

PROBLEMS WITH ECONOMIC RATIONALISM — Psychology, Green-issues, and Jobs

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**The current version is an evolving draft — and criticism is actively encouraged.
Changes made in the latest (December 2008) draft appear here coloured dark red.**

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ABSTRACT

Modern economics does offer some social stability and “rationalism” — yet it is often breathtakingly inadequate in its treatment of psychological sensitivities. Its power lies in its equations which are essential for large complex solutions. Its weakness comes from the lack of equations for significant psychological factors, no doubt because psychology is too much an abstract art which cannot yet be slotted neatly into the grand model.

There might be no solution to this dilemma, but in view of the high stakes it seems sensible to try. Here we might ideally like a general model for the evolving human mind: a model which would be (a) true to real dynamic foibles within each separate individual, (defence-mechanisms, etc.), but also (b) anchored in explainable and credible micromechanisms which could account for those foibles. Perhaps only then could we build up a reliable-and-credible collective model of society — an updateable model capable of doing justice to the general wellbeing of the many very different individuals-or-types, rather than the present attention to the mere “*economic*” wellbeing of the rather rare “*Mr Constantly-Average*”. As it stands, mainstream psychology is too vague for this modelling purpose, but there is some hope that it can be upgraded using advances in Piagetian accounts of psychology and epistemology.

There are also two better-known aspects of economic modelling in which such intangibles are dangerously under-represented, if only through *denial* of inconvenient truths: Firstly the “GREEN” issue of unsustainability, which tells us of dire “long term” consequences of uncurbed growth — (though this “long term” has already arrived uninvited for many subgroups within the world). Secondly the “RED” issue — the problem of finding employment generally while (i) markets tend to dry up thanks to the satisfaction of natural needs (or due to poverty), and (ii) machines increasingly displace workers. Currently this is partly solved by economic growth, but we clearly need to find some other way. — In fact, this problem of *jobs-despite-zero-growth* is one main challenge almost no-one is facing up to.

No grand solution to this implied ensemble of equations seems to have even been considered openly in public, but surely now is the time to do so. It is unlikely that such a model would be politically palatable (even though such political feelings should ideally be factored into that same model itself). Nevertheless such all-inclusive attempts are surely needed — as a sobering guide, if nothing else.

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1. Are economics-solutions even possible? — A meta-economic question

1.1 Al Gore's warning of the climate crisis;— and then?

In his speech at the Nobel peace-prize ceremony, Al Gore¹ emphasized the urgency of solving the global climate-change problem — and we may agree that it is a threat which calls for the sort of popular commitment used to counter Hitler. Indeed we do surely need to act “boldly, decisively and quickly” — and much of that commitment can no doubt be generated by Churchill-like *rhetoric* from authorities like Gore himself.

But this leaves unmentioned some practical nuts-and-bolts issues of just how we could act “decisively”. After all, it was not just Churchill's speeches that won the war, there were also huge efforts on the technical and organizational side — and that is the question which I now raise regarding the interaction between economics and the environment. After all, if we mess up the technicalities, we will soon be faced with widespread disillusion and a breakdown of the cooperation which will surely be needed.

Probably the most crucial technical requirement is a model of reality which can warn us of some of the unforeseen consequences of this-or-that action, (and such unforeseeables are increasingly common in large complex systems with arcane feedback loops). Size quickly calls for *large complexes of equations*, to serve as the model of reality, so it is those equations that this discussion will keep returning to.

(However there are also simple cases of blunders which could have been avoided just with a modicum of informal “equation-like” thought: E.g. In China under Mao, it was decided to greatly increase the production of iron-or-steel as the way to progress. It is said that every village was thus required to set up a blast furnace and produce iron ingots from whatever source was available. Meanwhile there were no *heeded* implicit “equations” to warn of (i) the importance of output-*quality*, (ii) the loss of the labour diverted from more essential tasks, so that there was a huge loss of efficiency and hence widespread starvation; and (iii) the capital loss from the melting-down of essential kitchen-items, etc. (iv) whether a steel industry really had good future prospects anyhow!)

It should not have needed formal equations to prevent such elementary stupidity — but formalisms of that kind might perhaps have helped — maybe! Meanwhile equally stupid policies are even more likely in large systems which are beyond the competency of unaided common-sense, and

¹ Gore (Dec. 2007) — <http://epiac1216.livejournal.com/205671.html>

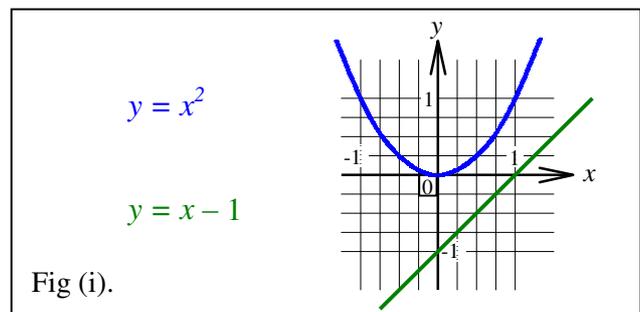
that takes us back again to formal models and their equations — but not just those equations for the obvious, easy, or convenient features. We must also face up to the forces which we do not yet properly understand, and *do our best* to formularize them too — and we shall see that these are often psychological issues.

1.2 Solvability of equations

Economists seek to represent our socio-economic reality by sets of equations — and when these are solved together, they should firstly show *the range of what is possible in the future*. (Of course, this may then offer advice on how to *steer destiny* within that range, but we will come to that later in the discussion).

But now we should ask: — “What if this set of given equations cannot be solved at all?” After all, no such solution is guaranteed mathematically.

E.g. consider these two equations and their graphs:



It is clear that these graphs never intersect, so there is no real solution; and this will often be the case if we choose to gather up equations at random.

1.3 Real Forces versus Man-made Equations

If we get away from pure maths into the real world, *something real has to happen*, nomatter how good-or-disastrous. If our equations do not allow for that, they cannot be faithful to reality so they will need to be rethought.

“Reality” effectively has her own private *causality equations*. These are forever hidden from us, except that we are free to work out (as best we can) just what we think those equations might be — and then solve these in the hope that we have a valid model overall.

Wherever there is some interaction, then Reality's causal equations must intersect somewhere. If our supposed copy of them fails in this respect, then there must be something wrong with our copy-system — perhaps because one-or-more equation needs updating.

This is a matter of some moment in economics since it is all too easy to get used to the temporary validity of some equation or supposed-solution, and then not notice that

Reality's own secret-equation has changed, leaving our "copy" invalid. Indeed it may even be quite nonsensical-or-irrelevant if it no longer intersects with others in our set.²

1.4 Unwelcome results

Sometimes fate has a nasty future in store for us, either (i) with an inevitability about it which we can in no way influence — such as activity on the Sun; or (ii) conditionals which we might be able to ameliorate if only we can get our act together — and the topical issue of "global warming" is a typical example.

Fate of this sort is built into Reality's secret equations which (with any luck) we may have replicated into our own equations. The obvious trouble is that we may then wish to *deny* such unwelcome news³ — or at least just pretend that it isn't there because we don't know what to do to solve the problem. (Indeed there might be no attainable better solution, as in the case of "(i)" above — and unfortunately we cannot always tell the difference between (i) and (ii) in advance.)

Where (ii) applies so that we are theoretically able to take effective action, we will probably have to invoke "lateral thinking" which perhaps means that we need some means of *reshaping the graphs-and-their-equations* such that appropriate intersections do occur, yielding acceptable forecast results. And if those forecasts do not come true, then we must think again — probably along the same general lines, but with new detail.

1.5 Psychology — missing from the equations?

We have seen that psychological issues are at least relevant³ — but *could it be possible to fit them into the grand systems of equations used by economists?* That is the big question, to which we will now turn.

2. Could sharper psychology-insights give us better economics?

Economic models are essential, but these models will be dangerously misleading whenever their equations omit important influences — such as the psychology of real people. (Mathematically this may typically amount to simplifying a graph from 3D+ down to *one particular 2D cross-section* which will only be valid occasionally).

We may provisionally⁴ **define economic rationalists** as those economists who manage to ignore their naivety regarding psychology; and thus proceed as if human nature were of no concern, or simply intractable.

This is clearly bad psychology — a failure to consult or give respect — but, as we have just seen for "3D+", it is also a *bad simplification of the mathematics*⁵.

For Economics, the dilemma is between

- The use of equations to model society, unavoidable due to the complexity of that society, and
- Our ignorance which prevents the "inner" psychological realities from being expressed in those equations. In practice, it is left for the intuition of politicians *to bridge this gap which the existing equations cannot handle* — and that intuitive fill-in is risky for us!

2.1 Neat equations versus messy humans

The Main Type of Economic Model

The debate amongst economic-modellers concerns (a) just what the model's equations should be (and that is our main concern here), but also then

(b) which variables should be manipulated to achieve the desired results (where that is possible).

The name of *J.M.Keynes* features at both stages, an ambiguity which can cause confusion over the term "*Keynesian solution*", so it will help if we are clear about the distinction:

² or if one graph is now a simple constant (horizontal straight line) within the now-relevant range of possible intersections, so that no effect can be transmitted from its "x" to its "y" — etc. We will return to these compatibility issues later on.²¹ (page 12).

³ Perhaps the main motive for denying such unwelcome news, is the fear of having to change course, thereby *writing off massive "sunk costs"* (i.e. financial investments in now-condemned industries, plus personal investments in training, and in personal identity with the *status quo*). Such issues are serious, as even Adam Smith was aware; so any solution would doubtless need to address them — via new extra equations perhaps — or at least recipes which could serve that purpose.

⁴ I will offer a more general definition at the start of Section 2.

⁵ In general, it ignores some important dimensions — as if we were to evaluate packages by their *visible measurements* only.

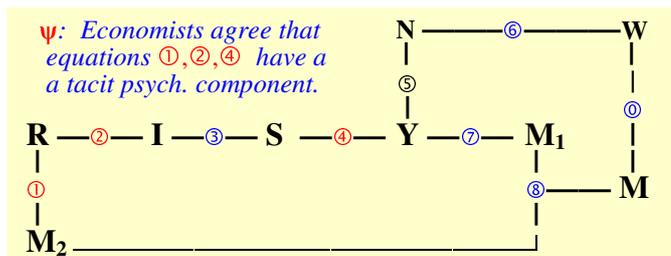


Fig (ii). Outline of how the equations link up within a Keynes-like integrated system.

Further details need not concern us here; however they are summarized in two tables within the Appendix

(a) What equations, and how linked?

Keynes (1936) proposed a feedback system of about ten equations, linking variables like: Y (nett income), Savings from the income, Investment, Rate-of-interest, Money-supply (including M₂, the money held back for likely investment), Wage-rate, and Number employed — see fig (ii).

There were also two other rival equation-networks: of the Monetarists and the Neo-classicists (both now usually regarded as much more in line with the new conditions), but Stein (1982) devised a generalized system which subsumed all three. Nevertheless this Stein/Keynes/etc. generalization still leaves many psychological features unrepresented.

The Australian Commonwealth Treasury (2001) uses the TRYM model which appears to be a further elaboration along these lines; but still psychologically naive, ignoring the effect of subcultures and their interactions.

Our “CHALLENGE-1” then is to look carefully at existing equations (especially ①, ②, ④). — and try to improve-or-replace them with any formulations of psychological theory which are sufficiently relevant and well-structured; (or, failing that, at least explicitly list the defects). This present overview account is not the place to actually attempt such revision, but we may note some aspects of the task:

- Equation ④ tries to say how much income will be saved from consumer-spending, and that involves the psychology of income-earners.
- Equations ① and ② connect the Rate-of-interest with both the M₂ money held for investment in capital equipment, and that Investment itself. This is another psychological set of issues, where existing equations do scant justice to individual realities.
- There is nothing in this system to directly express the human cost of such things as unemployment, nor environmental issues; (see below). Moreover if we do try to cope with them, it is no good considering them piecemeal in isolation. Instead they must be brought into the equation-system so that feedback and interaction can be assessed for the whole ensemble — insofar as that is possible.

(b) Control: Which variables to manipulate?

This is less a matter of psychology, so it is a bit aside from our main topic. However it is a matter of concern when one is trying to manage employment and environmental issues (see below).

Hence it may be worth noting some of the opinions here, if only as background knowledge. Thus Keynesians advocate increased government-spending to solve unemployment (without also causing excess inflation). Meanwhile Monetarists favour manipulation of the money-supply; and Neo-classicists say to leave well alone — do nothing, and the system will “eventually self-correct”.

2.2 Can we get a neater idea of human foibles?

(a). A Mainstream-Psychology approach to the Solution?

Mainstream clinical psychology does have value despite its intuition-based mixture of art-with-science. But nomatter how good that skill might be, it is difficult to communicate its “artistic” value, or generalize from its clinical rules.

For instance, we might make some progress with a classification of maturing personal motivations such as Maslow’s five-step scale (1954), with very different economic implications for each step! — This already suggests usefully the need for a rethink when it comes to modelling.⁶

Now I could be wrong, but I don’t foresee equation-planners taking any such individual-psychology seriously unless we can explain it in plausible bio-mechanistic detail.⁷ — The worry is that such micromechanism-

⁶ Maslow’s well-known formulation is mainly that the needs of individuals form a five-item hierarchy, such that: Their first need-level must be satisfied before they bother with the others; then they attend to the second, and so on. The point here is that each of these different need-levels is likely to have different economic implications — often with very different financing:

	Basic Need	Service required	Resources?
1	Physiological: hunger etc.	food, water, avoiding extreme cold, etc.	Logistics + basic costs?
2	Physical safety	protection, housing, basic-medical, ...	Major costs & investment?
3	Social belongingness	social organizations, &/or work-places	Imaginative planning often requiring only a medium marginal cost, but calls for sophistication
4	Esteem and respect	society with many role-opportunities, +	
5	Self actualization	opportunity to make the best of oneself	

⁷ Indeed the main justification for any such micro-account of mind mechanisms could well be, not as direct equation-producing

psychology seems a bit of a tall order; so what can we do about trying to take the next step *without drifting off into fantasy-land*?

(b). Piaget's psychology, based on "scheme"-elements arrangeable into control-hierarchies

Piaget's idiosyncratic approach to psychology seems closest to what is needed. — Hence the present attempt to develop his ideas, even though they may seem strange or difficult to apply:-

Using the concept of "scheme", *as a mentally encoded representation of an action-sequence*, Piaget was able to explain the sensori-motor⁸ formation of the *object concept* — *in semi-mechanistic terms*; — and from there we can go on to explain *self-concept* (with self as that object which reliably responds to one's own wishes, etc.).⁹ (Traill, 1976, 1978).

(c). Extending the Piaget Model into plausible micro-mechanism — and beyond

But, as it stands, that Piagetian theorizing is all too abstract; — that is, *unless* we can say what a "scheme" really is, biologically. There must surely be some way of explaining that eventually, even if we are not yet on the right track. For what it's worth, various other works have already argued that any basic "scheme" must be embodied in a molecular coding-string such as RNA (as Piaget himself hinted in 1967) — or more likely, as a replicated *population* of such molecules. And now, with this model, many human foibles begin to make sense. — (Traill 1976, 2005b)

So *if* we seek a quantum jump in our understanding of human mental needs, this might be the best chance — though of course much more work would need to be done. Such knowledge would perhaps be of *some* direct help in any socio-economic modelling of the public and its aspirations. It is not clear just *how much* help this explication could be — (though it *has* already

themselves, but rather as a support for existing clinical opinions. (This would thus offer a rationale for Maslow etc. instead of mere authority-driven formulae).

⁸ *Sensori-motor*. This is the pre-conscious developmental stage seen in early infancy. (A term much used by Piaget).

⁹ In fact, in principle, *any of our mental constructs* could be explained via a hierarchy of such schemes, — and all organized in a way *reminiscent* of the computer-software construction of "virtual screen-people" using a formidable nested hierarchy of subroutines. However this illustration is only a rough guide.

offered some ideas on what happens within neuroses and psychoses — (Traill, 1978, Chapters C7 and C8)).

Unexpectedly though, we shall see that such knowledge just might also be applicable *elsewhere* within our problem: — by suggesting *nature-like* improvements to our computer systems, thus perhaps enabling them to combine some **Human-like experience-based judgement** with their own superior **Speed and Attention-span**. Indeed note that it is this combination of skills which we will probably find *indispensable for regulating and monitoring* our all-inclusive solution if we ever decide what it is to be.

(d). Limitations, and hints about such modelling

If we were to imagine that this approach would give us *detailed predictions* of what Tom or Mary would do in the future, we would clearly be deluding ourselves. Yet on the other hand, we might well make reasonable *statistical predictions about their whole population*, provided the individuals acted fairly independently. (However such independence is hardly guaranteed, especially in a world of advertising and cell-phones, (Lin & Burt, 1975).) Nevertheless we will look at an instructive simplified case (not involving humans) in Section 2.4 below.

As already implied,⁷ the main value of such structured accounts might be merely *to reinforce what mainstream clinical psychologists are already saying*: *e.g.* that if we treat children or outsiders abominably, then we will rue the day a generation or so later; — *i.e.* that internal unseen scars can be just as harmful as external scars. The point is, *that a structured explanation* is much more likely to make a political impression on decision-makers — especially if that structured concept can then *fit into an equation, or into some similar slot in their pre-existing world view*.

But can such mental-model insights actually give us plausible explanations? — *e.g.* of post-traumatic stress? — or why children have to master some skills in a certain order? — or why a two-year old “Jill” may not be capable of self-organizing a tidy-up task, even though she can do it physically? — I believe that the answer is a qualified “yes”; but clearly more work needs to be done, and further support would help.

(e). Integrating these ideas?

Can we integrate such ideas profitably? — or are we ourselves like the two-year old “Jill” in this respect? — overly challenged when faced with the meta-problem! I leave that question for general consideration.

2.3 Coping with messy psychological measurement

Empiricism and its Problems

During most of the 1900s there was great emphasis placed on the merits of *empiricism* — of experimental demonstration (positivism) — or alternatively, as Popper would put it, of formulating problems in such a way that they could be subjected to experiments capable of *disproving* them.

That creates obvious obstacles for some hypotheses about historical, astronomical, or mind/brain events — cases where relevant direct observations will often seem impossible. But in any case it is now realized that our supposedly *purely-objective*-observation is actually itself impossible: — In fact it is an illusion which we cannot ever accurately attain (if only because the very process of observation-itself is always based on some unprovable premises and assumptions). *E.g.* see chapter 1 of the book by Hans Albert (1968 / 1985); — or, as an example of the misuse of empiricism, Traill (2005c).

Thus it seems there is also a place for also partly depending on internal tests of self-consistency: — what Piaget would call “*equilibration*”, and others refer to as “(*internal coherence*”); *e.g.* Thagard (1992 / 1993), and Traill (2005c).

Accordingly there is now less excuse for sidestepping psychological issues simply because they are said to be immeasurable in the traditional sense.

[1]. Interpersonal Comparison — A Psychometric Problem

It seems obvious that \$1 is of more value to a poor person than to the rich — but how can we *prove* this effect, or

measure its degree? Answers do exist; but they are questionable — leaving the field open for lobbyists to exploit.

WELFARE ECONOMICS aims to compare the “*utility*” of the \$1 (or praise, companionship, or punishment, etc.) for persons A, B, or C... . But that is just in theory, so where does that leave us in practice where we usually expect “objective” measurement?

Economic Rationalists see *the market* as the ideal measure of comparative utility. — Here they are effectively behaviourists.¹⁰ After all, the self-organizing markets display *practical exchange behaviour* — and the results serve as easy-measurement. Of course that overlooks such hidden inner details as *price-ignorance*, *loyalty*, and *feelings of duress*:

[2]. “*The market as a measuring-tool*” — A critique of this doctrine

Let us consider the stock-market, since that is what is uppermost in the minds of most economic rationalists. Here are some share-prices for two rival stocks on the Australian stock-exchange. These are figures generated by the market, so that market *appears* to have done its duty as a measurement-tool. Indeed such figures are watched very carefully by participants.

Date	Time	BHP-Bil. \$ (AUD)	Rio Tinto \$ (AUD)
3 Mar 06	noon	24.66	70.85
1 Oct 07	close	44.50	108.84
6 Dec 07	close	43.38	144.74

But what do these figures actually mean? Surely they are symptom-results of an already-labyrinthine process. Certainly there is plenty of interpretation to be had, *but it is not contained in the “measurement”-figures taken alone* — figures which closely parallel the uninterpreted data from a behaviourist’s experimental results.

In contrast, the real business of the market surely includes some intangible-but-basic knowledge about the politics and personalities of the evolving situations (*e.g.* that Rio’s high price of December 2007 was largely the result of BHP’s takeover-bid for it — and that both have benefitted greatly

¹⁰ Behaviourists conduct their studies as if psychological beings had no imaginable internal mechanisms at all (so that it is supposedly nonsense to talk about any such mechanisms, and often their very existence is denied). In short, to them, stimulus and *behaviour* are everything. (This is closely related to the above-mentioned philosophical issues of strict Empiricism and Logical Positivism).

over that last year-or-so from a boom in Chinese industrialization).

Moreover the prices themselves, although useful for specific practical purposes, betray little of the mysterious decision-processes that individual investors use, nor of how they influence each other via feedback or other interaction, nor how the statistical effects might build up.

In short, although the market does generate some information about reality, that information is somewhat limited and lacking in any penetrating insights as to what is really going on — and hence it lacks the flexibility and insight-provision that a proper model might offer.

Could it be then, that the market just measures its own activity, for its own practical short-term needs — but with no serious aim of capturing the overall causal picture of reality?

[3]. *Can we measure elusive mental-properties like “Utility”?*

Consider this: Native peoples have their lands seized by an ancient conquistador like Cortez, or by a modern timber company. Who then assesses the gains and losses of “utility” on each side — and on what basis? — And how should the nett total utility be calculated?

Likewise what of the utility totals when jobs vanish, and how does one count feelings of injustice? Or how much does it take to motivate revenge?

The first problem here is that “utility” itself seems to be an oversimplified concept — implying a single monetary value that each person could put on (say) their share of the seized land. This implies some unanalyzed commensurabilities: between persons, between present-and-future, and of hard-commerce versus personal-identity.

We might perhaps find a way to solve all this, with the help of structured psychological knowledge (such as that aimed at in our earlier discussion); but then the problem of traditional measurement would probably seem even more elusive.

But even without these complications, the practical economist has traditionally just given up, assumed that the market forces will sort it all out (measuring *and* taking-part at the same time) — and that any remaining anomalies can be left to the politicians or charities to deal with, or at least give some appearance of doing so.

In fact it probably *is* impossible to usefully measure such *subjective* properties as utility via traditional *supposedly-objective* experimental means. However, in view of the likely importance of such variables, we should maybe try a different tack. Here we might note that the judging of Art-competitions, and Olympic diving both rely on subjective

judgements, at least to some extent¹¹ — so why not “utility” (or whatever other key hidden variables we deem important)?

But we have a social problem here. Many will hold that it is “unscientific” to use subjective assessments in our model-building. Indeed their objection is sometimes worthy of support, e.g. if one’s basic theory (like Freud’s) lacks any plausible-and-stable internal structure. (That is why I have instead emphasized the well-structured psych-concepts of J.Piaget and W.R.Ashby).

A second defence of such partial-subjectivity is that there appears to be *no alternative* — apart from the current tactic of opting out altogether, and pretending that utility-and-suchlike need not explicitly concern us.

A third defence is to respectfully point out that this involves a finer point of “scientific method” and that such matters are not actually within the expertise of Science-as-Such, but rather a question of Epistemology (or *Meta-science*).¹¹ True, scientists then use rules which are supposed (i) to have come from reputable sources, (ii) to be correctly applied, according to the original rationale, and (iii) to have kept up-to-date with later developments within epistemology. Thus any cries of “unscientific” should be checked against this list.

Anyhow, the conclusion here is that we really do need to take important psychological hidden variables into account in our models *even if we cannot measure them in a traditionally-acceptable manner*.

¹¹ In fact (as already pointed out on page 7), there is a strong epistemological case for claiming that all so-called *objective measurements-and-observations* will always actually depend on (usually unrecognized) fallible heuristics — qualitatively similar to the spurned subjective judgements! Hence objectivity’s claim to superiority is somewhat spurious — having some element of truth, but only as a matter of degree. (Thagard, 1992; Traill, 2005c)

2.4 What if the economic equations also become messy — mathematically?

A. *One precedent where the maths became constructively complex, without being “messy”.*

Maxwell (1860, 1868) had spectacular success in applying statistics to the motion of molecules in gases, thereby giving accurate quantitative explanations for the gas laws. — So could we find some lessons there?

Note that he even allowed for *quite different types of individual-molecule* — starting with the assumption that they were perfect homogeneous spheres, and then introducing new realistic complications of heterogeneity and more-awkward shapes. (Here at least, there could be a lesson for economic-modellers who often treat all individual people as if they were all the same!)

I am not in the least suggesting that we should blindly imitate his actual mathematics, but we might nevertheless profit from his general approach of: • seeing what can be reasonably summarized about the individual units (whatever they are) *plus the interactions between them*; and then • trying to find some way of modelling the whole dynamic system.

In his case, although the mathematical equations were formidable, there was nevertheless a neatness about his solutions because (i) the irregularities were still regular from a statistical point of view! (ii) all contact-interactions were short-range in 3D space, and (iii) huge sample-sizes were involved, thus making the statistical predictions highly accurate. In that sense then, his results were far from being “messy”, despite the complexity involved — so that neat algorithmic formulae were entirely suitable.

B. *Some realities about the society which economists seek to model.*

Real people come in *many more* varieties than the few Maxwellian shapes, even if we can usefully sort them into stages or categories, guided by Maslow or Piaget — Also they will *often change* within the relevant time-period.

Moreover, *their interconnections will be much more elaborate* — especially with the sudden changes in telecommunication which have drastically transcended mere 3D contact.

Hence it is questionable whether a Maxwell-type model is even remotely feasible here, in any *practical* sense.¹² The

¹² Moreover there is the philosophical question of whether such *reductionism* has any legitimacy anywhere! — We shall not go into that here, but see the Monograph No.7 in the present series, (postponed, but its link will be www.ondwelle.com/OSM07.pdf when it is eventually released).

alternative is the equivalent of those pre-maxwellian gas laws — enunciated empirically, and practically useful, but lacking any clear explanation.

In effect, that empiricism is what we mainly have now in those Keynes/Stein-type equations¹³ — and clearly they have their uses up to a point. One practical trouble is that such rules-of-thumb tend to break down when times change, and new unformulated factors enter the picture. And of course there are also those problems of inequity due to ignoring the differences between people and other unmanageable complications.

C. *The challenge of reconciling between these empirical-versus-explanatory approaches.*

I am not seeking to actually solve this problem here, but it is perhaps timely to spell out the difficulties which first need to be resolved — and resolved sooner, rather than later!

This then is our “CHALLENGE-2” — How can we best model socio-economic reality, given the conflicting claims of empirical formulations and any deep-theory we happen to master? I will merely offer some pointers here:

- (i) This should really be a whole-world model, with a minimum of “externalities”

Present models are usually focussed on some local organization — usually a national government. These local economies are seen as ultimately competing against all others, and with little friendly-control over what actions those others might take within the general market — so those actions are treated as “externalities” which must simply be endured as outside our control, along with earthquakes and solar-flares.

Such competition is acknowledged as driving *growth*, and that has often been regarded as a good thing (perhaps rationalizing the supposedly inevitable); but as we shall see, the time has come to question this inevitability and supposed merit. Indeed it should be clear that infinite growth is mathematically impossible in any real world.

Complexity-in-modelling is thus guaranteed, and that probably calls for all feasible modelling tools — working in collaboration if that is possible. But then...

- (ii) The human mind is quite good at coping with complexity — within limits

Various works on this website have discussed how the mind/brain seems to tackle such problems, using a mixture of strategies which vary from the deep unconscious to highly abstract mathematics — and using both a search for concept self-consistency (internal coherence) and a

¹³ though there is also a small component of simplified psychological insight, at a “common-sense” level.

consistency with reality outside the mind/brain (external coherence).

That is a study in *epistemology* (how knowledge is acquired and handled), and note that Piaget regarded himself primarily as an epistemologist. It is also significant to note a formal similarity between such epistemological processes and some Darwinian/DNA-evolutionary processes¹⁴. Here we see the use of heuristic trial-and-error processes (rather than the supposedly more respectable algorithms of theorists like Maxwell) — but in truth, our human power comes from *our ability to mix both techniques*.¹⁵

However, one serious problem arises when our complex system becomes too big, and it is no longer possible for single minds (*or* committees!) to comprehend all the complexities. It is then that we have to fall back on such things as computers, and then *hope* that they have the hierarchical wisdom that Piaget and Ashby attribute to humans!¹⁶ Anyhow, such talk of big systems leads us into the next point:

(iii) It seems that Science and other communities have separate minds of their own!

As we have just seen⁽¹⁴⁾, there is a strong case for seeing society as a knowledge-gathering machine in its own right — intelligent maybe sometimes, though not conscious — and manifest in such things as “mob rule”! This goes against our usual assumption that, if society contains people with intelligence and good ideas, then these qualities will automatically be part of the social repertoire. Of course that sort of transfer does take place, but not as readily as we might hope — as many inventors and scientists (like

Galileo)¹⁷ have found to their cost, and as a cost to society itself.

The problem seems to be that society-as-such seldom has a well designed meta-theory hierarchy (Ashby, 1952) which might enable it to efficiently introspect on what its knowledge-processes are doing. That then deprives it of that special advantage that individual humans have acquired — and effectively leaves it with a reptilian brain, despite the frustrated insights from some of its human members!

If we happen to agree on this account, it does at least offer • a new insight into social forces, which might help us to manage them effectively, and • the basis for a recipe *to improve the thinking-power* of society-as-such — in the form of its governments, and companies, etc. (and their socio-economic models).

(iv) “One world or none” — the need for cooperation

This is hardly a new topic, so there is hopefully no need to say much here. We may however consider just two points of a mathematical nature:

Firstly, as long as there is any interaction at all between various parts of the world-community, then any grand system of equations which purports to represent reality, will be in danger of being seriously inaccurate if it omits the equations for any significant sub-community — unless we can make out a good argument to the contrary.

Secondly, competition is engendered when there is no mechanism to encourage cooperation, and we have seen that competition drives physical growth.¹⁸ That may have been fine for ensuring employment in the past, but its value is ambivalent at best — and it is positively dangerous if left unregulated in the long run. Hence there is here a strong case for the aforementioned “mechanism to encourage cooperation” — preferably on a world-wide scale, and across such chasms as class-or-ethnic-divides whenever possible. Of course that is another of those tall orders, but that should not stop us from aiming at it.

¹⁴ The epistemological process — building up knowledge from scratch — is no mean feat, and there is a good case for believing that there is only one basic strategy for getting the process going (even if other refinements are added later). That single strategy is *Trial-and-Error*, often employing huge numbers of “trials”.

•Darwinian evolution is the best-studied example (tacitly building up species-based DNA-knowledge of how to grow and survive in the real world), but •the immune-system is another such example; — and, according to Piaget/Ashby theories, •the mind/brain is yet another. — (Traill, 1999, Ch.4).

The following subsection considers a fourth example involving •whole communities, as distinct from their individual human members.

¹⁵ And note that both the algorithmic and the heuristic approaches depend on combined observational and self-consistency criteria, (*i.e.* both external *and* internal coherence).

¹⁶ Simplified versions (based on the complex model) are also need so that we mere humans can have some understanding of what is going on. That is particularly important for gaining and keeping public trust.

¹⁷ In this context, individual scientists are (to a disturbing extent), merely “random trials” within the social free-for-all, with little account taken of the logic of their ideas (which “society” cannot digest!); and only a crude evaluation through Trial-and-Error administered in a haphazard way — at least in the short-term.

¹⁸ which is itself ultimately destructive. But note that competition often also *discourages knowledge-growth* (through “spoiling litigation” over patents etc.), and that can be destructive in a different way: *preventing* growth in *non-physical* knowledge asset.

(This also then offers an example of those bewildering effects of complexity, because “good” new knowledge often presents as *a threat to existing sunk-cost* — and many will see that as bad rather than the good which we might naively assume).

(v) Respect for individuals within society

Individuals are sentient beings, embodiments of joy-and pain. *Societies are not*. — “Nations-as-such” feel no pain; and Corporations feel no joy, even though the law grants them the legal fiction of “person status”.

That obviously puts Society-as-such in a paradoxical position: On the one hand it seemingly needs to look after its own Darwinian survival (perhaps in a perceived life-and-death struggle with other societies); but on the other hand, Society’s ultimate justification must surely be the survival and welfare of its sentient members — a dilemma which *does not arise for other less complex ensembles* such as

- the unconscious slave-cells within our own bodies, — or
- the probably-unconscious slave-ants in their colony.

Why then is this regard for sentient-individuals often overlooked? Clearly that is largely a psychological matter which calls for more extensive and systematic attention¹⁹ (even though the topic has already received much attention). Nevertheless a greater effort still seems needed — e.g. in putting the sagacity of novel-writers into terms which economists can work with. In fact, perhaps we should identify this as “CHALLENGE-3”.

3. Two growth-related obstacles to a truly rational economic system

3.1 Revised-and-wider Definition

We might now *re-define*²⁰ **economic rationalists** more generally as those economists who manage to ignore *any tricky factor* which they cannot cope with; and just proceed “logically” as if it did not exist.

We have just discussed their aversion to:

(a) Psychology — as above

But now we note their trust that **ECONOMIC GROWTH** will cure most problems — and their confidence is seductive. However, this ignores two better-known serious pitfalls, and worse still, makes it difficult for others to identify the trouble:

(b) Green issues — sustainability

It is obvious that material growth cannot go on forever, and especially not at an increasing rate. Breakdown must occur sooner — or x years later — “*though hopefully by then it will be someone else’s problem!*” — or even, alas: — “*The Biblical end-of-the-world will happen before then, so why worry?*”!

Moreover, if we look round the world, there are numerous examples of communities where growth has *already* hit a brick wall. (Darfur, for instance, where the genocide is reputedly driven by economic desperation).

But, to make matters worse, there are other perturbing forces which seem to drive the opposing policy of increased growth at all costs: —

(c) Dwindling markets and job-prospects

This is an old problem, but it is much more difficult to comprehend properly. The key issue is this: No matter how inventive some of us may be in devising new “widgets” for sale, a growing production will eventually exceed what other people want (or can afford) — so sales will drop — people (somewhere) will lose jobs — then *they* will buy less — and so on.

We are led to believe that the cure lies in some version of the Keynes-like equations; and if one formulation does not work, then we should try another. Indeed they can sometimes be made to work; but this effectiveness seems to be either *temporary*, or *local* — typically shifting the problem to another country or era.

¹⁹ For instance we could discuss: [1] Excess self-promotion by some participants (who unfairly co-opt society’s facilities for their own ends — sometimes because they have little choice); and [2] Lack of whatever-it-takes to get society to work together towards benign ends — • inadequate social know-how or balance, • attitude-patterns, • communication, or whatever. This might include the situation of any well-meaning dictators who dare not make concessions for fear that chaos will ensue:

“*He who rides the tiger, cannot dismount!*”

²⁰ Cf. footnote 4, regarding the earlier provisional definition, p.4).

Moreover consider *fig.(ii)*'s equation ⑤ — which is supposed to relate the employment level N , with the level of economic activity Y . — (*Sec. 2.1, page 4; and the N-Y sketch-graph within Table B, page 26*).

The graph of this equation is, as we speak, already becoming increasingly flat as technology develops (thus displacing humans — e.g. DVDs displacing cinema-workers and live performers).

In the extreme then, the machines would do all the work, and *all the humans* would be unemployed and unable to buy the gifts of this “progress”! — What use the Keynes-like equations then?²¹

3.2 Ambivalence about Waste

Waste is a time-honoured method of relieving unemployment! Planned obsolescence obviously makes for more work. War certainly banished the unemployment of the 1930s. **Competition** too can be very destructive (both physically and mentally), so we might think twice about its ambivalent virtues — wastefully creating jobs.

Innovation too can be a mixed blessing, as we saw earlier.^{18 (paragraph 2)} New inventions often mean dumping the earlier “sunk cost” investment in the pre-existing technology. Clearly that does not suit everybody, but it does have its uses even if we look only at the wastage it causes (provided that this increases nett employment)!

Paradoxically, Schneider (1998) reports the view that one main goal of economic rationalism is “**efficient** resource allocation”.

Probably the answer to this paradox is that

- (i) efficiency is sought within *my* group, “so that I can win the battle against you”; and
- (ii) “I mean ‘efficient for *my purposes*’, and to hell with efficiency for the world-as-a-whole”

In short, the tacit policy could be: “Waste is vital, but let someone else bear the pain”. — So we might ask: “Is this usually the *real hidden agenda*, whereas the traditional pseudo-logical arguments are mainly rationalizations to disguise a perceived unpleasant necessity?”

²¹ Without going into the actual detail, let us return to the question of equation-compatibility raised earlier² (p.4). If we look at how the equations are connected (p.4) and the typical graphs for those equations (p.26), we can easily see *in principle*, that a general solution will probably depend on the graphs having *the right range of shapes*. If they drift out of shape (as seems quite likely), then whatever formula worked before, may well now fail us.

That is how the “Keynesian solution” eventually came to grief — and there is no guarantee for future solutions unless perhaps we can actively re-shape any offending graphs.

In the immediate case raised in the above text, the $N=f(Y)$ graph degenerates to a horizontal straight line — so $N=0$ (zero employment) for all values of Y — clearly an untenable state!

3.3 A Better Solution? — an outline in general terms

Bertrand Russell (1932) advocated a *four-hour working-day* whilst maintaining a satisfactory wage-level. That now seems to be worth taking seriously in the light of the above discussion.

Indeed in about 2001, the French government took some modest steps in that direction. But one serious obstacle is-and-was how to cope with the claim that “*if I hold back, then my rivals will drive me out of business*”; and that unfortunately applies to countries too.

Evidently this would ultimately have to be tackled on a world-wide basis — free from any bully-powers; and that would surely need all the skills that psychologist can offer! — clinical and all!

Anyhow we surely need to find some cure against:

- (1) Our collective insatiable desire to produce too much! and
- (2) Our outdated habit of tying incomes to the dwindling number of jobs worldwide within this destructive endeavour!

4. The practical politics of real solutions

4.1 Slogans, beliefs and motives as extra “equations”, or as equation-shapers

In the real human world, destinies will often depend on belief and thoughts, nomatter how irrational-or-biased these may sometimes be. That is something which advertisers presumably know very well already, and maybe we should learn from them if they will let us. In any case, we should recognize that such influences should be captured within our models-of-society if they truly purport to represent reality — and hence they could perhaps claim a status roughly equivalent to our other equations.

Thus we should at least be well aware of:

- Primitive “logic” such as “guilt by association”,
- Rhetoric and “spin”,
- Hidden motives and their rationalization (and other Freudian defence-mechanisms),
- The role of psychopathic leaders,
- The role of “infallible” know-allers such as fundamentalists,
- The role of fear, sex, and ambition; etc.

It may not be clear just how we might turn such awareness into equations, but it would obviously be convenient if we could.

Failing that, we would be wise to find some effective alternative, such as ensuring helpful training (and a non-panic environment!) for politicians and/or administrators who ultimately have to interpret the second-rate models. *Sometimes we may already have that now perhaps; — but then, sometimes we don't!* Either way, it *might* help to make such processes explicit, though that does not always work as intended within such human administrations.

Then (as discussed above), let us not forget the possible need to *reshape* the existing real-life graphs so that they will collectively yield suitable outcomes. *If* that can be done, it will doubtless entail suitable education procedures — and such activity might itself also need to be factored into the model, as new extras!

4.2 Ambiguity of destinies — personal versus social

It is all too easy to speak of “The Good of the Economy”, as if that were all that mattered,²² and that any linked benefit

²² Marxists will usually claim that the term “The Good of the Economy” is just a misleading code for “The Good of the Ruling

to individuals were either “obviously guaranteed”, or else of no account. Of course neither assumption is fully correct, though there is some element of truth there — given that any macro-breakdown is likely to be painful all round. Let us say then that we need some formula for *adequately* benefitting *all individuals* (as well as the *whole-system*), insofar as that is possible; — and given that this slogan is contentious, especially regarding the italicized terms.

It is not clear what formula should be used here, nor how it should be updated when (inevitably) it is found wanting during actual use. Some guiding principles might not go amiss here, and the following come to mind: • Some semblance of equity within and between nations (whereas failure here is ultimately likely to lead to, or maintain, violence). • This pseudo-equity need not be equity in the financial sense, but should follow psychological factors (as in Maslow’s need-scale⁶). • As there will almost certainly not be enough orthodox jobs to go round worldwide, especially given the red (market-saturation) and green (resources) constraints mentioned above, we may need to radically reorganize income-mechanisms and procedures, including internationally. • We should recognize the non-financial aspects of a job — bestowing a measure of self-respect and companionship in many cases.

To such ends, there may be some benefit in occasional theoretical developments in psychology or elsewhere, such as: • The above Piaget-based attempts to explain-and-understand some human foibles; and • The concept that Society-as-Such (including Science and “The Economy”) might be best thought of as a largely autonomous “knowing-entity”, more-or-less separate from the individual minds found within its members; (Traill, 1999, Ch.4).

Class (&/or nation)”. This is not the place to judge whether (for any particular case) this is true, false, or somewhere in-between. We might perhaps say evasively that it is “*T%*” true. Yet the real point is, that nomatter how noble the support for the Whole-Economy-or-System might be, some support is also due to its individual members, in some supposedly-equitable manner. Thus the maximization sought from the model should reflect that aim. The question of course is “How?”.

5. The practicalities of “least-bad” general socioeconomic solutions

It should be obvious that it is quite impossible to ever get a *perfect* general model of society.²³ Clearly we must always make do with something less satisfying; but that should not stop us from always seeking to improve — seeking to form general-model-systems which are *less bad*.

What we have now is a disorganized array of competing models (mathematical *and/or* descriptive), dealing with disparate aspects of salient social problems, whilst overlooking other problems altogether; — and some of these “models” are no more than pseudo-psychological folklore. As such these myths can have their use. After all, planners (if they exist at all) do need *some* view about the society they are dealing with: Sometimes, *even bizarre misinformation* can lead to tolerable practical policy, as with any other chancy Darwinian mutation!

However we ought to be able to do better than that — especially as the world is already embarking on new crises.

In his book “*Design for a Brain*” (1956), Ross Ashby showed that the way to improve on this sort of trial-and-error strategy is to add a coordinating *meta-level* of organization — and this new level can at least systematize the trial-and-error, even if it is also initially operating on trial-and-error itself. Moreover this adding of meta-levels can (in principle) go on indefinitely, thereby increasing the ability of the brainlike system to think abstractly and “logically”, and hence deal with increasingly difficult problems.

This approach may offer a tool for coordinating and improving existing *models and their equations*, and for adding some of the missing aspects.²⁴ In short, if there really is **no meta-level monitoring** (by informed personal intervention if need be) then the “planning system” is operating at the level of reptilian intelligence or worse — and hence outrageously stupid decisions are to be expected! (Does that sound familiar?)

Anyhow let us now look at some of the practicalities of coordinating-and-improving existing detached “models”:

²³ If there is any doubt, it might be helpful to see my list of six totally-insuperable barriers, *all of which would need to be overcome* if such a model were to be viable. (Traill, 2000, p.13).

²⁴ More controversially (and perhaps less relevant here), Ashby’s approach might help to coordinate *political entities and bureaucracies*, though of course there we have to consider the complexities of ego-involvement and personal empire building! Perhaps the attempts by the late Stafford Beer (*e.g.* 1972) to implement such Ashby-based ideas in corporate-and-government organization might be some guide. His *quantitative* comments on the limits of political power may also be of some interest. (1974).²⁵

5.1 Missing “bridge-spans” in any general theory?

Let us think of all the different “models of society” which are used by the movers-and-shakers of this world. There will be vague *mythologies about human nature*. There will be formal *economic models* of varying accuracy, run by many different governments, companies, and other agencies. And there will be many related *political* perceptions-or-models; etc.

Picture these different models as a multitude of islands. Ideally we might like to think of these islands as all becoming united into one harmonious whole — but of course life is not quite like that,²⁵ so we need to be on the lookout for workable compromises. As far as one can tell at this stage, probably the best solution would be some sort of network akin to the internet, with no central dominance, but with ample scope for **meta-level** provisions — tactful and diplomatic *guidance towards true-relevance and cooperation*, all sponsored by the network itself. In terms of our metaphor, we can picture these links as multiple “bridges” between all the islands.

Such bridgework-attempts (like the United Nations) are not new of course, but their record leaves much to be desired. Why? Some obvious reasons are • Imbalance of power; • Non-understanding of those at different Maslow-levels;⁶ • Not understanding that such things matter; • Personal ego (and the fear of “losing face”, especially in situations where the protocol is unfamiliar); • National ego; • “Reptilian intelligence” of one’s Society-as-such — (especially if many *members* of that society are not helpfully educated); • Pre-occupation with existing crises. • Etc. ...

At this stage, the only remedy offered here is that such issues should be made explicit (and perhaps elaborated upon); and laid out for public discussion. But meanwhile such bridge-building may be held up as an eventual goal.

5.2 Making do with “ferries” in the meantime

The above “bridges” metaphor tends to assume both • reasonable communication skills-and-facilities, *and* • well-structured (computerized?) models for the various viewpoints. To some extent these two may be inter-

²⁵ This “harmonious whole” dream is, of course, the excuse used by countless empire-builders. (Napoleon, the Roman empire, and Stalin come to mind — not to mention present-day governments who use drastic measures against those who challenge this dream). The trouble is that, *even if the motives are truly benign*: (a) any undemocratic imposition of such a system seriously cuts across the above-mentioned respect for individuals; and (b) It is simply impossible *physically* for a large *centralized* empire to order itself justly and rationally — as Stafford Beer (1974) explains in terms of information-handling capabilities.

changeable, and we would be rash to expect perfection in any case.

In fact such solutions might be a long time coming, and meanwhile time is unfortunately not on our side — so we would be wise to adopt other less-rigorous planning-strategies in the interim.

As it happens, the human brain is quite good at this sort of problem-solving — given the right conditions. E.g. (A) We can sometimes use vague “hermeneutic” discussion to good effect (Traill, 2000, Part I), especially if we do so in an orderly way; and (B) Many a skilled “bricolage” handyman can work wonders much faster than a formula-dependent engineer — though perhaps in a more limited field.

The point is this: It would be nice to have solid bridges between all the islands, but that is not going to happen in the immediate future. — So meanwhile we should summon up whatever resources we actually have, and use them as “ferries” to attempt the same basic task (though with due regard to our extra limitations).

In particular, that will probably mean paying especial care to the non-dictatorial *meta-level guidance* available to all social-regulation modelling systems: Economic, Political, or whatever. The alternative may be the continuation of “Reptile-minded” social institutions, and a good chance of the breakdown in world-order after 53 years of comparative peaceful existence.

6. The Recession Dilemma— Jobs versus Environment?

6.1 Do we have to choose between jobs and environment?

The above text was written before May 2008. How things have changed since then!²⁶ Some of us had been surprised that this sort of collapse did not happen 20 years ago; yet it nevertheless came as a shock when it did actually happen — especially since the delay has been so lengthy.

For a while I found it very difficult to write anything constructive about the new situation. In line with my remarks in Chapter 1, there seemed no way of solving the “red” problem of employment except by significant economic expansion worldwide — and yet the “green” problems all tend to demand the opposite. In short, we seem to have an insoluble set of simultaneous equations so that our system must surely break down catastrophically. Meanwhile most politicians equivocate: vainly trying to placate both sides of the debate.

However if a chaotic breakdown is inevitable anyhow in the near future, we might as well see if we can devise our own mode of breaking the system down *in a controlled way*; thus re-moulding it into some new system which is at least acceptable. That might mean a significant revision to our sets of equations and assumptions; but then, so be it — even if that does seem inconvenient or embarrassing.

Keynes himself was obviously happy to change equations-and-assumptions to match shifts in perceived reality.²⁷ He evidently realized that his 1936 “solution” was only a pseudo-solution in that it did depend on growth — which was fine for that moment, though it could never be a permanent answer. Seen that way, it looks as though this expansion had just been a mere “quick fix” with only temporary value.

But actually (at least until very recently), growth was also very important for another reason, as follows: In a dog-eat-dog free-market, if one’s country-or-company does not grow in certain ways, then it is likely to lose its business to its competitors and ultimately perish in a **Darwinian extinction** — a case of unstable equilibrium.

²⁶ This present economic emergency first became obvious with a series of bank-failures in the USA, reaching a local crisis over the weekend of 13-14 September 2008 — and since spread throughout the world, with no end in sight.
[RRT, here writing November/December 2008]

²⁷ Thus he introduced the concept of *m.p.c.* (the marginal propensity to consume), and instituted the vital distinction between M_1 and M_2 — two psychologically-different allocated uses for the total money supply (M).

If you *want* growth, then that unbridled competition is fine. But if we now need to *halt* growth, we should apparently arrange for *cooperation* instead — even at the risk of costing jobs. However, in our hoping for the best, we might ask • *Would that cooperation* really always cost jobs? — And even if it did: • *Couldn't we then invent new jobs or pseudo-jobs as a replacement?* — After all, • *why exactly* do various citizens need jobs, and is there any adequate substitute? Let us look at these questions in reverse order:

6.2 (♣). X asks: “Why do I do this job?”

Some likely answers are: (i) to provide my family with essentials; (ii) to provide my family with “extras” and minor luxuries — both usually via money-wages²⁸ unless on small farms. Then: (iii) to give me a sense of social-belonging, and the chance for agreeable companionship; (iv) the chance of attaining-or-holding a position of esteem within that community; and (v) to make financial provision for future ill-health and retirement. — These all seem to be legitimate and important justifications for traditional employment.

There are also *less legitimate* reasons, like: (vi) to exercise one's megalomania or other sociopathic tendencies; or even the supposedly “obvious” reason of (vii) “usefully” producing or marketing *object Y* or *service Z*. After all, sometimes society does not have any real need for *Y* or *Z*, and would-or-should prefer to see the input-resources left unused.²⁹ — So if these ventures are really just “job machines” to keep entrepreneurs and their workers within the “employed” category, we might be better off simply paying them to stay home, or to fulfill those reasons (i)-(v) in some other way which does *not* entail traditional production! — Which brings us to:

6.3 (♠). Are there suitable alternatives to employment?

It is often instructive to look at extreme examples to clarify a point of discussion, so let us go back to that hypothetical case³⁰ where machines do all the work, so there are no jobs left for anyone, and yet all desired goods-and-services are readily available; — available, that is, *IF* we can decide who is now allowed to use them!

²⁸ In the memorable “Harvester judgement” of 1907, in the Australian Commonwealth Court of Conciliation and Arbitration, *Justice Higgins* laid down a formula for a basic level of just wages which could support workers in “**frugal comfort**” — a concept which we will find useful in what follows.³³

²⁹ Bulk supplies of bottled water (within areas where the tap-water is just as good) is one obvious example. Even sillier was the suggestion (in a marketing-course exercise I once attended) for tinned drinks for dogs — though I did later see the brief appearance of such a product!, presumably dreamed up elsewhere!).

³⁰ See page 12, at the end of section 3.1 [??]

We currently have a social convention that people who have a certain social construct called “*money*,” can use some of it in exchange for those available goods-and-services. Now supposing this “*money*” can only be obtained through having a job, and given that there are no longer any jobs to be had (thanks to the beneficent machines); then no-one can acquire any of the beneficence and it simply sits there unused! — an extreme example of a depression-and-starvation, and yet situated in the midst of plenty!

Clearly that is madness, and yet that is the stand-still *widespread depression* situation which the “red problem” tends towards whenever there is a failure to sell that *overproduction* which is needed to *artificially employ us all* (after our natural unstimulated needs have been more-or-less met).³¹

Once that failure is triggered, many people lose their jobs, so then they can't even afford the services that the *do* still want — and of course that makes the situation much worse, (especially if the effect has an “escalating” exponential-growth typical of positive feedback). The end result can then resemble the imaginary extreme case of total depression detailed above, — *unless* governments intervene appropriately:—

In seeking an immediate cure, it helps to distinguish the two causes-of-the-crash implied above. (i) The immediate cause is **the snap loss of confidence in the consumerist bubble**. That is not surprising in retrospect because, as we have seen, that “confidence” was mostly built on an artificial house-of-cards anyhow. And because of that artificiality, it is not

³¹ Properly managed, there is no such worry about overproduction while society is recovering from a major disaster such as World War II (which then entailed a genuine-need boom for about 20 years). After that, the public customers have to be conned into buying services of doubtful relevance to their real needs — and while that conning continues to work, there is apparent stability within the economy until one day the illusion falls away and “the emperor is seen to be naked.”

This probably explains the extraordinarily **high salaries** paid to chief executive of companies in recent decades. They had the *tacit task* of trying to maintain the illusion for as long as possible; though now that the bubble has burst, that huge-salary arrangement might well change. Meanwhile advertising-and-marketing staff have also been quite highly paid, and for similar reasons. Much of the blame for the recent collapse has been levelled at financial institutions who were rash enough to grant many loans to “subprime borrowers” thus incurring increasingly greater risks of default. While it is easy in retrospect to say how foolish this was, we might reflect that they were actually fulfilling the key apparent-need — facilitating the extension of the consumerist illusion in a desperate attempt to keep it going — though most of them would probably not have been explicitly aware of that role in such terms. Hearsay has it that many actual operators were not so much “greedy” as *fearful of losing their jobs* if they failed to generate prolific loans in support of consumerist ventures.

easily re-built once that trust is shattered. Of course not everyone will see the situation in the same way, but it would still be virtually impossible to get back to pre-crash conditions — even assuming that we would want to, and I hope we would not! (Indeed I have suggested that, for resource-depletion-reasons, we should actually try strenuously to avoid such fragile and destructive Consumerism-for-its-own-sake).

So, if we can't-and-shouldn't restore such consumerist props to employment, that puts all the strain on the background cause — the shortage of *available paid-jobs* which are *genuinely useful*; — (a shortage which was hidden by the often frivolously unhelpful consumerist-based-jobs which evolved within the Darwinian struggle of the free market).

So let us look at this more fundamental case:

(ii) **The shortage of useful paid-jobs** which are not already done better by machine — *and* which are not seriously dependent on servicing those consumerist “(i)-type” businesses.

In a depression, government planners can-and-do partially cure this shortage by effectively re-employing the jobless. Such new jobs can be in the direct form of working for that government via new public projects such as painting murals artistically, building roads, or personal services. — Or the government may commission outside companies (probably in trouble themselves) to do the employing. Such “New Deal” measures should be effective, as long as their scale and duration is of the right magnitude.

But here it is instructive to look again at that imaginary “*machines now do all the work*” scenario where there are no jobs at all, and people are starving. In such circumstances, a wise government could well decide to create jobs in a similar way until everyone had a paid job painting artistically, or doing philosophy or pure science³², raising children, or whatever — artificial no doubt, but hopefully more useful than making arbitrarily-destructive consumerist items.

³² Recent university courses have recently laid great emphasis on “vocational” courses such as Law, Finance, and Business-studies — obviously aimed at good salaries for the individuals, and *GROWTH for society!* Could we dare to suggest that this was actually a big mistake? Shouldn't we now return to such “useless” frivolities as ancient philosophy and languages, or *physics problems with no obvious application* — and **pay researchers in such off-beat areas as long as they are doing responsible work?**

That all makes sense if our prime objective is to create jobs which do not just further unwanted growth. And who knows? We might occasionally gain some surprisingly helpful results as a byproduct. (Faraday was allegedly once asked about his electrical work: “*So, what use is it?*”, to which he is said to have replied: “*Madam, what use is a baby?*”)

Alternatively that government might simply give everyone a pension,³³ and leave them to decide what voluntary work they might feel like doing — if only for the fun of it. And that could be rather similar to living in an abundant paradise where the beneficent robot-slaves supply all tedious needs, and treat everyone like a lord. Or indeed we could think of other variations on a similar theme.

Now I realize that such scenarios are beginning to look like some unrealistic Socialist utopia, (though if such arrangements could *really* be achieved then maybe there would be no huge objection to them). However it was not my intention to push such propaganda here — indeed I surprised myself by re-inventing this theoretically possible solution via the logic of the otherwise-bleak situation. The point is simply that, far from despairing at an apparent impasse, there may be an acceptable (or even attractive) alternative, as long as we are prepared to carefully re-scrutinize our basic assumptions.

If there are any better solutions (which properly face up to all the inconvenient facts), the please let us hear about them!

In short, we need not be seeking Utopia as such (though such writings could well be relevant), but rather I hope we can avoid ending up with some ghastly *dystopia* — which seems to be where we could well be heading right now if the history of the 1930s repeats itself, *or* if some pitiless “green” constraint catches up with us — *or both!*

Now it is clear that many governments are actually issuing handouts on a large scale — and along lines somewhat similar to the above imaginary scenario. Perhaps the main difference is that they all probably see this as a temporary measure, doing a Keynesian correction whilst they try to steer the world-economy back to its previous artificially-growth-oriented course. After all, they do still hold up the

³³ This amounts to a tentative proposal, so it would be helpful to spell it out a bit further. The extreme version is: “*A pension for everyone, as of right (with no taint of disdain or patronage nor work-requirement), and enough to at least cover ‘frugal comfort’²⁸ within whatever community they belong to in the world; — all financed by ‘a tax on the machines doing the output’ (whatever we take that to mean!)*”.

As a better, less extreme version, we might have: “*... and enough to just cover ‘frugal comfort’ (or perhaps ‘subsistence’), but also a limited opportunity to earn more through their other activities, e.g. by merely participating in social events(!), or by doing traditional jobs if these are available AND BENIGN; — ...*”

In any case, excessive private incomes should probably be discouraged unless there is a very good counter-reason. Meanwhile gross production would clearly suffer from such an arrangement, which is what makes it unsuitable when growth is needed. However, right now *we want total-world-growth to stop*. — That is indeed the point of such a policy.

“percent growth-rate” as the ultimate measure of supposed “national success”!

Well, I’m sorry, but that won’t do! *Maybe some* of the “green” limitations can be circumvented, but we simply can’t escape them all indefinitely. Worldwide average growth, or at least its *physical growth* just has to stop. And “right now” does seem the best time to face up to that fact. Moreover, if we do adopt an alternative to profligate consumerism, then our task of growth-reduction should be much simpler — “*killing two birds with the one stone*” as they say.

But before we get too carried away with policies which resemble traditional socialist formulae (see G.B.Shaw, 1929), we should at least consider the practical obstacles to such mutual-help strategies, and what has sometimes made them unpopular:

6.4 (●). Problems of collaboration within a competitive world

As already mentioned on page 16: — in a “dog-eat-dog” free-market, one has to *out-grow* one’s competitors in at least some respects. In contrast, consider those firms or countries which are preoccupied instead with welfare issues, (or which simply see manic growth as stupid): — Alas, such groups will tend to lose their viability due to the predatory behaviour of their aggressive rivals. Hence the Darwinian result is *growth to satisfy short-term needs*, so that meanwhile other important issues are largely neglected.³⁴

That is the normal scenario during **boom times**, when new opportunities are opening up (at least for some people), and when investment is accordingly in demand — as reflected in the rate of interest, since we then have a competitive demand for the investment money.³⁵ At such times then, we can see why socialistic-tending programmes tend to seem unattractive — at least to many — and why business pressure-groups sometimes issue vehement propaganda against them.

During any widespread **depression** however, priorities will obviously be different — and especially so if governments are then adopting Keynesian policies of big-spending on any vaguely suitable project (even including welfare, and the psychologically important build-up of “social capital”).

³⁴ These are matters like: welfare, “green”, and long-term future — even though such considerations do, sometimes at least, get mentioned in the “triple bottom line” of progressive modern accountants.

³⁵ Compare this to the middle ages, when there was no significant pressure toward growth as such (though the nobles were quite happy to fight over *fixed-quantity assets* like land etc.). In those circumstances, it was considered evil to charge interest for loans — so we might ponder the present trend for interest-rates to fall to zero, especially in Japan and the USA.

IF, within that environment, we could maintain enough of the right sorts of productive capacity, we could then end up with a stable congenial system which gives proper attention to social and personal wellbeing. (That might not be a socialist utopia, but it would perhaps be a significant move toward such exemplary social ideals).

Of course, if boom times were to return, then such cosy arrangements might tend to break down again; (and we could worry about that later if-and-when it actually happens!) Meanwhile we have already seen that such booms are likely to aggravate those “green” issues which are the other half of the current crisis — so we should be trying to prevent those booms. — And if we can do that by simultaneously steering the “red” problem of employment into social-capital and “green-collar” projects,³⁶ then that would be a double advantage.

6.5 Past mistakes of the Left

On the whole, socialist-inclined programmes have been disappointing in their actual past performances. Despite their good intentions, such governments have tended to be too similar to the consumerists which were their supposed rivals — and/or they simply did not stay long in office (sometimes because their highly-motivated opponents deliberately sabotaged them).

So why were their opponents highly motivated? We can talk loosely about “greed” and suchlike; but in the light of the above discussion, there is a more coherent explanation:

Take the British Labor Party under Clement Atlee, which came to power in the aura of communal-feeling after WW2 — much to the surprise and disappointment of Winston Churchill, the wartime prime-minister. But the ultimate hidden problem for Atlee was that *postwar reconstruction* (once it gets going) obviously offers *ample scope for growth, and hence ample employment* — which all tends to render much of the socialist-orientated agendas superfluous and even tiresome within the new-found prosperity. (That induced a later rival, Harold Macmillan, to famously assert that “You’ve never had it so good” — as if that was all his doing.)

Of course similar things happened in the USA (which had virtually *no local war damage*, and so could quickly join the reconstruction going on elsewhere).

Things had been a bit more complex (due to bad policy mistakes) during 1918-1929 postwar period, after WW1 and its consequent flu pandemic. However there we can trace a similar trend of some weakly-socialist-leaning regimes until

³⁶ “green-collar” and “bioneer” are terms recently introduced for the idea of creating jobs explicitly aimed at solving the “green” problem in one way or another. Clearly *IF enough such jobs could be created and maintained*, that could solve our present “red-green” dilemma; but I am not yet aware of any such quantitative evaluation.

the markets became saturated, producing the great depression of the 1930s. That probably *could have* been a good opportunity *then* to introduce orderly welfare-oriented strategies, and Keynes did try — but ultimately it was too little, too late, *and too localized*; so WW2 was the final result. Let us be warned!

In short, the best time for social-welfare programmes is at the start of a threatened widespread depression, and *not* after some cataclysmic event like a world war, when our emotions might mislead³⁷ us into such a course. Such postwar periods are instead the time when free-market forces may well offer the best policy — that is, until the market reaches *natural* saturation. But if we allow the market free-reign after that, then we will be marketing into an ephemeral artificial consumerist world — a basically unstable house-of-cards which may seduce us into further card building, but risks falling into a heap at any instant.³⁸

6.6 For a welfare agenda, do we need world agreement first?

As already mentioned in section 3.3 on page 12, there is a problem in unilateral government initiatives toward social

³⁷ It is easy to be misled here, because after any war there will clearly be veterans and victims who do need welfare support. However, once society has reorganized to a peacetime footing, the general public is best left to its own growth-enterprises — until the time when natural re-growth has been completed.

³⁸ As a perhaps-superfluous further example, let us consider the late Soviet Union and its problems. As it happened, its timing was impeccably bad, and repeatedly so! At its inception (aided by the Germans smuggling Lenin into Russia, to sabotage its war effort), its aim was to implement a welfare programme. However we have just seen that the end of a major war is not an optimal time for that, and it might have been better (if anyone could have controlled the situation) to allow post-war development to take place first, and *then* step in with government sponsored programmes as soon as *natural* growth was accomplished (and before any artificial consumerist-boom could develop).

As it was, the “welfare” programme could only be sustained by repression — and this continuous repression *then* stopped them from properly benefitting from the postwar boom of the 1950s and 60s.

Eventually Gorbachev engineered the end of that policy, and sought to join the world of market-growth in about 1989. But by then, the West was already deep into the artificial-growth stage, so the Soviet Union (and then Russia-under-Yeltsin, plus other component nations) fell into disarray once more.

In contrast we may look at China. Mao’s leadership was such a disaster in many ways, that we can compare it to a major war, leaving ample scope for re-development after it had finished! Judging by the actions of the Chinese leadership since then, we might suspect that Beijing may have come to some of the above economic analysis some time ago, and learned from Russia’s mistakes (as well as Mao’s). However it is a pity that they are still weak on the *psychology* of their less-powerful citizens.

welfare and wider job-opportunities (like the French attempt to limit working hours). The problem is that other *unregulated* countries will simply step into the breach and steal the vacated business opportunities.

One theoretical solution would be to have some international mechanism to have such innovations applied equally to all economically-significant countries. In boom times this was not really a viable option, given that the United Nations Organization has but tenuous power over its members, and there was little generally-held motivation to make treaties on the matter.

(Cuba serves as an interesting exception.³⁹ Because it has had to endure a USA-inspired boycott, its economy has been largely isolated for about 20 years; — and being isolated, it has nothing further to lose by continuing its welfare measures despite the boom going on elsewhere. Hence Cubans are now keen to point out that they can offer a blueprint for how to cope with non-growth conditions! — And the changed world-situation might even allow them now to relax some of their more unpleasant regulatory machinery as well!)

But do those competition-fears apply during a recession? That probably depends on how much it is generally believed that we will all soon return to “business as usual”. Obviously if that belief is strong, then the competition-fear will persist. (It might also persist during recession-or-depression, though perhaps for other reasons which could be easier to counter.)

On the other hand, the sudden new urgency of applying Keynesian solutions to immediate domestic problems does seem to take great precedence over any fine-adjustment of competitive advantage. In that case, (i) it may be possible for countries to act much more unilaterally in implementing welfare expenditure, as new “social capital,” without worrying too much about what the other nations might be doing. And (ii) it *might* be possible to retain at least some of those advances after the employment-crisis is resolved in one way or another — especially if we can avoid the trap of another illusion-led boom.

In short, international agreement on implementing such welfare measures would be useful — but anyhow, *during non-boom conditions (like the present)* it could be possible-and-laudable for countries to spend their resources building their own “social capital,” without too much concern about lost opportunities in the world market-place.

That does not necessarily mean that the problem is solved, but at least it suggests that we need not despair! Anyhow, with mass-unemployment at one’s doorstep, and a large

³⁹ Islamic countries also offer an interesting contrast, given that they share the age-old doctrine of shunning bank-interest (and that largely implies shunning growth and hence consumerism). Indeed this is probably one factor (perhaps indirect) in their recent hatred of the USA, but I will not digress into that here.

backlog of society-building jobs to be done, *the prescription seems obvious* no-matter what the side-effects might be.

6.7 Pseudo-solutions from the False-prophets

Of course there are many influential people who see such complex situational problems as insoluble (as indeed they probably are if we refuse to look beyond traditional formulations). So, out of ignorance, laziness, or fear of losing some privilege, they set out instead to *grab all they can* from the sinking ship — meanwhile leaving others to drown.

If, for example, we are running out of oil, their concern is to corner the market *for themselves*⁴⁰ (at whatever cost); whereas they would do better to look for alternatives.

Meanwhile they will probably justify their actions via some other supposed-explanation — the well-known Freudian trick of *rationalization*: — i.e. inventing some acceptable plausible reason when the real reason escapes you or is so uncomfortable that you don't want to acknowledge it, perhaps even to your own conscious self! And such duplicity of explanation is especially likely within a collective group having an assortment of spokespeople, with their differing insights.

Then those who mistakenly believe their own propaganda will be totally mystified whenever those left out of the “grab” respond by fighting back, using whatever means are still open to them.

Lastly some just opt-out, using: (i) plain Freudian *denial*; or by asserting that (ii) “*the Lord will provide*”; — or that (iii) “*the world is about to end soon anyhow.*” Meanwhile many of us might well regard all those tactics as dangerously unhelpful.

⁴⁰ For simplicity, this text is written in terms of individual people; but it often also applies to *groups* such as ruling-parties, or some unruly mob which is “*thinking*” *collectively* in a crude imitation of the intelligence of some of the members of the group. Hence the collective group response can easily be somewhat stupid and short-sighted, or blindly selfish in a crude “reptilian” way. And of course some individual members can be just as bad. See my submission to the recent Higher Education Review (Traill, 2008b).

7. Conclusion

7.1 Original pre-crash comments

There is a looming contest within economics: — the RED “irresistible force” of economic growth to prevent unemployment, *versus* the GREEN “immovable object” of limited resources.

If we keep to traditional economic equations and graphs, we will probably remain *unable to solve* the overall problem or its equations. — We could just continue our tinkering with this-or-that aspect, while those who lose out become more-and-more bellicose. — Indeed current grabs for oil are just one symptom of such trends. Political attempts to coordinate the piecemeal measures have not been remarkably successful, and they are not likely to unless they can be supported by systematic-and-comprehensive models of reality. (Nevertheless such tactics may be the best we have, pending further developments).

It may not be beyond human capability to solve this dilemma more effectively, but it is a tall order, and it will probably require:

(a) an improvement in world cooperative-government, *but how?* Within the *individual* (according to Ashby and Piaget) there is a *hierarchical intelligence-strategy for disentangling problems* — a trick of self-analysis — of introspective mental meta-levels whereby “higher” thought can inspect and manipulate “lower levels of thought”. *In principle, that could also be systematically applied within society-as-such; but unfortunately that has not yet happened;* (Traill, 1978, 2008a, 2008b).

(b) A more structured understanding of what those same individuals need-and-want at a psychological level; — preferably an understanding accurate enough for it to be built into the equation-system, perhaps by adding extra dimensions to some of the existing equations. At any rate we need a general plan covering all important ramifications world-wide, and that almost certainly calls for a comprehensive set of equations to express the unavoidable forces of reality.

Maybe the task is beyond us; but in the hope that it is not, it seemed worthwhile to make a preliminary investigation of underlying psychological and epistemological issues.

To be more specific, we have here considered whether psychology-or-epistemology might, in principle, help with the problems of:

- Assessing “utility” (value *as perceived by others*).
- Fixing the poorly understood “psychological factors” within economic models.

Also, as an unforeseen addition:

- Finding some more-humane *philosophy and formula* for sharing employment and income — *and* how to make it workable!

Secondly, to get beyond this mere “in principle” wish-list, it seemed necessary to *sharpen our psychological concepts* so that

(a) non-psychologists would more readily *understand*, and
 (b) our psychology-concepts might be of *actual predictive use in economic planning and its calculations!*

In this, the extended concepts of Piaget and Ashby do seem to offer some promise for economic theory, though one cannot yet claim any more than that — (nevertheless, those new concepts appear to be already useful for other applications).

As regards a *practical agenda*, the following might be best:
 (i) Enhance existing economic models by • making significant distinctions between subcategories (*e.g.* guided by Maslow’s “hierarchy of needs” theory), and • treating them with proper mathematical techniques — (*e.g.* matrices, see Allen (1963), etc.).

(ii) Make sensible temporary estimates when hard data is not available (rather than just pretending that the distinctions don’t exist).

(iii) constantly revise models, estimates and data in the light of unfolding reality and theory.

(iv) Seek to optimize and stabilize — on a world-wide level.

7.2 New comments, made after the 2008 Financial Crash

Our situation is now dire on both the “red”⁴¹ and “green”⁴² fronts, and moreover these two problems are intimately related so that it is folly to try to solve the one without the other, except perhaps within short term emergencies — or, alas, because of political necessity.

Such political necessity reminds us of the inevitable unruly *psychology*-components within the total problem. Even a supposedly “perfect” technical solution will fail (often disastrously) if it runs foul of entrenched ideas. So a genuine solution must also account for those notions, and effectively add them into the totality of constraints (perhaps by engineering some way to modify them).

It is because of this difficulty of coping with how ideas are acquired initially, and how they then sometimes become entrenched (sometimes by individuals, *and* more often by societies-as-such), that I recommend a careful study of these processes, as just mentioned in §7.1; and relevant accounts appear elsewhere: (Traill, 1978, 2008a, 2008b *etc.*).

⁴¹ As noted in footnote 26:—

The series of bank-failures, reaching a crisis over the weekend of 13-14 September 2008 — with no end in sight, late December.

Hence widespread unemployment now threatens, (perhaps comparable to the 1930s unless we handle matters properly).

⁴² The economist, Professor Ross Garnaut (30 Sep 2008),

reporting quantitatively to Australian state and federal governments: <http://www.garnautreport.org.au> .

This includes a global perspective, and recognizes the problems of reaching an effective international consensus.

Even without such political problems, it is by no means certain that the “red/green” dilemma can be resolved. On page 17, I have outlined one conceivable approach.³² (Although it was not my intention, this turns out to have much in common with idealist Socialist agendas designed for another worthy purpose: *i.e.* *justice* rather than the *curbing of destructive growth* which concerns us here.) But even if we accept this as a valid “in principle” solution, there will still be an uphill battle to persuade people-in-general that such policies are even good for society. — Then they might need even more convincing that such changes were good *for them*, given their investment in the pre-crash-world — unless they have had a real scare meanwhile! They may not yet have had such a scare, though that might come later.

What would Keynes have done in this new situation, now that “green” and other constraints need representation in any thorough equation-set?

He was more versatile than a mere single-minded economist. — It might be more accurate to call him a *meta-economist*, taking an *overview* of the subject and how it might be revised. We have seen²⁷ that in 1936 he introduced (amongst other things) a new distinction between M_1 and M_2 — so it should not surprise us if his ghost might be suggesting a similar distinction between different types of investment according to their environmental effects, with each playing a radically different role within a *revised* equation-set. And no doubt he would make other changes too — probably going well beyond J.L.Stein’s (1982) suggestions for reconciliation with *Monetarism* and with *Laissez faire* (because they too overlook the “green” issues problem).

Of course such revision takes time, so he would surely be pursuing an informed *verbal+old-model* discussion along those lines in the interim. In any case, it seems that such would indeed be our best course for the time being.

—oOo—

“Well, it seems the party is over — but some of us haven’t even got near the bar yet!”⁴³

Extending that metaphor, we could accept such constraints and move instead to the corner-shop kiosk for a cup of something less exotic. — In the end, we might even find that more congenial, and maybe quiet enough to talk without shouting! However meanwhile we should surely now also invite new participants: those who had previously not even been allowed through the doorway of the party festivities.

⁴³ Stated at a seminar by a spokesperson for the Australian Labor Party, in the early 1990s, when the problems were already becoming evident — though mainly just *in theory* at that stage.

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Statistical Physics — a possible strategic analogy

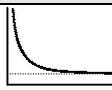
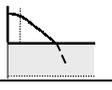
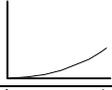
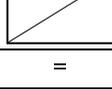
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Appendix

TABLE A: Symbols used in Keynesian Theory

sym -bol	units	Description
Y	£/year	Income (nett)
C	£/year	Consumed part of income; — [absent from Table B equations, but obviously C+S=Y]
S	£/year	Savings (nett) out of income — (i.e. <i>not</i> consumed)
I	£/year	Investment (nett) in actual production-equipment
W	£/year /employee	Wage rate for the average worker
M ₁	£	Money held for everyday living expenses —— “transaction balances”
M ₂	£	Money held in the hope of investing it profitably —— “speculation balances”
M	£	Total money-value held —— (for both purposes)
N	employees	Number of people employed
P	£/£	Price index —— the average level of prices
R	/year	Rate of interest — (average)
<p>NB. Here I have chosen to use “£” to represent real-constant-value unit of money (corrected by the price-index, and hence immune to inflation). In contrast I use “<u>£</u>” for money in the ordinary sense — subject to a loss of real value if the general level of prices should rise.</p> <p style="text-align: center;">Hence we can also have (though they are not important here):.</p>		
<u>M</u>	<u>£</u>	Total “nominal” money held, tallied as <u>£</u> notes, etc
<u>W</u>	<u>£</u> /year /employee	Wage rate as it appears on the payslip — tallied as <u>£</u> notes and coins

TABLE B: The Keynesian Equations, also generalizable to Stein (1982), etc.

<i>i</i>	<i>ii</i>	<i>iii</i>	<i>iv</i> — Description	<i>v</i>	<i>vi</i>	<i>vii</i>
R	↔	M ₂	Rate of interest ← Speculative money available		(1)	ψ
I	←	R	Investment in new productive plant ← Rate of interest		(2)	ψ
S	=	I	Income Saved → Investment	=	(3)	
S	←	Y	how much one is prepared to Save ← income-level (Y)		(4)	ψ
N	←	Y	Number employed ← average income (Y: so ability to pay)		(5)	τ
W	←	N	Wage-rate ← Number of workers employed		(6)	
M ₁	←	Y	more spendable Money ← more income (Y)		(7)	
M ₂	=	M - M ₁	M = sum of its parts	=	(8)	
W	↔	M	SHORTCUT: Instead of equat- ions (9) and (10), let's just say: Wage-rate ↔ general affluence	∞	"(0)"	
M	=	<u>M</u> /P	by definition of price-index P. (<u>M</u> , notes etc in circulation = shaded <i>constant-area</i>)		(9)	
W	=	<u>W</u> /P	by definition of price-index P (<u>W</u> , wage-rate on payslips = shaded <i>constant-area</i>)		(10)	

Explanation of the columns

(*i-iii*): The equation in outline form (e.g. “S ← Y” may be read as “S depends on Y” (*mathematically and causally*); — or more abstractly as, e.g. “R = ℘(M₂)” where ℘(...) uses the usual function notation.

(*ii*): Causal directions (implied by the symbols “←, ↔, =”) are sometimes debatable due to feedback relationships. Here the symbols conform to what seems easiest to understand; but actually a simple “=” would suffice for our immediate quasi-static needs.

(*v*) is a typical graph of the same function. Its y-axis plots the (*i*)-value, (both on the left) — and its x-axis depicts the (*iii*)-value.

(*vi*) is Lindahl’s equation-number, (1954).

(*vii*) This column flags extra influences which are not well defined, and do not figure in the given equation:

“ψ” indicates an acknowledged *psychological* component; and

“τ” betokens an effect due to progressive *technological* advance (which tends to put humans out-of-work).

These ψ and τ influences can be thought of as shifting-or-distorting the related curves — and, *in principle*, they could be factored into the equations (via *new extra dimensions*) if only we could formulate their influence reliably.