What do the following have in common?: the English, the French, oysters, economics and the environment. The answer is: 'a lot!'.

The first three words are the title of a fascinating book by Robert Nield, former professor of economics at Cambridge, England. Nield has loved oysters all his life. Shortly after he retired, on a long vacation in France, a question occurred to him. Oysters are plentiful in France, with 2 billion a year being produced, yet scarce and expensive in England, which produces just 10 million. Why? Nield knew that this was not always the case – in the mid 19th century oysters had been in such abundance in Britain that they were an important part of the diet of the Victorian poor. Why was this not the case now?

His researches took him deep into the whole issue of economics and the environment. The oyster is a natural resource which has all but disappeared in England yet flourishes in France. And the reason can be traced right back to the disastrous *laissez faire* policies of 19th century British governments towards oysters. Oysters were harvested almost to extinction in the free market environment of the UK. In France, in contrast, the extraction and conservation of this valuable natural resource was carefully regulated and controlled.

Nield's entertaining book – if you *really* want to know how to open an oyster this is for you – illustrates the usefulness of thoughtful, real world economics when applied to environmental problems.

Most environmentalists recoil in horror at the very thought of economics. Understandably, given the faith-like certainty which many economists attach to pure free-market solutions everywhere and at any time. Indeed, this is why I wrote the *Death of Economics* just over ten years ago. I wanted to do my bit to help kill off a wholly unrealistic and damaging way of viewing the world.

But at the forefront of the discipline, there is a lot going on which makes economics much more practical and useful. True, many economists themselves haven't caught up with what is going on, and remain stuck in their old ways. Yet environmentalists

can profit, if I dare link these two words together, from the way in which economics is moving.

The most important point is that the best economists are now designing their theories around the facts. Strange but true! Most economic theory bears no relationship to the evidence, but simply *assumes* that everyone behaves rationally, exactly like the orthodox theory postulates. Increasingly, at the forefront of economics, this is no longer the case.

Here, for example, is 2001 economics Nobel laureate George Akerlof in his Nobel lecture: 'in this new style [of economics], the economic model is customized to describe the salient features of reality that describe the special problem under consideration'. In plain English, the model must be designed to explain the particular problem at hand. Akerlof is saying: we cannot simply presume that a standard, free-market approach is the best. We must take account of the evidence. And here is the current Governor of the Bank of England, Mervyn King, himself a distinguished former academic : 'economics tells you how to think not what to think. It is not a set of settled conclusions about issues'. King is particularly scathing about models with 'optimising' behaviour, the very hallmark of free market theory : ' it is vital never to confuse the real world with a model'.

What does this mean for the environment? Well, it means there are economists who can think in sensible ways and who will not insist on text book, free market solutions. And environmentalists can strengthen their case by working with and not against them.

An absolutely vital question is what can be done to prevent the world from running out of natural resources. First of all, an observation which is guaranteed to raise hackles. The prices of most resources have been falling over long periods of time compared to prices of manufactured goods, the current oil scare not withstanding. Economics certainly does suggest that this implies that demand has not been running ahead of supply. Otherwise the prices would rise and not fall.

But here is where the danger of unthinking economics lies. We cannot extrapolate from this and assume that the 'market' will solve all our problems. A standard economic line is: 'even if we start running out, prices will rise and there will be incentives to discover new supplies, new ways of doing things, so everything will be fine'. The best economics, on its own terms, has shown this is not necessarily true. As long ago as 1979, Partha Dasgupta of Cambridge and Geoff Heal of Columbia proved, in a purely theoretical model of the free market, that we cannot presume in advance that prices will adjust to ensure there are no problems.

Environmentalists need to accept that markets and private property can play an important role in policy. For their part, economists need to be more humble and realise just how hard it is to come up with the right sort of institutional structure, the right sort of regulation, and the right sort of incentives to produce the elusive mix of policies which stand a reasonable chance of working.

A good example of this pragmatic approach is the congestion charge introduced in 2003 by the Mayor of London, Ken Livingstone. In the major global city of London, traffic was becoming a nightmare and pollution was high. Livingstone's political background is so far to the left he makes people like Edward Kennedy seem like evangelical Republicans. Yet in the first instance, he relied upon a market-based policy, and raised the price of driving into London at peak times.

The policy wasn't based on the assumption that everyone acts 'rationally', still less on the assumption that the free market always produces the best solution. But it has worked. Congestion has eased and pollution is down. The challenge now is to evolve a set of policies for the longer term. A combination of regulation and incentives in the form of better public transport is being evolved to try to wean more people away from the car on a permanent basis. The Mayor's economists are heavily involved in this whole process. No one is talking about the 'free market', 'optimal polices', 'rational behaviour'. Instead, their models are trying, in Akerlof's words, to 'explain the particular problem at hand'.

If readers can bear with another British example, in April 2002 the UK government brought in a scheme (I helped to design it ) to meet pollution reduction targets under

the Kyoto protocol. Companies can participate in what is known as the emissions trading scheme. Under this, the firm must undertake a binding agreement to reduce its use of energy. In return for this, it receives allowances to produce emissions at the agreed level.

The real innovation is that these permits can be traded. If a company finds that is easier to meet its target than it originally thought, it can sell some of its permits. Equally, if a firm miscalculates in the opposite direction, it can buy permits which allow it to produce emissions at a higher level than its original target. The overall target is met, even though individual firms make mistakes.

In reality, even big firms have far from perfect information – quite unlike in the economic textbooks. The scheme recognises this, and has proved a great success.

Whether it is oysters or traffic congestion or pollution, a realistic, less ideological, more humble economics can help.

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Paul originally read economics at Cambridge University and then did post-graduate studies at Oxford. He started work as an academic, and then went to the *Economist* newspaper group for 2 years as head of the Economic Assessment Unit. Since then, he has been a director of several successful small companies: 'running your own company means you can work on what you want. You are not in thrall to the conventional mind-set in the academic research grant process', he says.

In 1994 he wrote the *Death of Economics*, translated into over a dozen languages, including a massively popular cartoon strip version in Indonesian which appeared at exactly the same time that the IMF were in the country at the end of 1997 trying to 'discipline' their economy.

In 1998, he published *Butterfly Economics*, which made it into the overall top 10 on amazon.com. Paul's latest book is *Why Most Things Fail*, published in the UK in

2005 and due out in the US in February 2006. It has received excellent reviews in, for example, *Nature*, the *Times*, the *Sunday Times*, and the *New Statesman*.

Some of the material from his books and a lot of more technical papers are on his website www.paulormerod.com.

‘Do you need maths to study economics at university?’ is a question I often get asked. Here is a cautionary tale for anyone who still has illusions. A friend of mine teaches economics at Cambridge, England. Recently, she had a first year student who was very good indeed at maths. So much so that he complained there wasn’t enough of it in his course. For his second year, he was sent on an exchange to the other Cambridge, to the Massachusetts Institute of Technology. E-mails of an increasingly desperate nature began to whiz back to my friend across the Atlantic. The final one said simply: ‘Help! Please let me back home. There isn’t any economics in this course. It’s *all* maths’.

Things are not quite as bad as that in most places, but the use of maths has become pervasive in economics. Just for the record, at the right time and amongst consenting adults, I, too, use maths. You can tell I am an economist myself when I say, on the one hand there are good reasons for the use of maths in economics, and on the other hand there are bad ones. So far, mainly the bad ones have prevailed.

It wouldn’t matter much if economics wasn’t taken so seriously by policy makers. Hardly anyone bothers about some of the lunacies in literary theory, for example. But economics matters. I’ll be talking about the bad reasons why maths is used in economics, but also how, at the frontiers of the discipline, a subtle but profound shift is taking place. Economics is starting to become more realistic, more rooted in institutions, in history, in the real world. And as a result, more useful

That is in fact how economics started off in the first place. Only it wasn’t called ‘economics’ but ‘political economy’, symbolising the fact that economies do not exist independently of the political systems and institutions they are in.

Adam Smith single-handedly founded the discipline of economics over 200 years ago, and his influence is profound even today. Yet his *Wealth of Nations* contains no equations at all. Instead, Smith uses carefully constructed arguments supported by a wealth of historical evidence.

Less well known to the general public is the English stockbroker David Ricardo, whose *Principles of Political Economy* appeared in 1817. But the standard economic theory of trade, and much else beside, is still based on Ricardo's work. Skipping forward more than a century, two figures from opposite ends of the political spectrum clashed with each other, and both made wide-reaching contributions to economics. John Maynard Keynes was trained as a mathematician at Cambridge, switching later to economics. Friedrich Hayek, the intellectual inspiration of Thatcherism, had deep insights in psychology as well as economics. Ricardo, Keynes, Hayek, and a host of other key figures in economics, studiously avoided maths. Instead, they used thoughtful arguments backed up by evidence.

So how has maths come to be so pervasive in economics, when so much was achieved without it? The worst reason is that the use of maths makes economists feel that they are proper scientists. They suffer from deep physics-envy. Physicists have to use maths – try doing quantum physics in words. And they are real scientists, who really have explained how lots of things really do work. So if we use maths, that makes us real scientists, doesn't it?. Well, the logical error in this last sentence is pretty obvious. But it doesn't stop the inner glow of satisfaction that most economists feel when they cover the page in mathematical symbols.

There is a more serious and more damaging reason why maths, or at least a particular kind of maths, is used in economics. This is inextricably linked with the concept of Economic Man. In essence, economics is a theory about how individuals behave. And in the standard theory, it's not just that people are assumed to be self-interested. They act like some sort of super-computer, always gathering every single bit of information which is relevant to a decision. And then making the best possible decision out of all the available options. Not just a good decision, or even a very good one, but the best. A posh way of saying this is 'optimal', a word used widely in economics.

Now there is a whole branch of maths devoted to 'optimal' solutions. This is the differential calculus, which many readers will have come across in high school. It is the

ideal tool for a theory which says: individuals behave in a way which is optimal for them, given their tastes and preferences. So if you eat junk food and weigh 300 pounds as a result, or if you drink heavily and destroy your liver, or if you smoke and get cancer, hey, that's your choice. You must have been making what you believed to be the best possible life-style choice for you, and calculus can prove this!

This is still the basis for a lot of the economics which is taught. Yet, paradoxically, it has been precisely the use of maths within economics itself which has undermined this view of the world, and is a reason why the subject is moving on dramatically.

Maths can be very useful in economics, provided that we think of it as just a tool and not make a fetish of its use. It is a tool which can assist logical thinking. It's like another language. It can help us find our way around.

One of the things it has helped economists explore completely are the implications of the Economic Man theory of behaviour. It took a century to work this out. By the mid-1970s, this programme of research was finalised. There is nothing left to discover. It is a marvellous intellectual construct, but it turns out to be a completely empty box. It has no testable implications. When economists say 'demand curves slope downwards' or 'people are paid what they are worth', they have no theoretical basis for making these assertions. We cannot deduce logically from the theory of Economic Man behaviour that either of these statements, widely used by economists, are true.

Pioneers like the 2001 Nobel laureates George Akerlof and Joe Stiglitz moved the subject on in the 1970s. They realised something else was needed. So they abandoned the idea that people have perfect information when they make decisions. 'Bounded rationality' is what they called it: you are still trying to make the best decision, but you might not succeed because you lack vital information. So if you binge on junk food or smoke heavily, maybe after all you are not taking the best possible decision for yourself. A big step forward in making economics more realistic.

The 2002 Nobel winners, Daniel Kahneman and Vernon Smith, made even bigger strides in the work they did. They actually went out and conducted experiments to see how people really do behave. Just like real scientists in fact! And they found that most of the time, people don't behave like Economic Man at all. Here is what Kahneman has to say in his Nobel prize lecture: 'The central characteristic of agents [people ] is not that they reason poorly, but that they often act intuitively. And the behavior of these agents is not guided by what they are able to compute, but by what they happen to see at a given moment'.

In other words, in totally plain English, the whole concept of rational, calculating Economic Man is being abandoned completely. The Economic Man theory postulates that people have all the relevant information and take the best possible decision. In this new approach which is emerging, people have at best imperfect information, and they stumble along, trying to make reasonable decisions, sometimes succeeding but often failing.

Crucially, the rules of behaviour people use will depend upon the specific time and place. So when the Soviet Union fell, the policies forced upon them, based upon Economic Man, were a disaster. They led to theft and asset stripping on a stupendous scale and a massive fall in living standards. The policies failed to take account of the fact that Russians, and the other nations of the Soviet Union, had little or no experience of how markets worked. And above all they failed to take into account that in the West, the workings of markets are mediated by institutions, by the law, by custom and practice. *We* have very few pure 'free markets', yet an outdated view of the world forced them onto the Russians.

These new approaches, perhaps surprisingly, make economics much harder. Instead of just manipulating some equations, we have to think hard about what the relevant rules of behaviour are in any particular context. And we have to restore the importance of institutions and history. In short, in a totally modern guise, we have to restore the idea of

political economy. Hayek is mistrusted by many, but there is a profound truth in his remark: ‘an economist who is only an economist cannot be a good economist’

All this makes economics more humble. Instead of claiming a theory of behaviour which is completely general, which applies to all people at all times in all places, it is much less grandiose. But it also make the discipline more realistic and potentially more powerful as a force for helping to understand and improve the human condition.

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At the forefront of economics, major changes are happening. And many of them are changes for the better. The old economics view of the world, in which everyone acts purely in his or her own self-interest, in which free markets are the solution to almost everything, has been abandoned.

The list of economics Nobel laureates in the 21st century reflects these changes. It is largely made up of scholars who have worked outside the traditional Rational Economic Person, free market paradigm. The work of Daniel Kahneman and Vernon Smith deserves special mention even in this distinguished list. They created almost single-handedly the bourgeoning discipline of experimental economics. Standard economics merely assumes that people act in a particular way. Kahneman and Smith actually tested how people really do behave. Many of the assumptions economists make turn out to be wrong in important ways.

But there is a problem, and a very big one at that. Most economists continue to try to shape public policy as if very little has changed and that the old view of the world remains generally valid. Got a problem with inflation? Just fix the money supply. Want to develop out of poverty? Just privatise all industries and pull down trade barriers. These answers are routinely trotted out regardless of the evidence. And the evidence is often starkly different from the theory. Look at trade, with the sole exception of the first country to industrialise, Britain, no country has developed successfully without protecting domestic industries from foreign predation.

The problem stems from the way economics is taught. For many of the very best students, a course in economics has become almost indistinguishable from a course in the math department, wholly abstracted from reality. A friend of mine has a world-wide reputation in physics. A few years ago, he got interested in economics and looked at some of the advanced textbooks and journals. I warned him. He was still appalled. The proliferation of math, with 'theorems' and 'lemmas' on almost every page, totally astonished him. 'But *I* haven't had to prove a theorem for at least twenty years, physics

is judged on how well your theory explains the real world, not on whether you can do clever math, all of us can' he fumed.

Most students are fed not on esoteric math but on the standard textbooks. But these have, if anything, gone backwards in recent years. Aimed at the mass market of US community college students, they have dumbed down the subject to a terrifying degree.

I have in front of me the 1967 edition of Richard Lipsey's *Introduction to Positive Economics*. This, along with Paul Samuelson's textbook, was the best seller for many years. It is not aimed at geniuses, just ordinary, regular students, 'designed to be read as a first book in economics'. Of its 861 pages, only 32 contain any math, and even that is of the simplest possible kind.

Yet it is full to bursting with really interesting examples of real world behaviour. Yes, here is the basic model showing how in a free market, price can adjust to bring supply and demand into balance. But here, too, is an immediate counter-example, of great practical importance, discussed at length. Indeed, it has its own separate chapter. What happens if supply can't be increased quickly, if it takes time to respond to price changes? This is true, for example for most agricultural markets, trees take time to grow, even chickens need five months before they can start to lay eggs.

Lipsey shows, simply and clearly, using only diagrams, how the free market might work very badly in this case. His chapter summary, printed in bold, states: 'in the unstable case, the operation of the competitive price system itself does not tend to remove any disequilibrium; it tends rather to accentuate it'. Careful, practical study is needed on a case by case basis to see if a free market is likely to lead to stable or unstable behaviour. The crude policy advice that markets always work is simply not given house room, even in a textbook for the ordinary first year student.

So why are the textbooks not being re-written, not just to bring back the insights of the word-rich, math-poor texts of the 1960s, but to incorporate the real advances which have

been made in economics in recent decades? Until I was drawn into the textbook world, this puzzled me

A couple of years ago, I was approached by someone from a leading academic publisher. He was, he explained, their very top man across the whole of the sciences. His remit included economics This sounded interesting. What did he have in mind?

What the commissioning editor had in mind was very exciting. He wanted an entirely new textbook, to incorporate the really interesting advances in the subject over the past twenty years or so.

The editor, who already had a best-selling economics textbook of the standard kind in his stable, understood that at some point in the future all existing textbooks will be redundant. The new generation of textbooks will contain the economics of the 21st century, not that of the 20th (or even the 19th!) which the present ones do.

He was anxious that one of his rivals would get there before him, and bring out an innovative textbook which would scoop the pool and be hard to dislodge from its number 1 slot. So he realised that his company would have to innovate and bring out a completely new textbook. Was I interested? It sounded like a dream. But like most dreams, it was too good to be true

The editor faced a dilemma, which he articulated clearly. His problem was that the market – in this case the market for textbooks – is already occupied by the incumbents. They might ignore almost all that has gone on in economics in the past 20 years, they might be guilty of dumbing down, but they are there. And their publishers and authors use every trick to make it stay that way. For example, top textbooks routinely have over 10,000 multiple choice questions helpfully provided on a web-linked site. So teachers don't even have to think about making up the questions, they are all provided

So we have a situation in which products with inferior qualities – containing lots of old-fashioned economics – are preventing products which are superior from entering the market. The barriers to entry which they have erected are very hard to breach. In simple economics, this shouldn't happen. Consumers are supposed to have perfect information, so they should choose the new rather than the old. But the real world just doesn't work like this. Yet most students are now never told this, and they never get to choose – except by voting with their feet and dropping economics altogether,

And this was exactly the editor's dilemma. He knew that at some point the market will look completely different, that the new will eventually oust the old. But he had no way of knowing when this would be. In the meantime, any single attempt to enter the market with a new-style economics text would be likely to fail, unable to break the lock on the market which the current textbooks have.

We corresponded on this and talked. Eventually, the editor said he would go ahead on the basis that no more than 10 per cent of the total material could be the new economics, the other 90 per cent would be the old. But I just couldn't do it, I couldn't be part of disseminating a wrong-headed view of the world which leads to so much bad policy advice. I didn't blame the man. He was thoughtful and anxious to do good, but faced commercial imperatives. So the textbook of 21st century economics is still waiting to be written.

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