



# ENGINEERING FOCUS

JUNE 2013



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Ambassadors—  
Training our  
Leaders**

## ENGINEERING SUCCESS



**Another immensely successful year is coming to a close and the achievements of our students demonstrates their dedication and passion for a subject that shapes the world.**

Pushing the Boundaries was the theme of our display at Trevithick's Industrial Dartford and this is certainly true of the work that the hugely successful FI in schools teams took to the National Finals.

National Champions Turbocharged are already developing new ideas for next year to make sure they retain their title, while Red Shift look for sponsors to help them get to the international finals in Texas in November. The opportunity for them to collaborate with a school from another country is absolutely fantastic and will help them develop their already considerable engineering skills further.

The Caterham car is now complete and has been tested for road safety and, after a little tweaking, is now road legal and registered. After all of the work it is now time for the team to get out on the open road.

### Red Shift are interviewed at the FI finals



**Josh Brown with Her Ladyship the Mayor and Mr Denzil Reynolds**

Our work as a Bloodhound SSC educational centre has continued with students visiting primary schools to build balloon and k'nex cars and to introduce our new Bloodhound SSC Science Fair.

Sixth Former support during the South of England Regional Finals for Primary Engineer was amazing and helped this incredible event run smoothly. Primary School students from across the region competed to an extremely high level impressing our judging panel with their ingenuity and engineering knowledge, further details of the final are in this issue.

Wilmington Grammar School for Boys is the only local school that supports the annual Trevithick's Industrial Dartford event and it is a great opportunity for the local community to see what we have been doing. A full report on our day is on page 4&5.

All of this work demonstrates that ...“The Engineering reputation of the school grows from strength to strength allowing our students the best opportunities to help their futures” Mr Williamson, Headteacher.

# PRIMARY ENGINEER



Excited Engineers arrived ready to show the judges their cars



“exposure to practical creative activities is by far the most effective way to really engage young people”

**Fred Maillardet**  
**ImechE EAG**



Students discussed their work with the judges and tested it on the tracks



KS1 cars showed how far they would travel



Primary Engineer is a national organisation with a passion for engineering and a desire to share that love for Science, Technology, Engineering and Maths with primary students throughout the country.

The national challenge which is taken throughout England and Scotland is to design and build a powered vehicle to engineering standards. Students producing these

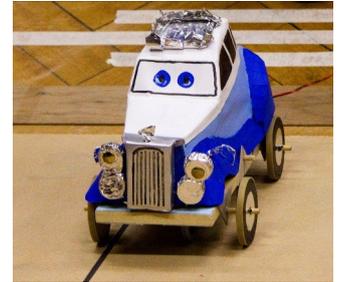


KS2 cars had to work in forward and reverse and be able to climb ramps

vehicles range from as young as 6 up to 11 years old.

Some of these amazing students and their fantastic work were on display at the South of England Regional Finals hosted by Wilmington Grammar School for Boys.

All students attending the regional finals had already succeeded at local and county level to secure their place at this prestigious event.



KS1 Apprentice Level students build a gravity powered car utilising the engineering concepts of alignment, friction, weight, gravity and considering the safety of their precious cargo – their favourite cuddly toy.

At KS2 students vehicles are powered by a 3V motor and pulley system giving the vehicles increased torque so that they can climb the steepest ramp without slipping and



# SOUTH OF ENGLAND FINALS



the quality of build ensures the vehicle can travel forward and backwards in a perfectly straight line.

Vehicles were tested and assessed by the visiting judges and the teams were each interviewed to find out why they had made the design decisions that lead to their



completed vehicles. Giving them the opportunity to show the judges how much they had learned about the engineering behind their vehicle.

The event was a huge success with the winners of the regional finals being announced and the opportunity for them to be crowned national finalists moving one step closer.

Our congratulations go to all of the teams that attended the finals and made it such an enjoyable and informative occasion and our special thanks go to our panel of judges from a range of different industries.

Stephen Metcalfe, Member of Parliament for South Basildon & East Thurrock said: "I was delighted to attend the regional final of the Primary Engineer Competition and particularly pleased to see the five schools from Basildon do so well and taking two firsts



and a second. However, in my view every single participant was a winner. The experienced gained from taking part I hope has opened the students eyes to the enormous possibilities engineering has to offer and also shown them that its fun! Congratulations to everyone who took part and to the organisers and I hope to be involved again in the future."

"The crème de la crème of the region's young engineers described and demonstrated their impressive creations, and their enthusiasm and motivation were both charming and heartening."

**Dr Adrian Alford**  
**ImechE**



# TREVITHICK'S INDUSTRIAL DARTFORD 2013



Mr Collins (retired DT teacher) and his Aerocamper



“No other school in the area does the variety of activities that you do”

**STEM Ambassador**



Miniature Traction Engines and Steam Wagons at the event



Trevithick's Steam Loco and Steam carriage



Whoever made the very first tool was the first engineer. Engineers have been quietly shaping the world around us for millennia and they are the people who will solve the problems of the future and save our world. As the human race has evolved some engineers have made such immensely significant breakthroughs that they will be remembered for all time.

Richard Trevithick is one such man - skilled,



innovative, talented and with a personal drive that pushed forward the boundaries of engineering for the world. As the inventor of the high pressure boiler he had an impact on manufacturing and transport that helped fuel the industrial revolution. He designed and manufactured the first steam locomotive and also the first steam carriage but died a poor man working in Dartford for J E Hall.

Every year Colin Wheeler commemorates Richard Trevithick and his industrial legacy to Dartford at the Trevithick's Industrial Dartford event held in Central Park. This opportunity for enthusiasts and historians to come

together and celebrate engineering in all of its forms is very popular and sees examples of full size and miniature steam engines, and vehicles from the days of the Hallford Omnibus through to the Piper Comanche Aerocamper.

With over 90 vintage and classic cars present the whole event was fascinating. I find the opportunity to discuss how the different vehicles work with their owners and builders gives me a greater understanding of the complexities of these



# PUSHING THE BOUNDARIES

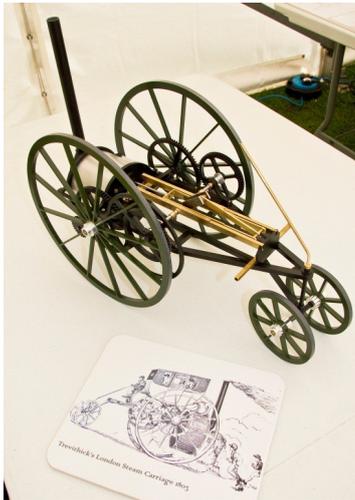


Visitors learnt about steam carriages, 3D printers, The Bloodhound SSC project and much more



Every year we try to take a new project to Trevithick Industrial Dartford with a slightly different focus on his inventions or inventors of his era.

This year's memorial project was the London Steam Carriage, the first omnibus not



pulled by horses. Research into the topic showed one thing; once again Richard Trevithick was ahead of his time, pushing the boundaries of science, engineering and social prejudice.



that Trevithick designed to power his omnibus. A single cylinder engine with two power strokes that could turn huge 8' diameter wheels and propel the vehicle along the streets of London.



As a vehicle The London Steam Carriage was a success, it did the job it was designed to do, but society was terrified by this 'fire breathing dragon' and after a small incident involving a fence it was condemned as too dangerous to work.



Research into the Steam Carriage lead to the manufacture of a miniature working chassis that demonstrated the mechanism



"I enjoy visiting your marquee every year to see what you have been up to, it is always a really good display"

**Trevithick Industrial Heritage Day Visitor**



# WHAT HAVE WE BEEN DOING?

Date	Students Involved	Activity
25/09/12	Year 8 & 9	<b>Teentech</b> —A national event showcasing STEM careers and education with students getting the opportunity to take part in hands-on activities throughout the day.
26/09/12	Year 12 & 13	<b>Coca-Cola Factory Visit</b> —Graphics and RM students visited the Coca Cola Factory in Sidcup to see how bottles and cans are produced. Students had previously been set a task to design a 'New drinks bottle' and they impressed the judges from Coca-Cola when they presented their ideas to them.
26/10/12	Year 12	<b>Arkwright Presentations</b> —Josh Brown and James Bevis were represented their Arkwright Scholarship Awards at the IET in London.
09/11/12	Year 9	<b>Merton Court - Balloon Cars</b> —Students from WGSB assisted KS1 students in building and testing balloon cars and relating it to the Bloodhound SSC.
16/11/12	Year 9	<b>Maypole - Door Hangers</b> —Students from WGSB assisted G&T students from Maypole school in designing and manufacturing vacuum formed door hangers.
16/11/12	Year 11	<b>Glendale Creative Solutions</b> —The Red Shift FI in schools team visited their sponsor Glendale Creative Solutions and collaborated with their designers to develop their pit displays for the FI in schools finals.
20/11/12	Year 12&13	<b>Senior Maths Challenge</b> —This encourages problem solving and phrases questions in a different way to those often asked in public examinations. It allows students to explore mathematics as well as providing an opportunity for the more able to compete against one another.
23/11/12	Year 9	<b>Merton Court - K'nex Cars</b> —Students from WGSB assisted KS2 students in building and testing K'nex cars and relating it to the Bloodhound SSC.
05/12/12	Year 11	<b>Science Museum</b> —Engineering Students went to look at the engineering exhibits with a focus on Man's Mission to the Moon
06/12/12	Year 10	<b>Science Museum</b> —Engineering Students went to look at the engineering exhibits with a focus on Man's Mission to the Moon
03/12/12	Year 9	<b>Futuremorph</b> —All Year 9 students had the opportunity to research STEM careers using the FutureMorph website.
11/01/13	Year 9	<b>Brent School - Door Hangers</b> —Students from WGSB assisted G&T students from Brent school in designing and manufacturing vacuum formed door hangers.
18/01/13	Year 9	<b>Joydens' Wood - K'nex Cars</b> —Students from WGSB assisted KS2 students in building and testing K'nex cars and relating it to the Bloodhound SSC.
01/02/13	Year 9	<b>Brent School - Door Hangers</b> —Students from WGSB assisted G&T students from Brent school in designing and manufacturing vacuum formed door hangers.
05/02/13	Mixed	<b>FI in Schools Regional Finals</b> —3 teams attended the regional finals at London City University. Turbocharged came first in the Bloodhound SSC class, Red Shift were runners up in the FI class and Full Throttle came 6th. Staff from WGSB also support a KS2 team from Bronte School, JAB took first place in their category.
07/02/13	Year 9,10&11	<b>Intermediate Maths Challenge</b> - This encourages problem solving and phrases questions in a different way to those often asked in public examinations. It allows students to explore mathematics as well as providing an opportunity for the more able to compete against one another.
08/02/13	Year 9	<b>Brent School - Door Hangers</b> —Students from WGSB assisted G&T students from Brent school in designing and manufacturing vacuum formed door hangers.
11/02/13	Mixed	<b>British Schools Karting Championship</b> —Two teams attended the practice sessions for this national event.
12/02/13	Year 13	<b>Whitecode</b> —Engineering students visited Whitecode Design Associates to learn about the role of the engineer and the impact of engineering on the environment.
13/02/13	Year 11	<b>Littlebrook Power Station</b> —Engineering Diploma Students visited Littlebrook Power Station to investigate computer control systems.
14/02/13	Year 10	<b>Littlebrook Power Station</b> —Engineering Diploma Students visited Littlebrook Power Station to investigate computer control systems.
14/02/13	Year 10	<b>Bloodhound SSC Science Fair</b> —Students from WGSB visited Anthony Roper Primary School and ran a hands-on science project for 45 year 5 students looking at Inventions and Discoveries relating to the Bloodhound SSC.
26/02/13	Mixed	<b>British Schools Karting Championship</b> —Two teams attended the practice sessions for this national event.
26/02/13	Year 12	<b>Review Display Systems</b> —Engineering students investigated the role of the engineer and evaluated the products made

Date	Students Involved	Activity
27/02/13	Year 11	<b>Littlebrook Power Station</b> —Engineering Diploma Students visited Littlebrook Power Station to investigate computer control systems.
28/02/13	Year 10	<b>Littlebrook Power Station</b> —Engineering Diploma Students visited Littlebrook Power Station to investigate computer control systems.
12/03/13	Year 12	<b>Kenard Engineering</b> —Engineering students investigated the role of the engineer and CNC manufacturing within the company.
12/03/13	Year 13	<b>Specac Ltd</b> —Engineering students visited Whitecode Design Associates to learn about the role of the engineer and the impact of engineering on the environment.
14/03/13	Year 8 & 10	<b>Big Bang Fair - STEM Event</b> —Year 8 attended the Big Bang Fair at the Excel Arena in London, this is a huge event showing careers and progression routes in the STEM subjects as well as giving the students the chance to try out state of the art equipment in a wide range of contexts.
14/03/13	Year 8 & 11	<b>Big Bang Fair - FI In Schools Finals</b> —The FI in Schools Bloodhound class team - Turbocharged attended the national finals which were held at the Big Bang Fair. They left National Champions and new Record Holders for their class.
15/03/13	Year 10&11	<b>Big Bang Fair - FI in Schools Finals</b> —Red Shift attended the National finals for the FI in Schools during the day they tested their cars and were interviewed by an array of judges looking at all aspects of their work.
16/03/13	Year 10&11	<b>Big Bang Fair - FI in Schools Finals</b> —Red Shift returned to the Big Bang Fair to find out the results of the FI Challenge. They left, elated, having taken third place overall and with the new challenge of raising £15 000 of sponsorship to take them to the world finals in Texas
22/03/13	Year 9	<b>Joydens' Wood - K'nex Cars</b> —Students from WGSB assisted KS2 students in building and testing K'nex cars and relating it to the Bloodhound SSC.
25/04/13	Year 12	<b>Visit to Abbots</b> —Students visited the Cell Culture and Fermentation labs to see in practice the techniques that they had learnt about in class, many were surprised at how much goes into producing the diagnostic tests used in hospitals. The staff at Abbott were so impressed with our students that they created extra work experience places for two of our students.
25/04/13	Year 7&8	<b>Junior Maths Challenge</b> —This encourages problem solving and phrases questions in a different way to those often asked in public examinations. It allows students to explore mathematics as well as providing an opportunity for the more able to compete against one another.
19/04/13	Year 12 & 13	<b>Primary Engineer Finals</b> —As regional centre for the Primary Engineer we hosted the South of England Regional Finals. Schools came from across the South. A-level Engineering students assisted with a range of activities during the event.
11/05/13	Mixed	<b>Trevithick's Industrial Dartford</b> —This annual event held in Dartford Central Park is a great opportunity for us to work with the local community and set up hands-on activities for our visitors. See pages 4&5 for images of the event.
17/05/13	Year 9	<b>Horton Kirby - Balloon Cars</b> —Students from WGSB assisted KS1 students in building and testing balloon cars and relating it to the Bloodhound SSC.
07/06/13	Year 9	<b>Horton Kirby - K'nex Cars</b> —Students from WGSB assisted KS2 students in building and testing K'nex cars and relating it to the Bloodhound SSC.
10/06/13	Mixed	<b>Caterham Car</b> —After successfully passing its self build DVLA assessment, the Caterham was formally registered and given a number plate. Students involved in the build were able to have a test drive in the car they had built.
17/06/13	Year 7,8,9 & 10	<b>Bloodhound Blast</b> —All students in year 7 to 10 were given the opportunity to sign up to the Bloodhound Blast forum and find out more about the latest news from the Bloodhound Project.
20/06/13	Year 11	<b>Imperial College Physics Taster Day</b> —An opportunity for year 11 students to attend a physics open day at Imperial College to find out about the possibility of studying physics at university.
21/06/13	Year 9	<b>Our Lady of the Rosary - K'nex cars</b> —Students from WGSB assisted KS2 students in building and testing K'nex cars and relating it to the Bloodhound SSC.
22/06/13	KS2	<b>Primary FI in Schools</b> —Staff from WGSB have supported the KS2 FI Team at Bronte School and attended the National Finals in Coventry after winning the regional finals.
28/06/13	Year 9	<b>Our Lady of the Rosary - K'nex cars</b> —Students from WGSB assisted KS2 students in building and testing K'nex cars and relating it to the Bloodhound SSC.
08/07/13	Year 7 & 8	<b>FI Enrichment</b> —Teams of Yr 7 & 8 students will complete the FI challenge during enrichment week giving them the chance to find out about the FI in schools challenge and whether they want to form the next team.

# BLOODHOUND IS A BLAST



Students worked independently to investigate all aspects of the Bloodhound SSC project



WGSB was visited by 40 students from Dartford's twin town of Hanau in Germany during June. Our visitors took part in a range of activities and to give them a taste of the Bloodhound SSC project during their visit the students had the chance to build and test k'nex cars using our compressed air launching systems.



As an Education Centre for the Bloodhound SSC project we often work with primary schools in the area encouraging students to get involved in STEM projects and to find out what it is like to build and test vehicles and then refine and improve their designs.

I asked for volunteers from our school to help with the activity and chose students who were studying both Engineering or Electronics and German. Some of whom had run the project previously at some of our link primary schools.

Although interaction was slow at first the k'nex proved an easy way to get ideas and thoughts across because it is quick to assemble and demonstrate which meant that the students were soon working together on testing and improving their designs.

Within WGSB all students from year 7, 8, 9 & 10 were given the opportunity to sign up to the Bloodhound Blast Forum so that they can learn all about this amazing project. Bloodhound SSC is an engineering adventure that will not only demonstrate that Britain still leads the world in engineering innovation and ingenuity by building a car that will travel at over 1000mph but which also aims to inspire the next generation of scientists and engineers throughout the country.

Results were varied with some of the cars exploding when they were launched, others having the firing tube streak down the hall but leaving the car behind and the best travelling the length of the gym and successfully completing the challenge.

If you would like to sign up to the forum to learn more about how the team are tackling the challenge or when the first test runs are going to be go to — <http://www.bloodhoundblast.com/> or visit their main website at <http://www.bloodhoundssc.com/>



Students only had 50 minutes to build and test their cars, they came up with some excellent solutions



For further information regarding any topic in the Engineering Focus please contact [esmith@wgsb.org.uk](mailto:esmith@wgsb.org.uk)  
Or visit our website at <http://wgsbengineeringfocus.weebly.com/>



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