheap food (bread) for the urban masses.

• *Intervention*, high-tech Earth engineering.

Interventionist proposals so far floated include

- ① New oceans in parts of the Earth's land surface lying below, at, or near sea level. These projects would make the mega-dams of recent times look like children's play.
- ② Wintering effects. Production of sufficient dust in the atmosphere, achieved for instance by

¹⁰ See e.g. Pearman p.18. Note that methane is beginning to rival carbon dioxide as a gas whose atmospheric proportions really matter and whose present exponential increase is excessive.

nuclear detonations, to mitigate heating effects. Such enterprise would make modification of the weather by cloud seeding look like child's play.

Fortunately these and other expensive and grandiose proposals, which would call for considerable international cooperation, *are* far down the planning track; with these schemes procrastination is rational.

- *Regulation*, controlling free(-wheeling) enterprise.

Regulation itself is of course transparadigmatic; where it belongs depends on what measures (what sorts of constraints, rights, etc.) are proposed and how they are imposed or enforced. If it is, for example, some industrial law-and-order, smokestack scrubbing regulations or Greenhouse polluting rights, within the status quo, that is one thing, but if a minimally-constrained growth paradigm is questioned and alternative socio-economic arrangements advocated, that is quite another, and falls outside the dominant paradigm. Such policies involving regulations controlling fossil fuel emissions especially, are negatively labelled *prevention* in the predominantly American policy literature, though there is now no preventing some Greenhouse effects; but the worse to follow could still be prevented. What is usually covered under the label is however some regulation within prevailing political arrangements. So energy efficiencies and savings for investment in growth elsewhere is comprehensible, straight growth-curtailing non-consumption is not contemplated. But the latter is just what alternatives do contemplate.

Democratic political arrangements do not exclude such alternatives; both the power bases of political leaders and economic prescriptions do. Adequate regulation within prevailing socio-economic arrangements is going to prove impossible, without adjustment of power structures and economic imperatives - in effect without far-reaching systemic and ideological adjustment. While such adjustment appears rational, it seems unlikely (see further section 5). Power holders and the power structures into which they slot have too much to lose. So it is hardly remarkable that regulation itself is not so bureaucratically popular (at least under that mode of presentation) in these latter days of economic irrationalism, and is strongly resented and resisted.

Some of the U.S. bureaucratic reaction to the Antarctic ozone hole, now regularly attributed to extensive CFC usage, is instructive. A top Reagan official 'said that since CFC's were useful to industry, people should use sunglasses and baseball caps as protection against retina damage and skin cancer' - individualistically distributed adaptationism, terrific for creatures outside "sunglasses and baseball caps" economies. Other Reagan administrators spoke for procrastination, one academic-turned-bureaucrat observing that 'so far the ozone hole has had little effect on skin cancer rates in the United States'. The prevailing bureaucratic procrastination stance that was applied to the much easier ozone problem (which has belatedly obtained weak international responses), is now extended to Greenhouse effects. It is typically, typically irrationally, stated by high administrators that 'significant gaps exist in our knowledge ...'. These scientific uncertainties

must be reduced before we commit the *nation's* economic future to drastic and potentially misplaced policy responses' (preceding quotations from McKibben p.10, p.11, italics added).

The extensive *chauvinism* and the *environmental shallowness* of the Greenhouse business is thereby also revealed. Like heart disease and cancer, Greenhouse effects are gaining much discussion and some funding because they just may severely effect the affluent, affluent humans and affluent nations, that have a good deal to lose, in United States especially. The impact will, however, be at least as severe in some third world nations, whose forests and towns will be blown down by enhanced cyclones, whose lands or much of them will be flooded, countries which cannot afford extensive expensive dyking (or where such effort would be in the longer term, as seas rise, be pointless), countries such as Pacific coral atoll nations and delta states like Bangladesh. But the really serious losers will no doubt be, not humans, rich or poor, but nonhumans.

Biological diversity, already being reduced by various human activities, may be one of the chief casualties of global warming. Massive destruction of forests, wetlands, and even the polar tundra could irrevocably destroy complex ecosystems that have existed for millennia. Indeed, various biological reserves created in the past decade to protect species diversity could become virtual death traps as wildlife attempt to survive in conditions for which they are poorly suited. Accelerated species extinction is an inevitable consequence of a rapid warming (Worldwatch p.10).

3. Arguments to dislocation and for a Lesser Venus Prospect.

There is at least a small probability that predicted increases in mean atmospheric temperatures will seriously interfere with most remaining natural habitats and result in the degeneration or destruction of many of them, especially forests, wetlands, and marine environments. For example, most wetlands will either be flooded or else evaporate under increasing temperatures. Again, the prospect is for the boreal forest to shrink from about 23% of the world's forest to something like 1% of a much diminished forest covering. Nor will adaptationism help here; for natural evolution is much too slow for adaptationism to succeed ¹¹.

Natural ecosystems will not adapt effectively to rapid climatic change... With regard to forests, habitats for plants and animals cannot be re-created or transplanted rapidly. Continuing climatic changes would strain the capabilities of management practices even in commercial tree plantations (Beijer Institute Report pp.21-3).

¹¹ Cf. Keeton pp.763-4, '... typical migration rates for forest boundaries are of the order of 50-2000m per annum ... [A requisite] shift of 500-1000km would, however, take hundreds of years. ... Pollen evidence... suggests that large changes occurred in forest composition during the Holocene period some 8000-10000 years ago, even though the climate changes then were less than those expected by 2030 [and forests were more extensive and less interfered with]' (Pittock 87a p.209, rearranged).

(As changes are occurring too rapidly for natural responses, so on a grander scale events are moving too fast for interconnected Gaean control systems to respond. Again too positive feedback, as through increasingly rapid decay of organic matter, fuels escalations.) The decline or demise of these natural systems, vast reservoirs for greenhouse gases, will accelerate the warming, and accordingly make matters substantially worse:

Trees are adapted to a narrow range of temperature and moisture levels, and cannot cope with rapid climate change. A temperature increase of 1 degree Celsius per decade in mid- to upper latitudes translates into a shift in vegetation zones of 60-100 miles northward. Terrestrial ecosystems cannot migrate that fast. Vast numbers of trees are likely to die, and new trees adapted to warmer temperatures are unlikely to be able to replace them rapidly. During such a disruption, huge areas of forest could die and, as they decay or burn, send large quantities of additional CO₂ into the atmosphere, accelerating the warming (Worldwatch p.10).

Of course the immediate climatic patterns would be somewhat more complex. If enough soot and ash from fires were flung into the atmosphere there would be a cooling effect, like that of a small nuclear winter, before heating accelerated. The present pattern of ecosystemic loss would also be sharply accelerated. For when natural ecosystems get reduced to about 30% of their initial size, they tend to collapse of themselves.

Moreover, there would be other significant positive feedback from ecosystems other than the terrestrial forests, from the oceans especially. As the oceans warm, they lose their capacity to serve as carbon dioxide reservoirs. So they too release additional gases, including previously absorbed CO₂, back into the atmosphere, further accelerating the warming. A critical question arises as to how much danger such positive feedback poses? As so often, informed opinions, and so probability estimates differ. However 'several scientists working in the area consider that positive feedback effects will force a very bleak picture to be drawn' (Worldwatch p.19).¹²

Unlike the interim effect of a small nuclear winter, where after a few years at most, climatic behaviour (as distinct from radioactivity levels and, differently, from ecological communities) would presumably return towards the previous norm, there will be *no* similar *recovery* under greenhouse impact. Technically then, stability would be lost under the impact,¹³ disequilibrium induced. An eventual long-term return to some different but sufficiently congenial equilibrium could well be excluded. Under new climatic regimes plants themselves may be able to do little more than hang on for part of their own lives. In many places conditions would be too severe for much of the "year" to permit normal plant functioning, including what is crucial for Greenhouse amelioration, photosynthesis. In most plants, photosynthesis only occurs across a narrow band of

¹² Second order probabilities, probabilities and uncertainties in the light of first order subjective probabilities, enter importantly.

¹³ Stability is defined in physics in terms of immediate return to an initial (inertial) position after small disturbance.

temperatures (e.g. 6 - 34°C); outside that range the plants shut down operations.¹⁴ Even more important, many plants would leave few or no successful successors. Even where plants set seed, seedlings would not survive under the severe conditions expected; for instance, they would be killed by hot dry summer conditions, or in other places by frosts to which they are not adapted, both phenomena already familiar after clearfelling of forests. The situation at a famous place in southern Sahara, where there is but one ancient tree hanging on in thousands of square kilometres of desert, a tree with viable seeds which sets no seedlings, could be more or less replicated in many other places where forests or woody plants once grew.

In fact we are already witnessing the demise of the trees in much of Australia. Already dead and dying trees form a predominant feature of the Australian rural landscape. Virtually whichever way ecologists travel in Australia where trees remain, they are confronted with dead and dying trees.¹⁵ The reasons for the present decline of trees in rural Australia is, for the most part, not to be attributed to early Greenhouse or even pollution effects.¹⁶ It is thought to be due to a complex of factors, including a range of insect predators whose efforts are concentrated on isolated trees left after an excessive zeal for clearing (i.e. holistic effects enter as regards healthy persistence of trees). Excessive disturbance of ecological systems, though overclearing of trees, has seriously upset the systems. Types of systemic stress and disturbance are likely to be much accelerated given the additional impact of Greenhouse warming on plant functioning and reproduction.

There are several *arguments to some probability of ecosystemic breakdown* worth disentangling. Firstly, a system may be disturbed by interfering with critical components within the system structure, processing parts, such as botanical systems or their interconnections. As with a computer, if a critical component is broken or a circuit cut, the probability of serious malfunction increases. Secondly, a system normally operates within a certain range of condition. Take it outside these conditions or push it towards limits (let the computer get too hot or too cold), and probability of breakdown is much increased. Feedback loops, which are an important feature of cybernetic systems are particularly vulnerable to normality disturbance. Cybernetic systems afford one example of more holistic behaviour; dissipative systems, where perhaps strange new features may enter as systemic loading is increased, another. Such new features may not be at all congenial to dominant forms, or to maintenance of life support arrangements.

It should be evident from details already assembled that there is some probability the Greenhouse efforts could seriously disturb the crucial carbon cycle. The carbon cycle loops, in

¹⁴ The upper bound may be difficult to appreciate in most of Aotearoa. But in much of Australia, during the summer, many plants close down their operations for much of the day. Other effects of increased heat on major food plants matter for human affairs. Severe heat interferes with fertilization and reproduction in corn, and apparently affects the ability of rice in Asia to reproduce; so considerably reduced yields of staple foods may be anticipated.

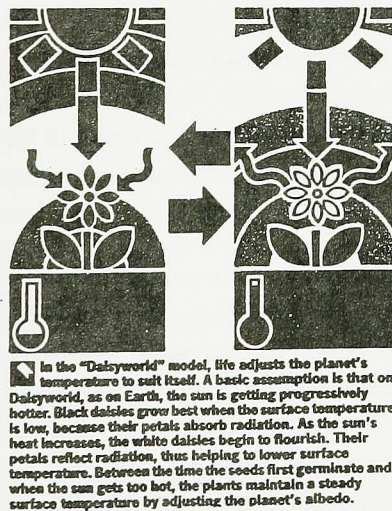
¹⁵ Reported by Recher on *Earthworm*.

¹⁶ Thus coastline vegetational destruction through detergents in sewerage waters.

major fashion, through both the higher plant complexes and the oceans, both major carbon dioxide reservoirs – but just how critically through them is uncertain. However, with the serious disturbance of main components in the cycle, the real possibility of cycle malfunction can hardly be excluded. Much the same holds with other crucial chemical cycles, such as the sulphur cycle (though woody plants are perhaps less important here, the oceans are highly significant, the oceans Costeau has already pronounced moribund). To a lesser extent, several of the other well-known bio-chemical cycles, such as those for nitrogen, sodium, and so forth, depend for their stability and maintenance on the adequate operation of active ecological structures. Plainly if a cycle loops through a component, such as a tropical forest, which is severely disturbed then the crucial cycle itself could be locally disrupted.

There is some probability, furthermore, that the changes will disturb other physical cycles crucial to the stability of systems. For some of the Earth's feedback systems are in fact maintained in equilibrium through natural ecosystems. A striking example appears to be the regulating of the Earth's temperature itself. Lovelock and collaborators have devised an elementary *daisy world* model which reveals how a feedback system with two types of daisies can, within limits, stabilize temperatures despite increasing solar energy input (see the next diagram). The limits are important, for as these limits are approached the maintenance systems break down. Thus again, instability could ensue under disturbance.

Diagram 5 . *Thermostatic regulation of the Earth's surface temperature through plants (a much simplified picture from Lovelock 88 p.58).*



Without doubt these matters are bad enough. Demise of most of the Earth's richness¹⁷ is not a minor matter. Worse could follow.

Apart from direct ecological breakdown, there are several other major ways through which the maintenance structures of the Earth can be not merely awkwardly disturbed, but thrown right out of kilter - perhaps, given the *delicacy* of several critical matters, never to return present norms. Most obvious and immediately threatening is

- nuclear warfare, and therewith nuclear winter.

But there are of course other severe shocks that the planet could suffer than those chemo-nuclear warfare, some human induced, some a "chance" matter of the planets' position in space; namely

- a mini Big Bang, or an undermining of metastability, brought about through very high energy experimentation (see Leslie);
- a collision with a large meteorite or asteroid.

Such uncertainties, not germane to the main climatic arguments, are listed, not to achieve a bogus completeness, but to emphasize that complete certainty is not to be expected, not rationally. Should we obtain it, should we obtain easy relatively unproblematic lives, then we have, by world standards, been rather lucky. Moreover, these latter uncertainties do so far appear negligible compared with those bound up with climate.¹⁸ The Greenhouse problematique differs (as do nuclear winter and also high energy experimentation) from such possibilities as destruction of the Earth's favourable climate or life-supports by collision with an asteroid in two crucial respects:

- * the poor prognoses are largely a matter of human making (meaning the making of certain among humans) and
- * the damaging situations could be substantially averted by positive or concerted human activity.

According analogies with remote phenomena such as decline of the sun, asteroid collisions, etc., sometimes applied to dismiss concerns with global environmental problems, do not hold up, and should be resisted.

The human-induced climatic problems are primarily ascribable to:

- excess economic development. The practices involve a complex and sustained assault on most of the Earth's major ecosystems, forests, seas, and so on, along with the alteration of atmospheric composition by greenhouse gases. For example, the forests are cut down, burnt, poisoned by

¹⁷ Natural richness is its main richness, much exceeding human artifice.

¹⁸ None of these assessments are strikingly objective, but are a matter of appearance. The risk of catastrophic destruction of Earth civilization by an asteroid or comet is discussed, and compared with other less exotic risks, in Chapman and Morrison, chapter 19. It has been guesstimated at a 1 in 300,000 chance per year, a much smaller probability than that serious Greenhouse effect will eventuate (often put at about 85%), but comparable with some rather more mundane risks (see p.283). The risks from very high energy experimentation will no doubt rise sharply as orders of attainable energy increase.

herbicides and acid rain, or otherwise removed or destroyed. (Therewith too a great deal more carbon dioxide is released into the atmosphere and major sinks of carbon dioxide are removed.) As a result of these concerted growth-and-development activities such systems are driven to limits, and breakdown occurs. Once it occurs at some weak point it can escalate elsewhere, like a conflagration; thus again ecosystemic collapse for example.

Quite apart from breakdown at or approaching limits, for instance because of systemic overload, remarkable changes can occur in dissipative systems under stress or strain.

- excess energy or chemical loading. Though such striking examples as the chemical clock, it has been demonstrated that dissipative systems can suddenly, and often rather unpredictably, undergo extraordinary changes, as for instance energy flux is increased (Prigogine and others).

Such non-additive or nonlinear effects, characteristic of more holistic dissipative systems, seem bound to occur within the Earth's atmosphere and oceans as they undergo compositional changes. Carbon dioxide itself provides a good example:

With small quantities its effect on the temperature of the air is proportional to the amount added; there is a linear effect. However once the carbon dioxide concentration in the air approaches 1%, new nonlinear effects come into play and heating greatly increases. In the absence of a biosphere to fix carbon dioxide, its concentration in the atmosphere would probably exceed the critical figure of 1%. The Earth would then heat up rapidly to a temperature near to that of boiling water. Increasing temperatures would speed up chemical reactions and accelerate their progress towards chemical equilibrium. ... eventually ... the Earth would become permanently cocooned in a brilliant white cloud - a second Venus, although not quite as hot (Lovelock pp.45-6).

Fortunately for Gaeian prospects, the percentage of carbon dioxide in the atmosphere is now nowhere near 1% nor likely to be pushed near 1% by projected increases in carbon dioxide levels under economic activity over the next 50 years¹⁹. However eventual exponential growth will lead towards accentuated levels, and the side effect of such growth, the release of carbon dioxide from forests and oceans and the considerable reduction in fixation of carbon dioxide with the decline of forests, will lead in that disastrous direction rather more rapidly. The 1% bound constitutes just one of the many serious limits (fortunately a fairly remote one) to continuation of present developmental practices.

Now there can be no rational confidence with respect to complex dissipative systems - about the behaviour of which we presently know comparatively little - that other nonadditive effects will not be encountered at a much earlier stage. After all, the Gaeian system, its atmosphere, oceans and ecosystems, will be pushed into essentially unexperienced and substantially unknown reaches. There is, for example, no experience from comparable past times of such elevated temperatures as

¹⁹ In the atmosphere of the very early Earth, CO₂ exceeded the critical 1% figure; but solar luminosity was about 25% less than now. With increasing solar flux the Earth would have overheated had the proportion of CO₂ not been much reduced (e.g. see Lovelock 88 p.56).

Greenhouse effects will lead to, to draw upon. 'There is no evidence that the land-bound glaciers in Greenland and Antarctica have ever completely melted in the last two million years'. There is experience of much colder periods. 'During ice ages, the earth's average temperature has been about 5°C colder than at present, with glaciers covering major portions of continents' (Barth p.7). But there is no similar experience of temperatures 4-5°C warmer than at present (in any warm interglacial period), 'a global increase of more than 2°C above present is unprecedented in the era of human civilization' (Schneider p.6).

It would accordingly be decidedly rash, rash decision making, to assign a zero or negligible probability to the emergence of new or unknown effects of relevance, to assume all will go smoothly and well. That would presuppose, in any event, a completeness in present scientific knowledge, contrary to the information we actually have that present investigation of holistic systems, among much else, is still in its infancy. The probability of something critical (e.g. perhaps water vapour already, perhaps radicals like hydroxyl) having been left out of estimations, of room accordingly for something unexpected or for something to go wrong, *may* be small (though experience implies it is not always so), but it certainly appears to be non-zero.

For the overconfident, with excess faith in the flimsy scientific edifice, there is a salutary lesson to be drawn from the erratic and stumbling path of the main proponent of Gaia hypotheses, Lovelock. Lovelock, coming from a working life as an industrial chemist, part of that time for a giant chemical transnational, had, and retained for a considerable time after he began his holistic hypothesizing, a strong antipathy for environmentalists.²⁰ Even Gaia was for industry and against the environmentalists; she was going to laughingly soak up all the pollution, courtesy of the chemical companies especially, that we humans could throw at her. In particular, we did not really need to worry much about ozone depletion or greenhouse gas escalation.²¹ 'Contrary to the forebodings of many environmentalists, finding a suitable' destructive agent to bring about a 'doom scenario' 'turns out to be an almost insoluble problem' (79 p.40). Lovelock makes it easier for himself by helping himself to the assumption that a doomsday scenario involves the destruction of all "life", 'down to the last spore of some deep-buried anaerobic bacteria' (p.40). But even for the least chauvinistic of environmentalists, destruction of all humans but the select elect would be quite enough for a decent doomsday. Lovelock's high redefinition of an environmental 'doomsday scenario' is unacceptable. Lovelock does not however stay within the bound of his redefinition. He proceeds to pooh-pooh the idea that anything much that we humans could accomplish would make any difference to Gaia (p.41) or even to most humans, including use of nuclear devices.

²⁰ Coupled with this, there was a certain schizophrenia in Lovelock's attitude to the natural environment. There was also a matching schizophrenia as to the fragility of life on Earth. On the one side, it required very delicate settings and fine tuning to arise; this is part of the argument for a Gaia hypothesis. On the other side, life is 'tough, robust, and [highly] adaptable', virtually indestructible (79 p.90). But though a flawed hero, Lovelock is a hero nonetheless.

²¹ See e.g. Lovelock 79, p.40ff; and also, on ozone, 88 p.63.

Unfortunately for Lovelock's credibility, he was writing three years before the seemingly obvious wintering effects of a major nuclear war were realised by the accredited scientific community. Appealing in a common scientific fashion to scientific authority, he proceeds to minimize the human and ecological effects of a major war. The report he relies upon as authoritative was a 1975 (unreferenced) one of 'the US National Academy of Sciences ... prepared by an eight-man committee of their own *distinguished* members, assisted by forty-eight other *scientists* chosen from those *expert* in the effects of nuclear explosions and *all things subsequent* to them' (p.41, italics added). Lovelock draws from the distinguished expert report the findings that

... if half of all the nuclear weapons in the world's arsenals, about 10,000 megatons, were used in a nuclear war the effects on most of the human and man-made ecosystems of the world would be small at first and would become negligible within thirty years. Both aggressor and victim nations would of course suffer catastrophic local devastation, but areas remote from the battle and, especially important in the biosphere, marine and coastal ecosystems would be minimally disturbed (p.41).

Three years later Turco and others proceeded to detail a very different scenario, that of widespread and ecologically damaging nuclear winter. Not for the only time, Lovelock had been caught out badly.

As with pollution, Lovelock has more recently shifted ground,²² considerably, on the vulnerability of the Earth to human-induced disturbance. When a system such as Gaea in homeostatis

is stressed to near the limits of regulation even a small disturbance may cause it to jump to a new stable state or even fail entirely. ...

It could be that the regulation of the Earth's climate is not far from one of these limits. Thus if some part of climate regulation is connected with the natural level of CO₂ then clearly we are close to the limits of its regulation. This is because CO₂ cannot be reduced much below the level observed for the last glaciation, about 180 ppm, without seriously limiting the rate of growth of the more abundant C3 type plants. If we perturb the Earth's radiation balance by adding more CO₂ and other greenhouse gases to the atmosphere or reduce its capacity to regulate by decreasing the area of forests or both of these together then we could be surprised by a sudden jump of both CO₂ and temperature to a new and much warmer steady state; or by the initiation of periodic fluctuations between that state and our present climate.

The anomalously low abundance of CO₂ on Earth when compared with the other terrestrial planets and especially the fact that the mean temperature of the Earth is on the cool side of the optimum for regulation, suggests strongly that the biota is regulating the climate by pumping CO₂ from the air. The common

²² Shifting ground may be fine, especially when it is to an improved position. But it should be done honestly and openly, not stealthily or shiftily. Lovelock proceeds to attribute a caricature of his *own* previous position to critics of the Gaia hypothesis (as a clever 'fabrication', which also it was not): that it is 'an argument developed to allow industry to pollute at will, since mother Gaia will clean up the mess' (85 p.53).

On some important earth issues, Lovelock has not duly shifted ground. Even in these latter post-nuclear-accident days he continues to sponsor nuclear power.

feature of most of our pollutions and of our exploitation of the land surface seems to be unintentionally to thwart this natural process (Lovelock 85 pp.53-54).

The argument to the lesser *Venus path*, to significant disequilibrium with the Earth's ecological support system destabilized, takes the following lines. The Earth appears to be a dissipative (far-from-equilibrium) system held at its present *balance* by a combination of an (increasing) solar flux - a main energy input into the system - and its major ecological arrangements, especially vegetational complexes and live oceans. The sheer extent to which the resulting system differs from the stable dead system it could otherwise be is shown by the following table for atmospheric and oceanic composition.

TABLE 1. *Planetary comparisons* (principal components per cent).

Substance		Equilibrium Earth	Venus	Lifeless Earth	Mars	Present Earth
A I R	Carbon dioxide	99	98	98	95	0.03
	Nitrogen	0	1.9	1.9	2.7	79
	Oxygen	0	trace	trace	0.13	21
	Argon	1	0.1	0.1	2	1
O C E A N S	Water	63				96
	Salt	3.5	n.a.		n.a.	3.5
	Sodium nitrate	1.7				traces
Surface temperatures (°C)		n.a	477	290±50	-53	13
Total pressure (bars)		n.a.	90	60	0064	1

The table is based upon tables 1 and 2 of Lovelock 79, p.37 and p.39.

The whole Earth system is accordingly far from equilibrium. Unpredictable behaviour as loads increase is therefore almost to be expected. A likely moral is presumably: stress the system, or destabilize ecosystem controls sufficiently, and the system may be in deep trouble. It is relevant to inquire briefly into what evidence we so far have on this score.

To do so let us reconsider some of the array of arguments there are from some sort of holistic organisation of the Earth (for a modest Gaea hypothesis, to the effect that the (outer) Earth is a naturally regulated nonadditive cybernetic system, important attributes of which are regulated

by the biota). *But for* the participation of the Earth's ecological support systems, plant complexes especially, the Earth would not be blessed with its present life-benign physical characteristics. The oceans would be much saltier and too salty for most life, the air would not contain the present rich mixture of oxygen and carbon dioxide so important for terrestrial life, and so on; perhaps most important the Earth would be significantly hotter and too hot for most life, for most of what does the regulating and stabilizing of present conditions. For the solar flux has increased in intensity about 30% since life appeared on Earth, whereas the mean global temperatures have exhibited no corresponding increase, but have remained relatively constant. Such an expected constancy in the face of disturbing inputs is ascribed, under holistic approaches that do something to explain it, to the concerted activity of plant life, as already indicated.

The general tenor of the argument is so far this:- By arguments from physical and other models, and because of uncertainties, the probability that something could go badly wrong is not merely nonzero²³ but indeed far from negligible. Part of the argument can be put as follows:- There is a decent probability that a modest Gaea hypothesis holds. But then, there is a considerable probability that excessive Greenhouse build-up will lead to damaging system destabilization. So combining probabilities, there at least a nonnegligible probability of such destabilization.

An analogy should now emphasize both the dubiousness of what is being proposed under adaptationism and the precariousness of the human predicament. The proposal is to take this ancient craft, now overloaded with human passengers and their heavy baggage, a cargo it was never organised to carry, out on new routes and run it faster and higher than it has ever travelled before. Even for an experimental prototype, a now very fast (air-)bus say, with a select test crew, such a procedure, of running over new uncharted routes at speeds and heights never attained before, would be risky enterprise. With an ancient craft, with a heavy non-elite cargo of baggage and passengers (some whom try to interfere with the controls), the proposal is extremely rash. For the chances that the craft will break/down and perhaps crash, with serious consequences to passengers and for the baggage, are greatly elevated over the risks of proceeding as usual much more slowly. With the costs of crashing so severe, rational operators and sensible pilots would not take them.²⁴

²³ From logical theories of probability such as Carnap's non-zero probabilities are rather easily reached (perhaps too easily, with the converse feature that natural laws never obtain high probabilities. The difficulty can be averted, to some extent, by restriction to physical models.)

²⁴ The analogy is an old one, which we exploited before in the nuclear case; for the "bus analogy", see Routley and Routley. The analogy admits of much graphic variation. Instead of running the craft at excess speed, an alternative or additional image is that of destroying the controls of the craft. Lovelock deploys this apposite image (88 p.63), which corresponds to the demolition of Gaeian control systems. Others speak of a colossal experiment with the Earth; but strictly the conditions for a controlled experiment are not met.

Unfortunately the analogy is not at all far-fetched, but resembles what is in store for spaceship Earth, already under significant stress with its excessive human passenger load and their heavy ecological practices. Not only is the future itself pretty new territory, but it is a future at terrestrial temperatures never before attained. As a result too of these enhanced temperatures, important processes will proceed faster than ever before, in particular all chemical processes. Simply to take the craft up there, as do-nothing and adaptation approaches would have is to emulate the risks and hubris of Daedelus; such approaches are aptly named *Daedelian*. Given anthropic terrestrial practices, a Daedelian future and fate should not be excluded.

4. A Sting in the Cosmic Tail: the mini-Furphy theorem and on the likely decline of *Homo sapiens spp. economicus*.

The anthropic doomsday argument developed relies upon a modified Murphy's law. The trouble with the initial formulation of Murphy's law:

if anything can go wrong, it will,

was that it was insufficiently qualified, much too absolutist, and apparently self-refuting.²⁵ Certain crucial qualifications are required:-

- Replacement of the too certain conclusion by a somewhat weaker probabilistic one: for instance, it *probably* will.
- Correlative to weakening the conclusion, strengthening the premiss, by rendering it more specific; namely, in place of 'anything' or 'something' put 'some thing ... given a chancy situation'.

The modified formulation is accordingly the following mini-Furphy proposition:²⁶

*if some thing can genuinely go wrong, given a relatively chancy situation,
it probably will.*

Here 'chancy' means more or less what it means according to the dictionaries: doubtful, decidedly risky, or as we shall construe it, having a comparatively low probability vis-a-vis its alternatives. The precise extent of relative chanciness will be explained as we go.

²⁵ For this and other formulations of Murphy's law, and many loosely associated humorous maxims with grains of truth encapsulated, see Block. As to the history of the "law", which originated with J.M. Chase, editor of *Aviation Mechanics*, see the *Encyclopaedia Americana*; Chase's initial formulation in a 1955 issue read 'If an aircraft part can be installed incorrectly, someone will install it that way'. Silberman's paradox, that if Murphy's Law can go wrong, it will, is not a genuine paradox. For it can simply be asserted that where Murphy's Law is a real law it will not go wrong. The connection of Murphy's Law with the principle of plenitude appears to have escaped much notice.

²⁶ This little theorem was originally titled the Murphy-Leslie theorem. It is an adaptation, suggested by Leslie's work, of Murphy's Law. While this section is overwhelmingly indebted to Leslie, the arguments developed *do differ* from those Leslie advances. For Leslie's arguments and also his debts, and so the transitive debts of this section, see Leslie himself, who deserves to be read in defence his own legitimate doomsday apprehensions. The Appendix indicates the very limited extent to which Leslie's arguments are here endorsed.

The proposition is itself a corollary of a more general result, an ancient principle. The generalisation replaces 'go wrong' by 'happen'; the ancient principle is that of *plentitude*, sometimes stated, with quite insufficient reservations, as that all places are full, or *any genuinely possible state is bound to be realised* (when genuinely possible states are compatible with all that is already transpiring). The principle, whose distinguished history is traced in Lovejoy, has emerged in contemporary particle physics, in such forms as the following: if a thing (e.g. an elementary particle) is not forbidden, excluded by quantum rules, then it is bound to occur (or be realised), even is "compulsory". For things and events generally, such completeness (all nonexcluded particle niches are occupied) cannot reasonably be expected.²⁷ The main mini-plentitude proposition has, like its mini-Furphy specialization to bad outcomes, to take the much more hedged form: *if something can genuinely happen, given a relatively chancy situation, it probably will.*

To prove this proposition, let us first recast it in appropriate symbolic form. Let D be some arbitrary (bad) situation, a suitable disaster in the intended application. Let the possibility of D's happening - such as something's going wrong - be represented by a non-zero probability, and genuineness by non-negligible probability. It can be assumed that that probability, P(D), is small; if it were large enough the requisite conclusion would follow in any case. Let C represent the relativizing features, what is given that renders the situation chancy. Then what we aim to show is that where P(D) is small positive, P(D | C) is probable.

The proof applies a special case of Bayes' theorem, which takes the following form where there are n alternative hypotheses $h_1, \dots, h_n$ including h:

$$P(h | i) = \frac{P(h) \times P(i | h)}{\sum_{r=1}^n P(h_r) \times P(i | h_r)}$$

Here h is the hypothesis, which in our application is D, i is the additional information (or, as in Carnap, a new observation), which in our case is C.²⁸ P(h | i) is the probability of h given i, or

²⁷ There is a marvellous Greek term, *agathonic*, which could serve to cover items where the particle physics "principle" is satisfied. 'We may call an event agathonic to convey that, though in itself it was highly unlikely, we might have known that something of that sort was bound to happen. ... from the name of the tragic poet to whom Aristotle attributes the view that it is very probable that the improbable should happen. (Kaplan p.9 rearranged). Is the chronic chthonic Greenhouse escalation agathonic?

²⁸ The formulation is a special case of that proved in Carnap, p.331; namely that (absolute) case where the evidence e is elided, or e set = 1. A similar result follows, subject to slightly more rigorous conditions, in relevant probability theory; see Routley 79 p.954. In effect we shall look at the form

$$P(h | i) = \frac{P(h) \times P(i | h)}{P(h) \times P(i | h) + \sum_{r=1}^n P(h_r) \times P(i | h_r)},$$

with the sum excluding the product for h.

of h on condition i (the backward arrow notation, $\{$, symbolises the condition involved and shows its direction). For simplicity we shall suppose that all the alternatives to D are concentrated (as far as symbolic exposure goes) in one, namely D^* . Then the form we seek to apply is simply:

$$P(D \{ C) = \frac{P(D) \times P(C \{ D)}{P(D) \times P(C \{ D) + P(D^*) \times P(C \{ D^*)}$$

The arithmetic details needed can be tabulated in a revealing form as follows:

Cases	D	D*
Initial (or prior) probability of outcome	d	$1-d$
relative chance that C	m , say $1/d$	m/l , say $1/dl$

As it is the *relative* chance of C that matters, we can rescale to set $m = 1/d$. To make C relatively chancy, l has some modest size; specifically let l exceed $1-d/d$.

Then the probability to be estimated, $P(D \{ C)$, is

$$\frac{d \times 1/d}{d \times 1/d + (1-d)/dl} = \frac{1}{1 + k}$$

where $k = \left(\frac{1-d}{d}\right) \times \frac{1}{l}$. That is, $P(D \{ C) = \frac{1}{2}$ where $k = 1$,

and $P(D \{ C) > \frac{1}{2}$ when $k < 1$, i.e. when $l > \frac{1-d}{d}$.

Thus D is probable, at least in being more probable than not, given C, when l is of at least modest size, i.e. given C is relatively chancy. In a merely apparently more general form of the estimation, where we do not align m to d ,

Though demonstrable given satisfiable exclusion and exhaustion conditions, Bayes' theorem is not lacking critics, in part because of the surprises this bit of logic can deliver. Carnap meets the objection that Bayes' theorem has sometimes 'been applied to cases where it led to strange or even absurd results' thus: 'This was mostly due to an uncritical use of the principle of indifference ... [The] theorem is provable ... on the basis of those weak assumptions which practically all theories of probability seem to have in common' (p.331, sub 1 elided). Of course the present applications could (just) be objected to on the grounds that the logical conditions for the theorem to apply are not fully satisfied.

$$P(D \mid C) = \frac{d \times m}{d \times m + (1-d) \times m/l} = \frac{1}{1 + \frac{1-d}{d l}} = \frac{1}{1 + k},$$

as before. That is, m drops out, only the relative chanciness really matters. The little plentitude theorem follows as before.

Now to put some relevant flesh on these abstract statements and figures. Let D be some future disaster such as the catastrophic decline, for instance, through summer or winter phenomena, of the human species, from which the enormous present population never recovers. At worst (from a chauvinistic angle) the population, like many catastrophically effected by human activities, goes extinct. Suppose, for a bifurcating outcome, there is a catastrophe stage, before halfway through next century, 2050. If humans do not get their act together before then, they go into catastrophic decline, as already indicated. If however they do get their ecopolitical act together then humans, while they hardly live happily ever after (poverty, inequality, domination, and other evils not being removed), continue to persist or even grow in numbers, perhaps fanning out through the solar system (in the way envisaged by too many physicists). Suppose further we are optimists, imagining that the prior probability of D , ecodisaster and human decline, is small, say 1%. That is $d = .01$, and the initial probability of D^* , human "success", is .99. The figures are pretty notional. Supreme optimists would want to set d much smaller, pessimists rather at a higher probability.

Table 2. *Application of mini-Furphy theorem.*

Cases	D human decline	D* human success
Initial probabilities	1%, i.e. .01	99%, i.e. .99
Relative chanciness, of C	1/100, i.e. .01	1/100 $\times$ 1/l

Then the probability of human decline given C,

$$\begin{aligned}
 P(D \mid C) &= \frac{.01 \times .01}{.01 \times .01 + .99 \times .01/l} \\
 &= \frac{1}{1 + \frac{99}{l}} \\
 &> \frac{1}{2} \quad , \text{ when } l > 99.
 \end{aligned}$$

For example, when λ is set, conservatively, at 1,000, then the probability of human decline given present chanciness is approximately 90%. It remains to fill out C , thereby showing that λ is very likely much much larger than 99, and correspondingly human decline so much the more probable in the light of additional information, i.e. *a posteriori* probable in the usual jargon.

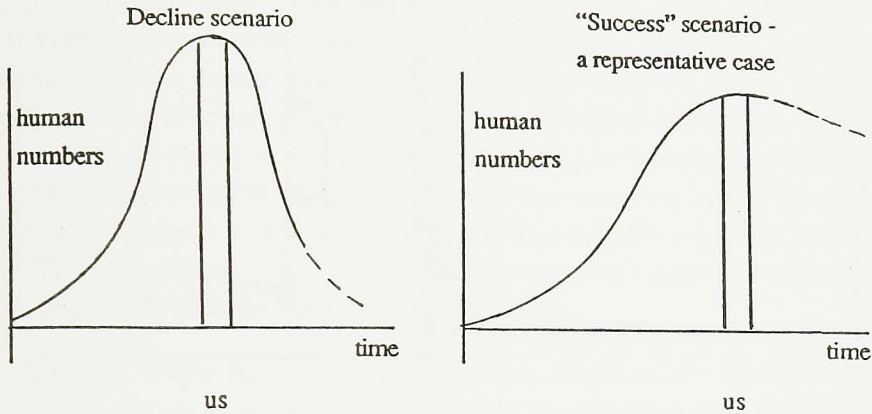
There are several high risk factors, acting in a certain concert, factors emphasized more than a decade ago in world systems modellings (such as, most famously, that of the Club of Rome), Malthusian factors such as human population, economic product, pollution, energy consumption, (The list rolls on.) It is appropriate to estimate posterior probability relative to any one of these, any of which can serve as C , in order to expose the riskiness of present gross human practices. In brief, because there are several high risk factors, so there are several appropriate relative or reference classes. Thus the posterior probability is assessed relative to such matters as humans now being thus and so, our or my being alive now (Leslie's first-person reference class), this being present energy use, present waste output, present forest destruction and so forth. The upshot is not the triviality that probability can be jacked up by placement in a suitably restricted context, though that analyticity is established.²⁹ The point is that, environmentally, more affluent humans have *themselves* produced such adverse circumstances, which are upon us, the very circumstances typically productive of limitation results.

In sum, the *anthropic* argument considers the environmentally invidious situation of present humans on the Earth. The argument can be carried through either in terms of sheer population, gross numbers, or in terms of human resource grabbing, as estimated for instance through energy consumption. In fact all the other factors are anthropically tied, to gross human numbers, via the environmental impact equation and because the levels are human-use numbers.

Let us consider the prospects given additional information as to the present phase of gross human population. C will be some such proposition as: the proportional preponderance of humans who have ever lived alive now, or to personalize it: the chance that you or your family, are alive now.

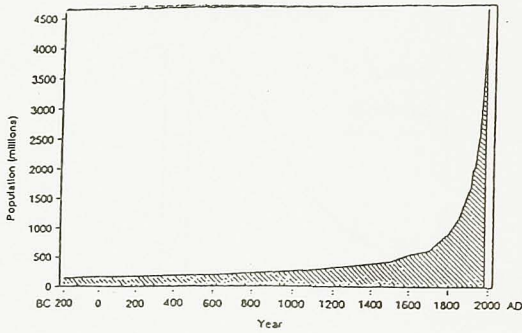
²⁹ One of the weaknesses in the argument may appear to be its dependence on an appropriate choice of relative class. For, the high relative probabilities can fall away if different reference classes, not exhibiting such growth patterns are taken, e.g. present wattle distribution, birds being thus and so. On the other hand, probabilities can be elevated even more by selection of more unusual reference classes, such as our being scientists, or being computer programmers, etc.. It is not so remarkable that probabilities can be wound up - or down - perhaps quite dramatically, by appropriate relativisation, by appropriate selection of a reference class.

Diagram 6: Our present population predicament on the two scenarios.

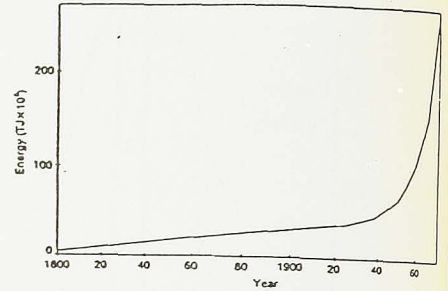


Humans have got themselves - to some extent *put* themselves, though much may be the result of muddling through - into an extremely dubious, environmentally insidious, and unsustainable position, on a range of critical parameters. Their numbers are excessive, their high energy use is excessive, their waste and their pollution are both excessive - and all these and other excesses are at the steep end of upward exponential curves. Several relevant graphs are distressingly exponential, with the present in the near vertical growth phase:

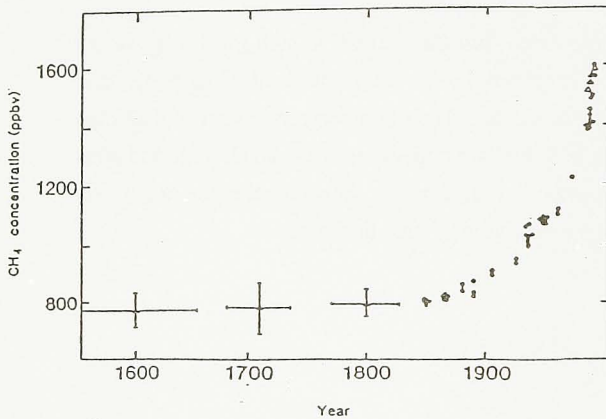
Diagram 7 : Growth in certain environmentally relevant parameters (all graphs exhibited are drawn from Boyden).



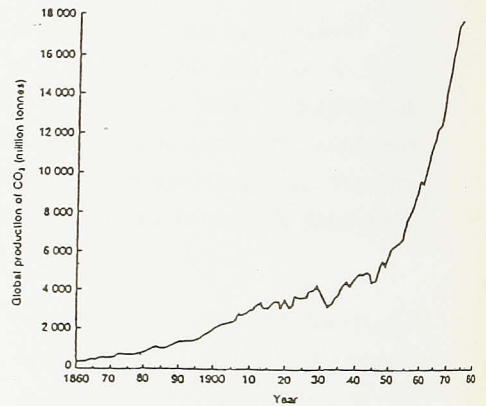
World population growth in the past 2000 years.



World extraneous energy use per year (1800-1975).



Methane levels over the past five centuries.



Annual global production of carbon dioxide from industrial activities.

Many other similarly shaped graphs could be added, for instance for growth of pollution, of waste products, of weapons (in terms of tonnes of explosive power), of other greenhouse gases such as the chlorofluorocarbons (which accelerated from zero in the nineteen thirties), and so on. The display typifies the accelerating human roller coaster (or air bus).

Those curves are tightly interconnected, in criss-crossing fashion. For example, the productivity of contemporary agriculture which enables the feeding of huge urbanised human populations depends on a very high energy use (in term of energy efficiency, contemporary high-tech agriculture falls below that of much traditional agriculture). The maintenance of high

populations with supplies of cheap food depends in turn on fossil fuel agriculture. Because of the intertwining of these phenomena, there is no easy way of getting off the accelerating roller-coaster.

Nor, as observed, is there much real effort devoted to slowing the coaster. For politicians it would be politically risky and inexpedient to try (for them the rhetoric about an ecologically sustainable future must remain just that, more rhetoric). For many other power holders and brokers such ideas are ideologically excluded: growth remains the gospel. So a precarious position becomes ever more precarious. Humans are in a decidedly chancy position, because of their population situation and other limitative factors; they are becoming very disaster-prone. If humans want an acceptable future for themselves - they have virtually ruled out an acceptable future for many other creatures, through their predominantly selfish thoughtless greedy practices - then they will probably have to mend their collective ways, very considerably and very soon. But, given the nature of the beast, that itself seems improbable.

Humans, if they seek a more assured future, should make a concerted effort to put themselves into a less precarious position. That could be achieved by proceeding to reduce relative risks. These relative risks, sharply reducing prospects for a reliable future, fall into two classes:-

- Manufactured risk factors, including weaponry such as mega-nuclear devices and elements of biochemical warfare, and experimental equipment such as very high energy particle accelerators (which could perhaps tunnel under a metastable state or induce a mini-Big-Bang; see again Leslie).
- Accumulated risk factors, such as the huge relative size of human population, energy consumption, greenhouse gas production, etc.³⁰

Despite the ideological obstacles – enormous political, religious and economic obstacles blocking the way of requisite change – major efforts should be put into reducing *both* these types of risks. Philosophers, beyond other intellectuals, *could* have a significant role in breaking down the ideological barriers and in clarifying and developing the arguments involved. Given the track-record of professional philosophers, don't expect very much.³¹

5. Further notes on human prospects and improved practices: What in general ought to be done about the Greenhouse problematique?

The general result already reached, that humans collectively should substantially reduce their risk taking, and in particular reduce their gross numbers, extends to rational Greenhouse decision and action theory. But that large and difficult challenge – with all that it entails by way of radical

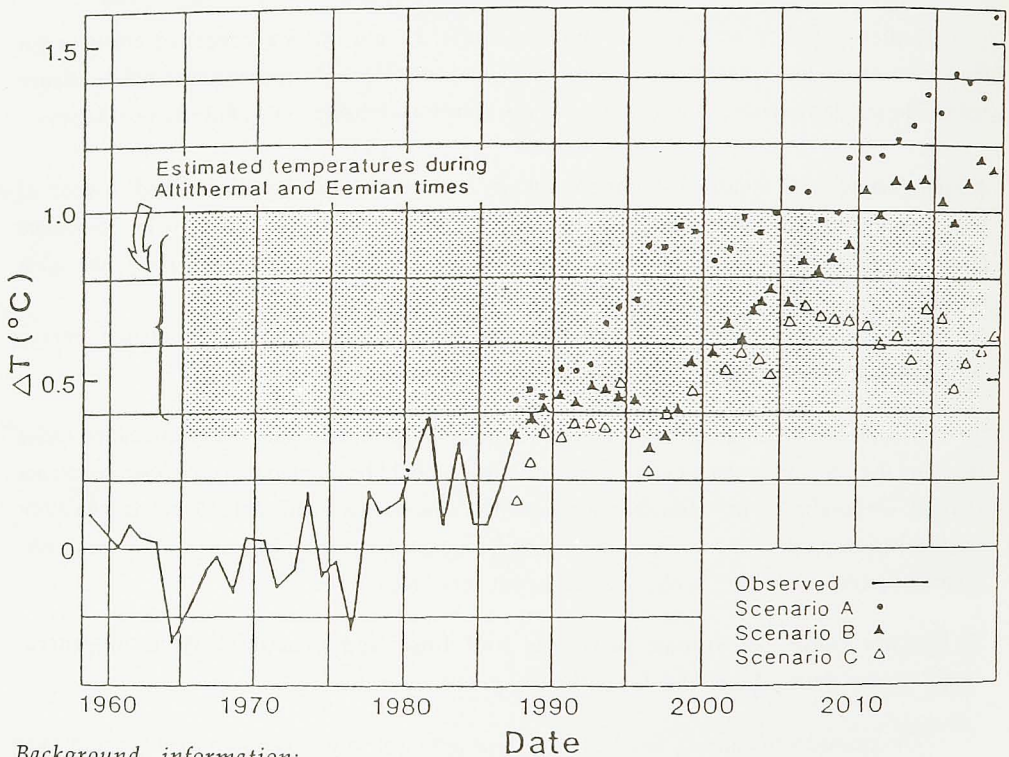
³⁰ As before, there are various different reasons why these induce risk, limitative and probabilistic in particular.

³¹ There is much else for philosophers to contribute in these fields, especially on the expanding issues of future redistributive justice, ecological equity, genuinely pluralistic arrangements, etc.

change upon present arrangements – is not all that there is to try, all that should rationally be attempted.

While some increase in mean global temperatures, and what that implies, can no longer be averted, the potentially most damaging effects *can* be: namely, by curtailing human-induced output of Greenhouse gases. Moreover, there is an approximate upper bound of importance, upon temperature, which can serve to supply a significant limit on output. That bound - which *contains risk taking* by confining encountered situations *to* those where there is some *past experiential basis* - is given by estimated temperatures during Altithermal and Eemian eras. Those temperatures are estimated to have been between about 1/2 a degree and 1 degree Centigrade above contemporary (pre-1980) temperatures; so the upper bound is about 1°C.

Diagram 8 : Mean global temperatures under three interesting scenarios.



Background information:

'Annual mean global surface air temperature computed for trace gas scenarios A, B, and C Scenario A assumes continued growth rates of greenhouse gas emissions typical of the past 20 years, i.e., about 1.5% per year emission growth; scenario B has emission rates approximately fixed at current rates; scenario C drastically reduces trace gas emissions between 1990 and 2000. ... The shaded range is an estimate of global temperature during the peak of the current and previous interglacial periods, about 6,000 and 120,000 years before present, respectively. The zero point for observation is the 1951-1980 mean; the zero point for the model is the control run mean' (Walsh p.14, from whom the diagram is drawn).

Not only will a continuation of current emission trends take global temperatures clean through and way beyond that bound, so also will an alternative set-up where emission rates are fixed more or less at current rates. The only apparent way to remain rationally within an experiential domain is to curtail sharply trace gas emissions, beginning early in the 1990s. That means shifting from the dominant growth ideology; it means expensive re- and de-industrialisation. Short of catastrophic nuclear war it seems unlikely.

There are several reasons why requisite change looks unlikely. Firstly, requisite changes are generally difficult, ideologically unwelcome, extensive and expensive. Politicians will accordingly be extremely loath to undertake them, to offer more than tokenism. Moreover, those states and corporations that avoid making hard changes will, like free riders, be at a comparative advantage in the short term as regards both profits and power. Secondly, then, there are Tragedy-of-Commons reasons, i.e. those deriving from general Prisoners' Dilemma situations. However the troughs induced by such dilemmas could be climbed out of; they can be transcended given, for instance, some resolute players committed to major change, despite heavy commercial and political disadvantages, and prepared to pursue judicious tit-for-tat strategies. Thirdly, because main Greenhouse effects are gradual, long-term by political standards, and uncertain, the main political temptation will undoubtedly again be to avoid the problems – to muddle incrementally along, and hope that the problems will dissolve or that something (some magical technology perhaps) will turn up or that adaptation will occur or, at worst, that the problems will fall to some successors. Meanwhile the problems will continue to be dismissed as “too hard”, “too uncertain”, and their costs, political and economic and ideological, as “too great”. We have already accumulated substantial experience of these inadequate evasive, dismissive and postponement procedures.

What should of course be attempted involves extensive changes and restructuring across virtually the entire face of industrialisation and urbanisation, and therewith extensive alterations in the demands they impose upon new urban environments. The ultimate objective as regards the Greenhouse problems – a reduction in the rate of increase of, and then in the gross levels of, emissions of Greenhouse gases – directly implies, above all, constraints on the combustion of fossil fuels, both decelerating use and improved use, but also much better regulation, in one way or another, of production of other Greenhouse gases and of interference with ecosystems storing or absorbing Greenhouse gases. The main burden as regards requisite changes falls on the main users of fossil fuels and main consumers of Greenhouse relevant products, namely the Earth's most affluent centres: North America, Japan and Europe. In these centres especially, the work should be started on reducing consumption of fossil fuel involved goods and services. (In a thoroughly methodical approach a GG, Greenhouse gas, rating would be assigned to each sort of good and service, the objective being to reduce these ratings, an effort that would no doubt concentrate upon highly rated and easily altered items.) The general types of changes needed or desirable are well enough known to environmental planners, and include: restructuring of cities

into network systems, so that reliance upon automobile commuting and truck transport of goods is much reduced, improved building practices for energy efficiency cogeneration and related technologies, increased reliance on solar energy technologies, and so on.

Venturing much further into unknown territory are the types of political and economic alterations required to implement the planning changes. It has already been insinuated that conventional governmental and public policy practices, analyses and procedures are inadequate to the tasks ahead. For these presuppose, for example, relatively short-term and quite bounded settings, in which most information (as to costs, benefits, beneficiaries, etc.) is more or less certain, and where an ethical/ideological framework is taken for granted. Indeed most of the favoured procedures – such as reliance on standard cost-benefit analyses, on markets of orthodox economics, on muddling through, etc. – not only depend on certainty and are unfitted for situations of uncertainty, and assume at best a decidedly shallow approach to environmental matters; but further they tend to exhibit, what is quite compatible with short-term rationality, long-term irrationality. Much intellectual effort should be invested, straightaway, in designing and developing improved political structures and matching decision-making procedures. Such structures deserve to be better articulated and understood – a large task – before the struggle is begun in earnest – perhaps in East European style – to put some of them into place.

From the angle of radical change, then, impact of the Greenhouse problematique is far from entirely negative. For it may encourage or even force many more of us into thinking about and doing what should be done from a deep perspective anyway, such as rectifying recent heavy human impact upon environments, and beginning at once to put in place more environment-friendly arrangements and structures.³²

32 This more positive conclusion contrasts with final pessimistic corollary which ended the previous interim version of this essay. The corollary, which followed the gloomy (but warranted) claim that requisite restructuring change seems unlikely, and was intended to underpin it, was simply this: Humans collectively are not (particularly) rational. But we had already been told as much by philosophers like Russell and surmised as much from the latest perambulations in the long history of human wars. Finally, a significant debt should be recorded at least to all the following: to John Leslie for leading ideas and for comments, to David Bennett for comments and for research and production assistance, to Pat Troy for an opportunity to read his unpublished paper on the topic, to Malcolm Slade and Joseph Wayne Smith for encouragement to write on the topic, and to several members of the audience at the Australasian Association of Philosophy Conference, held in Christchurch, New Zealand, during August 1989, where parts of the essay were fruitfully discussed and several worthwhile suggestions or objections made.

APPENDIX: As to the Doomsday Argument circulated by Leslie.

The anthropic argument of the penultimate section applies limitation results to escalate probabilities. By contrast, the argument deployed by Leslie has comparatively little to do with limitation features or the special risks of the present times (it does depend upon some features of the temporal distribution of the total human population). As a consequence also, it has no direct application to the special environmental problems of the present. It yields at best a general admonition against human risk taking – and even the inference to that is shaky *if* the argument itself is unavoidable.

The central claim of Leslie's argument comes to this: unless the human race ends soon, then any one of us present humans is not an ordinary one at all, but an exceptionally early one. (Such statistical ordinariness is presumably supposed analytic upon total human population distributions.) Thus (contraposing and distributing a reasonable expectation functor), since it is reasonable to expect that such humans are ordinary (minor premiss), it is reasonable to expect the human race will soon die out.

One of the weaknesses of Leslie's Doomsday Argument, especially in its quasi-inductive guise (e.g. PQ p.2), is its background reliance upon an indifference principle assumption, much as in faulty applications of Bayes' theorem, already noted. (The principle is used in Leslie's urn argument; see p.12.) The problematic assumption shows up in *ceteris paribus* clauses in Leslie's deontic probability (typicality) principle, what he describes as 'the Argument's underlying principle' (in fact a minor premiss): one should, *all else being equal*, take one's position to be fairly typical rather than very untypical, or in different formulation: whenever *lacking evidence to the contrary*, one should prefer to think of one's own position as fairly typical rather than highly untypical (both principles are stated, though with different emphases in PQ p.2). Much the same principle, but in stronger form, operates in what he calls 'the crux of the argument': '*unless you have specially strong reasons* to believe that you are a very untypically early human, you ought not to believe it' (p.10, rearranged, different emphasis).

Unfortunately for the Argument's principle, matters are not so indifferent, things are not so equal, some scientists have reasons which they think are cogent, for believing that present humans are fairly early members of the species. Consider Lovelock, whom, as we have seen, used to think that the Earth and its life systems were virtually indestructible; it is only necessary to add the familiar belief that humans themselves (like rats) are very resourceful beings, virtually impossible to exterminate, to arrive at the result that there is reason to believe that the human race is bound to persist for many more generations. That is, of course, both the informed and not unreasoned popular view, guiding much practice. As a result the principle is, at the very least, in doubt. Accordingly what Leslie presents as the crux of the argument is not endorsed here.

The Argument is vulnerable in other ways as well. For one, the main premiss is, in duly contraposed form, not quite so evident, as for instance the human race could just tail off at low population levels on Earth. For another, the distribution of the functor 'it is reasonable to expect that' across the conditional involved is not unproblematic: the distribution principle itself is contested in the literature, and here the result it is supposed to yield looks unreasonable!

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ILLOGIC AND ILLUSION IN BIOLOGIC EVOLUTION

In the great civilized centres of the Earth, virtually all but fundamentalists believe in modern evolutionary theory, but virtually none but priests of the doctrine intuit with any precision what it is. Remarkably few people, including those trained in biology, have any very clear idea of what the theory of biologic evolution is supposed to assert. Moreover, those who do claim to have some reliable idea, often have different ideas. As a result, formalisation of the esteemed theory, whether a misguided quest or not¹, looks a pretty hopeless task. Part of the illusion is then that of a clear well-validated theory on which there is a consensus, informing and powering the contemporary biological paradigm; part of the illogic is that of the pre-research textbook theory, which while at least clear is clearly unsound.

Despite the murkiness of "the" research theory, there is a surprisingly uniform set of myths, directly descended from Darwin, encapsulated in biology textbooks, both elementary and advanced, and widely propagated in schools and universities. A useful way of trying to gain a working impression of what a mainstream theory is alleged to maintain is to look at the textbook theories, at what is taught in the schools or, better, universities. To be sure, the textbooks may supply only an initial guide. Many professionals, especially in the social sciences, want, having climbed the text-book ladder, to throw away what they gained their credentials with, or at least to erode it away qualifications.² How many professional philosophers, for that matter, would be really happy to see their subject represented by the standard introductory, survey and collection textbooks, for instance by blockbuster philosophy? In advanced biology, the textbook presentations are quickly eroded, particularly by input from the modern synthesis, a striking peer-group attempt to build consensus on evolutionary theory; but the synthesis is now falling apart, so it is claimed, and conventional textbook wisdom is thereby further undercut. Furthermore, no uniform theory commanding scientific allegiance now stands beyond the textbook theory, with which we shall begin.

¹ For the misguided misguided theme, see for instance "post-positivistic" philosophers of science, such as Kitcher. Certainly mainstream interest, formerly positivistically influenced, has now dropped out of the difficult enterprise of trying to formalise versions of the theory, of improving upon worthwhile but defective articles attempts such as that of Williams, etc.

² Similarly Stebbins with his "modal", or indefinitely quantifiable, themes, which admit variation upon variation, in biological science. So, for example, 'the Mendelian laws of heredity ... should be replaced by [a] modal theme. ... They have been so strongly modified by successive discoveries that in their original form they are useful only for elementary teaching' (82, p.4 rearranged).

1. The elementary textbook theory of biologic evolution

'schooling generally is ... a period of regimentation and control, part of which involves direct indoctrination, providing a system of false beliefs.' (Chomsky p.6).

What will be called *the School-Book* or *elementary textbook theory* comprises 3 facts together with (at least) 2 "deductions" (Barrett et al, p.750, a US university textbook). There are very similar accounts in other US texts, for instance Weier (hereafter W) which offers 3 "deductions".

Fact 1 [Prolificness]. Nature is prolific, i.e. there is great reproductive prolificness in nature (also 1 in Weier). The alleged fact is quantified in terms of *geometric increase* (even among "slow" breeders). The immediate consequence is: there are more offspring than required to replace parents.

Objection. Evidently the claim fails in many ecosystems, e.g. austere ones, damaged ones. And it fails for many species, which are, for one reason or another, generally not so prolific; e.g. populations of animals which regulate their own numbers. What is presented is not then a "pure fact", that could be arrived at by straightforward observation, but an *idealisation*, conveniently abstracted and shaped for the intended theory.³

Fact 2 [Constancy]. Despite the tendency for a geometric increase in numbers, numbers remain relatively constant (also 2 in W). There is relative constancy.

Objection. Again this is a convenient idealisation. There are many apparent exception, most conspicuously humans.

Deduction 1. 'The struggle for existence' as regards survival of both individual and species. This is said to be Darwin's "answer" to Malthus. (There is a fuller statement of the "deduction" in W).

Objection. But no such *struggle* in any way follows. All that follows is that there are *factors* which account for the nonsurvival of much that is produced. There is however no single factor; there are *several* such factors. Consider seed. Much seed falls on barren ground, when it falls upon the ground at all; much falls in already occupied locales. There is no struggle in any of these cases. The idea of a struggle is an unwarranted extrapolation from certain special cases, some much promoted, whose elevation is not exactly a value-neutral choice.⁴

³ The fact of prolificness, not well exhibited in many industrially impacted landscapes, is of course also very convenient for rapacious economism, both capitalist and state socialist.

⁴ Unlike the contemporary textbooks which flatly assert a struggle for survival or existence, where there may be none, Darwin much more cunningly resorts to redefinitional techniques. He will call any case of dependence or differential survival, a *struggle* for existence: 'I use this term in a large and metaphorical sense including dependence of one being on another ...' (p.66) - an incredibly low redefinition. So, for example, lettuce seeds collected in a packet, perhaps for later planting, are struggling for existence! And similar bizarreness: struggles where there are none. Thus Darwin proceeds to give a characteristically misleading picture of the operation of the natural world, on which more below.

In fact the persistence of an enthusiastic Malthusianism in Darwinian evolutionary theory is a trifle surprising given the drubbing such arguments have received elsewhere, for instance as arguments for limits to growth.⁵ Evidently Malthusian conditions where they obtain are neither sufficient, since no alternation may occur, nor, more important, necessary for biological modification. For, to jump ahead in the argument, selection can occur under a variety of *constraints* other than competition of an expanding population for scarce food supplies. It does not even require an expanding population. It can in principle occur with a static or even declining population. Consider for instance birds in a polluted environment; in the presence of DDT, sea eagles which produce thicker eggshells are no doubt favoured in producing offspring. (Of course too theoreticians struggle to retain what *suits* them, reflecting the low placement of logical argument except for propaganda purposes.)

Fact 3 [Variation]. 'No two biological objects are identical' (is this more than a special case of Leibniz's law?). There is [*extensive*] variation (also 3 in W). Individual variations occur within species. No two members of a species are alike.

Better, rarely are two individuals exactly alike. The point is re-put in terms of 'infinite variation among individuals within all animal populations' But this is false insofar as populations are all finite. *Potentially* there may be infinite variation in *some* species. No doubt, there is often some variation.

Deduction 2. 'Survival of the fittest occurs by natural selection'

Objection. In no way can this follow, as claimed, from Deduction 1 and Fact 3, which say nothing about *what survives* - not even that it is *fit*, let alone fittest - and which do not introduce *any* notion of selection. Nor otherwise, especially in the light of "deduction 1", does 2 follow. Survival may be due to luck, chance, etc. All fittest members were wiped out by an avalanche, etc.

The claim made in deduction 2 certainly needs expansion. It obtain it first of all thus: 'From among the variant individuals in a population... those most suited to their environment [the fittest reproductively] survive in larger numbers to reproductive age and leave more offspring who also bear those traits. Consequently, a higher proportion of the population comes to bear the characteristics that adapt members of a species to the environment in which they live' (p.750).

Objection. Further "facts" and equations are imported. For instance, those better "suited" to their environment may not be reproductively active. For instance, there are inheritable traits which are not passed along. In any case, the claim surely fails - firstly, for many populations (and characters), e.g. plants, and secondly, outside "normal" times. Moreover the claim looks

⁵ Of course there are differences between these Malthusian arguments concerning population, resources, and evolutionary processes - such as the feasibility of substitution of resources *sometimes*, the availability of enhanced technology, etc.

unfalsifiable, or at least untestable (and perhaps even tautological, depending upon re-definitions of terms). 'Natural selection' remains inadequately explained.

Deduction 3 (in Weier). 'These selected variations may be inherited ... and thus gradually give rise to new species' (p.662).

Objection. Without "deduction 2" (which however only refines a subpopulation *within* a species) and much more, this is simply further assumption. Most important, the idea of new species *arising*, and doing so *gradually*, is simply infiltrated, not derived, justified, or explained.

There ends the main School-book presentation of evolutionary theory. It should by now be evident that it is unsound: the conclusions do not follow, and the premisses, far from being facts, are false or dubious.

The textbooks then separately cite, as if they were optional extras, the *further* intertwined pair of postulates (invariably served up as Darwinian, but proposed earlier by Buffon⁶):

Postulate Co1. All similar animals evolved from a common ancestor; there is common descent.

Postulate Co2. All living organisms [might have] evolved from a few or even one common ancestor.

These further "common origin" postulates are properly separated out. For the independence of these postulates from the main "theory" may be shown by network modellings (consider e.g. "ascent" lattices with no bottom node). While the first postulate, Co1, looks plausible, it is in the absence of some satisfactory account of *similar* animals, excessively vague. As for the second, Co2, there is quite inadequate evidence so far for the strong form, a singular ancestor, a single-stemmed above-ground tree of life on earth, while the weak bracketed modal form, though no doubt true, is hardly a scientific claim, but a result of applied modal logic. Moreover the standard claim that all living organisms past and present, are related by descent, is surely false given the prospect of life on other planets. The same applies to the stronger common descent theme, that all of life is descended from the same single-celled micro-organism. This is unsupported by solid evidence, is very improbable, and accordingly should be rejected.

2. The textbooks merely copy with slights refinement Darwin's theory, which too Darwinism but adapts and hardens.

'... these intellectual illusions arose from Darwin's own intellectual dislocation' (Darlington p.69).

These schoolbook stories are, as it happens, not merely reminiscent of Darwin's original account, but directly descended from it. They represent the conventional wisdom distilled from

⁶ Buffon claimed 'that man and ape have a common origin; that, in fact, all the families among plants as well as animals, have come from a common stock', *Histoire Naturelle*, vol IV(1749-1804) p.382.

Darwin. Darwin's account is summarily repeated, in a standardised format, *ad nauseam*. In the *central dialectic* it involved the following steps :-

Species

themata

- *Variation* : members of biologic species tend to vary in the parts, organs and functions of life, and to pass on these variation by inheritance.
- *Species mutability* : species of living things not only can change but do.

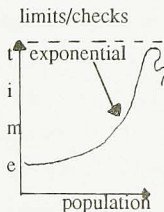
Malthusian

core

- *Superfecundity* (exponentiation): there is a geometric increase in numbers in all species, in principle at least. In more old-fashioned terms: 'Organic beings increase at such a rate that the progeny of any single pair would crowd the earth were their multiplication not checked' (Reese p.118).

Constrained

Growth Picture



- *Limitation and (fluctuating) constancy* : Because of resource limitations and scarcity, numbers do increase at less than maximal levels and tend, as limits are approached, to a fluctuating relative constancy.
- *Struggle for existence*: there is a struggle, competition, for scarce resources, especially food. In more old-fashioned terms (assuming constraints), 'multiplication is checked by the competitive efforts of other beings to survive and reproduce, both within and beyond the species in question. Such competition constitutes a struggle for existence on the part of every species' (Reese p.119).

Natural selection

- *Survival of the fittest* : the superior, or fittest, survive in the on-going struggle. Natural selection, equated with this, is 'preservation of favourable (i.e. useful) individual differences and variations, and ... destruction of those which are injurious' (*Origin* p.75).

Origin

deduction

- *Origin of species*: species vary and are modified in the direction of those individuals fittest to survive in the struggle for existence. Briefly, natural selection operates on the variations Malthusianism makes available, but then crushes, to differentially order species modification.

There is much more to Darwin's theory than is exhibited in the central dialectic, most of which passes through into Darwinism. There is for example:-

- *Common descent*, formulated as above.

As with the dialectic, so in most further themes, apparently *biological features are intricated with ideological assumptions*. It is important to bring out these striking ideological elements, integrated with the themes of Darwinianism, though more exposure is unlikely to deconstruct them; nor even is a destructive critique likely to dislodge them, so well entrenched are some of them.

The main additional features arise from the *on-going process of natural selection*⁷ :-

- *Gradualism and continuity* : all evolution can be explained in terms of small gradual changes exhibiting continuity, i.e. through composition of smoothly continuous microevolutionary stages. There are no large changes that are not decomposable into sequences of small ones; there are no jumps.

These features, contested in punctuated equilibrium theory, reflect the incorporation of the traditional metaphysical doctrine of *the Great Chain of Being* into Darwinian evolution, in fact the Aristotelian contribution to this longstanding Western synthesis. But the neo-Platonistic contribution to the synthesis - the maximization of existence, that whatever can consistently exist does, as opposed to the incremental arrangement of the great whole - is also well represented both in main themes and in subsidiary themes of Darwinism, such as the maximization of populations subject only to constraints, the maximum occupation of ecological niches, etc. Indeed Darwinism like the mechanistic framework within which it is set, is replete with maximization hypotheses. That will be a main criticism of the Darwinian heritage.

- *Individualism and reductionism* : selection occurs at the level of individuals. All apparently higher level selection, e.g. among groups, species or higher taxonomic levels, reduces at least to individual selection. The theme is usually subsumed under a more sweeping methodological individualism or reductionistic individualism.
- *Mechanism and determinism* : selection provides a deterministic mechanism which explains modification.
- *Adaptationism* : selection is predominantly (almost invariably in mainstream Darwinism) adaptive.

In much recent literature biologic adaptation is simply equated with natural selection, though it is plain enough, as a matter of semantics, that natural selection may be nonadaptive. To some extent this substantive equation is encouraged by Darwin, who tended sometimes to explain natural selection by way of adaptation. In Wallace it is much clearer that natural selection is tantamount to selection by Nature, as agent (an image also deployed by Darwin, e.g. p.77, while insisting it was dispensable, e.g. p.75). And Nature may be neither a utilitarian, nor a maximizer of *fit* or other utilitarian objectives (as already argued in MS).

There is little doubt, given the way in which selection *for* (selection *per se* is insufficient for evolutionary purposes) is explained by Darwin and followers, that a form of

- *Utilitarianism* is written into Darwinian evolutionary theory. Nature is scene of utility, in the shape of fitness maximization. While artificial selectors, plant breeders and the like, are given the

⁷ Natural selection is sometimes used to encompass virtually the whole of Darwin's theory or of Darwinism. The theory of natural selection just is (!) Darwinian evolutionary theory (e.g. Goudge).

option of selecting for utility *or fancy* (e.g. *Origin* p.56), natural selection is typically explained through selection for advantage or usefulness, with what is injurious or unfavourable assumed to be the negation of what is useful. Even where natural selection is said to preserve *beneficial* variations (p.75 again), thereby opening the door to non-utilitarian evolution a crack, the crack is quickly closed, *beneficial* contracts to *useful*.

Later Darwinianism went further, and came to exalt in a *self-interest-based* utilitarianism. Species utility emerged (like the community good, on analogous “invisible hand” speculation) from unalloyed pursuit of self-interest. It was simply assumed further that the fittest, the superior, who survive, are the strongest, quickest, first on spot, trickiest, nastiest, etc.; there is no place left (except very derivatively) for courtesy, charity, simple decency.⁸

Towards the end of *Origin*, a still larger ideology begins to intrude, including in particular

- *progressivism* : organic forms evolve towards the more complex, and there is an identification of latter stages of evolution with what is higher and *better* (further echoes of the Great Chain of Existence).⁹

Finally in Darwin's theory there is a

- *qualified pluralism* , especially as regards types of selection and transmission of characteristics. The pluralism is qualified because, for instance it remains within the framework of individual reductionism, excluding species and higher-order selection and the like. Among the further “mechanisms” admitted are

- Sexual selection, of mates, supposedly again “directed at” offspring; and
- Lamarckian inheritance of acquired characteristics: where acquired characters are reinforced, reinforcement will be inherited (at least if it is useful for survival, etc.). Such acquired characters also have “survival value”

Hardened Darwinism was much less lenient; it assimilated the first of these under natural selection, and rejected the latter outright. Other parts also of Darwin's theorising were quietly forgotten in Darwinism: the illusion of pangenesis, blending of inheritance, the idea of diffusion of “gemmules”, telegony,...¹⁰ Sometimes Darwin's “unscientific” pluralism is portrayed as

⁸ See Ruse, chapter 1, where yet another enthusiastic summary of Darwin's theory is presented.

⁹ Thus, for instance, in an earlier setting, Erasmus Darwin on the competition among males for females which was seen as additional to “ordinary” competition. ‘The final course of this contest among males seems to be that the strongest and most active animals should propagate the species which should thence become *improved*’ (quote from Darlington p.11, italics added).

¹⁰ Of course too, Darwin's theories took in more than biologic evolution upon which we are concentrating. A little further afield was Darwin's account of social behaviour through social instincts, and his biological account of the origin and evolution of ethics. There are other conspicuous ideological biases in the *Origin* than those of immediate relevance, e.g. it is a now-obviously racist text, extravagantly Eurocentric. Subsequently Darwin endorsed the oppression of non-white races on the grounds that the “unfit” must inevitably make way for the “fit”

opportunism; sometimes Darwin is accused of operating a double theory, only one component of which is properly scientific (thus e.g. Darlington p.69).

Darwinism sheds Darwin's qualified pluralism and such later inserts into Darwin's theory as Lamarckian inheritance, and tightens the integration of the theory into the modern scientific paradigm.¹¹ Indeed Darwinism proceeded to include, reinforce, and represent as science¹², too much of those more noxious themes of the modern mainstream ideology: in particular, a substantially mechanistic anti-teleological picture of the natural world, which was both deterministic and reductionistic; and a prevailing individualism, encouraging pursuit of self-interest, though within a "progressive" utilitarian adaptationist setting. In these terms, Darwinism thus represented a further major triumph for mechanistic ideology, especially for a main form thereof, mechanistic materialism, bringing all of life within its orbit. Under mechanistic portrayal, the real world - as opposed to the sensible world (and as opposed perhaps to a higher or remoter world) - consisted of a mechanical order, of complexes of particulate matter, governed by immutable deterministic laws of motion, represented by timeless logical-mathematical equations. This world was composed of individuals, or real "things", occupying space, but perhaps stripped of most sensible and other properties (i.e. of secondary and tertiary features). Removed also were all supposedly problematic items, such as intensional features and objects, ends, values, universals, wholes, etc. Either these were reduced or eliminated, as under materialism, or contracted to some isolated mental or extra-material sphere, as with dualisms. Only a choice *within* mechanism was left open, and it could often be avoided. For long Darwin publicly avoided the intra-ideological dispute between materialistic and dualistic form of the dominant mechanistic ideology, by leaving humans out of the *Origin*, while the more politically naive Wallace steadfastly declared that Man did not fall within the orbit of organic evolution.

3. On the ideological loading of Darwinism, and how to shed it.

'the ebullient vigour of the forest with its riotous variation looked in no way fragile, nor as if it were crumbling under pressure from ... voracious elephants'
(Douglas-Hamilton p.35).

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- ¹¹ Sometimes Darwinism is simply a selection of approved theses from Darwin's theory. Thus, for instance, the introduction to *Fossils* reports (p.4) that the *postulates of Darwinianism* are:
- a. species change continually. (But the evidence is that mostly they are stable; rather there is individual variation within, as individuals come and go.)
 - b. change is gradual and continuous. (That claim is not exactly confirmed by the fossil record, its punctuation, etc.)
 - c. the mechanism of change is natural selection, i.e. survival of fittest (but sufficiently "fit" would surely serve, etc.)
 - d. 'all life is interrelated by common descent' ...
- As a set of postulates, these are seriously incomplete, omitting the Malthusian core in particular, as well as unduly (though not uncharacteristically) sloppy in their formulation.
- ¹² No doubt something like that was science, and in most quarters something rather too like it still is. That is one reason why many New Generation People tend to disown association with science, because of features of reductionistic science and its almost invariable application.

The heavily ideological nature of Darwin's theory and of Darwinism has certainly not passed unremarked; what is remarkable is how little has been done to reshape evolutionary theory so as to remove the obnoxious and ramshackle ideology. In a famous passage, Marx indicated the ideological imposition:

It is remarkable how Darwin recognises among beasts and plants his English society with its division of labour, competition, opening up of new markets, 'invention', and the Malthusian 'struggle for existence'. It is Hobbes' *bellum omnium contra omnes*, and ... the animal kingdom figures as civil society.¹³

The main point is repeated and elaborated by Engels:

The whole Darwinian theory of the struggle for existence is simply a transference from society to organic nature of Hobbes' theory of *bellum omnium contra omnes* and of the bourgeois economic theory of competition, as well as the Malthusian theory of population. When once this feat had been accomplished, it is very easy to transfer theories back again from natural history to the history of society, and altogether too naive to maintain that thereby these assertions have been proved as eternal natural laws (p.307f.).

Some of these Marxist observations were expanded by Darwin's biographer, Irwin:

Darwin's matter was as English as his method. Terrestrial history turned out to be strangely like Victorian history writ large. ... The economic conceptions [of laissez-faire deregulationist liberalism] ... can all be paralleled in the *Origin of Species*. But so alas can some of the doctrines of English political conservatism. ... The constitution of the universe exhibited many of the virtues of the English constitution (p.98).

The work also reflects features of the English landscape, the resilience of the (already ecologically impoverished) landscape under industrial and agricultural exploitation, the proliferation of weeds and imported pests, and so on. There is little or nothing in mainstream nineteenth century evolutionary theorizing about the vulnerability of species, the delicacy of much biological balance, the fragility of much of nature.

The Darwinian world was, at bottom, much the same as that of Hobbes', and driven in the same way by competitive fires. Darwin himself heavily exploited the idea of a war of nature; battle images recur through the *Origin*; it is from this incessant war indeed that even the most exalted forms of life issue (*Origin* p.223). Under Darwinism, Nature, in the state of nature, was red in tooth and claw, life was commonly nasty, brutal and short. There was constant competition, an endless struggle for existence, for advantage, for success. Darwinism thus supports a picture of the world and nature which has proved very congenial and convenient for dominant ideological

¹³ Marx, letter to Engels, 1862, in Paddover, p.157. But Marx elsewhere stated that the *Origin* contained 'the basis in natural history for all our views'; he was not going to meddle with the theory.

forces.¹⁴ Duly pressed, it is the familiar business-projected world of competition, struggle, ephemeral success, survival of the fittest, in a individualistic deterministic mechanistic world. The picture projected undoubtedly has survival value, whence ‘... the world through a neo-Darwinian cognitive lens: The natural world was the scene of incessant and ubiquitous struggle for existence – ... Competition, not cooperation and symbiosis, was the only law of the jungle ...’ (Callicott, p.285). Not only should this awful but commonplace picture have its pseudo-scientific support and credentials removed; it should be duly banished from respectable popular biologizing. (In the future the picture may be displayed in the rogues’ gallery, in the section reserved for theories, where it too can be viewed as a warning.) In fact ‘we inhabit a [very] different world from the one Darwin envisaged’, and from the one Darwinian descendents not merely envisage but, when in positions of power and influence, endeavour to impose, often successfully, on the underprivileged.¹⁵

It is sometimes supposed that the damaging ideology of the *Origin*, by no coincidence substantially exploited in defence of the Darwinian evolutionary theory, somehow falls cleanly off the pure theory when it is extracted? That would be improbable; furthermore, as already observed, it does not happen. It remains in the Malthusian core and in the elaboration of natural selection. It will hardly do intellectually then, to remark, in the fashion of many commentators, on the evident ideology of the *Origin*, but to leave the evolutionary theory there pushed, and perpetuated and propagated in contemporary academic curricula, substantially intact. For the ideology penetrates and infects the theory.

What is required is evidently an alternative evolutionary theory which sheds the illusory components. The outline of such a theory is not difficult to locate. In fact, an appropriate framework appears to predate Darwin’s publications, in the non-Malthusian selectionist theory of Naudin (1852) and perhaps of Lawrence (1819); Darwin complains about Naudin that ‘I cannot find one word like the Struggle for Existence and Natural Selection’, and later, ‘But he does not show how selection acts under nature’ (cited in Darlington p.93). The core of Darwinian theory is that “the struggle for existence” is the solution to the problem of transformation of species (see Darlington p.3). It is precisely *this Malthusian core* that *is to be abandoned*; selectional evolution can survive without it. There is in general no incessant ubiquitous struggle for existence. That is not to say that there are no cases of struggle, especially struggles induced by humans, of the deprived, or of hardship in catastrophic times. But nature has rarely been a total battle scene;

¹⁴ This is not to deny that there are alternatives to Darwinism within the same materialist metaphysical mould which are even more advantageous to Marxism and certain forms of capitalism, e.g. Lamarckianism. For much more on the dominant ideological forces, see Gare.

¹⁵ The underprivileged include not only millions of humans but also millions upon millions of other creatures. The quotation comes from Gould (82, p.382); but he puts the observation to no political work; he was reflecting on the difference “punctuated equilibrium” makes to how “the” world looks.

the war of all against all, the universal existential struggle, is a mass illusion, projected onto nature by a manipulative mechanistic ideology.

It may be imagined that contemporary advanced evolutionary theory already provides the sought ideologically-adjusted theory. Unfortunately, the mainstream theory, the Modern Synthesis, does not; nor in fact do most of the increasingly competitive sidestreams (punctuational, neutral, etc.). For, while the Modern Synthesis occasionally, in more truncated formulations, provides glimpses of an ever-promised more peaceful evolutionary land, typically it is more busy Darwinian business-as-usual, replete with Malthusian excesses; what it does rather is to make additions to, thereby adding the weight, complexity and authority of contemporary reductive biology to, a renovated Darwinian dwelling. The renovation may include toning down the Spencerian slogans "struggle for existence" and "survival of the fittest", or displaying them only out the back or in the dunny¹⁶; but the ideas conveyed are not abandoned: nor could they so easily be, as they inform the research paradigm.

4 Beyond the School-Book and Darwinian theory? The Modern Synthesis and neo-Darwinism partly disentangled.

The *Modern Synthesis* was introduced as essentially that: an integration of the disparate parts of biology around a Darwinian structure. The other parts of more immediate concern included Mendelianism and population genetics, as well as the traditional areas of classical botany, taxonomy, systematics, paleontology and morphology. It is a synthesis based on neo-Darwinism; and *neo-Darwinism* is, essentially, *the geneticisation of Darwinism*, that is, it adds to Darwinism variational details of genetic mutation and recombination.¹⁷ In the *crystallized* version of the evolving Synthesis the central claims of Darwinism are, so it is convincingly claimed, restated.¹⁸ All the regularly stated elements of Darwinism, are present: inherited variation, superfecundity, biological Malthusianism, natural selection (as allegedly deduced), gradualism, adaptationism, individual reductionism. That is, the Darwinian structure amounts to Darwinism itself. The Modern Synthesis is at bottom, a Darwinian synthesis. So *it succumbs to the same critique* as Darwinism.

But matters are not so clear-cut. For the Synthesis is often very incompletely stated, and in some of the truncated statements look very like an alternative acceptable theory (what will be called

¹⁶ Some of the advanced texts eschew the provocative slogans altogether.

¹⁷ For a typical, yet revealing, textbook example, see Keeton. There the detailed neo-Darwinian theory of chapter 18 is grafted onto the sketchy Darwinism of the Introduction. In his Introduction Keeton presents the standard Malthusian-centred theory (see esp.pp.11-12), though in less explicit form than the schoolbooks considered above. In the fuller presentation of chapter 18 the same Darwinian theory is reexpressed in genetic jargon and filled out, not varied.

¹⁸ Thus, e.g., Gould 82 p.382. The picturesque expression 'crystallized version' comes from Gould, who also looks at earlier, more liberal versions of the Synthesis.

deep-green evolution), like Darwinism without Darwin or without biological Malthusianism. Thus, for example, it is sometimes claimed that in the Synthesis, 'evolution through natural selection is ... a two-step process. The first step is production (through recombination, mutation and chance events) of genetic variability; the second is the ordering of that variability by selection' (Mayr SA p.12); i.e., stripped of the genetic accretions, it comprises *variation*, mostly random, and then *selection ordering*.¹⁹ The Synthesis, so truncated, looks very like the deep-green upstart. However such a truncated Synthesis is but part of the Synthesis; not only is the presentation seriously incomplete, as well *much* more is said elsewhere (by Mayr and other proponents of this modern pastiche).²⁰ Firstly, although such a presentation offers a promising beginning, as more it is patently inadequate. For it does not say what selection comprises; nor does it separate off saltational, punctuated equilibrium, or other theories. It says nothing as to naturalness. It says nothing about species even. And so on. But should we read on and into the finer print, we are given some of these details, along with which Darwinism reemerges, first at a trickle, then with a rush. Natural selection is further explained: individuals with 'sets of genes that are better suited to the currently prevailing assortment of ecological pressures' 'will have a statistically greater probability of surviving and leaving survivors than other members of the population' (p.13). This is said to determine evolutionary direction *and* progress, increasing fitness, adaption, radiation, etc. It is a heavy derivational burden, which the structure does not logically sustain. Secondly, elsewhere, Mayr includes more and different themes under the Synthesis; it is said

to designate the general acceptance of two conclusions: gradual evolution can be explained in terms of small genetic changes ("mutations") and recombination, and the ordering of this genetic variation by natural selection; and the observed evolutionary phenomena, particularly macroevolution processes and speciation, can be explained in a manner that is consistent with the known genetic mechanisms (Mayr, in Mayr and Provine p.1).

On this presentation we are given as well gradualism, small changes and microevolution, reductionism (in the last clause), and perhaps much more. It all depends upon how what is demanded, especially in the latter "blank cheque" statement, is spelt out. To confuse a clouded picture still further, in other places Mayr is decidedly less specific on certain of these central points. For instance, in more popular expositions (such as SA p.12) instead of a clear formulation of theory, we offered a more poetic exposition. The synthesis is said to be distinguished by

- 'an emphasis on the gradualness of evolution' (instead of insistence upon it)
- 'the realisation that evolutionary phenomena are population phenomena' (perhaps platitudinous)

¹⁹ A certain part of this brief account is analytic on the notion of *evolution*. Evolution is a *process* involving (gradual) ordered *change*. So it includes (possible world) variation and then selection, which orders. Here are rudiments of a general model (see further section 7). The population statistics picture is, like frequency accounts of probability, a reduction attempt, designed to avoid exceeding actual world confines.

²⁰ Mayr is but one of the more prolific proponents of the Synthesis, not one of the earliest, though now one of the most celebrated. For the environmental record, Mayr is also credited with giving us control-burning of forests.

- ‘reaffirmation of the overwhelming importance of natural selection’ (instead of requirement of it).

As well as such Darwinian assertions, the Synthesis also includes the stock Darwinian rejections:

- ‘a complete rejection of the inheritance of acquired characteristics’
- rejection of the essentialism and saltation of Mendelians [who did not accept natural selection], and as critical feature, often omitted however,
- rejection of the fixity of species.

Thus once some development is made of the Synthesis, it certainly begins to look Darwinian.

But there is a real problem as to what the Synthesis does amount to; there are references to “broad versions” and to more partisan and restrictive formulation.

The modern synthesis has sometimes been so broadly construed, usually by defenders who wish to see it as fully adequate to meet and encompass current critiques, that it loses all meaning by including everything [of evolutionary significance. Thus, for instance,] ... Stebbins and Ayala [who] have tried to win an argument by redefinition. The essence of the modern synthesis must be its Darwinian core (Gould 82 p.382).

There is no need here to argue for long here about what is intended by the Synthesis. It is the *full* Synthesis, which includes contemporary Darwinism which is the object of criticism, not a suitably truncated Synthesis, which escapes criticisms directed at the fuller theory. The full Synthesis includes Malthusianism. Indeed no fuller Synthesis can at all easily avoid Malthusian elements, since otherwise there would be no guarantee of actual variations upon which selection could operate (see further section 5).

Among the reasons for the slackness and variability of formulations of the Modern Synthesis are reasons like those of Darwin for the imprecision of the *Origin* (given that more precise source material was available to Darwin). The Synthesis was organised to try to build a consensus among biologists, to construct a working paradigm; its authors accordingly did not want or seek too exact a statement from which there would be ready dissent - any more than Darwin, who was out to build a constituency. The political strategies of the modern group and Darwin's circle have a good deal in common (Darwin's ‘slippery’ strategy is discussed in Darlington, e.g. p.69ff.). The Synthesis represents a solidarity attempt, of *political* cast, to bring different feuding factions and schools together in a biological *united front*, a main official opposition comprising declared anti-science, including religious fundamentalism (more covertly it also dealt with renegade scientists and dissidents). The fairly successful attempt was the work of a biological establishment, an Anglo-American establishment (primarily American, though several members were immigrants from Europe), by contrast with the very English circle that supported Darwin and subsequently promoted Darwinism. This scientific push adopted Darwin as hero (so it is the *Darwinian*

synthesis), selectively drawing upon, or altering, his theory.²¹ A false history and a grand patron are thus achieved. Darwinian evolution is made into *the* biological paradigm, to support the reductionistic biological paradigm. To adopt that “scientific” paradigm is - not so differently from smarter religious - an act of faith. For what is *not* in place so far is a clear and well-confirmed theory unbeset by anomalies and apparent counterexamples. There is rather a certain jerry-built, or synthesized, “evolutionary” *framework*, organised through a defective hypothetical-deductive methodology.²²

The Modern Synthesis now has many of the trappings of a scientific paradigm, indeed a dominant paradigm in the broadly biological field. It has its own texts, research texts on the evolutionary synthesis, and advanced textbooks (contrasting with the elementary Darwinian textbooks), it has elaborate research projects within the vaguely delineated framework, and it has a substantial following of scientists, including no doubt the preponderance of research biologists. It also has conspicuous dissenters, committed to variant theories,²³ and by contrast with most older scientific paradigms, it has a popular largely non-scientific opposition, largely descended from the fundamentalist opposition to Darwinian theories.

The Modern Synthesis offers at best a very limited escape from the ideological problems that Darwinism bore. The Synthesis labours under a similar load. In particular, the contemporary biology texts on evolution, advanced as well as elementary, are chocked full with metaphysical prejudice of a reductionistic cast. Thus they are for efficient mechanistic explanations and against purposive ones, for atomistic analyses and against holistic approaches, for mechanistic physics and against philosophy, for science and against metaphysics. Science indeed becomes the modern marvel (largely superseding religion); the serious philosophical problems with its methodology, and with its ideological presuppositions, are simply, simply irrationally, ignored.

Likewise, there is persistent imposition upon the natural world of ideological assumptions, with features expected to be exhibited there on the strength of the theory. A prime example deriving from application the Modern Synthesis to socio-ecology, is the invariable imposition of individualistic maximizing behaviour on natural communities and creatures within them. Thus, for

²¹ See Darlington. Keeton, for instance, continues the heroic individualistic presentation of science, with Darwin the Newton of biology who virtually single-handedly turned the subject around and set it upon its modern advanced course (e.g. p.6)

²² A different approach - unwelcome to mechanism, materialism, etc. - is to regard (non-reductive) parts of evolutionary framework as offering attractive or working *hypotheses*. Lewontin more or less winds up in such a position (in SA) when he effectively takes adaptation by natural selection as a *working hypothesis*.

For the received hypothetical-deductive methodology uncritically stated and applied in evolutionary theorizing, see e.g. Williams p.370. For some of the difficulties of the methodology, see Glymour.

²³ A curiosity is a conspicuous double standard among some of its leading proponents, who profess adherence in their textbook activities, but doubt and even dissent in some of their research productions (Stebbins esp.).

instance, Rubenstein and Wrangham, who assembled many examples of such ideological imposition on behaviour of species of birds and mammals,²⁴ organised under the one theoretical roof:

The twin pillars of the modern theory of social behaviour are the principles of individualistic reproductive maximization ... and kin selection With the development of these principles, animals came to be viewed as individuals who were armed with many behavioural options in their struggle for maximizing either their own reproduction, or that of their relatives. ... By analysing the [maximizing] behaviour of individuals, the foundations for a comprehensive theory of social behaviour were laid (p.4).

Not only should much of Darwinism be scrapped; so, inasmuch as it builds onto Darwinism, should much of the Modern Synthesis and its derivatives. Thus eliminated are Malthusianism, ontological competition, survival of the fittest, pure adaptationism, gradualism, and mechanism, determinism and reductionism. What remains, to build upon? Variation, and selection under certain conditions, modification of species. A good deal of work has to be put into getting these strangely neglected foundations in order, to carry the reconstruction.²⁵

5. Back to deep-green basics: descent by modification of species and natural selection..

What is rejected from the main dialectic of Darwinism is, the Malthusian core. What is retained - on deep-green evolution - is the rest of the central dialectic duly adjusted: species mutability, variability, and natural selection (but *not* natural selection in the shape of survival of the fittest). Variation is as before, and as is now supported by the theory of genetic mutations. Selection is a bit different, and a logical issue to which we shall to return. As a very preliminary account the following will hopefully pass muster:

Selection *for what* ? For beneficent or *favoured* features, for what enables a subject - organism, species or whatever - to do well enough, make out well, as opposed to ill.²⁶ No doubt subjects with beneficent characters will tend to flourish or their descendants will, while those without will tend to fare less well and will sometimes fall by the wayside. No doubt too, environmentally favoured characters are contingently linked to genetic complexes, some fairly directly.

²⁴ The contribution on kangaroos illustrates well how a maximizing ideology can influence and direct field studies; male kangaroo behaviour can be at least as satisfactorily explained on satissizing assumptions.

²⁵ Philosophers of biology have been so busy scooting along in the theoretical clouds, and putting out propaganda for the mainstream positions, that they haven't bothered much about such low level details. Their substantial neglect of things like Williams' axiomatisation of "Darwin's theory" is indicative.

²⁶ In certain respects *favoured* is a better term than *beneficent* . Not only is it already in established usage; but more, what is favoured, though it enables what has it to do well, may be or be linked to evil features.

Selection *how* ? Primarily by way of new or changing circumstances, as for instance by isolation in a new environment. There *need* be no struggle for survival (though sometimes there may be). An item, organism or group, does not have to struggle to do well, but it may have to change to do well easily. (A properly Taoist evolutionary story would no doubt make really natural evolution *effortless*.) The solution indicated is broadly adaptive selection, adaptation to an environment; but there is no reason to suppose that such selection exhausts requisite processes of biologic change, and there is no reason to exclude nonadaptive selection (e.g. through genetic drift, or chance). Such selection will certainly not require the Malthusian core.

Furthermore, such an evolutionary theory appears to match the Darwinian mainstream in explanatory power. For successful Darwinian explanation can be substantially rerun in alternative deep-green terms, without invoking any struggle for existence or heroic survival of the fittest. The argument for this does not consist simply of a case-by-case retelling of evolutionary events in non-Malthusian terms, though that retelling is important. A different sort of argument for the claim can be developed from Williams' axiomatisation, which purports to 'generate the Darwinian theory of evolution' (p.367), and so presumably to explain what it explains. However Williams' axiomatisation sheds both struggles for existence and survival of the fittest; indeed maximization of fitness is abandoned, all that is required being increase in some primitive biological parameter ϕ which is said to designate "fitness". What a Williams'-style remodelling of Darwin's theory offers is evolutionary theory without obtrusive Malthusianism, a remodelling (more along deep-green lines) that need sacrifice no essential explanatory power. Now to proceed beyond preliminary scene setting, to basics.

The rock-bottom thesis of biological evolution is a (minimal) *particular* claim - an *existential* claim Platonists would say - which goes as follows:

M. *There is modification of (some) biological species by descent*, where *descent* is spelt out in ancestral terms, and *modification* implies a change of a species property. Specifically, let S be a representative manifold which changes from time t_1 to t_2 , and set $S_1 = S$ at t_1 and $S_2 = S$ at t_2 :-

ad modification: there is some species (differentiating) character F , such that $F(S_1)$ and $\sim F(S_2)$ i.e. it is not the case that $F(S_2)$.²⁷

ad descent: at least for *pure* descent, for every y in S_2 there is some x in S_1 such that x is ancestor of y , where ancestor is the ancestral of *some* parenting relation (not necessarily a sexual reproductive relation).²⁸

²⁷ Or, in weak negation setting, there is some G such that $\sim G(S_1)$ and $G(S_2)$. But normally $G = \sim F$ will serve.

²⁸ *Ancestral* may be defined as in the mathematical logic texts, e.g. those of Quine (or, better, through an ontological neutralisation thereof). Adoption of textbook accounts enables the first part of Williams' axiomatisation (p. 346ff.), which is just ancestral theory, to be significantly shortened. But it also exposes the nonbiological character of much of Williams theory (which can slot neatly into the formalism of general nonbiological evolutionary theory); the objects involved

There are evidently variations upon pure descent. *Uniformly pure* descent might require that all ancestral chains ascending from S_2 pass through S_1 , i.e. there is no "outside" mixing. *Mixed* descent might require that for some, or enough, y in S_2 there is an ancestor in S_1 . And so on, for other notions that are more often applied to races than species.

There is a relevant ambiguity in M, between a weaker form MW in which one species (S say) "simply" undergoes an alteration of a species character between t_1 and t_2 , so that *sub* species or race alters, and a stronger form MS where a changed species character is species differentiating so that S_1 and S_2 are *different* species (and there need be no underlying *species* S). The stronger form, our main concern, must be satisfied sometimes if species are to evolve. In effect Darwin proceeds, by a dubious slippery-slide, argument from a form of MW to MS, from the concession that varieties and races change (p.61) to the alteration of species (*Origin* p.63). Again he is assisted by definitional strategems which bridge the gap: 'a well marked variety is an incipient species' (p.63); '... species are only strongly marked and permanent varieties' (p.65, similarly p.63; not surprisingly, then, he deliberately avoids defining 'species' p.61).

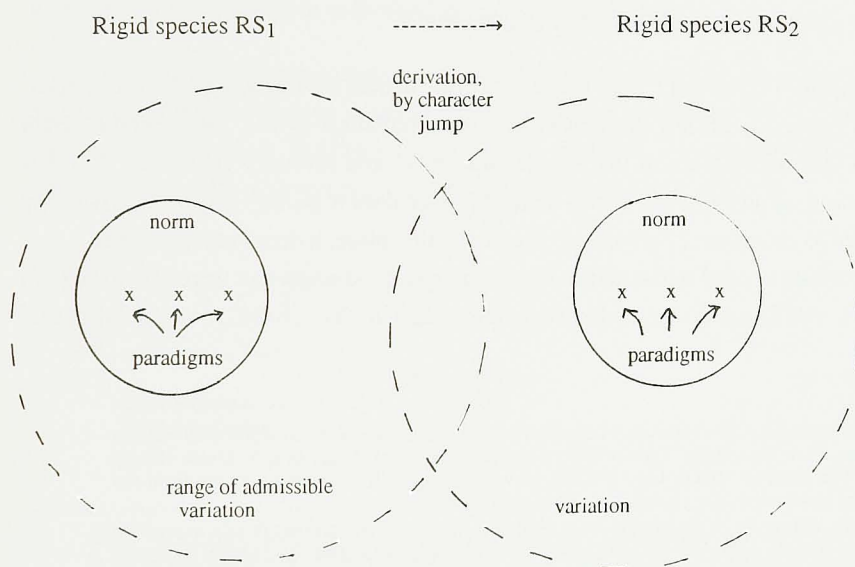
Although the claim MW is a comparatively weak one, it does contradict the absolute fixity of biological species, maintained by Aristotle and Christianity and still insisted upon by creationists and various fundamentalists. Indeed MW is tantamount to a denial of such fixity. But there is a certain incommensurability, or better incomparability, involved. Consider the change from Aristotle to Buffon, both of whom publicly upheld the fixity of species. But whereas Buffon defined a *species* in terms of the relation of interbreeding (so that two animals of opposite sex belong to the same species if their [potential] offspring are fertile and belong to different species if they would fail to produce offspring or produce offspring that are sterile²⁹), Aristotle, and even Linnaeus, defined a species rigidly or essentialistically in terms of invariant characteristics. So while a species could change in characteristics under a characterisation like that of Buffon, it logically could not under rigid or essentialist characterisation. In short, fixity of species, of *rigid-species*, was (rather like fixity of contemporary extensional classes) a matter of logical necessity. To avoid straight inconsistency, a claim like MW required some different characterisation of *species* (perhaps just an ostensively based one), or reformulation on neutral ground, for instance in terms of manifolds of certain organic sorts. Indeed it appears that Buffon himself effectively achieved such an outcome by using common nouns and class terms as *non-species* terms. For Buffon maintained both that species are not mutable; that they are 'perduring entities, as ancient, as

need hardly be 'biological entities'. The worst of it is, however, that the crucial notion of *species* makes no appearance in Williams' account.

29 Note that there are several problems with this explication, which has first of all to be conditionally rendered with a good many qualifications. For example it is restricted, inessentially, to animals, but essentially to bisexual species. Despite problems the account is maintained in contemporary work, with one further difficult qualification: to "natural" conditions (e.g. Stebbins).

permanent, as Nature herself', and that 'man and ape have a common origin; that, in fact, all the families among plants as well as animals, have come from a common stock' (Volume IV p.382). We shall follow the more satisfactory course of adopting some flexible free-wheeling contemporary account of species and of distinguishing traditional species as rigid-species. Then MW and MS can consistently stand (as modellings of course reveal).

Nonetheless, a small detour is warranted. For, contrary to the mainstream view that the fossil record makes a fixity-of-species interpretation untenable (thus e.g. Keeton p.7), there is an ancient alternative, not so readily put down. Now too, what did not pass unnoticed in Darwin's time, an alternative account of the fossil record can be given in terms of rigid-species. Indeed, in terms of rigid-species, an alternative theory of descent can be formulated, a saltational theory of *descent without modification*. Though species are rigid, nonetheless some can be said to *derive* from others, from adjacent species, by a jump in species character. How this can happen is more readily illustrated, as in the following diagram:-



Species were conceived in this sort of way, as admitting a considerable range of variation, before the rise of modern evolutionary theory. Artificial selection was alleged to push selected individuals progressively further out into the region of variation away from the norm, towards which descendents will revert however if forced selection is discontinued. Wallace's main contention was that natural selection sometimes pushes descendents over variational boundaries. It is open to a saltational opposition to claim that, in such an event (not admitted under absolute fixity), boundaries are not transgressed, but that a "new" species is instantiated. Under straightforward explanations of this jump derivation, only an "equivalent description" will be given by such a saltational theory. In any case, even orthodox evolutionary theory involves a certain fixity of

species; for species are characterised in terms of sets, which cannot change membership. That is to say, since (abstract) sets are fixed in terms of membership, there are difficulties with a standard representation of species as sets.³⁰

Thesis M does assign standing to species, and thus on orthodox ontological assumptions, carries commitment to the existence of species. Such existence of new species under MS is part of the much-vaunted *creativity* of Darwinian evolution³¹; natural selection, as the *origin* of species, actually brings new species into existence. Creative Darwinism is indecently platonistic. As a result, even the rock-bottom thesis makes things difficult for nominalisms and conceptualisms, which must find some different way reconstruing species, from more straightforward abstract set or kind explanations. Such difficulties are not avoided by switching to fashionable reductive talk of *gene pools*; for such pools are set-like objects. Moreover, they are enhanced through reductionism; there is a severe, insufficiently observed, tension between species ontology and individual reductionism. In fact it is a simple matter to avoid all such difficulties through item-theory, adopting a neutral construal of species. Species are accordingly quantifiable objects which do not exist, but which may be represented by abstract sets.³²

The core thesis M is ancient. 'The Taoists ... firmly denied the fixity of biological species' (Needham 56). Certainly such a thesis was in wide circulation by the 18th century. Both Maupertuis and Diderot maintained that species transmute and diversify over time. There is accordingly nothing particularly Darwinian about M. Nor does it go very far towards what are regularly regarded as elements of Darwinism. For, in the first place, it does not require that D1. The species notion is valid across all life forms. Indeed it is enough that there should be (but) two species, S_1 and S_2 , with S_2 a modified descendent of S_1 . Such a model, allegedly

³⁰ Hence recent (problematic) proposals to construe species as *individuals*, as if the only options were abstract set or individual. Darwin took a species to be a set ('a set of individuals closely resembling one another!' p.63), but no doubt he was using a different notion of set from the contemporary narrow one, else evolution might be precluded.

³¹ With the temporalisation of the Great Chain of Being, to that of *Becoming*, in late eighteenth century Romanticism, came new high evaluations of creativity and originality ('wholly foreign to most earlier periods'). The temporalised doctrine placed increasing 'emphasis upon the conception of God as insatiably creative, [whence] it followed that man, who as a moral agent or artist, would imitate God, must do so by being himself "creative". The word, which through much repetition has in our own day become a sort of tiresome cant, could still in the late eighteenth century express a very exciting, and for theorists a very stimulating, idea' (Lovejoy p.296). Despite what Lovejoy says about the creativity cant, it remains very fashionable in work emanating from the vicinity of Boston. Linguistics, for example, is stuffed full of exaggerating cant about the linguistic creativity of ordinary humans. Now cosmology has it that the universe itself is creative, an "immensely creative scene". Biology too has to be in on the act; natural selection is creative. *Not* creationist, but creative.

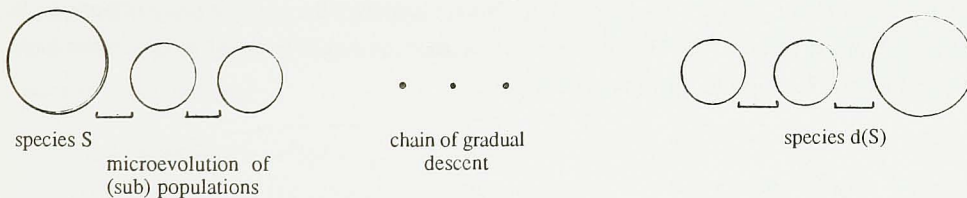
³² A species taken through time delivers a set; time slices through this set, species at time t , give further sets, subsets of the first. Some acceptable-enough ordinary discourse will require some unscrambling if only such set terminology is deployed. For example, saving an endangered species becomes saving representative members of the present set. As to quantification over objects that do not exist, neutral construal of universals, and item-theory generally, see JB.

forthcoming from the fossil record, verifies MS, definitively *if* the fossil record supplies decisive examples (something that was for long disputed).³³ There are attempts to escape the limited validity of the species notion by talk of populations, but such (extensionalising) talk also evades, and indeed is irrelevant to, certain central issues of biologic evolution, those concerning species especially.³⁴

D2. *All* species (that are well defined) are mutable (or terminal), as Wallace and Darwin asserted. For MS, all but two species could in fact be fixed. While there is substantial evidence that many species are, or were, mutable - so that the number of mutable species is presumably some finite cardinal greater than two - there is also substantial evidence of constancy of other species (e.g. the Tuatara), what Darwinians describe, in a dialectical turn, as "evolutionary constancy" (e.g. Stebbins p.158ff.).

In the second place, M, with or without D1 and D2, yields none of other controversial features of the Darwinism: none of superfecundity, and the (enthymematically) consequent competition and struggle for existence; or natural selection, for instance from variation; or maximal selection, as with survival of the *fittest*; or individual reduction; or gradualism.

Given that species are sometimes modified, a prime question is How? Or, in the terminology derived from the mechanistic paradigm that remains all too fashionable in biology, what is the *mechanism* of change? The Darwinian answer is of course: (By variation and) natural selection. The Darwinian story of descent can be depicted as follows in a simple case:



³³ Given the extent of past *theory* involved in supplying the data for natural evolution, for instance in the *interpretation* of fossil evidence, it is a trifle surprising to find Darwinians vociferously insisting upon the *fact* of evolution (e.g. Stebbins p.13 and in more specific form Ruse p.1). There is a large insecurity complex lingering there in Darwinism.

³⁴ It is enough, fortunately, for present limited purposes that some (enough) species can be delineated. For so far 'evolutionary biologists have not been able to agree on a suitable definition of a species ...' (Bush p.119). For some of the problems with the standard style of definition, see Keeton pp.807-9 (Keeton's own definition, p.792, has the decided drawback as well of collapsing separate plant species which hybridize into one another.)

Another facet of the problem is that the notion of *species*, solid enough for large animals and Northern higher plants to which taxonomy and evolutionary ideas were first applied, weakens as the emerging classifications are extended to the Southern Hemisphere and down the usual hierarchy of the plant kingdom. 'Natural hybridization, often between what appear to be widely different species, adds to and complicates the variation of many New Zealand plants. There is no [species] way of describing the complete range of forms that are found when hybridization occurs' (Poole and Adams p.9). Similarly such Australian genera as the eucalyptus are highly resistant to rigorous species classification.

Such a chain meets the requirements of gradualism and avoids jumps (saltation). The microevolutionary steps, involving incremental change of a character, in turn occur chiefly through "natural selection".

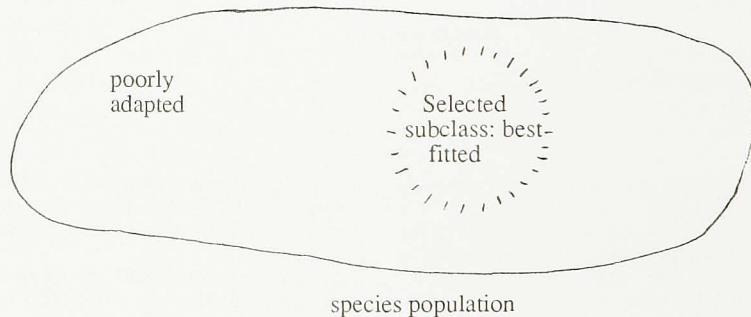
D3. Natural selection is the chief means of (micro)evolutionary change.

Indeed it is the *only* means some (neo-)Darwinians are tempted to assert (e.g. Stebbins 71). It is easy to glimpse why they are tempted - it is disconcerting to have entering into a central Darwinian thesis, such a vague term as 'chief' (which also calls for a classification and explanations of exceptions, as with externalities to market forces). But it is also easy to glimpse why they withdraw - because there are evident enough exceptions (e.g. artifice, chance).

From a logical point of view, one of the least satisfactory parts of evolutionary theory is natural selection. What the devil is it? In many biological texts, the term is simply infiltrated as if it was obvious what is meant. Here is a typical example of such infiltration:- Darwin

made the logical deduction (*sic!*)... that the factors which check the increase of numbers in a species act more strongly on those individuals which are relatively poorly adapted and favour those which are *best fitted to their environment*. Since these favoured individuals will leave more offspring than their less well adapted associates, this process of natural selection, continued over many generations, *should* ... bring about progressive evolution' (Stebbins 71 pp.7-8, italics added).

Here it looks as if natural selection weeds out the poorly adapted, who coincidentally do not reproduce so well, and *favours* the best fitted, who not accidentally produce more offspring. In the intended literal context, 'favoured' can hardly amount to more than 'selected', so the basic picture is this (with respect to a given environment):-



Part of the trouble with the notion of natural selection derives from its substantially analogical introduction. Animal and plant breeders had been able to produce much altered breeds of domestic animals and cultivated plants by careful selection of breeding stock or seeds. The selection of populations practised by breeders (who were selectors) was denominated 'artificial selection'. Natural selection was like artificial selection then, but selection on the part of "Nature" (where however there was no selector, except poetically). Analogical explanations persist, with natural

selection the driving or 'directing force of evolution'³⁵, or even the driver: 'Natural selection, which directs genetic availability towards adaptation to the environment, can be compared to the driver of the [evolutionary] vehicle' (Stebbins p.3). Since the advent of the Modern Synthesis, the construal of natural selection as providing an ordering or direction of genetic variation, or even guidance has become commonplace in the texts.³⁶ But again requisite elaborating detail, supplanting metaphors, is invariably missing.

Selection is an operation which, as the above picture reveals, when applied to a class gives a subclass. Such a purely mathematical operation - which does not require an operator - can be represented as a function. By deliberate analogy then with an element (or individual) choice function f , which defined on domain D delivers an element $f(y)$ in y (i.e. $f(y) \in y$), for every nonnull subset y of D , we define a group (or subclass) *selection function* g on domain D as follows: For any nonnull subset y of D , $g(y)$ is contained in y (i.e. $g(y) \subseteq y$). Such a selection functor also supplies a direction, that of the relation it involves, from domain to range (from y to $g(y)$ for each y).³⁷

The evolutionary selection function is not well-defined, so far, either as to the domain on which it operates, or as to range, which it delivers. Evidently some restriction to biological domains is presupposed (though the same general ideas transfer to cosmological evolution) and a range delimitation, to the fittest or sufficiently fit, is commonly imposed under the rubric of "natural selection". The intended domain of *biological* selection functions comprises certain subsets of (potential) members of natural kinds, normally of those kinds considered in taxonomy; it will not reduce however to populations of species (for species and higher taxonomic types may themselves be selected).

A *natural* selection function is a biological selection function where the selection proceeds by natural processes and methods, as opposed to artificial or contrived or differently supernatural

³⁵ Thus e.g. Gould 82, p.381. The image of natural selection as *channelling* occurs over and over in Gould's writings. A more accurate pictorial image is exhibited in Williams p.369.

³⁶ As well, the newer terminology voids the helpful older contrast of *selection* with *direction*, made by Darlington according to which selection follows variation whereas direction influences variation (p.15, p.26). The distinction readily enabled rival theories to natural *selection* to be distinguished. There were several *directional* rivals to selection: e.g. theories of Naegeli 'who thought evolution was directed by an inner force'; of Eimer 'who thought orthogenetically of variations following a defined direction rather than sporadic, fortuitous one, but attributed the process directly to environmental influence'; and also of Carrier and de Vries who assumed catalysmic origin of species (by mutations). Of course *natural* selection had its contrasts and rivals too, e.g. divine, artificial, and even chance selection, and, narrowly construed as adaptational selection, neutral selection.

³⁷ Correlative to selection functions, which are inclusion functions, are *exclusion* functions. An exclusion function g^c is so defined that $g^c(y)$ is disjoint from y ; that there is a barrier between members of y and those of $g^c(y)$. Some pretty logics of selection and exclusion can no doubt be developed.

means, a little more specifically, where there is no selector³⁸ and no intervention or interference by humans or superhumans or like manipulators. Natural selection does not exclude however selection made by chance or related phenomena (e.g. drift). A constrained natural or *adaptive* selection function is a natural selection function where the selection is made under environmental constraints (such as scarcity or change) and the result counts as *favoured*. Thus not only is the output (or range) of the function being restricted, to favoured or beneficent cases; but further the process of selection is being delimited, something that exceeds the contemporary logical explication of a function. Short of liberalising the notion of function (something needed, but for another occasion perhaps), elements of the process can be incorporated into the output, which becomes something like beneficent qua constraints (or favoured after undergoing constraints) or, briefly, environmentally favoured. While the subclassifications of selection functions may seem excessively vague, after the simple mathematical elegance of the starting point, worse is to come. For what are members of present generations of species (for example) selected from? Not just from themselves, but from some class of larger sets which include (certain) *potential* members of the species.³⁹ Evidently there are various ways in which the domains, which each consist of actual plus potential members, can be defined. There are for instance, maximal domains comprising all the members that each population *would* contain had maximal production (in some further specified sense) occurred. These are *not* Malthusian domains (but *nonexistent* analogues, of maximal domains of the Great Chain), as there is no presupposition that such domains would exist but for environmental checks such as scarcity; superfecundity is not assumed. But plainly there are other ways of characterising the larger domains upon which selection is made: for example, regard a present generation as selected from a larger domain which resembles the previous generation.

6. Further features of deep-green evolutionary theory.

Such a theory will be *neutral* in the logical sense, i.e. not carrying unnecessary existential commitments to species and like "abstract" objects. Both species and objects further up the taxonomic hierarchy are fuzzy nonexistent objects. When considered over the whole of (space-)time, they can be represented as fuzzy classes, abstract objects the membership of which is not fully determinate, because of borderline cases. Many or all members of these classes do not exist; for instance, with passenger pigeons no members of the species (now) exist, with *rattus rattus superior* no members of the subspecies (yet) exist. As well as members of species that do not exist, we need, for selection purposes, to be able to talk about potential members of species that never did or will exist (e.g. the 4 offspring of Zed had she borne them, as she could have in more favourable circumstances). Naturally, we can talk about these types of (presently) uninstantiated species, and these sorts of potential members of species, as we have briefly been doing, quantify

³⁸

Except a personified Nature, which is otiose given that no difference is made.

³⁹

In the background an even-aged assumption is being invoked, allowing species and the like to be stratified into generations. But the assumption can be dispensed with subsequently.

over them and so forth, without being in any way committed to their existence. So much is familiar from item-theory (as explained in JB).

Thesis M is adopted. Biological species (where defined) are typically modified under descent. The same applies to higher taxonomic types, such as families. The process of natural modification occurs by virtue of natural selection, primarily through adaptive selection as characterised. Such selection is not maximizing; the classes selected are not necessarily the *fittest*, *best* fitted, *most* adapted. Rather the selection involved is satisizing; it selects, as favoured, those that are sufficiently fit, fit enough.⁴⁰ It looks, for all that Darwin embraces Spencer's "survival of the fittest" slogan, equating it with natural selection, as if Darwin was not decisively committed to maximization, or did not clearly separate it from satisization. Not only does he shift back and forth from *fittest* to *fit* as if it made no difference, but he goes out of his way to remark that the (selected) indigenous fauna and flora of continents and islands is not as fit as it might be, that is, species which are selected are not maximally fit (but capable of improvement). Darwin's point (whether correct or not) also puts paid to the comeback that, in the evolutionary context, there is no real difference between sufficiently fit and maximally fit; here as elsewhere the sufficiency threshold can fall well below maximal values. Whatever Darwin's (ambivalent) position, subsequent Darwinism was in the main in no real doubt: selection maximized fitness. Deep-green theory rejects such maximization themes.

Further elements of deep-green evolution will be apparent from what has proceeded. Non-manipulated evolution proceeds by natural selection upon variations within populations or kinds, in principle at levels of the taxonomic hierarchy, and proceeds primarily by adaptive selection. Of course deep-green evolution will, like Darwinism, expand into a larger synthetic theory, appropriately integrated with what is correct in other parts of contemporary biology (not so much as is often imagined). In particular, variation will be accounted for through genetic and like structures.

Like neo-Darwinism, the theory is distinguished as much by what it rejects as what it asserts. Some of the rejections follow from what has already been asserted. It is enough at this stage, to list rejections. These include; fixity of species, essentialism, gradualism and continuity,

⁴⁰ Satisizing is further explained in MS and MM, where too attempts to reduce satisization to maximization are critically repudiated. Much of Western evolutionary theory has followed satisizing lines, right from the outset in Empedocles; the theme is selection of the fit, *not* the fittest. The fit are those with sufficient advantages (speed, strength, resistance) to cover some relevant threshold. In fact the ancient Greek theory appears to have been throughout a satisizing one. Selection in the modern theory is often presented in a satisizing guise, as when what selection is said to do is to eliminate the unfit, who fail to pass through some constraint doorway. For that is tantamount to selection of the (sufficiently) fit, who manage to get over the threshold. Interestingly, Williams' axiomatic foundations for Darwin's theory do not assume maximization, and will fit into a satisizing framework. Her formal theory, duly repaired and enlarged, provides a promising basis for formal development of deep-green theory.

Malthusianism, existential struggle, survival of the fittest, individual reductionism, and all other types of reduction (e.g. of macroevolution always to sequences of microevolution) including mechanism, determinism, utilitarianism. What deep-green theory rejects above all are the metaphysical presuppositions, and the associated predominantly mechanistic picture of nature, underlying Darwinism. With these rejections go others, of the theories that are parasitic upon neo-Darwinism, including sociobiology and evolutionary epistemology (or Hume's verificationism refurbished). But these theories are in big trouble anyway.

These are but sketchy beginnings, upon which *much* more detailed work will need to be done, else the "theory" will fall to objections like those lodged against many other upstarts, including the crude: put up or shut up. That real work will have to be future ado: for the present we simply locate the theory in its wider setting.

7. General evolution and process theory.

Evolutionary theory, like relativity theory, has two parts: general or comprehensive, and special, such as biological. Biological evolution, now central to evolution, is concerned with the evolution of life. General evolution removes that restriction; it includes the evolution of both physical systems, such as islands and galaxies and the entire universe, and also psychical systems, such as frameworks of ideas and the thoughts of individuals. General evolution includes that of communities, cultures, economic structures, social systems, etc., as well as biological, chemical geological, cosmological. Social evolution theory, for instance, concerns the evolution of communities, not subspecies even. It aims to explain the origin and rise of various social phenomena, such as property (ownership), states, social hierarchies and classes. Strangely, creationist origins have not been offered for these phenomena. It is mainly nonuniversal phenomena for which such explanations have been sought. Apparently no one has so far tried to explain the origin of the family (a near universal *human* cultural feature) through surplus or scarcity, peace or war, cooperation or competition.

Because it includes so much that is artificial or arbitrary, such as evolution of fashions in clothing and styles in architecture, there can be *no complete general theory* of substance of *general evolution*: any thesis could be refuted by further artifice. Worthwhile theorising is bound to impose some restrictions, for instance to "natural" processes in one sense or another (including non-artificial cultural evolution). It is worth persisting despite the difficulties thereby introduced, if just because historically there has been an on-going transfer of evolutionary assumptions back and forth from biological to socioeconomic and cultural domains.

For there is a good deal more in common between the special and the more general theory than may be supposed. Certainly genetics is special to life forms; but the Darwinian evolutionary theory was formulated independently of genetic theory. The amalgamation was only made

subsequently, in the later syntheses. It pays to begin with *biological* evolution; for even though the biological theory looks increasingly indeterminate, it is nothing compared with evolutionary theory considered generally. But having already grappled with biological evolution, we can risk glancing at general evolution.

There are various elements of evolution that can be separated, in particular

- 1) the *conditions* for evolution, and
- 2) the *process* of evolution.

Now while the processes may look, at first glance, pretty different in different cases, the conditions are not so very different. In each case suitable separation is a common prerequisite. In biology, 'separation or isolation of some sort or another seems most important for speciation' (Ruse p.70), though there is disagreement about the extent of ecological separation required, e.g. whether it must be geophysical isolation. A similar condition of isolation for the generation of genuinely new ideas has often been stressed (e.g. by Russell).

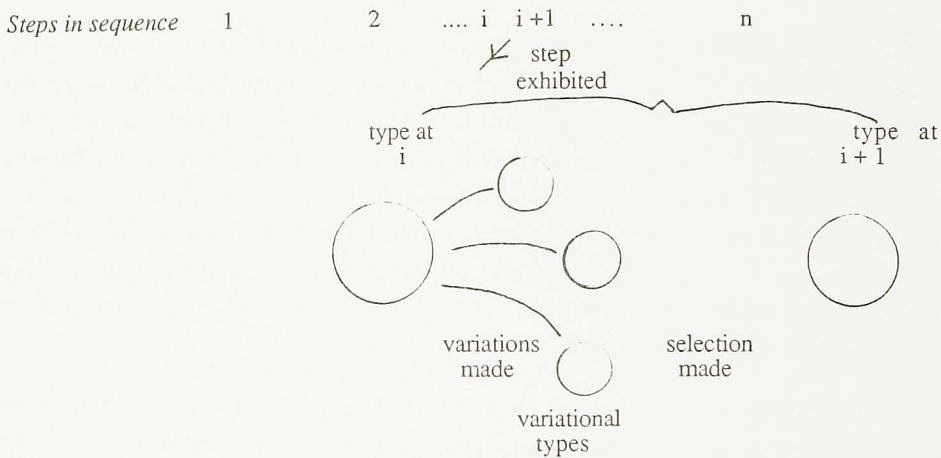
Nor are the processes all that different, regularly consisting of variations from a simpler original, followed by selection. This pattern prevails not only in the biological sphere, with streamlined Darwinian principles a standard example, but also in the ideological sphere (e.g. trial and error, incremental improvement, etc.). The general evolutionary pattern thus discerned consists of a sequence of steps, each consisting of variations upon the previous end-state achieved and then appropriate selection from the possibilities offered. There are also further features of the types of evolution commonly considered, features corresponding to common descent. These include increasing complexity (in some sense), and increased variety⁴¹. Some such further themes are incorporated in evolutionism.

More generally still, each case of evolution can be regarded as a type of process, and accordingly evolution subsumed under process theory. Given that we can arrive at a theory of processes (as initiated in PT), a critical question is: which processes are *evolutionary*? An initial definition runs as follows: Normally, relatively slow cumulative transformation of *form* (of something, some *class* or *type* of items) to certain later (more "evolved", e.g. complete, *adapted*, *favoured*, complex) versions. To avoid patent circularity, 'evolved' is replaced by some exemplifier or other. As there is an evident familiar problem in defining *complexity*, and nothing in principle to prevent evolution toward less complex forms, it is better to avoid the latter bracketed elaborations, except perhaps for *adapted* or *favoured*. Other features normally coupled with

⁴¹ Or just increased ϕ , for some "fitness" or other parameter ϕ . Williams' axiomatisation fits in neatly at this stage, affording an appealing formation for a more comprehensive evolutionary theory than mere biological evolution (simply reexpress the theory as an elaboration of ancestral theory without specific biological terminology). Indeed it may afford an initial mathematical model not merely for part of the more general theory, but for other informal evolutionary theories in philosophy, politics and economics.

evolution will have to be shed also for a general characterisation, e.g. closeness, gradualness, incrementalness. The process story does not become vacuous; there remains both variation within the type and selection, as explained. That is, it represents a distinct general kind of process. Moreover, by sticking with the *process* story, we can avoid direct entanglement with notions, and problems, of change, which, it is commonly claimed, 'evolution presupposes'. 'Transformation' can be treated as a process.

An evolutionary process is an temporally-ordered sequence of processes which is integrated (and is joined end-to-end at each step other than end points), of an evolutionary type, such that each step in the sequence is a variation plus selection step, that is consists of a set of variations upon the type at the outset of the step followed by single type selection from that set. In brief, a evolutionary process can be represented diagrammatically as follows:-



What now distinguishes *biological* evolution, apart from its operation upon natural classes of living things, is above all the way in which the variations are produced: by mutation and genetic recombination.

Another interesting example is furnished by the universe itself, no doubt an evolutionary type, under multiple-universe quantum mechanics. It follows that the muddling along of the actual universe is an evolutionary process, since the process can be sequentially ordered (with some artifice perhaps, at worst by a choice axiom) and each step consists of an "evolutionary process", a branching of universes (under Schödinger process) followed by contraction, actual universe selection, which is done by interference (such as measurement) or happenstance.

Evolutionism is said to be the comprehensive theory that the universe, including life in all its forms, is the product of cumulative change (thus e.g. Goudge). What does this mean, what does it

exclude?. Presumably it is meant to exclude all but naturalistic processes. Presumably it embraces everything exhibited in the universe, including intelligence, culture, urban organisation, and so on - though less sweeping forms of the position, duly restricted to processes that are evolutionary and not instant artifice, would undoubtedly have a sounder basis. Adequate reasons for believing in non-tautological versions of sweeping evolutionism are presently lacking; but the theory is nonetheless tenaciously adhered to, and often presented as an integral part of [atheistic] science. In evident respects such a theory does have more explanatory power than anthropocentric rivals such as God hypotheses; so perhaps it is inferred by an - evidently rotten - argument to best explanation. But there is really no need or reason to believe it; there are only defective rivals to reject. Judgement should accordingly be reserved; it should be left high in the speculative sky. Agnosticism is here a rational resting place. Similar points apply to the sketchy physicalist story of life as having evolved from inorganic matter, a prominent version of evolutionism. Smart, for example, argues as follows: '... it is not impossible that life originated from inorganic matter, and in the absence of any plausible speculations about how *else* it could have come about it is reasonable ... to believe that it did originate from purely physical processes ...' (p.93). That too is an evidently rotten argument. Even if it were conceded that there are no other plausible stories as to how life could have come about (one alternative is that matter was intensional all along, and that intensionality became concentrated in special circumstances that evolved), still there are other possibilities; so Possibly *P* hardly justifies It is reasonable to believe *P*. What is again more reasonable is to leave the issue *open*: *not* to believe this or that allegedly appealing speculation. The faulty physicalist inference looks in the end too like the wish-fulfilment inference; in the absence of solid countervailing evidence, it is reasonable to believe what we (scientists) are disposed to believe!

APPENDIX: Darwin, real research, and elephants.

Darwin is said to have liked calculating how many off-spring even "slow breeders" like elephants could produce, if breeding at an unchecked maximum (an elephant example is given in his notebooks). No doubt he would have been thrilled to bits with contemporary computers, given which he could have done his Malthusian calculations, exponential growth and limits to growth, desktop. They would not have solved his problem however as to limits: What held elephant population in check, given there were no natural predators (p.69), but man. 'Before man inhabited India or Africa, some cause must have checked the continued increase of the existing elephant. Dr Falconer believes that it is chiefly insects which, from incessantly harassing and weakening the elephant, check its increase' (p.171).

Darwin's calculations and speculation bear no good relation to what limited empirical data we now appear to have on elephants.⁴² Elephants do not in general reproduce at the maximum rate which their biological attributes apparently permit (but exhibit 'the K factor'). More important still are 'elephant population regulatory mechanisms', such as 'deferred maturity and reduced fecundity'. Together with a significant increase in calf mortality, 'this has led to a massive decline in recruitment' in the elephants of North Bunyoro, Uganda, up to 1975 (Laws and others, p.260, in one of the few studies of elephant population dynamics, accomplished by real research methods, namely as part of a grisly commercial operation shooting elephants). Elephant populations can also be reduced through malnutrition (whence increased calf mortality) and even starvation, as when their habitats are eliminated, for instance under agriculture, or degraded, perhaps under elephant activity itself under crowding (see Douglas-Hamilton). But elephant populations do not appear to be seriously affected by insect harassment.

Time is however running out for finding out about wild elephants. Time appears to be running out for wild elephants. Time appears to be running out, ecologists are now beginning to say, for Africa. There may be but 10 years or so for most of the remaining wild elephants of Africa (those of Asia are in even worse straits). There may not be much more than 10 years before eco-catastrophe overtakes much of Africa.

There may be as few as 400,000 African elephants left, though there were more than a million a decade ago (when *biological* research could still proceed as a by-product of commercial destruction and death). Other figures have the African elephant population cut by a half in 10 years to some 625,000. That gives an average reduction rate of 62,500 elephants a year. Other information puts the reduction rate at 90,000. Plainly the information is rather elastic. However straight Malthusian extrapolation of recent figures - say a decline of about 50,000 elephants a year from a present population of about 500,000 - gives about a 10 year life horizon for wild elephants. Of course, the picture is bound to be more complicated. There will be some zoo-like reservations for tourists; a South African regime may still survive, and with it an authoritarianly-controlled and -culled elephant population; etc. But the complications are little consolation. The situation for elephants, and many other wild creatures in Africa, is dire, the rate of destruction horrendous.^{43*}

⁴² The emphasis put on Darwin's meticulous assemblage of data, as part of the case for ascribing the modern theory of organic evolution to him rather than others who earlier arrived at the elementary theoretical principles, is overdone. Not all the data is so solid; a goodly amount is speculative or relies on hearsay; some is misinformed. A striking example of the latter concerns the claim as to wild food of Australia and the Cape worth cultivation: "... neither Australia, the Cape of Good Hope, nor any other regions inhabited by quite uncivilized man, has afforded us a single plant worth culture' (p.59).

⁴³ And the elephant parts markets in Japan and Hong Kong, the main ivory markets, wicked.

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