

Harry Kroto

23 January 2003

"Jaws" was attacking my bumper, trying to shove me into the slow lane.

Why are cars getting larger when we need greater fuel efficiency?

If we are to make better use of our resources, we need look no further than the pioneers of steam technology for inspiration

As I was driving home the other day musing over the fact that it took more than 60 years for Glasgow's James Watt to add the condenser to Newcomen's 1712 basic steam engine - the advance that ushered in the industrial revolution - I suddenly became aware that "Jaws" was attacking my back bumper. It was the grill of a giant sports utility vehicle that was attempting to shove me into the slow lane. Why, I wondered, are cars getting larger when we desperately need greater fuel efficiency? Of course, bigger cars mean that you can see over others and that you are safer in a crash. An American colleague gave "I hate to lose" as his excuse.

The SUV is really the present-day equivalent of Newcomen's inefficient 18th-century condenser-less engine, which worked by means of a piston pushed up by steam and then allowed to fall by injecting cold water into the cylinder to cool it and condense the steam causing the down-stroke. We urgently need a modern-day analogue of Watt's condenser to improve - at a stroke - the efficiency of today's technologies. The comparison is perhaps unfair to Newcomen, though, as, at the time, his engines provided the only way to pump water out of mines and save miners' lives, whereas I am not sure why off-road vehicles supposedly designed to get up Ben Nevis, are being used on the road to the supermarket.

This Christmas, I was given Jenny Uglow's book *The Lunar Men* about the men who created the industrial revolution: Watt, Arkwright and others - products of revolutionary towns such as Glasgow, Bolton and Birmingham. I lived in Bolton, at 45 Arkwright Street, a road that has since disappeared.

How could the Burgermeisters (or should that be Burger Kings?) of Bolton have got rid of a street named after Mr Arkwright and allowed housebuilders from hell to deposit buildings already more decrepit than the 19th-century house in which I was brought up? Uglow's book quotes Watt on the momentous moment of the 18th century, if not the millennium, in the spring of 1765, when his attempts to improve the efficiency of Newcomen's engine bore fruit: "I had gone to take a walk on a fine Sabbath afternoon. I had entered the Green by the Gate at the foot of Charlotte Street, had passed the old washing-house. I was thinking upon the engine at the time and had gone as far as Herd's House when the idea came into my mind, that as steam is an elastic body it would rush into a vacuum, and if communication was made between the cylinder and an exhausted vessel, it would rush into it, and might be there condensed without cooling the cylinder. I had not walked further than the Golf-House when the whole thing was arranged in my mind." It has been said that science owes more to the steam engine than the steam engine owes to science. Semantics. They went hand in hand, as indicated by Watt's use of the term "elastic body" and his friendship with Priestly and, in particular, Joseph Black, who explained his fundamental concept of latent heat, which was crucial for steam power. It took 12 tough years to make it work, partly because the right materials were not available. No synthetic polymer seals, stainless steel or lubrication oils in those days, nor the engineering craftsmanship to make smooth-fitting pistons and cylinders - things taken for granted today.

We now know that 200 to 500 mile-per-gallon vehicles, milliwatt lightbulbs and nanowatt computer chips are possible. Nanotubes, which are 100 times stronger than steel and a sixth of the weight, promise to transform electrical and mechanical engineering. Recent advances in light-emitting polymers promise to emulate fireflies. Molecules that can switch current promise AA battery-powered pocket supercomputers placing the total knowledge of mankind at our fingertips.

This is the realm of nanoscience and nanotechnology (N&N), the "New Chemistry" that is underpinning physics, biology and engineering in a molecular-based materials revolution. To realise the promise of N&N is a daunting task as the problems are as demanding as they are exciting, and they will be overcome only if talented youngsters are inspired to solve the 21st-century "condenser" problem. They must condense machines by ten to 100 times in mass and devices by 100 times in size.

Raymond Boulton, Watt's collaborator, told Boswell in 1776: "I sell here, sir, what all the world desires to have - POWER." If we are to survive, what all the world needs is efficient use of power. N&N promise this.

Indeed, it will be a key part of the Green revolution - but, if it takes another 60 years, it might be too late.

Sir Harry Kroto is professor of chemistry at Sussex University. He won the 1996 Nobel prize for chemistry.

Comment on this story

Top of Form

174255	1
--------	---

Post your comment

You must fill in all fields marked *