THE RICHARD DIMBLEBY LECTURE

"ENGINEERING THE DIFFERENCE"
by JAMES DYSON

JAMES:
IT'S fair to say none of us would be here if it wasn't for an engineer. John Logie Baird. A bit of a crackpot. But if it wasn't for him – and several other inventive engineers – there would be no television.

Without TV, the BBC might not exist. In which case, I wouldn't have joined millions of viewers watching the Queen's Coronation in June 1953. Stuck in remote north Norfolk, it was the first time I'd seen a television. The experience was made all the richer by Richard Dimbleby's commentary. Over the next few years, he became a regular fixture in my mother's living room. As the presenter of Panorama, I'll always think of him as the face of serious television in my youth.

Had it not been for television, it's fair to say Richard Dimbleby and his sons wouldn't have made their reputation in quite the same way. And this lecture, held in their father's memory, wouldn't be taking place.

Logie Baird started quite something, when you think about it.

And here I am, the first engineer to deliver the Dimbleby Lecture.
And look...
I'm not wearing overalls.

If it alarms you to have to listen to an engineer, let me reassure you. Like you, I once thought engineers were quite beyond the pale. My family were all from a liberal arts background. My parents taught the arts. And as a schoolboy, I didn't know what an engineer or even an architect did. I was a Classics scholar who went to art school. While at the RCA, I accidentally discovered the glories of making things. And I can tell you it was quite a shock when I realised I was getting interested in engineering.

Now, as I said, no engineer has ever stood here before. And the **last industrialist** to occupy this spot did so nearly 20 years ago. I can't help thinking, **that** long absence says something about the way we regard engineers and manufacturers. Manufacturers and engineers make things to **improve our lives** and **create wealth.** But they're less important to us than those who occupy their time writing about it or worring about it.

It was this disregard for the **engineer's** creation – the **manufactured object** – that led me to stand down as Chairman of the Design Museum a month or so ago.

There are two sides to the design coin. There is serious design – making sure that the manufactured object performs its task in the best possible way. And there is styling – the essentially superficial task of making sure something looks attractive.

Both are important to me. After all, my wife is a rug designer and an artist. My daughter and son-in-law design clothes.

However, the Design Museum was set up by Terence Conran to champion the manufactured object. There are dozens of places that examine style. The V&A, art galleries, newspapers and style magazines. There are very few places that focus seriously on how and why we make things.

I felt the Museum was failing to get the right balance. I still care deeply about the Design Museum, but in its current guise, I have little to contribute. So I stepped down.

A day or so after my resignation, I turned on the radio. When I resigned, I had mentioned a Constance Spry exhibition and now the Today programme was interviewing two flower arrangers.

The interviewer cut through the **florists**' proclamations, about the life-enhancing effects of lilacs, to ask a very pertinent question. Can you really, he asked, say that flower design is as important – or even the same – as designing an aeroplane?

Their answer? "Of course it was."

I knew there and then that my decision to go had been correct. And that it said something about our appreciation – or rather lack of appreciation – of manufacturing.

My resignation caused quite a rumpus.

At the Museum, the visitor figures shot up by 50 per cent! Butlers Wharf had never been so popular.

Meanwhile, in the press, my departure was being deconstructed as a clash between the past and the future. I was told that styling had usurped engineering in the latter half of the 20th century. And that it went deeper than just a change of fashion. My values of technology and manufacturing were old-fashioned, they said. And if our economy was to succeed, I had to realise something:
"The future prosperity of developed nations, rested in the hands of stylists."

"Engineering belonged in the past."

Yet here I am. Someone whose recipe for success, has been to make things that people want to buy. Not because they look better – although of course I hope they do – but because they work better.

I have spent 35 years making things in a country that often has little regard for its manufacturers. It has left me more convinced than ever that engineering is this country's future.

And that styling for its own sake is a lazy 20th century conceit. One that has passed its sell-by date.

This world is driven by technology.

WE HAVE NO CHOICE but to shake off our obsession with styling. And to focus on creating new more-advanced products. The first thing we must do, is divest ourselves of several lazy misconceptions.
What kind of deceits?

"That the 18th and 19th centuries were a golden age of manufacturing."

They weren't.

"That Britain once led the industrial world. And that we really knew how to make things well."

We didn't.

"That we are a nation of inventors, more creative than anyone else."

We're not and we never have been.

"That the service and creative industries – there's an oxymoron for you – can replace manufacturing."

They can't.

"That long-lasting wealth can be consumer generated."

That's just plain naïve.

"That engineering doesn't have a place in a post-industrial society.

Rubbish.

That the industrial future belongs to companies producing **intangible** goods such as computer software or information."

More rubbish.

It is essential that we dump hoary old myths if we want to maintain our wealth, power, and influence over the future. This evening I'll explain why and how.

Unlike most of the commentators, I have 35 years' experience of making things. And it's taught me a lot. However, the biggest lesson came four years ago when I located our assembly in Malaysia.

Much as I was resisting the change, there were very clear reasons why we had to change direction.

We needed to invest heavily in research and development. But our manufacturing costs were going **up** and our market place prices were going **down**. And we were trying to expand our factory in the face of local planning opposition. Meanwhile all our competitors were manufacturing in China, while we were watching our profits go into freefall.

I could see our demise.

But the biggest problem was that we had no local suppliers. Our British three-pin plugs were made in Malaysia. Our polycarbonate plastics came from Korea. Our electronics came from Taiwan. It was a logistical nightmare. We needed our suppliers on our doorstep so that we could drive them to improve their quality and keep pace with technology.

In the 1970s, when I was developing the Ballbarrow, I needed some bent metal tubing. I got in my car and went to Birmingham. In the space of a few streets, I found workshops and suppliers who between them could provide the tubing, cut it, bend it and coat it. It was an **extraordinarily vital environment**. And it was absolutely essential to the small engineering entrepreneur.

You might ask what happened to these British suppliers and subcontractors? Quite simply: we drove them out of existence. Employment and property laws made it difficult for them to take on extra staff and premises. They needed a tax regime that appreciated the volatile nature of their business. Instead, Governments imposed PAYE and hammered them with high interest rates, year after year. By the mid-1980s, most had gone to the wall.

Moving Dyson production abroad was a tough decision. Most especially because I had to make 550 people redundant. However, it meant we could cut our costs, and expand our production. We could invest in R&D and employ more staff.

The upshot is that we now have more people at Malmesbury than ever. All of them are in higher-skilled, better-paid jobs. Most are scientists and engineers. They contribute more to the local economy. And as a company we pay much more in taxes than we did four or five years ago.

In Malaysia, the biggest benefit has been that all our suppliers are within 10 miles of the factory. Some were there anyway. Others we developed, such as a tent pole maker. We got him to make our highly-engineered telescopic handles. And he turned out to be much better than our previous German suppliers.

At this stage, the benefits are obvious. Our engineers and scientists are in Wiltshire.

For a company that depends on innovation, that's what counts. The know-how is here. It's British. It generates money for the British economy.

Thousands of other companies are doing what we were forced to do. From Doc Marten shoes and Hornby train sets, to Sony's high-tech electronics, they were all failing to make things competitively in their home markets, and moved their production to China.

This shift has led to a huge period of wealth creation. But it won't last.

Why?

Because countries such as China have already mastered low-cost production. Now they are buying Western know-how – the joint venture between Shanghai Automotive and MG Rover, is primarily to secure rights to Rover's technology. Chinese companies are also copying Western styling. I should know – I'm constantly having to stop them.

Their universities are churning out vast numbers of engineers and scientists. And they're good.

They're taking on Western companies by snapping up Western brands. Today, a Chinese company bought **IBM Personal Computers** lock, stock and barrel. Manufacturing, management **and the brand.** Chinese corporations have bought Thomson and RCA televisions, Dirt Devil and Vax vacuum cleaners, Alcatel cellphones, and Dornier aircraft.

To survive against them, we can't just rely on shallow styling. We need technology and design that they don't have. As long as we continue to innovate and produce products that have better features and work better, we can compete.

Our only chance for survival is better engineering.

Now I'm frequently told that championing manufacturing is yesterday's game. That we live in a **post**-industrial society. That the service and creative industries have replaced manufacturing.

Well consider this:
Of the world's **10 largest** corporations by **revenue**, nine make big, heavy things. Like cars or ships' turbines or computer hardware or consumer electronics.

These companies rely on their engineering and their technology – not their styling – for their wealth. Only **one** – WalMart – is a service company.

Look at the most **profitable** companies and again the facts speak for themselves. In the top ten, only **three** are service companies.

And as for the world's **least** profitable company? Why it's Vodafone, a service company that made a loss of more than **fifteen** billion dollars last year.

So why does Britain need a manufacturing industry in this supposed age of the service economy? My answer is simple. We have no choice. Only one in **seven** British jobs is in manufacturing, yet they generate nearly **two-thirds** of exports. Manufacturing creates the wealth and spending power that feed the service industry.

It's obvious. The rest of the world relies on manufacturing for its wealth.

Why do we think we can be different? If we want to maintain our position alongside other leading nations, we've got to join the rest.

We must take steps now. In ten years time China, with its mantra of employment over profit, will not only be the workshop of the world, it will be the technological superpower.

And what will happen to us?

** Britain's service industries will wither without their manufacturing customers. Call centres and software developers are already disappearing to efficient service economies. Such as India.

** Innovation will be stifled.

** We will be surrounded by products that we have not made. That's something that is already culturally destructive. Ultimately we will be at the mercy of the buying habits of Chinese shoppers.

** The impact on the trade deficit will be ruinous.

** The loss of manufacturing expertise will compromise our military strength.

History repeatedly shows the correlation between a nation's wealth and its diplomatic and military powers.

Before the Industrial Revolution, Britain accounted for just one fiftieth of the world's manufacturing output, while China spoke for a third.

Fewer than a hundred years later, China had been invaded by a small British army. Its industry was now backward. Britain, with two per cent of the world's population, was making nearly half the world's goods. And politically we led the world.

So if we want to protect our quality of life and our influence, we must maintain our average wealth – our GDP per capita. The **only** sure way to do that, is to **continue** to **innovate** and **manufacture**.

I believe manufacturing **is** the future, not the past. And we need to be clear what manufacturing means in the 21st century. It boils down to three models:

Firstly, high-tech manufacturers such as jet engine maker Rolls-Royce. These survive in the face of lower-cost economies simply because they have the engineering know-how.

The RB211 jet engine was a revolutionary leap of technology. Airlines value features and reliability over price. As long as Rolls-Royce maintains its engineering edge, it can manufacture in a high-cost economy.

Then there are companies like Dyson – creating products in Britain, but making them abroad. We've pared our costs to the minimum but we've maintained our head offices in our expensive home nation. Why? Because we've spent more than a decade building up a highly-talented team of engineers and scientists, to develop our technology and ensure our future.

Finally, there are companies such as the stylish Apple. Outside contractors do their manufacturing and engineering. Apple maintains its value by marketing its brand expertly. However, in my mind this could make Apple vulnerable. If a rival makes a significant technological leap, then styling and branding will count for nothing.

So again it's plain to see. In all three scenarios, only innovative engineering will guarantee a future.

But to get engineering and manufacturing right in the future, we need to recognise our strengths and failings in the past.

I am convinced the industrial revolution happened **not** because we were aparticularly inventive or industrious nation, but simply because of circumstance.

By the early 16th century, we'd cut down most of our forests. The Royal Navy had built the fleet that defeated the Spanish Armada. We were constructing **wooden** housing and using **charcoal** to fire blast furnaces. Our timber stocks were so depleted that, Parliament passed laws restricting the use of wood.

We had little choice but to turn to **coal** to fire the pottery furnaces, and to power the textile looms that were emerging in the Midlands. **Necessity was the mother of invention.** We developed the **steam engine** to help us mine that **coal**. That triggered the industrial revolution.

As luck would have it, this spark of industrialism coincided with a period when Britain was hitting its imperialist stride.

In this virtuous circle of confluent political and industrial needs, industry grew at an incredible rate. The Empire expanded rapidly and we created many inventions. Our imperial ambitions were fuelled by our industrial might. And vice-versa. The Empire provided plentiful raw materials, and a captive market.

The growth in manufacturing capability was extreme. It is tempting to suppose it was the result of adept management. Or the skilful exploitation of our engineering know-how. **That would be a big mistake**. It happened because the conditions were **so right** that it was almost impossible to fail.

It was nevertheless a period of great creativity. We have a lot to be proud of. For 200 years we dominated invention, science and manufacturing. Like no other country before or possibly since. From Newcomen, Watt and Savery's development of the steam engine, in the early 18th century, to Fleming's invention in 1904 of the vacuum diode. Britain ruled each successive wave of technology.

Behind all these, are fascinating tales of human ingenuity and determination. But, above all, these inventions came about in Britain, because the conditions at the time were absolutely right.

Crucially, few were the result of particularly clever engineering **development**. They were the products of good **craftsmanship** rather than **scientific investigation.**

It was more a culture of gifted amateurs, than dedicated professionals.

And it meant we **repeatedly failed** to **capitalise** on many of our best ideas. A British **curse** that persists to this day.

For example, we developed every major innovation in the iron and steel making process. Yet our steel industry, failed to adopt them with the same **gusto** as its counterparts in France, Germany and America.

We were soon left behind.

We lacked initiative. We had a ready supply of raw materials.

And we had an Empire on which to foist our goods.

These were conditions that bred complacency.

And lo and behold, by the late 19th century our volume of production had fallen behind America.

To make matters worse, we were failing to educate the next generation. On the eve of the First World War, Germany had 60,000 university students. We had just 9,000.

German universities turned out 3,000 engineering graduates every year.

In England and Wales, only 350 students
secured first and second class honours in **all** branches of science, technology and mathematics – including engineering.

Our industrialisation had **boomed** with the expansion of the Empire.

And so it **retreated** with the decline of our imperial power.

By the end of the second world war, we **were** in a sorry state.

Having founded reasonably good car, aerospace, textile and shipbuilding industries, we seemed to give up.

My theory is that by 1945 everyone was exhausted. After two world wars and a depression, a desire for security was endemic in society.

We were encouraged to get a job that promised a safe future – accountancy, law, medicine, the foreign office or some other part of the civil service.
We sought refuge in the comfort of pipes, nursery food, big fat armchairs in stuffy, overheated rooms and low-risk jobs for life.

We'd become lazy and we failed to capitalise on our wartime inventions such as penicillin, radar and computers.

Meanwhile, grammar and public schools groomed us for university. We were encouraged to become middle-class professionals and to avoid industry and manufacturing.

When I was at school, my teachers told me that if I failed my exams I'd end up in a factory.

They conjured up a ghastly Dickensian image of grime, repetitive tasks, lousy working conditions and book-keeping on thick ledgers on high lecterns.

Well I proved them wrong.

Somehow I passed most of my exams.

And yet I still ended up in a factory.

In fact, I built one.

And as a manufacturer, I've had to get used to the brickbats that I heard bandied as a child.

The most prevalent of which was that manufacturing was exploitative. Oh, how we liked to paint a picture of being "under the thumb of big business".

Even as a child, I never quite understood why anything to do with industry was portrayed as a dark, evil thing.

But if someone made money from 40,000 inherited acres of prime farmland, or from retailing, then somehow it was morally acceptable.

And then we nationalised our major industries.

In one fell swoop, we killed entrepreneurship.

As a result of all these attitudes and conditions, we failed to benefit from the great, international, post-war, economic boom. While the economies of other countries were expanding, ours was contracting.

Much of it was down to our dwindling manufacturing base.

In 1950, we produced a **quarter** of the world's exports; in 1970, just one **tenth**.

By the mid 1980s our international goods trade was in deficit. Fast forward to today. We rely on our service industries to prop up our alarming trade deficit. And this sorry situation, is often presented as the conclusive argument, that we have tipped from a **manufacturing** economy to a **service** economy.

Time and time again, I'm told Britain can rely on service industries.

"It doesn't matter if we buy all our low-cost goods from abroad," I hear.
"We can rely on our service industry to finance it."

It has become a paradox of our age.

The number of 'Made in…' labels in shops, is no longer an accurate gauge of a country's economic output. So how can we continue to generate wealth when we're **making** less and **importing** more?

A commentator recently gave an example. Buying a plastic model of Professor Dumbledore the Harry Potter character - costs around £10. Doubtlessly it will be labelled 'made in China'.
But according to the commentator, the retail and wholesale margins, royalties, design, advertising and promotion will contribute £7 or £8 to Britain's GDP.

Well I'm sorry to disillusion everyone who believes this argument, but as a manufacturer who operates in 37 countries, I know from experience that this **isn't** the case.

The retailer's margin would be tiny. And it might well be Toys R Us, Amazon.com or some other non-British company.

Most of the distribution costs will be spent shipping the toy to this country. Advertising and promotion are likely to be co-ordinated in the manufacturer's home country. And 10 per cent or more of the cost will go to Warner Brothers.

All money **spent abroad.**

And there are other reasons why the argument is short-sighted.

First, we spend much more on big, expensive engineered things than we spend on cheap goods such as plastic toys.

Things like: cars or aeroplanes, or the glass and steel used to build skyscrapers in the City.

And if you buy something substantial, then the proportion of the total cost spent on distribution and marketing, within Britain, is minuscule.

But there is an even better argument for supporting our manufacturing industries.

Just imagine that a British company was manufacturing the toys. Then, instead of scraping a few pennies off each doll sold here, we would be recouping the revenues from **every** Dumbledore sold **anywhere** in the world.

But I am not arguing that we have to manufacture **everything** in Britain for it to continue to generate wealth for us. What we need is companies that make their **money from manufacturing.** Even if they do their assembly elsewhere.

Manufacturing companies and entrepreneurs need to have their ideas **here**.
Do the engineering **here**. Develop the technology **here**. Oversee the production from **here**. Plan the marketing and organise the selling **here**.

Then if they sell their Dumbledores – or their cars or aeroplanes or televisions – **anywhere** in the world, then the revenues return to **this** country.

And the people doing those engineering jobs are highly paid. More than the people doing the retailing jobs that the commentator cited.

But instead of appreciating this simple fact, we have created a strange society.
One in which economic growth relies on us **continuing** to spend **ever** greater amounts of our money shopping. Napoleon wasn't quite right. We're not a nation of shopkeepers, but shopaholics.

I'm as guilty as the next person. I like nothing more than a trip to the shops. I often find myself lost and overwhelmed in DIY stores.

But I am convinced that our love of retailing is part of the reason for our lack of interest in engineering and manufacturing. We say that we're heading into town for a bit of "retail therapy." What we're really doing is going for some **product** therapy.

But the phrase 'retail therapy' reveals our true motives. We are as turned on by the act of buying as by the goods we purchase. We have become divorced from the producer.

Just try it yourself. When you show off some thing you've bought, I **guarantee** the first question will be 'Where did you get it?', not 'Who made it?'. The inference is, that if you bought it somewhere expensive and exclusive, then it must be good.

The perception is that the shop makes the goods, not the producer. The producer is eclipsed by the massive retailer.

Yet making money from **retailing** or the **City** is admired. While making it from **manufacturing** is not. Clean money is okay, it seems. Dirty money isn't.

'Not bad for two years' work,' said Philip Green, when he made £460m in two years from his investment in BHS. The general reaction was good luck to him.

Maybe it goes back to the Florentines teaching us the business of trade. Trade, of course, predates manufacturing and has always dominated it. **But** it's pretty pointless if we don't **make anything** to trade.

So China breathing down our necks. The **only way** we'll be able to sell our products, is if they have **better technology** and are **better designed.**

That means investing in engineering, and engineers, to ensure we don't repeat the mistakes of the past.

What do we need to **do** to ensure we get manufacturing **right** in the future?

The first step is to address the shortcomings of our education system. And to use it to change attitudes.

Actually, it is **one area** of our culture that has vastly improved its approach to engineering. We have a generation of children who have studied Design and Technology at school.

I'm also heartened by the changes taking place on our university **design courses.**

They have recognised that styling, **as a separate entity** was an invention of the latter half of the 20th century. And that it was essentially about putting a tired product in new clothes.

Most art and design colleges are now moving from teaching **industrial** design to teaching **engineering** design. It's not just a name. They are actually **teaching engineering.**

The Royal College of Art was in the vanguard when it devised a **joint-course** with Imperial College. It draws on Imperial's **engineering** expertise – something I did myself when I was at the RCA.

And they have been followed by the best design colleges around the country. Brunel, Newcastle, Southbank, Glasgow, Dundee and Leicester are all changing.

Five years ago, students got away with turning out conceptual designs. Few of them worked. They were entirely **styling** and **marketing** exercises.

Nowadays, students have to make **breadboard prototypes** that **work**. **Then** they think about the packaging and styling.

But there's more we could do at schools and universities. I believe we force our children to **specialise** too early.

By the time they are **14 or 15**, our children have been **pigeonholed**. They are either **scientists** or **artists**. It limits their choices. And it doesn't create the kind of **rounded** characters that make innovative, **lateral thinkers.** After all, the **Lunar Men,** who made the discoveries that set the industrial revolution in motion, were polymaths.

The arts and science **divide,** has done such **damage** to this country's prosperity. Look at the countries where **engineering** is held in high esteem – France and Germany. Most pupils continue with **some science** instruction right through school. They are countries with a good **vocational** teaching tradition.

We also need to develop a culture of rewarding failure. For too long, we have valued **effortless brilliance,** like the Oxford double first. Not the dogged determined slogger. It has created a culture in which **"having a strong work ethic"** is a term of insult.

But the fact is, the B grade students are the most successful in life. They make the best entrepreneurs. They have learned to **persevere** and they're not scared of **failure**. Thomas Edison summed it up brilliantly:
"invention and success are **one** per cent inspiration, **99** per cent perspiration."

Most successful entrepreneurs have overcome several **failures.**

If I had given up on prototype 05126 I wouldn't be standing here tonight. It took **one more** prototype to really make it work. All that taught me a **huge** amount.

We need to encourage children to be **different** at school.

In subjects such as Design and Technology, **I think** students should be marked by how many **mistakes** they make.

It's what they **learn** from those mistakes that's important. Not how **quickly** and **neatly** they complete the task. We need to instil an ethos that learning should be through **experience** and **experiment**, rather than by **rote**.

Educating our children to appreciate **engineering** is only the **first** step. The next is to change their **attitudes.**

At the moment, the **arts** are more important to us than **science. or engineering.** Just look at the front page of this week's Sunday Times. Two articles.

On one side "an extra 125 million pounds for Theatreland." On the other, "funds for sciences at universities to be cut."

Since 1997, we have closed 18 physics departments and 28 chemistry departments. As a result, we now produce only 3,000 Physics graduates a year. Compare that to an astonishing 15,000 psychologists!

And it's going to get worse. Yet more science departments are due to close.

Again**, long-term prosperity** is being sacrificed at the altar of **short-term gain**.

A quick buck.

Certainly it's an attitude I encountered again and again when I was starting up.

And it brings me to the third step in my manifesto for manufacturing change.

We need to encourage manufacturing **investors**. And to make them think **long-term**.

Twelve years ago, I was trudging from **venture capitalist** to **merchant banker**. I was seeking funding to manufacture my vacuum cleaner. A delightful American called Bob Peyton was also looking for money.

He wanted to expand his chain of pizza restaurants.

I wanted to build up something with a **potential worldwide market.** My business would not offer a **return** for **several** years, whereas Bob was promising a **relatively quick buck.** So **guess** who got the funding?

And it hasn't changed.

Banks and venture capitalists are not going to invest long-term unless we give them an incentive.

To do **that** we need **two things**. Tax breaks on long term manufacturing investment. And lower interest rates. Permanently.

As I explained in evidence to the Monetary Policy Committee, manufacturers quite like **inflation**. It's interest rates and the exchange rate that bother them. Inflation means our borrowings get smaller, faster. High **interest** rates, on the other hand, hamper investment. And high **exchange** rates create the double whammy of less revenue from exports and more competition from **cheaper imports.**

So it seems to me **utterly bizarre** that we set a **target** rate for inflation. And to achieve it, we try to use **interest rates** – a **blunt** instrument at the best of times. It should be the other way round. We should set low targets for Interest and Exchange Rates. **That** will encourage investment in manufacturing and R&D.

At Dyson, we invest **12 per cent** of our turnover in research and development. It's a fortune by British standards. British companies invest a **meagre** 2.1 per cent of turnover in R&D, less than half the international average of 4.3 per cent.

Yet it's been shown that companies which invest in R&D, repeatedly outperform the rest of the stock market. So **there's** a good reason for the City to take a longer term view.

The Government already gives a small tax break for R&D. It needs to be extended to cover not just innovation, but devising step by step improvements to existing products and the consequent re-tooling. It's what made Japanese products so successful.

But without support for on-going research, it is much more productive for companies to invest in advertising. It offers a short-term sales gain but provides no **long term** investment in our future.

The Government could take genuine steps to encourage R&D investment. Then we could turnaround one of the most depressing signs of our diminishing inventiveness. We file fewer patents with each passing year.

And in terms of patent applications per capita - probably the best measure of a nation's inventiveness – we are fast slipping down the league tables. A few years ago, Britain was in **seventh** place, behind Luxembourg and only just ahead of Monaco. I'd be tempted to ask you to name a famous Monegasque inventor. But that would be to highlight our sorry state of affairs.

But it needn't be like this.

We can get it right.

All we need to do is give engineers a free hand.

We need to encourage more people to become engineers and scientists.

And to encourage manufacturers and financiers to invest in the future through R&D.

We're already taking the right steps in our schools and universities. **They** have turned their backs on shallow styling. **They** have realised that the future belongs to people who make things that **work** better.

The cultural change has long been apparent in architecture. It has abandoned the hollow styling obsession of post-modernism. The best architects now make a feature of the technology that makes their designs possible.

And look. A **bridge** in Gateshead won the Sterling prize.

It shows that in the field of architecture, technology and engineering are shaping the future.

Now we **must** do the same for the **manufactured** object.

We got it halfway right in the past. If we recognise our failings, we can do better in the future. Manufacturing and engineering are about **brains**, not brawn or looks. And the future belongs to those who use their brains **BEST**.

Rise up engineers!