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Is There Life after Samuelson's *Economics*? Changing the Textbooks

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Obviously, yes. Samuelson's text, imitated now in literally hundreds of versions since 1948, is only the most recent model, each with roughly a sixty-year reign. Before Samuelson came Marshall's *Principles*. And before that Mill's *Principles*, and before that *The Wealth of Nations*. It's been sixty years since Samuelson. With most of our colleagues in the Post-Autistic Economics community, we believe it's time to change. Mainstream economics—or as we prefer here to call it, "Samuelsonian economics"—has reached sharply diminishing returns. *Economics* and its many hundreds of knock-offs are not suited to the needs of the current generation.

Nowhere is the defensive scientific posture of Samuelsonian economics more evident than in today's introductory textbooks. Economics is a plurality of conversations, but with a few honorable exceptions today's textbooks don't deign to mention the fact. The actual economic conversation is heterogeneous. Yet the textbooks are startlingly homogeneous. The actual economic conversation is conducted by feminists and libertarians, empirical Marxists and postmodern Keynesians, historical institutionalists and mathematical Samuelsonians. But most of today's textbooks teach Samuelsonianism pure and simple, period. They are dogmatic, one voiced, unethical. At bottom the monological textbooks are hostile to the student: "Enter our restricted version of economics, oh ye pathetic undergraduate, or be damned!"

In *The Economic Conversation* we're trying a new approach.¹ We want to produce a book that reflects the actual conversation of economics, Samuelsonian to Post-Autistic. Our web site—TheEconomicConversation.com—intends to nurture an already worldwide community of teachers and students who believe there's more than one way to skin an intellectual cat---and that a fair and public hearing of the alternatives is crucial to the health of the economic conversation.

We don't expect to be the next Samuelson. Market share would be nice--- we openly admit to a profit motive!---but it's not our main goal. After all, that's one of the leading points in the Post-Autistic movement, that human goals are multiple and cannot be reduced in most cases to Prudence Only or to Mr. Max U or to any of the other formulas for sociopathy recommended by the Samuelsonians. If market share were our main goal, we'd write another Samuelsonian knock-off.

Our book, with a handful of honorable attempts by others of a post-autistic bent, means to be different. In ice cream terms we see our book as a Ben and Jerry's among the blandness of ice-milk Dairy Queens. The three of us reflect the international and pluralistic spirit of the community we are trying to nourish. McCloskey is a Chicago School free-marketeer, though recently also a progressive Christian and a postmodern literary type and an activist in the GLBT community, too. Klamer was trained as an econometrician, moved on

¹ forthcoming, Palgrave/MacMillan, early 2008: <http://www.theeconomicconversation.com>.

to history of thought and method, and is now an evolving European social democrat with substantial political activities. Ziliak, an economic historian and rhetorician with a background in welfare casework and civil liberties is committed to racial and social justice, leaning towards the market for some solutions and towards the state for others. The thing we have in common is “the rhetoric of economics.”

We come together in protest against the forced consumption of ice milk. Two-and-a-half cheers for the rich (if fattening) flavors of the real economic conversation!

A full-year introduction to micro and macro, *The Economic Conversation* presents the tools and principles of neoclassical economics as does any textbook---somewhat more open-handedly, we hope. But a fourth to a third of every chapter is written in *dialogue* form, Socratic dialogue, like a real economic conversation. The idea is to simulate a real classroom, a real seminar room, in the open ways advocated by Paulo Freire, bell hooks, and Jane Tompkins. Students at the university level need to learn how to argue sweetly but seriously. Dialogue does the job.

Participants in the dialogues are the authors themselves, joined by four students, with an occasional guest commentator. Most of what a teacher wants a student to leave an economics course with is forms of argument, not the definition of price elasticity of demand or the details of indifference curves. We therefore want the dialogues to be treated with rigor equal to that of the conventional sources of text, though differently. The learning that takes place in actual dialogue is different from conventional, monological learning of the Samuelsonian kind.

Economic dialogues

When in the 4th century Plato claimed to be writing down the ideas of his teacher Socrates, he chose to do so by way of dialogues. The implicit argument is that knowledge—such as knowledge about beauty and love in the *Phaedrus*, or knowledge about virtue, rhetoric, and good government, as in the *Gorgias*—comes from the give and take of conversation. We learn from conversation, even if only an internal conversation within ourselves.

That seems right, and many other great teachers have followed Plato's lead. Two thousand years after Plato, Galileo presented his scientific ideas as dialogues between imaginary characters:

Sagredo: Will you not then, Salviati, remove these difficulties and clear away these obscurities if possible: for I imagine that this problem of resistance opens up a field of beautiful and useful ideas; and if you are pleased to make this the subject of to-day's discourse you will place Simplicio and me under many obligations.

Salviati: I am at your service if only I can call to mind what I learned from our Academician [that's Galileo referring to himself] who had thought much upon this subject and according to his custom had demonstrated everything by geometrical methods so that one might fairly call this a new science.

Galileo Galilei, *Dialogues Concerning Two New Sciences*

(New York: Dover, 1638 [1954]), p. 6, trans. by H. Crew and A. de Salvio.

But by the nineteenth century the dialogical form had fallen out of favor as a method of scientific persuasion, replaced by so-called objective and neutral “observation,” “testing,” and “writing up the results” in the now-standard format. Newton originated it, as a rhetorical device to shut critics up. A century later Gauss perfected it in mathematics: he was called the “fox” because like a fox wiping out his tracks in the snow with a bushy tail, Gauss gave none of the indications natural to dialogue of where his ideas came from or where they were going. It was just theorem and proof, theorem and proof. You may recognize it in the pages of the *Journal of Economic Theory*: “Consider the following setting” or “It is obvious to any rational mind that.” The numerous enemies of the anti-dialogic form call it the “rationalist [or empiricist] monologue.” The “method of science” you were supposed to learn in high school now follows the rigid outline of the empiricist monologue, embodied in such documents as the *Publication Manual of the American Psychological Association*, from scientific question to (alleged) scientific answer. Hypothesis and finding, hypothesis and finding. No conversation, please: we’re Scientists.

The suppression of dialogue has been a pity, and has made learning how to argue difficult. Commenting on the form of argument is called of course “rhetoric.” By “rhetoric” we do not mean “deceptive speech” or “flowery language,” a point better grasped in Continental languages than in English. We mean the art of real conversation, real argument with real human beings. Why do you believe what you believe? The dialogues show economics, in other words, to be a controversial and conversational subject, thoroughly “rhetorical” (though of course “Consider the following setting” is a rhetoric, too), where people start in disagreement with one another, and seek to persuade more or less reasonably to an end of at least mutual understanding.

Our student interlocutors are four. *Paul* is as he puts it “a middle class suburban kid,” and a business major. He seeks the middle of the road in most matters. He is self-confident, perhaps too self-confident, and is in university strictly to further his goals in business. *Bayla* came to the United States from Eastern Europe. She’s older than most students, and wants after university to work in the fashion industry. Having come out of a region damaged by Communism, she’s a fervent believer in capitalism--maybe too fervent. She celebrates the entrepreneur. *Maria* is the only child of a single mother who immigrated from Mexico and now owns an organic-food restaurant in a working-class Latino neighborhood of Chicago. Maria is troubled by the injustices of the current economic system, and calls attention to the plight of minorities, especially women. She’s religious. *Rodney* is definitely not. He is more radical in temperament than the other three. A leader of the debate club in college, in love with anything British (he plays the English game of cricket, of all things: he learned it young from a doting Jamaican uncle), he’s also a budding intellectual. He loves the argumentative character of economics. According to Rodney, an African American who sees himself as a budding politician, the capitalist system is wrong, and radical changes are needed.

Thus the *dramatis personae*.

Argumentation in Economics

How to argue economics is illustrated in the dialogues. For example:

Maria: I don't know who to believe about foreign trade.

McCloskey, *turning to the other three*: Ultimately you-all need to believe what you can persuasively defend to yourself. But it's only sensible to get some knowledge of economics before venturing an opinion, yes? Do you believe for example that the United States should protect itself against foreign competition? Lou Dobbs, the American TV journalist on CNN, certainly thinks so, and says it every day.

Paul: I think we should. My dad is an executive in a factory that makes parts for cars, and the foreign competition is killing him. Asian suppliers are subsidized by their government and aided by an unfair exchange rate. That's not right. If the U.S. government doesn't do something, my father will have to start firing people. And maybe he'll get fired.

Bayla: Wait a minute. What about the Americans who buy cars? If we stop the import of inexpensive foreign parts, we'll have to pay more for cars produced here, right? Free trade sounds good to me.

Rodney: What about the workers that Paul's father will lay off?

Bayla: Can't they find other work?

Paul: Maybe---flipping hamburgers. And what's going to happen if other countries take *all* our jobs away?

Ziliak: "All" the jobs? Think about it. Does that seem plausible?

Bayla: Yeah, it's crazy to imagine "all" the jobs going. And why think only of Americans? What about people in China and Brazil? They need jobs, too.

Paul: Come on. Trade is like a war: it's us against them. You have to play tough or you lose.

Klamer: Really? Why is selling people cars "like a war"?

Rodney: I think it is "war" from the business point of view. And guess who's going to lose the most? the workers, not the bosses.

Bayla: I don't believe that. Trade makes everybody better off.

McCloskey, *summarizing, and picking up a piece of chalk*: Great discussion! You've made the standard points for and against free trade. You are all making arguments, as

you expect economists to do. But look back on how you argued. *She moves to the blackboard.*

What's an Argument?

The conversation of economics resembles, in some regards, a court of law. True, in the conversation of economics there is supposed to be no final judge or Supreme Court--though the Establishment of Samuelsonian economics tries to usurp the role of final arbiter, packing its editorial boards with conventional Samuelsonians who dogmatically defend their turf. But let us talk of the ideal speech situation. If after serious thought and thorough research you are convinced that low taxes are best for the United States, you are supposed to face the task of making your case—your *argument*—as though to a judge and jury. In other words, you need to present arguments that persuade your audience, whether that audience consists of family and friends, the students, the professor, or the community of economists and policymakers. We said "ideal."

A syllogism is one simple form of argument, though hardly all of argument. Argument depends on stories, metaphors, appeals to authority, context, interests, power. It is *not* a realm of first-order predicate logic alone, ever, nor among humans should it be.

Aristotle noted that most arguments take the form of an "enthymeme" ("EN-thu-miem"), an incomplete or not-quite-air-tight syllogism. "Free trade is good" or "Taxes reduce output" are enthymemes, not-syllogistic arguments. The average French economists may find such arguments 45 percent true, the average American economist 80 percent true. Arguing an enthymeme is successful when the economist defends the 45 or 80 percent true as "true enough." Economics, like other sciences, works in approximations. "Good enough for government work," as McCloskey likes to put it.

That an enthymeme is not a syllogism is not damning---despite what some few of our colleagues in the Department of Philosophy might say. Stephen Toulmin (b. 1922), the great philosopher, rhetorician, and ethical theorist, long ago proposed a model of argument:

The Toulmin Model of Argument

(1) a **CLAIM** is made; (2) **DATA**, that is, facts to support it, are offered; (3) a **WARRANT** for connecting the grounds to the claim is conveyed; (4) **BACKING**, the theoretical or experimental foundations for the warrant, is shown (at least implicitly); (5) appropriate MODAL **QUALIFIERS** ("some," "many," "most," etc.) temper the claim; and (6) possible **REBUTTALS** are considered.

Source: Toulmin, Rieke, and Janik, 1984

Thus the claim "taxes always reduce output" might be supported by data from rises in cigarette taxes, conveying, too, a warrant in the form of a supply-and-demand model, together with backing for using such a model (for example, it has worked in past economic arguments; it works in experiments; a downward sloping demand curve is an implication of rationality), tempered by adding "usually" (admitting, for example, that second-best arguments might foul up the simple prediction), and defended by criticizing alleged rebuttals

(people are *not* rational; taxes inspire radical technological change in the cigarette industry; taxes are massively evaded).

The Toulmin model and the ancient tradition of rhetoric with which he works helps understanding economic arguments. But it goes further, to what we call "overstanding." The "warrants," the "backings," the "qualifiers," the rebuttals" are the stuff of serious scientific or political argument, well beyond the grotesque misuses of syllogism in existence theorems and *t*-tests. When the student begins to overstand she becomes a maker of argument herself.

Joining the Economic Conversation

The Economic Conversation wants to practice what it preaches---which we readily admit is *not* easy. The textbook is, like the economic conversation itself, evolving. That's where you come in, dear reader. We hope to hear from you. Please visit one or more of the links on our web site (<http://www.TheEconomicConversation.com>).

How are the conversations working? What is going right and what is not? What should we add or delete? Please tell us. Frustrated neoclassicals, feminists and libertarians, empirical Marxists and post-modern Keynesians, and everyone in between and far beyond: let's get a serious conversation going about how economics ought to be taught.

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Finding the Ratchet: The Political Economy of Carbon Trading¹

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Universities contain rooms and buildings that academics never enter, such as boiler houses. Amongst their contents are meters, some of which at my university, Edinburgh, now have two roles: as well as determining our gas bills, they measure, indirectly, our emissions of carbon dioxide. The meters have become part of the European Union's Emissions Trading Scheme, and thus are part of a microcosm of what may become a worldwide carbon market.

One doesn't usually think of universities as big carbon-dioxide emitters – aside from in inevitable jokes about the generation of hot air – but the capacity at two of Edinburgh's three highly efficient combined heat and power centres pushes them over the 20 megawatt threshold of European emissions trading. Like other operators of combustion installations in the European Union of that size or larger, the university has in consequence to hold permits to emit carbon dioxide.

Edinburgh University receives an allocation of allowances, each permitting it to emit a tonne of carbon dioxide. If it were to emit more carbon dioxide than it has allowances, it would have to buy further permits on the carbon market, or else face a fine. If the university were to cut its carbon emissions below its level of allowances, it could sell the excess permits, thus earning income from its frugality. Such purchases and sales take place via brokers and on a number of organised exchanges such as Nord Pool, the Nordic power exchange. If it chose, Edinburgh University could trade carbon futures – contracts that would oblige it to buy or to sell allowances at a set price on a given date. Those futures are now traded on the European Climate Exchange, using the electronic trading platform of London's International Petroleum Exchange.

Edinburgh University could also indulge in even more exotic trading. We could invest in a 'Clean Development Mechanism' project in the third world, and once the International Transaction Log that registers such transfers is up and running later this year, exchange certified emissions reductions from the project for European allowances. If California's carbon trading plans come to fruition, and a current study by its government and that of the UK were to lead to its emissions market being linked to that in Europe, we could buy or sell allowances in Los Angeles or San Francisco. If the blueprint in the UK Treasury's Stern Review is followed globally – a big if – we would before long be able to trade carbon anywhere in the world.

As John Lanchester noted in the 22 March issue of the *London Review of Books*, the science of global warming is not straightforward. The basic physics has been clear since the nineteenth century. What's been harder to understand in detail are matters such as the many feedback loops by which a rise in planetary temperature alters other processes (such as cloud formation) that in their turn also affect temperature, the extent to which smoke and emissions of sulphur and particulates (all of which reflect sunlight) are masking greenhouse-

¹ This article originally appeared in the [London Review of Books](http://www.lrb.co.uk) (<http://www.lrb.co.uk>) and appears here with the *Review's* permission.

gas warming, and the likely behaviour of the great ice sheets of Antarctica and Greenland as temperatures rise.

While intensive, large-scale scientific research stretching back over thirty years and more has by no means eliminated all such uncertainties, its findings now point unequivocally to the conclusion that it would be dangerously irresponsible not to attempt to slow global warming. How best to do so has been a debate largely dominated so far by economists, such as Sir Nicholas Stern, the leader of last year's widely reported Treasury study.

Economists tend by inclination to be sceptical about either voluntary restraint or governments' capacity to find cost-effective ways of regulating emissions. The record so far suggests they may be right on the former. The profession in general is perhaps too pessimistic on a direct role for government, but it's certainly true that government intervention in the field of energy technology has at best had mixed results, as the chequered history of civil nuclear power demonstrates.

So economists have tended to support mechanisms that curb emissions by making them costly. As the Stern Review puts it, 'the first task of mitigation policy' is to make emissions of carbon dioxide and other greenhouse gases (which have up to now been 'free' from the viewpoint of the emitter) carry a price. A carbon tax could do that, but in recent years the dominant proposed mechanism – by-and-large the preference of the Stern Review, for example – has been 'cap and trade' schemes such as the one now in place in Europe.

In such schemes governments set a cap on emissions, sell or give that number of allowances to emitters, and then monitor emissions and fine anyone who emits without the requisite allowances. If the monitoring and penalties are stringent enough, overall emissions are thus kept down to the level of the cap. Crucially, if trading works properly this happens in a cost-effective way. Those for whom reductions are expensive will want to buy allowances rather than incurring disproportionate costs. The requisite supply of allowances is created by the financial incentive thereby provided to those who can make big cuts in emissions relatively cheaply. They can save money by not having to buy allowances, or (if allowances are distributed free) can earn money by selling allowances they don't need.

In 1968, the University of Toronto economist J.H. Dales first put forward in something like full-fledged form the idea of controlling emissions via a 'cap and trade' scheme. Emissions markets were implemented in relatively minor and sometimes ham-fisted ways in the 1970s and 1980s, mainly in the United States. It was only in the 1990s that the idea became mainstream.

The crucial development was the start of sulphur-dioxide trading in the US in 1995. It had been known for twenty years or more that damage to the environment and to human health was being caused by sulphur-dioxide emissions, notably from coal-fired power stations, which react in the atmosphere to produce 'acid rain' and other acid depositions. Numerous bills were presented to Congress in the 1980s to address the problem, but all failed in the face of opposition from the Reagan administration and from Democrats who represented states that might suffer economically from controls on sulphur dioxide, such as the areas of Appalachia and the mid west in which coal deposits are high in sulphur.

Sulphur trading broke the impasse. It combined a clear goal that environmentalists could embrace (reducing annual sulphur-dioxide emissions from power stations in the US by

ten million tons from their 1980 level, a cut of around a half) with a market mechanism attractive to at least some Republicans. A particularly influential lobbyist for trading was the advocacy group Environmental Defense. One of its members of staff, the lawyer Joe Goffman, largely drafted Title IV of the Clean Air Act Amendments of 1990, which introduced sulphur-dioxide trading. Economists such as MIT's Richard Schmalensee and Robert Stavins of Harvard's Kennedy School also became involved directly. They didn't simply advocate a cap and trade scheme, but helped steer it to political acceptance.

What was agreed upon in the 1990 legislation differed from what economists might have wanted in two respects. First, there was no attempt at a cost-benefit analysis to determine the optimum level of reduction of sulphur-dioxide emissions – and in a sense fortunately so. Cost-benefit analyses of contentious issues tend simply to become mired in controversy, because they often pivot on factors that can only be estimated, not measured. (In analyses of global climate change, for example, the dominant factor is typically the choice of 'discount rate', which determines how costs and benefits at future times are translated into present-day values. There has already been fierce technical dispute over the Stern Review's choice of a low discount rate, and thus high present-day values.) A ten-million ton reduction in sulphur-dioxide emissions was roughly consistent with the science of acid rain, and it had the straightforward advantage of being a memorable round number. The economists involved in advocating the sulphur market just accepted it, rather than seeking to fine-tune it.

Second, when economists such as Dales proposed emissions trading they assumed that governments would sell the allowances in question. Instead, nearly all the sulphur allowances were given away free of charge to the utility companies that operated power stations, in amounts roughly (but, as discussed below, not exactly) proportional to the calorific value of the fuel they burned in the baseline years 1985-1987. 'Grandfathering' – as this way of proceeding is called – has disadvantages compared to an allowance auction. It entrenches incumbents, because of the cost advantage they then enjoy over newcomers who have to pay for their allowances. Indeed, if an industry can see 'grandfathering' coming, there's an incentive to increase a polluting activity in order to achieve a larger allocation. In respect to carbon, there are suspicions that new coal-fired power stations are currently being built in the US in part for this very reason.

Those who planned the sulphur-dioxide market realized, however, that there was no politically feasible alternative to the free distribution of allowances. Forcing utility companies to buy them would have generated a level of hostility from the industry that would have been fatal.

Free allocation meant enormously complex jostling over its rules. In the months leading up to the eventual signing of the bill by George H.W. Bush on 15 November 1990, there was intense lobbying for provisions that would favour mining and/or utility interests in particular states by introducing exceptions to the baseline allocation of 2.5 lb of sulphur dioxide per million British thermal units of input. Some states, such as Florida, were able to win favourable allocations simply because they were expected to be finely balanced in that autumn's elections.

For some of the economists involved in the sulphur market, it was an education in the political process. Thus MIT's Richard Schmalensee (co-author of the main study of sulphur trading, Ellerman et al., *Markets for Clean Air*) recalled laughing when a special provision concerning lignite, the 'brown coal' common in North Dakota, was proposed at a meeting of

Congressional staff members at which he was present. 'He was forcefully reminded that North Dakota was a relatively poor state with bleak prospects and, more important, that Chairman Burdick [Quentin Burdick, the octogenarian Democrat from North Dakota who chaired the Senate Committee on Environment and Public Works] was not to be trifled with.' The lignite provision duly became law.

Uncorrected, the need to buy off potential Congressional opposition with favourable allocations would have led to failure to achieve the ten-million ton reduction. When the implications of all the various rules such as the lignite provision were worked out (which was not a simple task), they added up to an over-allocation of allowances of around 10 per cent.

However, those lobbying for the legislation had cleverly inserted a correction mechanism early in the legislative process: 'the ratchet', as it became known. This was a rule that clawed back any aggregate over-allocation by imposing a corresponding uniform across-the-board cut in allowances. Once the more powerful special interests had successfully been bought off with what turned out to be the 10 per cent over-allocation, everyone's allocation was then reduced by roughly a tenth. The detailed calculations were made not by the House or the Senate, but by the Environmental Protection Agency, which imposed the ratchet months after the legislation was irrevocably on the statute books. The sheer complication of the process of working out what the rules implied for the sizes of allocations hampered opposition to the ratchet: participants seem to have assumed that it would cut their allocations by only around a twentieth.

While all the politicking indeed affected who got what, the ratchet thus kept the requisite overall cut in emissions more-or-less intact. Furthermore, the cut was then achieved in practice far more cheaply than almost anyone had imagined. Industry lobbyists had claimed it would cost \$10 billion a year, while the actual cost was around \$1 billion. Allowance prices of \$400 a ton were predicted, but in fact prices averaged around \$150 or less in the early years of the scheme. The flexibility that trading gave to utilities helped reduce costs (by around a half, according to the analysis by Ellerman, Schmalensee and their colleagues) but other factors were equally important. 'Scrubbers' to remove sulphur from smokestacks turned out to be cheaper to install and to run than had been anticipated, and rail-freight deregulation sharply reduced the cost of transportation from Wyoming's Powder River Basin, the main source of low-sulphur coal in the United States.

That the sulphur-dioxide market was, broadly, a success shaped how the Clinton Administration approached the negotiations that led to the 1997 Kyoto Protocol. In the Protocol, the industrialized nations undertook that by Kyoto's 2008-12 'commitment period' they would have limited their greenhouse-gas emissions to agreed proportions of their 1990 levels: 93 per cent for the US, 92 per cent for the European Community overall (with varying levels for its member states), and so on.

At the insistence of the US, Kyoto gave its signatories sulphur-like flexibility in how to meet their commitments. A country with a Kyoto commitment can meet it by controlling emissions domestically. Alternatively, it can pay for reductions made via projects in developing countries without Kyoto targets (that Kyoto provision is the 'Clean Development Mechanism') or via projects in other industrialised countries (such 'Joint Implementation' projects are mainly to be found in the former Soviet bloc). Indeed, a nation-state signatory can simply pay another signatory for reductions the latter has made beyond its commitments. Because the Kyoto commitments of Russia and Ukraine did not take into account the collapse

of heavy industry after the fall of communism, they may have a lot of essentially spurious 'reductions' to sell once their governments have met the requirements for international trading under Kyoto, such as the construction of national greenhouse-gas inventories.

The Kyoto Protocol was no more than the barest skeleton of a market, containing almost no detail on how this trading was to take place. The US had only just got its way. Much of the developing world was suspicious of international trading as likely 'carbon colonialism', fearing that the developed world would use it to escape its responsibilities. The European Union's preferred policy recipe had been a mixture of harmonised carbon taxes and co-ordinated government measures to promote low-carbon technologies. Notoriously, too, the US then walked away. In March 2001, the Bush administration announced that the United States was withdrawing from the Kyoto Protocol.

By 2001, however, the idea of carbon trading had come into favour in Europe. In part prompted by lobbying by Environmental Defense, the US NGO that had been the crucial advocate of sulphur trading, British Petroleum had set up an internal carbon trading scheme between its business units. While no cash actually changed hands, the resultant management attention to emissions paid dividends. BP was able quickly to cut its emissions by its 10 per cent target, and even made money doing it: if you stop the unnecessary flaring and venting of gas, you have then more to sell.

Denmark launched a carbon market amongst its big electricity producers in 2001. The UK began an experimental, voluntary scheme in 2002. The landmark scheme, however, has been the European Union's carbon market, launched in January 2005.

What pushed Europe towards trading rather than the initially preferred carbon tax is in good part an idiosyncratic feature of the political procedures of the European Union. Tax measures require unanimity: a single dissenting country can block them. Emissions trading, in contrast, counts as an environmental, not a tax matter. That takes it into the terrain of 'qualified majority voting'. No single country can stop such a scheme: doing so takes a coalition of countries sufficiently populous (since voting weights roughly follow population) to form a 'blocking minority'. A plan for a Europe-wide carbon tax had foundered in the early 1990s in the face of vehement opposition from industry and from particular member states (notably the UK), and its advocates knew that if they tried to revive it the unanimity rule meant they were unlikely to succeed. 'We learned our lesson', one of them told me. Hence the shift in allegiance to trading.

The design of the European trading scheme was deliberately simple. To date, it covers only carbon dioxide, not other greenhouse gases such as methane. In sulphur trading in the US, each smokestack is fitted with sophisticated automatic measurement devices. European carbon-dioxide emissions are measured less directly, using the method known as 'mass balance', in which for example gas-meter readings or invoiced quantities of coal or oil are multiplied by appropriate emission and oxidation factors. Only large, fixed installations are covered. Ground transport, shipping and aviation are all currently omitted, and the domestic sector is covered only indirectly via the participation of electricity suppliers. In consequence, no more than around half of Europe's emissions currently fall within the scheme.

The European carbon market is nevertheless a remarkable achievement. It took the US five years from the passage of the requisite legislation in to the start of sulphur trading,

while the European Union managed what was in many ways a more difficult task of market construction in three years. The number of big emitters of carbon dioxide is larger than that of big producers of sulphur dioxide, and the European Union has also been in the throes of wholesale expansion. The tricky technical stuff that too often undermines ambitious government programmes – such as constructing the central database and the national registries, and keeping track of the allocation of allowances to thousands of installations – has gone remarkably well, especially given the short timescale.

The trading of allowances seems to be going smoothly, with no serious technical disruptions even when the market is extremely busy. Measurement and independent verification, the foundation of any emissions market, is getting better. There were a lot of difficulties in the first year of the scheme caused simply by companies' unfamiliarity with what they had to do, but I'm told that the 2006 measurements, which currently are being collected and aggregated, are better in that respect.

Inconsistencies across Europe in how the measurement rules are interpreted remain a problem, and there is some room for 'gaming'. Installations can choose to use either the standard emission factor for a type of fuel, or a factor specific to the particular fuel they are using. If one burns coal with a carbon content higher than that assumed by the standard factor, while using that factor to calculate emissions, one can thereby deliberately underestimate one's emissions, perhaps by around 2 percent. It doesn't sound a lot, but aggregated over the scheme it could have a significant impact on the balance between the supply and demand for allowances.

Overall, though, such problems appear tractable. The most difficult issue has been the politics of allocation. In the first phase of the Emissions Trading Scheme (which runs from January 2005 to December 2007), Europe did not find its equivalent of sulphur's ratchet. As with sulphur, almost all carbon allowances have so far been given away, not auctioned. Again, the scheme's designers felt that this was the only politically feasible way to proceed, and in particular they feared that the similarity of the revenue-generating aspect of an auction to a tax might drag the scheme back into the sphere of unanimity.

The amounts of the allowances that are distributed are governed by National Allocation Plans drawn up by each of the member states. Predictably, Europe's industries and most of its governments pressed for generous allowances. The European Commission rejected the most outrageous of the plans for the 2005-7 phase of the scheme, demanding a 25 per cent cut in Slovakia's plan and a 16.5 per cent cut in Poland's. However, smaller exaggerations of likely needs in the majority of national plans have added up to a scheme that in the current phase is in overall surplus.

Initially, the extent of over-allocation wasn't clear. As the price of gas rose relative to that of coal in 2005 and the early months of 2006, so did the price of the allowances needed to burn the latter: coal is much more carbon-intensive than gas. Market participants also had to worry about uncertainties such as weather: a serious cold snap should push the carbon price up, as should a prolonged dry spell (because it reduces hydroelectric capacity).

Europe's power sector was in general short of allowances, while the excess was concentrated in the hands of energy-intensive industry. The big power generators are experienced, active traders, who often sell electricity at prices fixed a year or so in advance and thus want to hedge the risk of big rises in the costs of their inputs, which now include

carbon allowances. So they wanted to buy allowances, but industrial companies (often without an equivalent tradition of trading) were slow to sell, preferring to wait and see the extent to which their emissions fell short of their allocation.

The resultant temporary imbalance of supply and demand caused prices to rise markedly from January 2005 to March 2006, peaking at €31/tonne, a level that, if it had been sustained, would probably have been a sufficient incentive to encourage real emissions reductions (such as electricity suppliers switching from coal to gas). In April and May 2006, however, the news gradually leaked out that in 2005 the industries and power generators of most of Europe's member states had produced less carbon dioxide than their national allocations of allowances. On 26 April, the European carbon price fell 30 per cent, and by mid-May allowances were trading as low as €9. As the fact of over-allocation sunk in, prices sunk almost to zero: in early 2007, one can buy the right to emit a tonne of carbon dioxide for as little as €1.

There's a sense in which the first phase of the European Emissions Trading Scheme was always meant as an experiment rather than as a tool of substantial emissions reductions. The second phase, which will run from January 2008 to the end of the Kyoto commitment period in December 2012, is going to be much more significant. The European Commission sees the need to ensure the credibility of what is in many ways its flagship policy. It also now has much better emissions data to use to evaluate National Allocation Plans, and the fact that the second phase of trading coincides with the Kyoto commitment period means there's a clear benchmark against which to assess the plans of all the countries that are in danger of not meeting their Kyoto commitments. So this time round the Commission has been able to be significantly tougher in its assessments. Once again almost all member states have sought over-generous allocations, but this time their wishes haven't been granted: so far, all the plans except that of the United Kingdom have been cut back.

Overall, there's almost certainly going to be a shortage of allowances in 2008-12. However, that may not translate into a major need for abatement by European industry, because large numbers of certified emissions reductions from Clean Development Mechanism projects (and smaller numbers of 'emission reduction units' from Joint Implementation projects) will be available to be converted into European allowances. Indeed, Point Carbon, the leading carbon-market consultancy, estimates that the entire shortfall of allowances can be made up this way.

There's nothing wrong in principle with the idea of the Clean Development Mechanism: that companies and government agencies in industrialised countries should receive carbon credits in return for providing the capital for 'green' projects in the third world. Many such projects indeed seem very worthwhile, and unequivocally to be welcomed. As with all emissions trading, however, it's the nuts and bolts of the Clean Development Mechanism that matter: for example, the rules that govern which projects earn credits. As the Stern Review notes, almost a third of the credits 'in the pipeline' come from 15 big projects to stop the generation of gases like HFC-23 (trifluoromethane) from industrial production in China.

That needs done: HFC-23 is around 12,000 times as potent a greenhouse gas as carbon dioxide, kilogram for kilogram. It's generated mainly as a by-product of the production of a substance called HCFC-22, which is used chiefly as a refrigerant. HCFC-22 itself contributes to global warming (albeit not as much as HFC-23), and it depletes the ozone

layer, although it isn't amongst the most damaging such chemicals. You can eliminate HFC-23 from the waste gases of a plant producing HCFC-22 by burning those gases at very high temperatures. The process is tricky – get it wrong, and you produce dioxins – but it's well within the scope of existing technology and relatively cheap.

Under the Montreal Protocol governing ozone-depleting substances, HCFC-22 will eventually have to be replaced by environmentally-superior hydrocarbon and ammonia-based refrigerants. However, there's deep concern that the way in which HCFC-22 plants can earn money from the Clean Development Mechanism by eliminating HFC-23 could slow the phase-out – indeed that it risks providing a perverse incentive to build new plants producing HCFC-22. There's currently sharp debate over whether any, or how many, such new plants should be eligible for credits for destroying HFC-23.

Such difficulties have not killed the idea of carbon trading. After all, one could argue that by focusing attention first on the things that are cheapest, such as eliminating HFC-23, the market is simply doing what markets do. There's anecdotal evidence from those I've spoken to of the beginning of the emergence of a two-layer market, in which credits from more recognisably green development projects such as renewable energy earn higher prices than those from industrial-gas projects such as HFC-23 elimination.

Above all, emissions markets gain their political force from their capacity to create alliances between 'left-wing' environmentalism and 'right-wing' pro-market sentiment, and to attract business leaders such as BP's John Browne. The example of the BP scheme, and eloquent advocacy of carbon trading by BP staff were influential in laying the political groundwork for the European carbon market.

In particular, carbon trading is now building cross-party momentum and gaining significant industry backing in the US, and not just in California. In December 2005, for example, seven states in the northeast of the US announced that they planned to begin regional trading of carbon from their electric-power sectors in 2009. Indeed, by September 2006 Washington DC reminded John Carey of *Business Week* of the same city twenty years previously. Then too a Republican administration with a poor environmental record was entering its final years, thoughts were turning to the future, and the political groundwork was beginning that turned into bipartisan support for sulphur trading and eventual legislation under a new presidency.

There are multiple climate-change bills before Congress, the most high-profile of which is co-authored by a leading contender to win the Republican nomination in 2008, Arizona senator John McCain. Its sponsors include both of the most high-profile Democrat candidates, Hillary Clinton and Barack Obama. Although capping carbon has been an idea more strongly welcomed by Democrats, Republican strategists will have noted that the announcement of the Californian scheme gave Governor Schwarzenegger's poll ratings a healthy boost, helping him do better in November's elections than many of his fellow Republicans. Large sectors of industry in the US would much prefer a nation-wide carbon market with uniform, stable rules to a patchwork of incompatible, unpredictable state-level markets, so it's not impossible that a new President prepared to lead on the issue would be supported by significant sectors of US industry.

Nevertheless, many people, especially on the political left, have an instinctive dislike of the idea of emissions trading. Amongst its roots is a variant of what the economic

sociologist Viviana Zelizer calls the 'hostile worlds' doctrine. She's concerned with the worlds of economic relations and of intimacy. There, the 'hostile worlds' doctrine is that the intrusion of economic considerations corrupts intimacy, and conversely that kinship and other intimate relations need to be stopped from corrupting what should be impersonal economic transactions.

Zelizer questions whether the hostile worlds doctrine is right: for example, is paid care of children or of the elderly necessarily inferior to that provided by kin? Is your relationship to your children really damaged by paying them to Hoover the house or clean the windows?

In my view, Zelizer's open-mindedness should also be applied to emissions trading. Just as economic relations and intimacy aren't necessarily at odds, we shouldn't assume a priori that market pricing is detrimental to environmental stewardship. Capitalism, after all, has proved itself rather good at economising on inputs that carry a price, such as labour. If carbon-dioxide emissions carried a significant price – €30 per tonne, say – that was expected to rise over the long term, we could expect real efforts to reduce emissions. Indeed, there's already tentative evidence from Point Carbon surveys that corporate abatement efforts in Europe, little in evidence a year ago, are beginning.

So the issue may be less the intrinsic merits or flaws of the idea of emissions trading than the critical details that determine whether such markets are environmentally beneficial (as the sulphur market largely has been) or complicated ways of achieving very little. The European Union's unilateral commitment to reduce its emissions to 20 percent below their 1990 level by 2020 (whatever the rest of the world does) is a hugely encouraging move in this respect. By providing a simple, high-visibility target for reductions – one that will be increased to 30 percent if the rest of the world also takes action – it could set the scene for an equivalent of the ratchet in European carbon market from 2013 onward: a tough, centralised allocation that can't be met only by importing credits from elsewhere, and that would force real abatement.

Of course, what happens in Europe will have only a very limited impact on global emissions unless the US, China, and the world's other large emitters also begin significant abatement. Whether there will be an international agreement to replace the Kyoto Protocol, and if so what form it will take, remain profoundly unclear: serious negotiations are only just beginning, and progress will probably not be fast until after the US Presidential elections.

Almost certainly, though, if there is such an international agreement carbon trading will be at its heart. That will again raise the issue of the ratchet, of the need for a mechanism to stop a carbon market failing because the caps haven't been set tight enough. Finding such a mechanism has been hard enough even in a partially unified polity such as Europe; it will be much harder globally. Furthermore, even if the world can find its ratchet, carbon trading shouldn't be expected on in its own to solve the huge problem humanity faces in curbing emissions. Global efforts to do that are in their infancy, and it would be folly to neglect the other policy measures that could help, such as direct government regulation (a small but important example is the phasing out of old-fashioned inefficient light bulbs), massively increased research and development spending, and a well-thought-out policy for tackling the many practical obstacles to the uptake of energy saving measures and of the cleaner technologies that already exist.

Taxes, currently much less fashionable than trading, also have a role to play. Take aviation, for example. It seems likely to be brought into the Emissions Trading Scheme in 2011-12, but it's quite possible that phase-two allowance prices will be no more than €15 per tonne, which would translate into very modest increases in fares, ranging perhaps from as little as €2 for short flights to around €20 for long-haul return flights. Aviation's overall climatic impact – its 'total radiative forcing' – is reckoned to be of the order of two to five times that of its carbon-dioxide output alone (which is all that would be covered by current European Commission proposals), because of the role of emissions of nitrogen oxides, the formation of condensation trails and the enhancement of cirrus clouds. There's a strong case for using taxation to take those other effects into account. A good place to begin would be to end the anomalous situation in which aviation enjoys an advantage over other modes of transport because its fuel is not taxed.

Needless to say, such matters are intensely political. The European Commission officials who played the central role in constructing the new carbon market are intelligent and dedicated, and at the moment they enjoy a remarkable level of support from leading governments. But that support can't be guaranteed to continue. Europe's NGOs (not just the obvious ones such as Greenpeace and Friends of the Earth, but others such as the World Wildlife Fund) have played, and continue to play, a relatively unpublicised but important role in encouraging the tightening of the ratchet. But the NGOs are underfunded and easily outgunned by industry lobbyists. So there's much for political activists to do, and the relatively esoteric nature of carbon-market politics means that small numbers of well-informed people can have a real effect.

There's also much for my fellow academics to do. To date, research on carbon markets has almost exclusively been the province of economists, and generally it hasn't fully tackled the messy, highly politicised, material reality of such markets. So economic sociologists and political scientists are needed too, as are anthropologists and other area specialists who can help us understand the complex impacts of the Clean Development Mechanism's incentives in countries such as Brazil, China and India. We can't just take it for granted that all such projects are genuinely beneficial, and the rules of the mechanism need constant monitoring to ensure that perverse incentives aren't inadvertently being created. In short, colleagues, we've got to get inside the boiler houses, our own and the world's.

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What Industries

Does Multiple-Equilibrium Trade Theory Recommend?

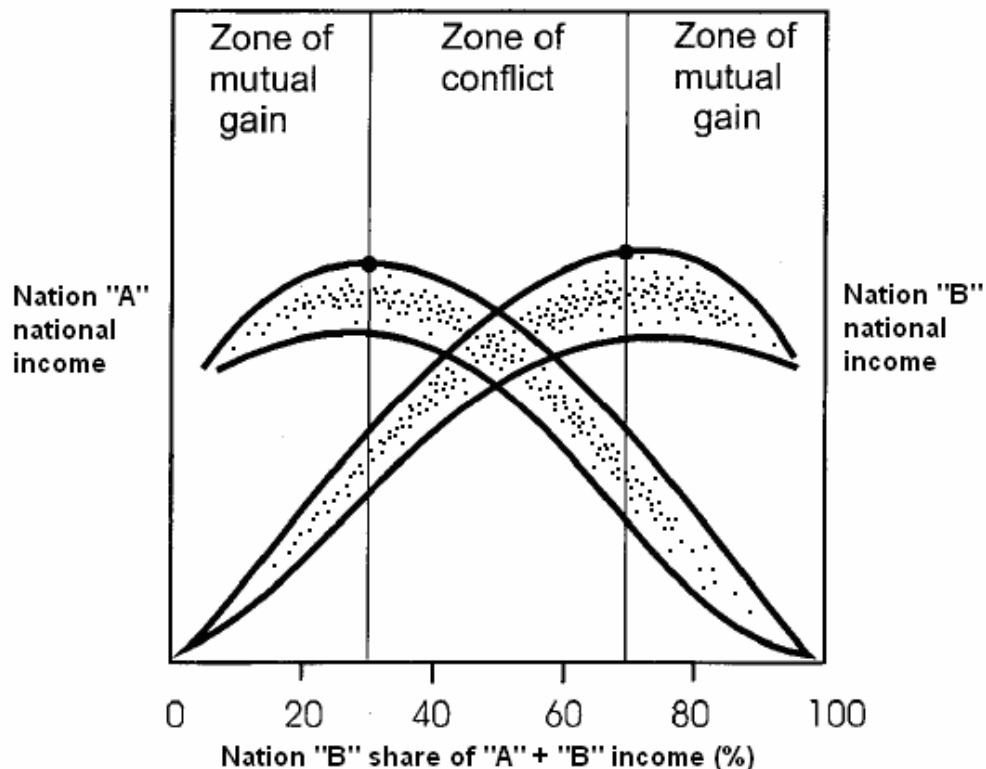
Ian Fletcher [USA]

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In trade theory, one major recent theoretical breakthrough has been that of Ralph Gomory and William Baumol (hereinafter GB), who have propounded a multiple-equilibrium model of world trade in their book *Global Trade and Conflicting National Interests*.

The GB model holds that if one assumes increasing economies of scale, then the distribution of industries among nations under free trade will exhibit not *one* equilibrium, as in the classic Ricardian model, but multiple equilibria. Each such equilibrium will be locally optimal (more efficient than any similar equilibrium) but may or may not be globally so (more efficient than any possible equilibrium). Which equilibrium the world economy settles on will be an historical accident, driven by such things as which nation entered which industry first. Therefore, any actually existing equilibrium can be sub-optimal, both from the point-of-view of maximizing world output, and the output of any given nation.

It follows that the free market will not necessarily give any given nation the highest output it could possibly attain. The natural question this implies, for self-interested nations, is how can they, under GB assumptions, maximize their output? In a nutshell, the model implies that their best move is to be "greedy, but not too greedy." That is to say, those equilibria in which a given nation wins *all* the industries in the world, result in its having less output than one in which it wins the lion's share, but not all. A graph representing this, in the simplified two-nation world the GB model uses, is below:



Each dot represents a possible equilibrium assignment of industries between nations A and B; the lines represent the upper and lower bounds of the dotted regions. When either nation has 100% of the world's industries – and thus 100% of world income – that nation actually has *less* national income, than when it has only about 70% of the world's industries, and its trading partner the rest. This happens because the existence of scale economies enables it to “lock in” (“retain,” in GB terminology) industry assignments that would otherwise be inefficient, and thus be competed away, under classic Ricardian conditions of decreasing scale economies. In other words, the ability to retain industries entails the ability sometimes to retain industries *inappropriate* for the nation retaining them! Another nation would have been the lower-cost producer, had historical accident produced an equilibrium assigning the industry to it.

It follows that when a nation holding 100% of world industries sheds some of these industries to its trading partner, it benefits, realizing well-known Ricardian gains from trade. Unfortunately, the GB model, as elaborated in *Global Trade*, does not say *which* industries the 100% nation should shed, nor specify criteria for identifying them. Unfortunately for the 100% nation, it will be no use to simply shed industries at random; it must shed those which it inappropriately retained. Observe that, in the graph above, the fact that equilibrium outcomes form a band of dots, not a line, means that for nation A to simply shed industries at random, when it is left of its income peak, does *not* guarantee that its income will go up. It is perfectly possible for it, when shedding an industry, to move from one equilibrium dot to another that is “southeast” of the first dot. Such an equilibrium will indeed locate fewer industries in nation A, as revealed by the fact that A now enjoys a smaller percentage of the world income than before – this is why it has moved “east”. But nation A would *not* get any payoff in terms of increased absolute income – this is why it has moved “south,” and in fact receives less!

So which industries is nation A shedding, as it moves from the “too greedy” position at the extreme left of the graph towards its optimal position – the peak of its national income line, at roughly 70% of combined incomes? These: it is shedding those industries for which the following is true:

$$\begin{array}{l} \text{Nation B production cost, at the far end of the scale-economies curve +} \\ \text{Nation B margin of monopoly profit} \\ \hline < \text{Nation A production cost, at the far end of the scale-economies curve} \end{array}$$

When the above is true, nation A is gaining income for the classic Ricardian reason: it is ceasing to allocate scarce factors of production to producing a given good, when it could buy it cheaper from another nation – enabling those scarce resources to move to a more productive use.

Why is there a term above for nation B's monopoly profit? Because the existence of monopoly profits is implied by the assumption that these industries are retainable. Whoever ends up with these industries, A or B, will be in the position to extract such profits. Which means that its trading partner must factor in the cost of paying a margin of monopoly profit to some other nation, when deciding whether to shed the industry or keep it.

Why does the phrase “at the far end of the scale-economies curve” appear above? Because the relevant question is *not* what are the two nations' production costs today. By the standard of *today's* production costs, nation A should hang onto all its industries – because its costs are lower, due to its having moved down the scale-economies cost curve.

This is precisely why it is able to retain such a disproportionate share of the world's industries, despite competitive pressures, in the first place. The relevant question is what will be the two nations' production costs *after* they have both run down the scale-economies curve. We can call this construct "clairvoyant Ricardianism."

What this means, is that the optimal trade outcome is that which *would* be correct, not on the basis of where every nation's industries are on the cost curve today, but on the basis of where they would be, if they had run down their cost curves and achieved their economies of scale. By definition, this hypothetical cost position cannot be observed, only predicted – that's why it's clairvoyant. Naturally, the free market cannot generate this outcome on its own, because the market only has access to information about how things are today.

To give an example, this means that if nation A can potentially reach world-beating productivity in the emerging widget industry, then it should protect that industry, so that it can use domestic sales to help this industry move down its economies-of-scale cost curve *before* any foreign industry can do the same thing. Then nation A will own this industry, and own it retainably, realizing super-normal profits as a result.

Conversely, if nation A *cannot* potentially reach world-beating productivity in the emerging widget industry, then it is a waste of its scarce factors of production to try to muscle its way into the industry with a tariff, subsidies, or any other non-market policy devices. It would be better off buying its widgets from the foreign lower-cost producer and allocating its factors of production to some other industry, in which its productivity will be higher.

This theoretical result accords well with a number of traditional, if non-theoretical, ideas of protectionists from Hamilton and List to the developmentalist technocrats of contemporary East Asia:

1. Infant industries must at some point become able to survive on their own, without protection, or protecting them was a mistake.
2. Protectionism is only good, insofar as it pushes the national economy towards higher ultimate productivity, and worthless as a mere "hammock," or device to enable low-productivity industries to survive.
3. The existence of monopoly profits in retainable industries makes it worthwhile to subsidize "breaking into" some industries, even if this is unprofitable in the short run.

For policy, the above model suggests two approaches:

1. Have a bunch of really smart technocrats figure out where various industries are going to end up, in terms of cost, and act accordingly. (Dynamic tariff)
2. Figure out a some set of static characteristics, that the industries you want to select for will have, and enact a fixed tariff to do that. (Fixed tariff).

The choice between these turns on issues outside the scope of this paper, many of them political. The key question will be which of the above choices is more likely, given

realistic assumptions about the competence and honesty of the political system, to *approximate* the clairvoyant ideal described above.

This paper should not be taken as arguing that the dynamic analysed herein is the only valid argument against free trade; there are of course other dynamics, which would have to be factored into any real-world policy solution.

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Narrative Pluralism

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A. Introduction

Einstein's revolution led philosophers and historians of science to abandon 19th-century views of scientific progress as a smooth accumulation of tested facts. Scholars came to focus instead on the processes by which one theory displaces or subsumes another. By the 1960s, obsession with competing theories became so extreme that increasingly all science was defined and interpreted relative to its infrequent revolutions. [Kuhn 1962] This narrative Gestalt has spread through contemporary culture, dominating its perceptions of the advancement of knowledge.

Generally the natural sciences ignore outsider analysis, but the narrative fixation on the dialectical side of scientific development has had and continues to have a deleterious effect on the human sciences. Of course, theory displacement offers a true characterisation of important chapters in science history. But there are many major advances in science for which the narrative of scientific revolutions, including its intervals of "normal science", has no explanatory power. More to the point, in the human sciences those "extraordinary episodes" which have "necessitated the community's rejection of one time-honored scientific theory in favor of another incompatible with it," are virtually unknown. [Kuhn 1962, p. 6] In economics, for example, the absence of such episodes weighs so heavily on its pursuit of understanding that no sensible overview of its fundamental ideas is possible without abandoning the traditional narrative structure.

The notion of *narrative* provides this essay with its central organizing concept. The term is deployed inclusively, so as to encompass everything from the theories of micro physics to the myths of traditional societies. Narratives commonly taught in universities, "knowledge narratives", will receive primary attention. It frequently happens that in a field of empirical enquiry there emerge several narratives which rather than being contradictory or incompatible are complementary in the sense of offering different windows for observation of the same or overlapping domains of phenomena. Every narrative – and, therefore, every theory, paradigm

and research program – launches itself from a conceptual framework, including a set of presuppositions about the nature of reality. Inevitably, different conceptual frameworks offer different points of view on the object of inquiry. What one sees when one looks at Michelangelo's statue of David depends on the standpoint from which it is observed; similarly, what any empirical inquiry makes of its object depends on the conceptual framework through which it is viewed. Just as full appreciation of David requires viewing it from more than one perspective, so knowledge accumulation often depends upon investigating empirical domains through more than one narrative. I call this the doctrine of **narrative pluralism**. It is the same view of empirical understanding that the physicist David Bohm describes as follows.

What is called for is not an *integration* of thought, or a kind of imposed unity, for any such imposed point of view would itself be merely another fragment. Rather, all our different ways of thinking are to be considered as different ways of looking at the one reality, each with some domain in which it is clear and adequate. One may indeed compare a theory to a particular view of some object. Each view gives an appearance of the object in some aspect. The whole object is not perceived in any one view but, rather, it is grasped only *implicitly* as that single reality which is shown in all these views. When we deeply understand that our theories also work in this way, then we will not fall into the habit of seeing reality and acting toward it as if it were constituted of separately existent fragments corresponding to how it appears in our thought and in our imagination when we take our theories to be 'direct descriptions of reality as it is'. [Bohm 1983, pp. 7-8]

The details of these and related arguments will be set out in three sections. First, the narrative function of conceptual frameworks will be explained by examining their various standard elements. Second, 20th-century physics will be surveyed as an exemplary case of narrative pluralism and its benefits. Third, narrative pathologies common to the human sciences and a consequence of anti-pluralism will be identified.

B. Narrative Selection

1. Simplification

"[E]xperience has to organize," wrote Henry James, "some system of observation – for fear, in the immensity, of losing its way." [James 1962, p. 3] At the social level, this path finding embodies itself in various forms of representation: maps, verbal accounts, formulae, systems of equations, graphs, pictures, etc.. All representations, whatever their form, proceed on the basis of a simplification of reality. There are no exceptions to this rule, not even the most sophisticated scientific theories. Jorge Luis Borges's parable "Of Exactitude in Science" illustrates the folly of disregarding this most fundamental of all narrative principles.

. . . In that Empire, the craft of Cartography attained such Perfection that the Map of a Single province covered the space of an entire City, and the Map of the Empire itself an entire Province. In the course of Time, these Extensive maps were found somehow wanting, and so the College of Cartographers evolved a Map of the Empire that was of the same Scale as the Empire and coincided with it point for point. Less attentive to the Study of Cartography, succeeding Generations came to judge a map of such Magnitude cumbersome, and, not without Irreverence, they abandoned it to the Rigours of sun and Rain. In the western Deserts, tattered Fragments of the Map are still to be

found, Sheltering an occasional Beast or beggar; in the whole Nation, no other relic is left of the Discipline of Geography. [Borges 1975, p. 131]

But charming and useful as it is, Borges's parable illustrates only one aspect of any representation's need for simplification. For every empirical domain there exists an infinity of possible points of view and, therefore, also of potential observations. These plethoras of possibilities together with the dilemma posed by Borges present observer/narrators with an acute problem of choice. They must decide which features of their domains they are going to describe and which they are going to disregard. Each of their narratives can proceed only on the basis of a radical simplification of reality. To this end, and in lieu of random observations from random points of view, narrators deploy principles of selection, or what James called "systems of observation" and today's writers usually call "conceptual frameworks". This process abstracts certain features of the narrative's domain while ignoring others. A narrative may make explicit its narrative framework, but more often it leaves it partly or wholly concealed, leaving it to operate outside critical awareness.

We must not forget that knowledge narratives, no less than popular and literary ones, explore reality by simplifying it. They obscure great masses of detail, so as to systematically highlight certain aspects of that reality which a group of individuals have identified as being of special interest to themselves. Different but non-competing narratives of the same domain give prominence to different dimensions of that domain. Each narrative functions as an interpretative system, as a *special* way of perceiving some corner of existence.

Narrative selection proceeds through a set of assumptions which simplify or pre-empt many features of the narrative's domain. These assumptions include a system of classification of entities, the attribution of a limited number of properties to those entities, some metaphysics which posits a kind or kinds of connection between events, and usually the recognition of different structural levels within the domain of inquiry. A narrative also views its domain from a certain scale, omitting details that it sees as too microscopical or too global, too short-run or too long-run. Typically it also describes its domain within some range of accuracy or approximation, ignoring effects which do not fall within that range. Finally, every knowledge narrative has its community of practitioners, people who develop and deploy the narrative in writing and teaching. As socially, economically, geo-politically and historically situated individuals, these people bring to the narrative enterprise various inclinations and sensibilities, as well as overt purposes, all of which help determine which aspects of the domain the narrative includes, emphasizes and ignores.

2. Classification

Wittgenstein noted that "*The limits of my language* mean the limits of my world," and that "what we cannot think we cannot say either." [Wittgenstein 1974, 5.6, 5.61] Our categories of thought, including our groupings of the objects of the world, pervade our descriptive use of language and organize all our experience. Even the predicates of everyday language categorize, though not always very precisely, the contents of the world. These informal classifications, with their mixtures of the personal and the cultural, are the means by which we order the perceptual fields of our daily existences. Similarly, every narrative needs to provide some classification of the objects in its domain.

In the specialized narratives of science this shaping of the facts is especially pronounced because the number of categories tends to be strictly limited. The selection of categories inevitably involves arbitrariness because there exists countless numbers of objectively grounded ways in which the contents of a domain can be categorized. Another parable from Borges illustrates this inescapable aspect of narratives. An Argentinean consults an imaginary Chinese encyclopedia which says that "animals are divided into: (a) belonging to the Emperor, (b) embalmed, (c) tame, (d) sucking pigs), (e) sirens, (f) fabulous, (g) stray dogs, (h) included in the present classification, (i) frenzied, (j) innumerable, (k) drawn with a very fine camel-hair brush, (l) et cetera, (m) having just broken the water pitcher, (n) that from a long way off look like flies." [Foucault, 1971], p. 2]

The outlandishness of Borges's imaginary taxonomy of the animal kingdom, as well as the ambiguity of its selection criteria, suggests the diversity of ways in which one can, without forgoing objective grounding, categorize a sector of reality. Make-believe classifications, however, are not alone in making manifest the arbitrariness of conceptual orders and their resulting perceptual fields. Ethnological studies offer numerous examples of zoological classifications whose non-essential nature is immediately obvious to outsiders. Consider the case of the villagers of Baan Phraan Muan in northeastern Thailand. They divide the animal kingdom on the basis of two criteria: edibility and habitat. [Tamiah 1969] These generate five major primary categories: insects (inedible), birds (edible), water animals (edible), animals of the house and village (animals in the house are inedible, animals under the house are edible) and forest animals (animals of the deep forest are inedible and other forest animals are edible unless they have domesticated counterparts in the house). But these criteria leave numerous organisms known to the Muan standing awkwardly alone in their own primary classes and rivalling Borges's for their apparent fancifulness. These anomalies include house rat (only small children eat), field rat (only small children eat; adults eat privately), giant lizard (medicinal food for children), monitor lizard (edible, but dangerous to mothers after childbirth), chameleon (medicinal food), snake (inedible), vulture (inedible) and crow (inedible).

The Karam people of New Guinea also use habitat as one of the two criteria by which they classify the animal world. [Bulmer 1967] But their notion of habitat differs from that of the villagers of Muan in being two-dimensional. Its horizontal axis has the forest at one pole, the homestead at the other and open country and gardens in between. Its vertical axis runs from aerial through arboreal, terrestrial and aquatic, to subterranean. The Karam's second set of criteria are morphological (physiological): winged or wingless; bony or boneless; bipedal, quadrupedal, multipedal or limbless; elongated or not; and large, medium-sized or small. These two sets of criteria divide the Karam's zoological world into 94 primary categories. One of these, flying birds and bats, contains 44 percent of the Karam's 422 named organisms, whereas another includes only tadpoles.

Cultural bias may incline us to attribute the disparateness between the Muan's and the Karam's ways of dividing up the animal world as due to their common absence of a scientific basis. More especially, we might expect that modern biology with its grounding in evolutionary theory, would provide for animals a determinate and definitive classification. But that is not the case. Science teaches us that the evolutionary process abounds with ambiguities. It is not even clear what are the units that survive or become extinct. Are they genes, fragments of genes, chromosomes, genotypes, phenotypes, groups of organisms, gene pools or species? This assortment of possible basic units has generated various formulations, offering different

points of view on the selection process. It is this family of narratives which comprises modern evolutionary biology.

Nor does nature's biological ambiguity as revealed by science end here. Not one but numerous concepts of "species" have emerged from evolutionary theory. [Dupré 1993, pp. 37-59] These concepts divide into two types, the "biological" and the "phylogenetic". The former defines a species as "a group of organisms connected to one another by actual or possible reproductive links, and reproductively isolated from other organisms." [Dupré, p. 46] Though we may find the biological species concept intuitively satisfying, it is inapplicable to asexual organisms and, therefore, to most micro organisms and, therefore, to microbiology. Phylogenetic taxonomies, on the other hand, have as their basic principle that the organisms forming a species should descend from a common set of "ancestors". But in an evolutionary context this condition obviously is not sufficient. Rules are needed to identify cut-off points in the lines of descent, and to establish "what makes a genealogically coherent set of organisms correspond to the rank of species." [Dupré, p. 48]. To this end, various criteria, each leading to a different classification, have been put forward and used in modern biology.

The plurality of possible basic units of selection and the diverse concepts of "species", however, are neither the only nor the most profound manifestation of pluralism in the classification of organisms in biology today. In ecological biology, niche, not species, is the basic classificatory unit. The idea of niche more resembles the Muan's and the Karam's implicit concept of habitat than it does any of evolutionary biology's notions of species. Frequently more than one species can perform the role required of a particular ecological niche. Consequently, ecological-based classifications of organisms differ greatly from evolutionary-based ones. [Dupré, pp. 43, 58]

Finally, a brief example from Thomas Kuhn will reinforce much that has just been said. It reveals two different classificatory concepts for "molecule" concurrently and productively at work in the physical sciences. Kuhn relates the responses of a "distinguished physicist and an eminent chemist" when asked whether a single atom of helium was or was not a molecule.

"Both answered without hesitation, but their answers were not the same. For the chemist the atom of helium was a molecule because it behaved like one with respect to the kinetic theory of gases. For the physicist, on the other hand, the helium atom was not a molecule because it displayed no molecular spectrum. Presumably both men were talking of the same particle, but they were viewing it through their own research training and practice. Undoubtedly their experiences had had much in common, but they did not, in this case, tell the two specialists the same thing. [Kuhn 1970, pp. 50-1]

The gist of this and of our other examples of classification can now be summarized. Borges's zoological fantasy, by means of what are from conventional viewpoints its glaring omissions, called our attention to how any classification of an empirical domain limits the possible descriptions, and thereby also the field of possible facts and possible questions. Similarly, without discounting their epistemological value for the cultural-geographical situations to which they are applied, the alien taxonomies the Muan and the Karam encourage us to recognize the indeterminateness and contingency of all classifications of empirical realms. But we also have seen from examples from contemporary biology that even when it comes to dividing up a domain on the basis of the most advanced science there exist more than one plausible and defensible way of doing so. *The best way will depend on the purposes of the*

narrative for which the classification is intended. Every categorization of a set of empirical phenomena uniquely circumscribes our possible understanding of that realm of reality, rather as every position which one takes up around Michelangelo's statue of David limits what one can see. Likewise, the numerous ways in which any domain can be divided up means that there exists many different bases for making a systematic inquiry of that domain.

3. Selection of Properties

Of all narrative genres, ontologies are the most elemental because they make assertions about the fundamental nature of reality – about what sorts of entities, properties and relations compose existence. But all narratives, and especially knowledge narratives, postulate a sort of proto-ontology in the sense of identifying a certain range of phenomena (a "universe of discourse") whose existence, real or imagined, they wish to take into account. In the formation of these proto-ontologies, the classification of entities typically requires the predication of various properties, making these two processes inextricably intertwined. This conceptual interdependency is especially pronounced in the more narrowly focused physical sciences, which, from out of the welter of phenomenological possibilities emanating from some empirical domain, abstract a very limited set of phenomena for cognitive attention.

Highly specialized proto-ontologies are commonplace in the study of physical matter. Consider the case of crystallography, the scientific study of crystals. It divides solid bodies into two classes: crystals and non-crystals. This division presumes certain properties – approximately plane geometrical surfaces with straight edges which meet other such planes, thus bounding the object on all sides – which identify some materials as belonging to the crystal category. Along with six kinds of symmetry (mirroring, inversion, and twofold, threefold, fourfold and sixfold rotations) these properties – not mass and extension or chemical composition or market-value – are the fundamental properties of the crystallography narrative. These selected attributes divide the class of all crystals into 32 subclasses. The result is a powerful but quite limited descriptive system, one of many useful frameworks of classes and properties for viewing solid objects.

A classification of objects leads to further questions about what additional characteristics of the entities classified should the narrative recognize. For example, in regarding material substance, classical mechanics includes the properties of mass and length, but not the symmetrical properties of crystals or the colligative properties of solutions. The immensity and richness of actuality compels even the most comprehensive narratives to exclude more characteristics than they include. For this reason, the descriptions of any narrative are always stylized abstractions of reality. Nor is it only knowledge narratives which are characterized by this sort of abstraction. All narratives, even Joyce's *Ulysses* and Proust's *Remembrances of Things Past*, take shape on the basis of radical exclusion of phenomenal detail. The Nigerian philosopher and anthropologist Robin Horton illustrates this narrative principle at work both in traditional African religion and in modern science.

Thus when traditional thought draws upon people and their social relations as the raw material of its theoretical models, it makes use of some dimensions of human life and neglects others. The definition of a god may omit any reference to his physical appearance, his diet, his mode of lodging, his children, his relations with his wives, and so on. Asking questions about such attributes is as inappropriate as asking questions about the colour of a molecule or the temperature of an electron. It is this omission of many dimensions of human

life from the definition of the gods which give them that rarefied, attenuated aura which we call 'spirituality'. It is the result of the same process of abstraction as the one we see at work in Western theoretical models: the process whereby features of the prototype phenomena which have explanatory relevance are incorporated into a theoretical schema, while features which lack such relevance are omitted. [Horton 1971, p. 225]

This idea of "explanatory relevance" suggests a further dimension of conceptual frameworks, namely the inclusion of some basis for conceiving connections between various categories of phenomena and their properties.

4. Interconnectivity: Ten Kinds of Narrative Linkage

Narratives need notions about how the things they classify and describe are connected. "[T]he most usual species of connection," said David Hume, "among the different events which enter into any narrative composition is that of cause and effect." [Hume 1955, p. 34] The relation of causation holds between two events when, given the occurrence of one event, it results in a second. The putative causal event may be either natural or supernatural, and the relation may be postulated either as a general rule as in the laws of chemistry and the procedures of witchcraft or as a singularity as with events in a novel. Causal linkages make phenomena fall into configurations, enabling us to apprehend various items as contributing to an interrelated system of parts or forming an intelligible pattern of events. This showing of things leading to other things distinguishes narratives from mere listings, descriptions and chronological sequences. I wish to consider these cause and effect linkages with regard to five criteria: whether they explain in terms of past or future events, whether these explanations are open or closed in the sense of admitting or not admitting indeterminacies, whether they explain a property of something as due only to that something's parts or due also to the structure by which those parts are organized, whether they explain the whole in terms of its part or vice-versa, and whether between entities they postulate internal or external relations.

a. Teleological and non-teleological explanations

Time's linearity leads to two basic methods of framing narrative connections between events happening at separate moments. Items may be explained in terms of their consequences, as when we say Othello fell on his sword because he wanted to die. Alternately, an explanation may run in the other direction, the consequences explained in terms of some prior event, as when we say Othello died because he fell on his sword. Explanations of the former type are called teleological or functional and find frequent use with respect to human actions. Such usage arises from regarding humans as purposive beings, a view which obliges us to explain their behaviour, at least in part, as a function of wishes to bring about various future events. Consequently, the human sciences abound with narratives which explain operations in terms of their consequences. But the range of knowledge narratives which rely heavily on functional linkage is much broader than this, and it is examples from outside the human sciences that I want to emphasize here.

Functional or teleological narratives interpret processes from the perspective of 'wholes' or systems of interconnected components desiring or designed for the achievement of some end, in other words, a future event. Such narratives focus attention on culminations and

consequences, and link the behaviour of each component to the end or purpose of the whole or system to which it belongs. Physiology is a well-known example of a primarily teleological knowledge narrative. It proceeds by identifying the function an organ performs for its organism and how it works to that end. Likewise, more often than not we perceive human artifacts, especially advanced technology, through functional or teleological narratives. A comb is a device for untangling hair; an automobile is a mechanism for getting about in and, sometimes, for impressing one's neighbours. Functional analysis identifies and classifies an entity's parts in terms of their subfunctions. For example, we commonly analyze an automobile into its various parts – a fuel system, an ignition system, a carburettor, some combustion chambers with pistons, a crankshaft, a transmission, a chassis, a set of wheels, a steering wheel, a breaking system, and seats – and explain them in terms of their contribution to the intended function of the whole. The same kind of teleological account pertains to a system's subcomponents and their operations. Continuing with the car example, a science dictionary tells us that the crankshaft is an "essential component of piston engines that converts the up-and-down (reciprocating) motion of the pistons into useful rotary motion." [Lafferty and Rose 1994. p. 159] The entry then explains how the components of the crankshaft work to this end. Technological culture could not exist without narratives of this type.

Proceeding from the other direction, nonteleological explanations focus attention on the conditions and events preceding the event, process or state of affairs being explained. "They seek to exhibit the integrated behaviours of complex systems as the resultants of more elementary factors, frequently identified as constituent parts of those systems; and they are therefore concerned with traits of complex wholes almost exclusively to the extent that these traits are dependent on assumed characteristics of the elementary factors." [Hempel 1966, p. 93] For example, under this narrative mode the crankshaft's conversion of reciprocating motion into rotary motion is interpreted in terms of the laws of mechanics, the firing of the pistons, and the initial conditions constituted by the crank pins, the connecting rods and bearings, and the crankshaft.

b. Closed and open narratives

Turn now to another, more difficult, and more provocative aspect of narrative linkage, the distinction between determinate and indeterminate explanations. Some narratives are *closed* in the sense that they describe all their events as predetermined, whereas others are *open* in the sense that they admit indeterminacies. Narratives divide between these two categories. Those of the closed or determinate variety claim that give X, Y must follow, whereas open or indeterminate narratives explain Y in terms of X without the presumption that Y *always* follows X. If a field of inquiry is not seen as wholly determinate, meaning that chance, contingency, choice, uncertainty, randomness, or spontaneity enter into the relations between events, then the sets of events open to explanation by the determinate and indeterminate approaches are not coextensive. With these different ranges of application, the choice between the two forms of narrative linkage is one of selecting a method appropriate to the perceived subject matter. As such, this question of finding a suitable narrative form must not be conflated with the metaphysical question of whether reality in general is determinate or not. Traditionally philosophers have lavished attention on the latter question, but for us it need not be at issue. Here we want merely to consider two types of narrative linkage, two conceptual angles offering different vantage points on the field of observation. As I will illustrate, within the same domain of inquiry both types of explanation may prove useful. Like the hammer and saw, the use of one conceptual tool does not preclude the use of the other.

To place these joint notions of open and closed narratives in a more traditionalist context, consider Popper's definition of a physically closed system. "By a physically closed system I mean a set or system of physical entities . . . which interact with each other – and *only* with each other – in accordance with definite laws of interaction that do not leave any room for interaction with, or interference by, anything outside that closed set or system of physical entities." [Popper 1972, p. 219] This definition, when modified as follows, defines a closed or determinate narrative. By a closed narrative I mean an account of a set or system of entities and their interactions with each other – and *only* with each other – in terms of definite laws of interaction that do not leave any room for interaction with, or interference by, anything outside that closed set or system of entities.

Tolerance for open or indeterminate narratives, however, is very much a modern development. Robin Horton notes that in the traditional cultures of Africa, the concept of coincidence or chance scarcely exists.

When a rotten branch falls off a tree and kills a man walking underneath it, there has to be a definite explanation of the calamity. Perhaps the man quarrelled with a half brother over some matter of inheritance, and the latter worked the fall of the branch through a sorcerer. Or perhaps he misappropriated lineage property, and the lineage ancestors brought the branch down on his head. *The idea that the whole thing could have come about through the accidental convergence of two independent chains of events is inconceivable because it is psychologically intolerable.* To entertain it would be to admit that the episode was inexplicable and unpredictable: a glaring confession of ignorance. (Italics added) [Horton 1971, p. 250]

But Western culture also has exercised a strong bias against open narratives. This partiality, which until a century and a half ago was hegemonic, owes more than a little to Aristotle. His *Poetics* scorned narratives whose episodes "follow each other without any probable or necessary connection," and applauded the *Odyssey* and the *Iliad* for the manner in which their events are "connected into one event". [Aristotle 1934, Part II, sec. V] With incomparable influence, Aristotle argued that actions "should arise from the structure of the fable itself, so as to be the natural consequences, necessary or probable, of what has preceded in the action". [Aristotle 1934, Part II, sec. VIII] Moreover, "the fable . . . should be an imitation of an action that is one and entire, the parts of it being so connected that if any one of them be either transposed or taken away, the whole will be destroyed or changed". [Aristotle 1934, Part II, sec. V] Determinism as embodied in many scientific theories is but a variation of this ancient sensibility regarding narrative and the connection of events. Newtonian mechanics, especially as reworked by Laplace, achieves perfect "unity of action". Given the positions and velocities of all the particles at any one moment, this narrative's system of equations determines the positions and velocities, and thereby the actions, of all particles for all moments, both future and past. With every event portrayed as part of an unbroken chain of events, if any one of them fails to take place, then the whole scientific narrative would, in effect, "be destroyed".

Horton's example of the falling tree branch, however, suggests that some happenings may not, at least from an epistemological point of view, always best be described and understood as emanating from a single and predetermined chain of events. Observation may repeatedly reveal gaps in such chains or chance convergences of two or more such chains, showing elements of unpredictability or randomness in reality. Historically these

indeterminacies have proven no less "psychologically intolerable" to many scientists and philosophers of science than they have to members of traditional African cultures. The willingness of the cultural elites of Western societies to engage with open narratives is an even more recent development than their willingness to engage with democratic processes. Prior to Darwin, no space existed in scientific narratives for indeterminate phenomena. This dimension of reality was barred from scientific inquiry no less than was heliocentric cosmology under the popes. "The doctrine of scientific determinism," writes Stephen Hawking, "remained the standard assumption of science until the early years of this century." [Hawking 1995, p. 59] As a physicist, Hawking thinks of quantum mechanics as the breakthrough narrative, but biologists have the better claim to being the first natural scientists to develop an open narrative that successfully breached the determinist hegemony. Evolutionary theory from Wallace (1858) and Darwin (1859) onwards relies heavily on indeterminacy as a narrative linkage.

Neo-Darwinism, which combines natural selection with Mendelian genetics and whose advent was roughly contemporaneous with the development of quantum mechanics, exemplifies open knowledge narratives. Neo-Darwinism admits indeterminacy at several levels. It predicates two sources of heritable variation, both conceptually conceived as indeterminate processes. First, the genes of each individual are the result of a random shuffle of existing genetic material (genetic recombination). Second, random mutational jumps occur due to accidents in replication and repair of DNA, accidents now attributed largely to cosmic rays modifying gene structures. Natural selection operates on these randomly shuffled and mutating genes within the field of a changing environment. The evolutionary narrative also treats this form of variation as indeterminate, as resulting from both random non-biological causes – for example, meteorites, volcanic eruptions, continental drift – and from the indeterminate and recursive process of natural selection itself. Modern evolutionary biology includes these indeterminate narrative linkages as well as determinate ones from the laws of inheritance, most especially that *in every case* mixtures of characteristics inherited from the parents do not blend but remain distinct.

Despite the development in the natural sciences of hugely successful narratives embracing "concepts which formally recognize the existence of various kinds of limitation upon the possible completeness of explanation and prediction," [Horton 1971, p. 250] there remain scientists and philosophers who retain a nostalgia for Newtonian certainties. The vision of a clockwork universe – no less than one governed by ubiquitous spiritual agency – is a dream not easily foregone. For those wedded to the metaphysics of determinism, quantum mechanics is but a halfway house to perfect knowledge, while evolutionary theory scarcely qualifies as science, it being so "riddled" with indeterminacies. But metaphysical belief aside, the open narratives of quantum mechanics and evolutionary biology are the biggest success stories of modern science, especially as applied to the practicalities of technology. For better or worse, we live on the eve of the brave new world of genetic engineering, whereas already quantum mechanics, notes Hawking, "governs the behaviour of transistors and integrated circuits, which are the essential components of electronic devices such as televisions and computers, and is also the basis of modern chemistry and biology." [p. 62]

c. External and internal relations

We need to consider briefly a further aspect of causality which impacts on the distinction between closed and open narratives. This is the question of whether or not a narrative admits internal, as well as external, relations. A narrative may be mechanistic in the

sense that the internal structures of its fundamental elements are independent of one another, the elements being connected by only external relationships. The classic detective novel, with its resolution worked out in terms of interactions between unchanging characters, exemplifies this type of narrative linkage. So too does Newton's mechanics, where the causal relations of collision and gravity leave the particles atomistically intact. Internal relations, on the other hand, are "identity-affecting". [Bhaskar, 1986, p. 111] Interactions between characters in a literary novel, for example, usually bring about "character development". The description of internally related phenomena has been even more central to the modern development of the natural sciences. This is illustrated by evolutionary theory, which is the story of how the identity of biology's primary units change through interaction.

d. Aggregative versus structural properties

There exist two primary ways of explaining properties. Some narratives explain the properties of things as simply the function of the properties of their parts. For example, engineering treats an object's mass as merely an additive function of the masses of its parts, and the floor space of the Empire State Building as the sum of the floor spaces of its various rooms. Properties explained in this way, I will call *aggregative*. Some knowledge narratives deploy only this approach in their conceptualisation of properties. For example, classical mechanics is based on only three properties – mass, length and time – and with each described in terms of an additive function. Further or "derived" properties are defined in terms of these three primary "dimensions", as for example, velocity is length divided by time, and momentum is mass times length divided by time. Thus, although classical mechanics includes an extensive list of properties, they all reduce to some mathematical combination of the three primary aggregative properties.

There exist, however, many things possessed of properties which are not properties of their components, but instead come to exist only through the structures by which things are combined. Therefore many fields, and especially the biological sciences, include properties explained as the due to the characteristics of the *structure* by which something's components are combined, rather than as an aggregation of microproperties. The property of being able to see, for example, is explained not just in terms of the various individual cells of the eye and brain – none of which have the property of being able to see – but also in terms of the way those cells are combined. Similarly, human crowd behaviour is understood as depending on the relations holding between the individuals as well as on the individuals themselves. Although it was Newton's dream that some day all of existence could be accounted for in terms of aggregate properties, modern science has tended to involve itself ever more with structural properties. Even physics, with its various field theories, today concerns itself fundamentally with structural explanation.

e. Direction of causation: micro or macro

Reality presents various levels of complexity, running from atomistic individuals to the universe. This polarity entails two possible directions of narrative explanation: accounting for the more complex in terms of the less so or vice-versa. The first approach, "micro explanation", characterizes Newtonian physics and for several centuries dominated the natural sciences. Chemistry, for example, advanced by describing the decomposition of compound substances by chemical processes into simpler compounds or into their constituent elements. But sometimes the object of inquiry begs a macro approach, as when a property of an individual

thing appears mediated or determined by the whole or ensemble of which it is a part. The facts that I grew up speaking English instead of Chinese and eating with a knife and fork instead of chop sticks, for example, seem more attributable to the family and society in which I emerged than to any aspect of my individual make-up. Likewise, when I die, although the event will fit some micro explanation such as heart-failure or perforation of the intestine, the complex changes that will then befall the millions of cells out of which I am composed will be seen to be due to the regrettable change in the whole to which they belong.

Because the metaphysics that grew out of Newtonian science was for so long hegemonic, even today there persists pockets of prejudice against the use of macro linkages in knowledge narratives. Yet science has long conceived of some quantitative properties, such as angle and probability, as based on macro relations. Thus any change in the size of a deck of cards causes every card's probability of being drawn to change. Even more noteworthy is that in physics itself, quantum mechanics has forced through innovations in the use of narrative linkages, placing macro explanation on an equal footing with the older micro variety. The quantum factor, explains the physicist Paul Davies, "denies that the world can be understood in terms of its components alone." Davies continues:

the reality of the subatomic particle cannot be untangled from the environment it inhabits. . . Evidently the macroscopic and the microscopic worlds are intimately interwoven. There is no hope of building a full understanding of matter from the constituent particles alone. Only the system as a *whole* gives concrete expression to microscopic reality. The big and the small co-exist. One does not subsume wholly the other, nor does the other wholly 'explain' the one. [Davies 1995, p. 39]

C. The Narrative Pluralism of 20th Century Physics

Until the appearance of Einstein's theory of relativity (1905, 1915), Newtonian mechanics with its theory of gravity was unrivalled as the most celebrated theory in the history of science. Its verification by countless experiments and astronomical observations supported the prevailing view of science as a smooth accumulation of facts generated by the application of well-tested theories. So inevitably the discrediting of Newton's theory dismayed and shocked the cultural psyche, traumatizing 20th century thought about scientific advance and fixating its attention on events structurally resembling the Einsteinean revolution.

Initially there was strong resistance to Einstein's new narratives of gravitation and cosmology, Newton's theory of absolute space and absolute time having for so long been accepted as an unquestionable truth. But following the solar eclipse of 1919, when Einstein's predictions were confirmed by two teams of astronomers, there began a cultural shift regarding the nature of scientific progress. Philosophers and historians of science especially faced a new narrative challenge. The historical situation no longer pressed them to account for continuity in science nor permitted them to characterize science as a process whereby new certainties are endlessly added to existing ones. Instead they struggled to identify and describe the processes by which one theory could or should replace or withstand a challenge from another. The first major work to recast the narrative of scientific progress in terms of *competing theories* was Karl Popper's *The Logic of Scientific Discovery* published in German in 1934.

Popper showed that no amount of verification and inductive support can ever prove a theory. Instead every theory always remains vulnerable to refutation and replacement by another. This was a narrative which nicely accommodated the recent astounding events in physics. Popper's account of theory replacement spelled out various methods, including degrees of falsifiability [Popper 1959, pp. 135, 112-135], empirical content [pp. 119-123], degrees of simplicity [pp. 136-145] and degrees of corroboration [pp. 251-282], for judging between competing theories. Under Popper's narrative of scientific discovery, competing theories fight it out on the basis of these criteria of scientific merit, and the "best" one wins.

From the 1960s onwards Popper's version of the new narrative of scientific progress increasingly came under attack. Thomas Kuhn's *The Structure of Scientific Revolutions* (1962) denied the historical efficacy of Popper's objective criteria for theory-replacement, arguing instead that competing theories or "paradigms" are often incommensurable and that sociological factors, rather than epistemological ones, often determine whether one theory is or is not replaced by another. Imre Lakatos's "Falsification and the Methodology of Scientific Research Programmes" (1970) argued that refuted theories may continue to be used if no better theory exists. Paul Feyerabend's "Against Method" (1970) emphasized that all observation is "theory-laden" and contended that no set of methodological rules can account for theory-replacement and that all knowledge claims are relativistic. But these and other alternatives to Popperian falsification were variations of the basic narrative which had emerged as the natural aftermath of Einstein's revolution. Each added to the collection and interpretation of historical science data to answer questions suggested by the competing-theories narrative. Almost inevitably the decades of debate on theory-replacement has had as its primary effect the deepening and widening of our culture's general perception of scientific progress as the outcome of a struggle between competing theories.

This essay challenges not the narrative of competing theories as such, but rather the hegemony which that narrative maintains over our vision of science. That that narrative fits important chapters in science, including the momentous one which inspired it, is above dispute. But there is much more to conceptual science than just the postulation of frameworks which challenge other frameworks. Formulation of scientific narratives is also about gaining new points of view on domains of inquiry. Viewing the domain from a new conceptual perspective may yield not only additional information but also a new dimension to the understanding of it. The new viewpoint may even reveal fundamental phenomena which were but dimly observable or not observable at all when looking through a prior conceptual system. That such new knowledge may be conceptually incommensurable with that acquired through another narrative lens should be regarded not as a scandal but rather as due to the nature of conceptual thinking. Except in the special case where two narratives make conflicting predictions, incommensurability between narratives does not argue for competitiveness between them. To the contrary, observing a domain of inquiry through more than one conceptual framework is eminently desirable, as is observing Michelangelo's David from more than one standpoint.

Phenomena observed through different conceptual systems may eventually be reconciled through a "deeper" level of theory (like a "bird's-eye view"), as with Maxwell's unification of electronic and magnetic theory. But such unification can never happen except where *narrative pluralism* first prevails for that domain of inquiry.

The narrative of competing theories, especially Kuhn's version, seriously underestimates the scientific imagination, that talent which John Stuart Mill characterized as the

faculty for "mentally arranging known elements into new combinations". [Mill 1893, p. 433] Kuhn's narrative assumes that the scientific mind is so deficient in agility as to be incapable of alternating freely between incommensurable conceptual systems. I would be the last to deny that examples of this stereotype exist in every discipline and that in some this intellectual ineptitude may even dominate. Nor do I deny that narrative communities sometimes exist in bondage to their conceptual system because they have failed to make explicit its primary presuppositions. But it seems a cruel travesty of the truth to portray the scientist in general, on the one hand, as an intellectual bumpkin, incapable of shifting between conceptual gestalts and, on the other, as a moral midget, committed primarily to the glorification of a particular narrative point of view rather than to the understanding of the empirical domain to which that narrative and others refer.¹

For too long historical data from science have been collected, selected and interpreted mainly to answer questions posed by the various versions of the competing-theories narrative of scientific progress. The case for regarding this narrative as a general explanation of scientific advance has, in its various forms, been constructed primarily on the basis of examples drawn from physics. Yet even here on its most favoured ground it is a simple matter to show that the narrative of competing theories not only fails to account for but also runs counter to most major developments.

In physics today, indeed for a couple of generations now, fundamental research is focused primarily on "unification". Various schemes are used to characterize "the unification process", but all describe a state of affairs incomprehensible in terms of the traditional competing-theories narrative of scientific development. Stephen Hawking, for example, explains the quest as follows.

Today scientists describe the universe in terms of two basic partial theories – the general theory of relativity and quantum mechanics. They are the great intellectual achievements of the first half of this century. Unfortunately, however, these two theories are known to be inconsistent with each other – they cannot both be correct. One of the major endeavours in physics today...is the search for a new theory that will incorporate them both – a quantum theory of gravity. [Hawking 1995, p. 13]

Reading this passage through the competing-theories lens invites total misunderstanding. Physicists perceive relativity and quantum mechanics not as competing theories, but rather as different and complementing conceptual approaches to the fundamentals of physical reality. These two narratives illuminate separate facets of what unification physicists see as ultimately the same domain of inquiry, but which cannot yet be reconciled with each other. The unification dream, with its implicitly deeper level of understanding, arises directly out of the co-existence of the two narratives, the heuristic significance of each being enhanced by the existence of the other. Physicists seek neither to discredit relativity or quantum mechanics, but rather to create "a new theory that will incorporate them both".

Another and more common conceptualization of physics' unification project centres on the four forces of nature: gravity, electromagnetism, the weak nuclear force and the strong nuclear force. Physicists aim to develop a theory which merges the four forces into a single narrative scheme, or, as Hawking puts it, "to find a unified theory that will explain all four forces as different aspects of a single force." [p. 76] The theories of gravity, electromagnetism, and the two nuclear forces, as well as the theory of the electroweak force (a unification of the theories of electromagnetism and the weak nuclear force) are referred to as "partial" theories, because

their frameworks of interpretation permit only partial and unreconciled views of the domain of force phenomena. *They are conceptually different ways of looking at that domain, and because they are conceptually different they reveal different dimensions of that domain.* Here again, as with electromagnetism, narrative pluralism is the indispensable prerequisite of fundamental scientific advance.

Shifting between narratives with fundamentally different conceptual systems can be a daily occurrence for 20th-century physicists. The time is long past when one could make a mark in theoretical physics without the ability to move freely between conceptual gestalts. Modern physics requires not only mathematical prowess but also conceptual agility. Unlike theory replacement, unification of narratives for a given domain demands the ability to jump back and forth between three or more conceptual systems: those of the incommensurate narratives and that of the narrative intended to effect the merger. But physicists working on unification projects are not alone in requiring conceptual ability. Today to become a physicist of any kind, one must master the basic concepts of both relativity and quantum mechanics. All the rest of modern physics is derived from one or the other of these two theories *whose conceptual frameworks differ radically.* Indeed "the basic concepts of relativity and quantum theory," notes David Bohm, "directly contradict each other." [Bohm 1983, p. 176] General relativity conceives of space and time as continuous; quantum theory conceives of them as discontinuous. General relativity conceives of matter as particulate; quantum theory conceives of it as a wave-particle duality. General relativity conceives of physical objects as having actual properties; quantum theory describes them as having only potential properties within the given physical situation. General relativity conceives all physical reality as determinate and all events as in principle having a causal explanation; quantum theory admits indeterminacy and events incapable of causal explanation. Conceptual differences greater than these are scarcely imaginable. In their fundamentals, relativity and quantum theory share little in common as descriptive approaches to physical reality. Yet for most of a century these two metaphysically dissimilar narratives have worked not in competition but in tandem to the produce arguably the greatest advances in the history of science.

D. Anti-knowledge

Robin Horton has categorized the similarities and differences between African traditional thought and western science. He identifies a general principle of divergence.

What I take to be the key difference is a very simple one. It is that in traditional cultures there is no developed awareness of alternatives to the established body of theoretical tenets; whereas in scientifically oriented cultures, such an awareness is highly developed. It is this difference we refer to when we say that traditional cultures are 'closed' and scientifically oriented cultures 'open'. [Horton 1971, p. 230]

A similar distinction pertains to communities of scholars and scientists associated with various domains of inquiry. Some are *open narrative communities*, in the sense that, like modern physics, they understand and support the epistemological importance of examining a domain from more than one narrative point of view. Others, like traditional societies, are *closed narrative communities* in that they insist that there is only one legitimate way of looking at their domain, all others being taboo. Open narrative communities may be the rule in the natural sciences, but in the human sciences they are few and far between. Closed narrative

communities, however, rarely exist in isolation but rather in opposition to one or more other narrative communities focused on the same empirical domain. These oppositions do not create situations like those featured in the competing-theories narrative of scientific progress.

In the human sciences, narrative pluralism – far from being a normal state of affairs – rarely exists except as a temporary truce among mortal enemies. The conflict endemic to these less successful fields of formal inquiry is idiosyncratic and inadequately understood. The Popper/Kuhn narrative of scientific development contributes little to comprehending these domains, where theories "compete", but *not* in the traditional philosophy-of-science sense. Unlike natural scientists, social scientists never need to come up against reality's hard-edged recalcitrances. With rare exceptions, the links between social scientists narrative beliefs and the world around them are conceptually tenuous. Rarely do their domains generate significant falsifiable predictions, making it virtually unknown for a narrative community in the human sciences to reach the point where, in Kuhn's words, it "can no longer evade anomalies that subvert the existing tradition of scientific practice" [Kuhn 1970, p. 6] This freedom to forever evade reality when combined with monist beliefs and true-believer mentalities, leads to various narratives pathologies, of which four are especially important.

1. Narrative cleansing

Closed narrative communities typically live in open hostility toward "alien" narratives. There exists a danger of radically misunderstanding the basis of this belligerence. The despised narratives rather than being "competing" theories in the sense of the Popper/Kuhn story of scientific progress, are complementary theories in the sense of the narrative pluralism of 20th-century physics. Advocates of closed knowledge narratives often publicly embrace an extreme and primitive form of philosophical idealism, whereby they declare that their conceptual framework rather than offering a point of view on an empirical domain, determines the extent of that domain. This can be true even of narratives founded on a strictly materialist metaphysics. Behaviorist psychologists maintain that psychological phenomena not visible through their conceptual lens does not really exist. Horton describes a similar mind-set ("the magical world-view") common to traditional cultures.

Since he ['the traditional thinker'] can imagine no alternatives to his established system of concepts and words, the latter appear bound to reality in an absolute fashion. There is no way at all in which they can be seen as varying independently of the segments of reality they stand for. Hence they appear so integrally involved with their referents that any manipulation of the one self-evidently affects the other. [Horton 1971, p. 235]

Similarly, the behaviorist claim to universality entails that when it changes its conceptual framework, as it does from time to time, then the domain of psychological phenomena changes also. Those parts and aspects of the domain which cannot be perceived from the current conceptual point of view are said not to exist.

Knowledge narratives deployed hegemonically block or discourage other knowledge narratives and thereby the scrutiny of other aspects of reality. It can be said that this mode of narrative deployment constitutes *antiknowledge*. Consider a hypothetical example. The narrative called "Newtonian physics" could have been deployed (and perhaps was for a while) to block the study of elementary physical phenomena not covered by the Newtonian narrative, such as electro-magnetism and the two nuclear forces. Physicists could have retreated into

subjective idealism and refused to recognize as "physical" those phenomena which can not be embraced by the Newtonian narrative. They could have decreed that non-physical phenomena are precisely those phenomena that are incapable of being analyzed with the Newtonian narrative. This kind of radical inversion of the scientific ethos and retreat into ultra subjectivism is common place in the human sciences. For example, a standard economics graduate textbook informs its readers that "*noneconomic* problems are precisely those problems that are incapable of being analyzed with the *marginalist* paradigm." [Silberberg 1990, p.2.] This mindset, which promotes and protects *a priori* thinking and is endemic to today's "mainstream" economics, anthropologists identify as characterizing traditional cultures. Their members, writes Evans-Pritchard, "reason excellently in the idiom of their beliefs, but they cannot reason outside, or against their beliefs because they have no other idiom in which to express their thoughts." [cited by Horton 1971, p. 231] This "absence of any awareness of alternatives" notes Horton, "makes for an absolute acceptance of the established theoretical tenets, and removes any possibility of questioning them." [p. 231]

Daniel Robinson, in his classic study of the history of psychology, describes an important example of anti-knowledge with a structure similar to the one noted by Harden in traditional cultures. Surveying the contemporary scene in American university psychology departments, Robinson notes that "hardly a vestige" remains of the program of experimental analysis of consciousness from earlier in the century.

But observe the difference between this shift in emphasis or complete abandonment of interest and the changes that have occurred in physics and biology. We *do* have minds, we *are* conscious, and we *can* reflect upon our private experiences because we *have* them. Unlike phlogiston or the inheritance of acquired characteristics, these phenomena exist and are the most common in human experience. The absence of orthodox Wundtians or Titchenerians or Jamesians, therefore, cannot be attributed to the disappearance of their subjects. Rather, it is to be understood as the result of the inability of the accepted *method* of psychological inquiry to address these subjects. The contemporary psychologist, if only insensibly, has made a *metaphysical* commitment to a method and has, per force, eliminated from the domain of significant issues those that cannot be embraced by that method. [Robinson 1986, p. 398]

Anyone coming from the natural sciences might wonder why social scientists expend so much time and energy "defining" and redefining their disciplines. But this otherwise pointless activity is a natural adjunct of anti-pluralism, it being an easy shortcut to narrative cleansing. The anti-pluralist seeks to establish as off-limits those areas and aspects of the empirical domain not visible from his or her single chosen conceptual vantage point. Laying down a definition which excludes phenomena invisible through that system, works to establish a professional taboo against the extension of human knowledge and understanding to all the rest of that empirical domain. This technique of defining away the unwanted is common to many forms of anti-pluralism. Two notorious examples are the Nazis defining "German" so as to exclude Germans who were Jewish, and America's founding fathers defining "citizen" so as to exclude Americans of African descent.

A movement that began on the fringes of economics in the 1990s illustrates points raised in this section. The history of economics is diverse but nevertheless anathema to the idea of pluralism. Beginning with the French Physiocrats in the mid 18th-century, economists

of all varieties have been inclined to believe that their approach to economic phenomena reveals, if not the whole truth, at least all of it that is worth knowing. It is with these broad conceptualizations, which are called “schools”, rather than with subject areas, that economists, like psychologists, form their primary professional identity. The assorted teachings and members of these narrative schools are labeled orthodox or heterodox depending on whether their school is the dominate one or not. Until very recently economists of all varieties have been comfortable with this quasi theological scheme of things.

But from the 1960s on, neoclassical economists were increasingly successful at purging economics departments of economists who viewed economic reality through other conceptual lenses. This cleansing took place worldwide, a process that accelerated with the rise of neoliberalism, which justifies itself by appeal to the neoclassical narrative.

Traditionally non-neoclassical schools of economics have quarreled among themselves hardly less than with the neoclassical. But in the mid-nineties, faced with near extinction, a peace movement began among these schools. Under the banner ICARE (Confederation of Associations for the Reform of Economics) (later changed to ICAPE , with “Pluralism” substituted for “Reform”) it sought, declared its manifesto, “to promote a new spirit of pluralism in economics, involving critical conversation and tolerant communication among different approaches”. But as these words show, this is a pluralism in the mode of a council of churches, a strategic pluralism rather than the epistemological pluralism of the natural sciences that this essay endorses. Even so, ICAPE’s conciliation campaign helped to breakdown among non-neoclassical economists the Popperian-Kuhnian tradition of viewing economics through the lens of competing narratives. This, as readers of this journal know, proved to be prophetic. In the summer of 2000 a group of French economics students circulated a petition that attracted attention from the media in France and subsequently from economists worldwide. The students labeled mainstream economics “autistic” because its allegiance to a single narrative necessarily means that in the main it refuses to look at economic reality. The students called for “a plurality of approaches adapted to the complexity of objects analyzed.” Out of this appeal emerged the Post-Autistic Economics movement.

2. Fake pluralism

As a means of fending off criticism of its autism, of further concealing its ideological role (see below), of diverting calls for pluralism and, perhaps most of all, just as a pastime, economics’ neoclassical mainstream plays a game of relaxing the assumptions. It loosens one or two assumptions around the edges of the theory and then does a bit of analysis. This is no better than when viewing a sculpture to lean to the left or to the right or kneel or stand tiptoed as a means of seeing another side of the work. Yet the whole mainstream project is now so infected with this methodological dilettantism that it seems necessary to spell out the difference between fake and real pluralism.

Even more than with a word, the meaning of a concept is its use. The meaning of a word depends upon the referent of the sentence, which as Wittgenstein noted is a “state of affairs” [*Tractatus Logico-Philosophicus* 2.01, 2.001, 2.02,]; likewise the meaning of a concept depends on the framework in which it appears. For example, take something so simple and straightforward as the concept of economic growth defined in terms of GNP. When you transfer this concept from the neoclassical framework which views the economy as a closed system that includes the ecosystem (“land, labour and capital”) to the conceptual framework

of ecological economics which views the economy as an open subsystem of the ecosystem, this concept's meaning, in all its dimensions, changes fundamentally. It also changes fundamentally when transferred from the masculinist neoclassical framework to a feminist economics that ascribes economic value to production not entering into market relations, for example family-provided nursing and child care. Each of these three conceptual frameworks, having the limited point of view common to all such creations, identify and describe a different "state of affairs". These examples illustrate two fundamental points: One must think from *inside* a conceptual system in order to:

1. grasp the meaning of its concepts and
2. to gain the vantage point that it offers on the world.

It is only when you shift from one conceptual system to another, *like physicists do*, not when you relax some assumptions of one system, that you have real pluralism.

3. Narrative inversion

A knowledge narrative may become *invert*, meaning that instead of being used mainly as an instrument for explaining reality, its focus becomes itself. Turning away from the empirical phenomena that inspired it, it becomes transfixed with its own existence. This may take the form of formalism, where the narrative's empirical content is subordinated to the articulation of formal devices, where a language "refers to the observer's logic but not to the subject" [Piaget 1973, p. 25], as in much recent economics and political science, or with an obsessive hermeneutic interest in "reading" and interpreting the formative texts of the narrative, theology being the supreme example, but with psychoanalysis sometimes not far behind.

In subject areas where experimentation is difficult or impossible, mathematical models may have no connection with the concrete or empirical world. Symbols in the equations, instead of referring to measurable quantities, may be only imaginary placeholders, like "Monopoly money" is imaginary money. In these cases – and they are especially common in economics – the models are merely play things, "being no more than a play of mathematical relations" [Piaget 1973, p. 25], referring only to those relations themselves, rather than to relations in the empirical world. The practitioners are not "engaged in forging tools to arrange and measure actual facts so much as making a marvellous array of pretend-tools which would perform wonders if ever a set of facts should turn up in the right form." [Worswick 1972, p. 79] In economics the inversion often goes even further. There exist branches of economics that differ from branches of mathematics only in two respects: they are of no real mathematical interest and some of their axioms and terminology may have in the distant past been related to some empirical question. In these pursuits, so favoured by promotion and grant- and prize-giving committees, further assumptions are made willy-nilly to facilitate mathematical manipulation rather than from any desire to simulate reality. And by varying the empirically empty assumptions, thereby generating an endless range of conceivable logical possibilities, a virtual infinity of "models" can be fabricated, each generating one or more publications and all impregnable to empirical critique – a scientist's nightmare, but a careerist's dream.

4. Concealed Ideologies

A conceptual system defines, at the exclusion of others, a point of view toward its object of enquiry. For the human sciences this fact poses a moral danger. Their conceptual systems relate to their objects of enquiry in two ways that invite them to play an ideological function as well as an epistemological one. Both of these relations are recursive. First, a social-science conceptual system can alter the objects of its enquiry by becoming part of the conceptual and belief apparatus through which humans define themselves, perceive others and make choices, thereby changing the structures and propensities of the human world. With the spread of mass higher education, this recursive phenomena becomes more common, pervasive and profound. Second, unlike the natural sciences, the human sciences are ultimately a means from on high of preserving or reconstructing the basic realities that they study, these in total being the human project. Different conceptual systems present different sets of choices, real or imagined, to be chosen and acted upon by human populations at large. It can never be the case that each of these sets of choices will equally favour every group in society.

This means that, regardless of value judgments, it is the nature of all social theorizing, economics being no exception, to favour some groups in society over others, so that any attempt to block enquiry and analysis from multiple theoretical perspectives, i.e., anti-pluralism, is an ideological move.

Since Napoleon's popularisation of "ideology" in a derogative sense, many commentators have attached various meanings to the word, meanings inspired partly by shifting historical and social contexts, partly by a desire to make the phenomenon intelligible from more than one conceptual viewpoint and partly also, of course, by ideology. But the common presumption of these formulations has been that an ideology is necessarily manufactured and/or disseminated, consciously or unconsciously, with an ideological end in mind. The presumption of intent holds not only for the concept as developed in the negative sense by Marxist and non-Marxist writers, but also for Mannheim's neutralized concept which identifies ideology as a distinct type of cultural formation, functionally indispensable in non-traditional societies. But the preceding taxonomy of differences in conceptual systems shows that the element of intent is not a necessary condition for an economic theory to function as an ideology. Each conceptual system for a given human field necessarily offers a different viewpoint of that field, and thereby suggests different possibilities for shaping, directing and organizing it. Consequently, if for whatever reasons, one conceptual system's partial view is made the only view on offer, its influence on shaping human experience in a particular direction will be no less than if it had been designed to do so. *Where there exist a plurality of conceptual systems that illuminate different dimensions of a social object but the teaching of only one system is permitted, that system functions as an ideology.*

One must be careful here not to fall into a logical hole. Because every possible conceptual system can view its social object only from a particular point of view, it is self-defeating to equate ideology with systematized bias vis-à-vis the social realm, lest the social sciences are to be regarded as but a subcategory of ideology. The test of whether or not an economic theory is ideological is not its essence nor how and through whom it came to be nor who uses it. Instead the test is *how* it is used. A knife can be a deadly weapon or a tool for preparing the family dinner. Likewise an approach to economics can be an exercise in ideology or a tool for the advancement of understanding. A conceptual system regarding

human affairs becomes an ideology when its partisans refuse to countenance the use of other systems as well, as when a group of economists refuse to teach their students how to view the economic realm from conceptual points of view other than the one that they favour. It is important to note here how the epistemological and ideological dimensions relate. *An economic theory becomes an ideology precisely at that moment when its partisans decide to curb the growth and prevent the dissemination of knowledge of how to see all those aspects of the economy that their approach leaves in the dark.* In economics ideology comes about mostly through the way it is taught, so that the primary agents of ideology in economics are not theorists and technical practitioners, but rather the teachers and, most especially, the authors of textbooks.

E. Summing Up

Even more than physics, modern medicine, where the general practitioner shifts freely between knowledge narratives, exemplifies the antithesis of the monistic approach to knowledge that characterizes traditional societies and many human sciences. The germ theory of disease, along with psychosomatic, genetic and life-style explanations of disease are each a family of narratives, and between which the competent doctor shifts freely back and forth in seeking a true and full explanation of his or her patient's complaint. These narrative families have overlapping domains – for example, diet (not enough red wine and too much butter) and stress (not enough leisure and too much aggro) contributing through biochemical processes to genetic susceptibility to heart disease. But there is no yearning or pressure in the community of medicine for a reduction of its many knowledge narratives to a master narrative, nor for a unification of narratives as in physics. Instead the medical community understands that its multiplicity of narratives for explaining disease and its absence is needed to serve the complexity of medicine's empirical domain. Indeed, it is almost self-evident that the ill-health and good-health of the human organism are causally more complex than the fundamental properties of the physical universe, and, therefore, not open to narrative unification. It should be self-evident that this is even more true of the socio-economic realm.

If the human sciences are to be a constructive part of the human conversation, they must be willing to adjust the conceptual vantage points of their narratives both to fit changes in the topics of that conversation through time and to illuminate the diverse perspectives of its participants. Above all, the conceit that because one is a social scientist one is blessed with a privileged or God's-eye view of the human world must not be indulged. Richard Rorty's injunction to philosophers is no less apt for social scientists: "to be rational is to be willing to refrain from . . . thinking that there is a special set of terms in which all contributions to the conversation should be put – and to be willing to pick up the jargon of the interlocutor rather than translating it into one's own." [Rorty 1980, p. 318] Epistemologically this is the recognition that a plurality of narratives enriches our understanding of any sub-domain of the human project, that, whereas in the special case such narratives may be incompatible, in general they are complimentary and their plurality essential to the advancement of knowledge and the good health of society.

Endnote

1. It is not generally appreciated how much the popularity of Khun among people in the humanities is due to the satisfaction, sometimes glee, they take in what *they* see as his portrayal of the scientist as implicitly

intellectually inferior to themselves. Your typical university literature lecturer, for example, thinks nothing of in a morning shifting through a whole range of gestalts (Marxist, Freudian, historical, New Criticism, deconstructionist, etc.) in interpreting a literary work.

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The Macroeconomics Of Down-Shifting: A Suitable Case For Modelling?

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Down-shifting is an ugly word for a beautiful phenomenon: people reshaping their lives to enjoy more leisure and less income, less stress and – crucially – lower levels of consumption. In Australia it's also known as 'sea-changing', after the popular TV series *Sea Change*, in which the heroine gives up her overpaid, high-stress job in the big city for a more peaceful life in a small coastal town. There's a related phenomenon known as 'tree-changing', which involves a move to the inland forests instead of to the coast.

Whatever it's called, down-shifting is obviously beneficial both for the individuals concerned and for the planet. (In the case of sea-changing there is a potentially serious problem of coastal sprawl, but that's a separate issue). If we're going to persuade people in poor countries that they can't all aspire to the consumption levels of a New York investment banker, a great deal of down-shifting may turn out to be essential for our very survival.

Mainstream economists tend to stop at this point, treating down-shifting as nothing more or less than a welfare-improving reallocation of resources. To paraphrase Robert Frank, choosing more SUVs damages the environment, but choosing more piano lessons does not.

This, it seems to us, misses the point. Piano lessons are commodities, in the technical sense that they are bought and sold in the market. Down-shifting, by contrast, means more time for piano practice, which is not a commodity in this sense. In macroeconomic terms it means less consumption (of goods and services). For mainstream macroeconomists this is no problem: Say's Law ensures that aggregate supply falls at the same speed as aggregate demand, so that the adjustment to a down-shifted economy will be very largely painless. There may be short-run microeconomic adjustment difficulties, but there is no macroeconomic problem.

The average citizen, who has not been corrupted by exposure to economics (as Joan Robinson would have put it), does not believe this. Neither, it seems, does the average climate-change-denying politician, who raises the spectre of global depression at the very mention of green politics and the associated down-shifting. For the politicians, Say's Law applies in all conceivable situations except this one.

For once, they may be right. There are good reasons for worrying about the macroeconomic consequences of down-shifting. In the short period, elementary Keynesian theory suggests potentially serious consequences if consumption expenditure slows down or falls. The accelerator principle links business investment expenditure to the rate of growth of consumption, so that down-shifting may have disastrous effects on investment unless offsetting monetary or (more plausibly) fiscal policy measures are in place.

If you think the accelerator principle is too crude to serve as the basis for a viable theory of investment, consider the Kalecki profit equation. One way of thinking about down-shifting is to treat it as entailing a fall in capitalist consumption. The Kalecki profit equation

tells us that a drop in capitalist consumption leads, *ceteris paribus*, to an equal drop in total profits. It is difficult to imagine that this would not lead to a decline in investment spending and thus (again, *ceteris paribus*) to a slump.

Either way, our coal-fired politicians in Australia and their oil-powered colleagues in the United States do have a point. Down-shifting may seriously damage your economic health, unless it's accompanied by tax cuts or increased government expenditure.

There's also a long-period problem, associated with dynamic economies of scale: the faster the rate of growth of output, the faster the rate of growth of labour productivity, and vice versa. But down-shifting means that output grows more slowly than before, or starts to fall. If down-shifting takes place in rich country A but not (at least initially) in poor country B, then B's productivity growth rate can be expected to accelerate relative to that of A. Does this matter? What are the implications for A's terms of trade, its real exchange rate and the rate of growth of demand for A's exports?

According to Nicholas Kaldor, exports provide the only truly exogenous source of aggregate demand. A decline in exports is therefore likely to have serious deflationary implications for countries where down-shifting becomes important. Can they be avoided by increased specialization, or do dynamic economies of scale operate at the level of the entire economy and not just in individual industries?

These questions cry out for formal modeling, which we are not qualified to undertake. King, who for his sins is an academic economist, has tried to interest his younger colleagues in these issues, and to attract research students with econometric skills to work on them – entirely without success. We wonder whether someone, somewhere in the world, shares our concerns about the macroeconomics of down-shifting and is already working on the problem. Perhaps it's a suitable retirement project for a superannuated Old or Post Keynesian? We'd very much like to hear from any heterodox econometricians with an active interest in these problems.

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A Note on the Paper by Alan Goodacre

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In the issue no.41 of the PAER Alan Goodacre published an interesting paper entitled "What would post-autistic foreign trade policy be?". In it he argues convincingly that the diverse recent criticisms of an undiluted free trade dogma are important and will obtain increasing importance in spite of or even because of increasing globalisation. He then gives a good and concise summary of the different theoretical attacks on the free trade argument showing that depending on circumstances some barriers to trade can yield superior welfare results than an uncritical free trade policy because of their effects on both the size and the distribution of income. What also emerges clearly from his paper is that the choice of an optimal foreign trade policy is a complicated matter in which different arguments have to be carefully considered. Both the introduction of regulations and the denial of regulations can lead to welfare losses when they are not carefully analysed.

Goodacre presents the problem and the choice difficulties from the point of view of a single nation which acts on the basis of its own national self-interest. This is suitable and realistic starting point. But it has to be supplemented – when the aim is to reach practical policy conclusions – by a recognition and consideration of the interrelationship of national trading policies which is important and will become steadily more important with the spreading globalisation. Trade policies following only a narrowly defined national self-interest are bound to lead to clashes and could easily be self-defeating. Indeed the charm of the undiluted free trade ideology is that it seems to prevent such unintended deteriorations following from uncoordinated national policies and policy fights. The disadvantage of this simple rule is however that nothing can be done to eradicate the negative consequences which follow from such an uncritical application of free trade without considering the very uneven needs and developments in different countries.

The correct and useful message that the traditional free trade theorem and its welfare promises cannot be accepted must be supplemented by new international agreements and institutions to make sure that national improvements of trade policies take account of their effects on other countries. Just as in the Bretton Woods days countries accepted the idea that – in contrast to the gold standard – countries might benefit from manipulating the exchange rate, but agreed that this should be done in a coordinated way to prevent "beggar-my-neighbour" policies, it will be necessary to provide similar provisions in a world in which trade policy will be recognised as a positive policy element.

Thus one could imagine that a reformed World Trade Organization would no longer police trade relations with a free market world as the generally valid benchmark, but would act as a mediator in international relations when a country or region finds it necessary or desirable to introduce some regulations in its foreign trade policy. Such changes would have to be put before such a WTO to be discussed and possibly modified with regard to contents or duration when other nations are threatened by serious repercussions. The main difference to the present situation would be that the discussions and decisions would not be guided by the assumption that preventing or abolishing national trade interventions are the obvious best choice. They would recognise the existence of useful regulations as a normal matter though needing cooperation because of their global interrelationship. Such a WTO procedure could

be supplemented by a right for every state to adopt limited and/or temporary autonomous trade policy actions when international trade shocks create immediate and serious setbacks to the economy.

There are of course also other possible arrangements which could be made to deal with the aim to foster a system of positive trade policies and their international compatibility. The main problem today is however that it will not be easy to overcome the dominance of the free trade argument as the guiding principle. The new technical and organizational possibilities have led to an enormous increase in the development and influence of globally acting transnational companies and financial concerns which have a strong interest in a principally free field for their global strategies irrespective of the fact that they have no inhibitions to demand and accept special national concessions in individual cases. These interests which are basic to the dominating neoliberal ideology would have to be met by sufficiently strong countervailing powers if a new trade policy ideology and trade policy practice is to have a chance of general realization.

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Opinion

Prizes, not patents¹

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Part of modern medicine's success is built on new drugs, in which pharmaceutical companies invest billions of dollars on research. The companies can recover their expenses thanks to patents, which give them a temporary monopoly and thus allow them to charge prices well above the cost of producing the drugs. We cannot expect innovation without paying for it. But are the incentives provided by the patent system appropriate, so that all this money is well spent and contributes to treatments for diseases of the greatest concern? Sadly, the answer is a resounding "no."

The fundamental problem with the patent system is simple: it is based on restricting the use of knowledge. Because there is no extra cost associated with an additional individual enjoying the benefits of any piece of knowledge, restricting knowledge is inefficient. But the patent system not only restricts the use of knowledge; by granting (temporary) monopoly power, it often makes medications unaffordable for people who don't have insurance. In the Third World, this can be a matter of life and death for people who cannot afford new brand-name drugs but might be able to afford generics. For example, generic drugs for first-line AIDS defenses have brought down the cost of treatment by almost 99% since 2000 alone, from \$10,000 to \$130.

But, despite the high price they pay, developing countries get little in return. Drug companies spend far more money on advertising and marketing than they do on research, far more on research for lifestyle drugs (for conditions like impotence and hair loss) than for lifesaving drugs, and almost no money on diseases that afflict hundreds of millions of poor people, such as malaria. It is a matter of simple economics: companies direct their research where the money is, regardless of the relative value to society. The poor can't pay for drugs, so there is little research on their diseases, no matter what the overall costs.

A "me-too" drug, for example, which nets its manufacturer some portion of the income that otherwise accrues only to the company that dominates a niche, may be highly profitable, even if its value to society is quite limited. Similarly, companies raced to beat the human genome project in order to patent genes such as that associated with breast cancer. The value of these efforts was minimal: the knowledge was produced just a little sooner than it would have been otherwise. But the cost to society was enormous: the high price that Myriad, the patent holder, places on genetic tests (between \$3,000 and \$4,000) may well mean that thousands of women who would otherwise have been tested, discovered that they were at risk, and taken appropriate remediation, will die instead.

There is an alternative way of financing and incentivizing research that, at least in some instances, could do a far better job than patents, both in directing innovation and ensuring that the benefits of that knowledge are enjoyed as widely as possible: a medical

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prize fund that would reward those who discover cures and vaccines. Since governments already pay the cost of much drug research directly or indirectly, through prescription benefits, they could finance the prize fund, which would award the biggest prizes for developers of treatments or preventions for costly diseases affecting hundreds of millions of people.

Especially when it comes to diseases in developing countries, it would make sense for some of the prize money to come from foreign assistance budgets, as few contributions could do more to improve the quality of life, and even productivity, than attacking the debilitating diseases that are so prevalent in many developing countries. A scientific panel could establish a set of priorities by assessing the number of people affected and the impact on mortality, morbidity, and productivity. Once the discovery is made, it would be licensed.

Of course, the patent system is itself a prize system, albeit a peculiar one: the prize is temporary monopoly power, implying high prices and restricted access to the benefits that can be derived from the new knowledge. By contrast, the type of prize system I have in mind would rely on competitive markets to lower prices and make the fruits of the knowledge available as widely as possible. With better-directed incentives (more research dollars spent on more important diseases, less money spent on wasteful and distorted marketing), we could have better health at lower cost.

That said, the prize fund would not replace patents. It would be part of the portfolio of methods for encouraging and supporting research. A prize fund would work well in areas in which needs are well known – the case for many diseases afflicting the poor – allowing clear goals to be set in advance. For innovations that solve problems or meet needs that have not previously been widely recognized, the patent system would still play a role.

The market economy and the profit motive have led to extremely high living standards in many places. But the health care market is not an ordinary market. Most people do not pay for what they consume; they rely on others to judge what they should consume, and prices do not influence these judgments as they do with conventional commodities. The market is thus rife with distortions. It is accordingly not surprising that in the area of health, the patent system, with all of its distortions, has failed in so many ways. A medical prize fund would not provide a panacea, but it would be a step in the right direction, redirecting our scarce research resources toward more efficient uses and ensuring that the benefits of that research reach the many people who are currently denied them.

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Opinion

Should We Aspire to a High Score for ‘Economic Freedom’?

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South Africa is apparently not doing wonderfully in the ‘economic freedom’ stakes. The American Heritage Foundation’s Index of Economic Freedom has given us an overall rating of about 5 out of 10; and we have dropped in the rating since last year. The media has reported this as a real shame, something we need to correct - an impression confirmed in interviews with economists employed by business.

Before you get too depressed about this, the concept of ‘economic freedom’ needs unpacking.

Essentially it means freedom for business – investors and managers – to make decisions and create practice without rules. Freedom means business being allowed to maximise profits for shareholders, without externally imposed restrictions. They include those relating to the interests of other stakeholders – employees, the natural environment and the wider body politic. So an economic freedom rating of 10 out of 10 is one where business can do what it likes in its own interests, regardless of its effect on the resource base, the health of people round it, the elected authority or anything else.

The two areas that reduce our rating are affirmative action (called ‘race laws’), and legislation for minimum standards for wages and other conditions of work. These are considered to limit the right of employers to hire and fire without reference to legal, political or other restriction. And so they do.

They do so because the government reflects most voters’ opinion that these two areas require legislative rules for the sake of economic justice, historic restitution and societal harmony.

In other words, the government sets ‘economic freedom’ within the parameters of the political economy and human rights for everyone. It recognises that inevitably different interests of different groups need to be balanced by an authority – the elected government – that can hold the ring. So it makes rules. Another, differently rooted, political party might set different rules. But the idea that rules are unacceptable in principle seems remarkably primitive and unintelligent.

It is surprising that a sports-mad country can so easily assume that lack of rules is the optimal condition. What would happen if there were no restrictions on the number of players in rugby, on the size and weight of boxers, on the weapons that may be deployed in soccer, on what constitutes a court or a ‘game’ in tennis ... ?

We know why we need rules in sport. It is to prevent sheer might being automatically right. If there are no rules, the biggest, ugliest, most grossly aggressive brute force would take the prize every time. Fairness is the essence of the attraction of sport. Why not in the arena of the economy? If there are no rules, the biggest, the most ruthless, the most short-sighted will

dominate the arena. Size would be of the essence: Big Business would be the only powerful show in town.

Which raises the second problematic assumption. In this context 'economic freedom' is assumed to mean 'business freedom'. What is good (or 'free') for business is by definition good ('free') for the whole economy. So business is assumed to constitute the whole economy.

That is why most media treat the economy within the context of business. Typically 'economic news' is considered news about the progress – success or failure - of businesses, defined by profit; and reported in the Business section of the print or electronic media.

Typically, also, comment on news like our 'economic freedom' rating is asked from economists employed by business. They are assumed to provide objective comment. When trade unions' views are reported they are represented as partisan – which they are, but no more so than the view of economist employed by business. There is nothing wrong with representing those interests; but they are only one part of a complex economy of different and sometimes overlapping interests.

Business, like all sectional interest, will try to enlarge its influence. But I have never understood why progressive business does not lobby for regulation to prevent unscrupulous rivals getting a competitive advantage through destructive behaviour.

Much of this skewed definition of the economy as limited to business interests derives from another set of assumptions – explicitly rigidified into doctrine some three decades ago. It is that only the private sector can be efficient in the distribution of resources - via the pursuit of profit through the markets. Therefore employment can be created efficiently only through business, so that what suits business suits everyone.

The doctrine has failed. Inefficiencies in the market constantly require remedial action through governments. Business cannot create enough decent jobs to enable demand for its products, nor provide services, including roads and courts, which cannot pay for themselves. So the business and public sectors are interdependent; and business is one element only of a successful economy – let alone a sustainable political and natural environment.

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