

ISSUE 4 // OCTOBER 2007



Engineering



Non Sibi Sed Aliis
Aiming at Excellence

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TRANS- FORM

THE ENGINEERING NEWSLETTER
FOR BALSHAW'S C.E. HIGH SCHOOL

The Fourth edition of Transform is here. When we set out on our journey, little did we think that the quality would improve with each edition but it has, and I know a number of local people look forward to reading it.

The North West Cluster of Engineering Colleges deemed it a "huge success" and "head and shoulders above the rest". This has to be accredited not only to those who contribute the articles but also to the generosity of St Andrew's Church and Runshaw College for its production.

As we continue to aim at excellence I hope that you will enjoy the different reports and perhaps even contribute something yourself for the next edition.

Yours sincerely

J M Venn, *Headteacher*

SURVEYING THE GROUNDS

In Maths lessons year 9 have been learning about trigonometry. They put their knowledge to use in a very practical way one overcast day in June.

They had made their own clinometers to find the height of buildings and trees around the school grounds.

They first had to measure the distance that they were stood from the building, and then, using their clinometers, find the angle of elevation to the top of the building.

The pupils then had to use Tangent ratio to find the height of the buildings.



AMIR KHAN VISITS BALSHAW'S

On Friday 9th February, the Olympic silver medallist and potential world boxing champion visited Balshaw's. He was highly impressed by the facilities around the school and in particular by the ICT suite and the new maths/technology areas.

In an interview with senior prefects and sports captains (Stuart Humber, Jim Fox, Sarah Hamilton and Emma Dovey), Amir outlined his ambitions and how he intended to achieve them. He described his school career in Bolton and emphasised the need for hard work and effort in all areas, academic and sporting.

The main focus of Amir's visit was to attend the circuit training sessions which run every Friday lunchtime. Here the pupils used the brand new heart rate monitors to gauge their effort levels over a range of exercises. More

than 100 pupils took part in the session supervised by Mr Jennings, Mr Croft, Mr Nolan and Mr Barrett.

Overall, the visit was a great success. Amir was greatly impressed by the school and all the pupils he met. Well done to all those involved and best wishes to Amir in his future fights.



THE DAY I JUMPED OUT OF A PLANE!



It was finally here. After two months of postponement, I was going to do it. A tandem-skydive from 14,000 feet.

With the nerves jangling and the heart pounding, I made my way with the instructor to the plane. Being the biggest, we got in last (it was only later it dawned on me that we would be first out), the door slammed shut and the engines began to roar. Slowly the plane accelerated until the momentum lifted us up into the air. Higher we began to rise, up towards the clouds. This is high enough I thought, but no, onwards we went, up above the clouds. "Everybody out" came the shout from the front, and the door slid open.

Down to my left I could see the world stretch out in front of me. There was nothing between me and the ground but the clouds. The instructor moved me into position by pushing me forward out of the door. I clutched my harness and began to pray. I felt us lean forward and the howl of the wind overcame me as we began to accelerate towards 140 mph. The only thing keeping us airborne was the drag from the air. Gasping for breathe I began to enjoy the ride. In no time at all, the parachute was deployed and descent was slowed to 25 mph. What a feeling as the canopy opens above you. The world becomes silent and, once the tears had gone from my eyes, what a view. A five minute glide later and we were back on safe ground. It seemed as though the whole thing hadn't been real.

Thank you to all for the sponsor money. It helped to raise £400 for 'Help a local child!' *I have the DVD if anyone doesn't believe I could do it!!*

Grant Jennings

TEACHING PRACTICE PLACEMENT

I am just coming to the end of a four-month teaching practice placement in the Maths department at Balshaw's. It seems like a lot more than four months since I first arrived on the doorstep, but not in a bad way of course. The staff have been so friendly that I feel like I have always been here.

The department have been extremely supportive and have always made me feel part of the team. Training to be a teacher has been hard work. There is always a mountain of paperwork to get through, assignments to complete, and of course lessons to be planned and taught. During my time at Balshaw's, I have been able to try out new ideas and have been given helpful feedback on the things that have gone well and the things that have perhaps not gone quite so well. I have had the opportunity to get to grips with all sorts of new technology, particularly the interactive whiteboards, quite daunting on first acquaintance.

The students at Balshaw's have, on the whole, been fantastic too. They come up with some very interesting ideas and we have had some interesting discussions. I

particularly enjoyed listening to party political broadcasts made by form members during a recent mock election campaign. Some of the candidates certainly convinced me.

I have also had the opportunity to work with the students outside class. Attending Year 7 Drama club each week was a great way to escape from the lesson planning and assignments for an hour or so. Preparing for the end of term performance was certainly an antidote to algebra with year 10. (The details of this may change according to what you did in the Drama club and Year 10 etc.)

Before I came to Balshaw's I was not a hundred percent sure that a career in teaching was for me. However, the positive experience I have had here has convinced me that this is the way to go. I feel extremely fortunate to have had the chance to do my training in such a great place, and would like to say a big thank you to everyone who has helped me during my time in this school, special in so many ways.

Amelia Spruyt (who has since been appointed on a 12 month contract at Balshaw's to take Mr Jennings' classes whilst he is in Korea)

ENGINEERING IS EVERYWHERE!

HOW A SUBMARINE WORKS

The first designs of submarines resembled rounded balls, which was a good idea since a sphere is an excellent shape to resist the pressure of the water. Spheres however are not good shapes to steer in any direction, nor are they easy shapes to hold weapons and personnel. If you stretch a sphere into a long tube with a half sphere at either end you can get the best compromise of practicality with pressure resistance. Most modern submarines have this internal shape. This shape forms the pressure hull, the part of the submarine that keeps the air in and the water out.

To make the submarine move you need some form of propulsion, generally a choice between nuclear power or a combination of diesel and electric power.

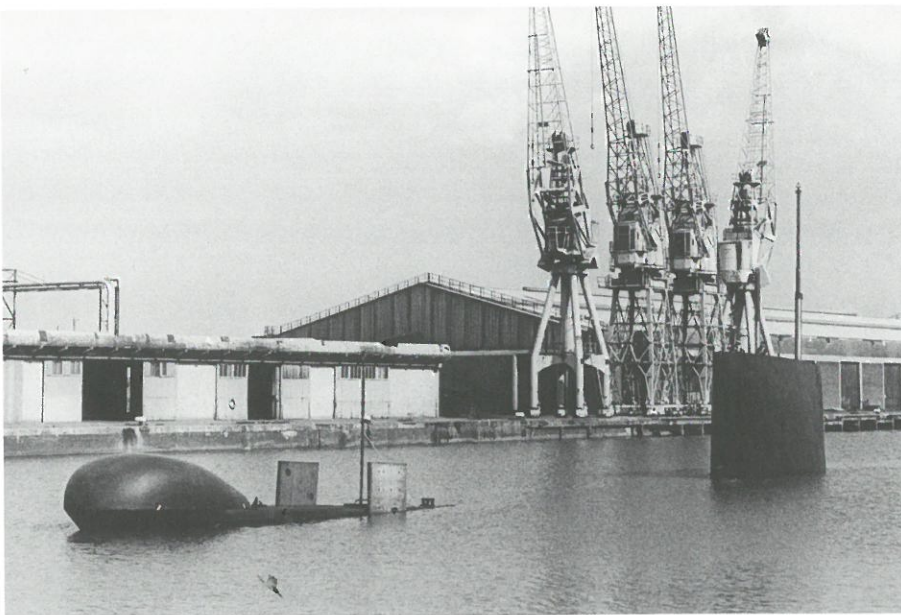
Whatever propulsion is chosen the output of the system has to be turned into motive power via propellers or propulsors external to the hull. In order to control the direction of the submarine a rudder is fitted. So now you

can move in two dimensions – forward and back, and left and right (port and starboard!), but how do you move in the third dimension – up and down?

Submarines are fitted with ballast tanks which are full of air when on the surface and provide buoyancy. When a submarine dives she opens holes, called main vents, in the tops of the ballast tanks and releases the air. As the air escapes from the top it is replaced with seawater entering the bottom of the tanks through free-flood holes. Once all the air has escaped from the tanks the crew close the main vents and then very accurately adjust the overall weight of the submarine by pumping water out or flooding water into trimming tanks to achieve neutral buoyancy – something that needs constant assessment and readjustment.

If the submarine is cruising at 55 metres below the surface and wants to go deeper to 180 metres she will have to pump water out of her tanks in order to remain in trim at the deeper depth. This is because the increasing water pressure will squeeze the hull of the submarine smaller as she goes deep. Whilst the hull squeezes

smaller the mass of the submarine remains the same thereby making the submarine effectively denser relative to the outside seawater. In order to prevent the submarine going out of trim water is pumped out of the trimming tanks to compensate for this change. The opposite occurs when the submarine returns to a shallow depth. The pressure reduces, the hull expands and the submarine becomes relatively less dense. Water is flooded



HMS Otter doing a trim dive in Hull docks in 1986 on completion of refit. The dive is being carefully monitored from outside by shipyard and Royal Navy personnel.

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back into the tanks to compensate and prevent her becoming positively buoyant. To show the degree of hull compression it is common to tie a piece of string tightly across the inside of the pressure hull when deep. As the hull expands on coming shallow the string eventually breaks, much to the amusement of the submarine crew and very disconcerting for any non-submarine visitors onboard! When it is time for the submarine to surface, compressed air is blown into the ballast tanks forcing the seawater out through the free-flood holes at the bottom. This rapidly increases the buoyancy of the submarine and returns her to the surface.

This might all seem very complicated, and the job of assessing and adjusting the trim of the submarine at the start of a patrol is usually given to the second in command, the First Lieutenant. He has to take into account how many crew are onboard, how much stores, fuel, weapons are onboard, and how much water is in every single tank on the submarine. Adjusting the trim of a 2200 ton conventional submarine, or a 5000+ ton



HMS Otter, conventional submarine with diesel/electric drive showing ballast tanks along the sides of the submarine. You can see four of the main vents just above the waterline on the port side. The large dome houses the main sonar array.

nuclear submarine is therefore frequently carried out by someone whose only qualification in mathematics, physics, or engineering is a GCSE they were awarded 6 to 9 years previously at high school.

TAJ MAHAL - 350 YEARS OLD

We have a number of pupils whose families are from India, and they have been researching the Engineering feat of the Taj Mahal which has just celebrated its 350th birthday. 20,000 labourers worked for 22 years to build this white marble mausoleum on the river Jumma near Agra.

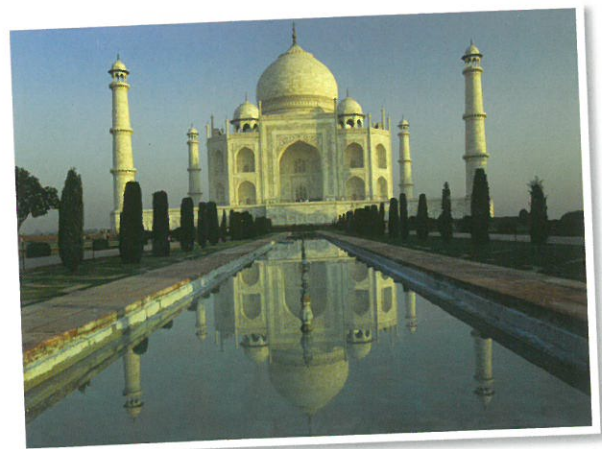
It was built by Shah Jehan in memory of his favourite wife and is a celebrated example of Indo-Islamic architecture which is a fusion of Muslim and Hindu styles.

The Taj Gate was completed in 1648, stands 30 metres high. The original door of the gateway was made out of solid silver which is decorated with verses from the holy Koran.

Red sandstone was brought from Sikri, Jasper from Punjab, Jade and Crystal from China, Turquoise from Tibet, Lapis Lazuli and Sapphire from Sri Lanka and Diamonds from Panna. 28 kinds of rare, semi-precious and precious stones were used for inlay work.

The workmanship has been described as "designed by giants and finished by jewellers".

It is a tribute to a beautiful woman and a monument for enduring love. The Taj Mahal is pinkish in the morning, milky white in the evening and golden when the moon shines. The changes depict the different moods of women. People say that the Taj has a life of its own that leaps out of marble, provided you understand it is a monument of love.



THE POWER OF ICT IN ENGINEERING

Computer development was one of the greatest engineering feats of the 20th century and has changed our lives in so many ways and has had social, political, and economic effects.

One of the greatest changes it has made has been the amount of information that people have available to them, and this in turn allows people to research and develop products and services as diverse as the mp3 player, to the creation of a ship that will go to the moon. It has also changed the way we work and store information, and taken a lot of the mundane jobs out of the manufacture of products and increased the quality of the production to a point where tolerances can be to a thousandths of a millimetre.

The computing power of new computers doubles every eighteen months and the amount of data that they can store expands at an exponential rate and will change our lives so much that we will have to ask the question: will humans be needed in factories or will it all be automated?

Remember the future is what we make it and the mistakes of today will be paid for tomorrow.



NEW ARRIVAL

In September I started at Balshaw's and I couldn't wait.

I feel immensely excited and proud to have earned the opportunity to come and join a school with such a wonderful reputation and history. I would like to thank everyone who made me feel so welcome on my interview days, especially the students who I met on my day in school. Clearly everyone at Balshaw's is proud of their school, and rightly so.

I have worked in three very different schools in Chorley, Rochdale and presently in Bolton. All three have their diverse specialisms which have added significantly to the enrichment of student education. However, I am

especially looking forward to being part of a school with Engineering status. It is clear from reading previous editions of this newsletter that Balshaw's specialism impacts across the whole curriculum. I have seen the impact that engineering and technology can have in enthusing young people at first hand through the work of the Bolton Technical Innovation Centre (T.I.C.). This is located next to my previous school and is a place where young people can be 'hands on' in creative, innovative design processes using the latest state of the art kit that is normally only found in universities and research agencies.

Finally, the prospect of working with you all at Balshaw's is one I am truly relishing.

J S Morgan

茅以升

Name: Dr Mao Yisheng

Born: 9th January 1896

Died: 12th November 1989

Introduction: Born in Zhenjiang, he is regarded as the founder of modern bridge engineering. In his youth he had to do the unthinkable (which was obviously thinkable as he did it): to stop the approach of the Neanderthals from Japan in 1937 during WWII, he destroyed the Qiantang Bridge near Hangzhou; it was a bridge he had helped to build. Fortunately, he rebuilt it when the war was over. In April 18th 2006, Carnegie Mellon University set up a statue to honour him as their first doctoral graduate. His son-in-law said Mao Yisheng could remember Pi to the 100th digit. An ability as useful as a paper dinghy.

During his lifetime he was:

- President and Professor of Tangshan Engineering School of the Jiaotong University (now Southwest Jiaotong University), China
- Director of Engineering Course of Southeast University, China
- President of Engineering Course college of Beiyang University, China
- Director of Project Office of Transportation Ministry of Kuomintang Administration, China again.
- Leader of the China Engineers' Association
- Leader of the Chinese Civil Engineering Society
- Director of Railway Institute under the Ministry of Railway, China
- President of Railway Scientific Research Centre
- Chairman of Beijing Science Association
- Honorary President and Vice-President of the China Association for Science and Technology
- Vice-chairman of Jui San Society
- Vice-chairman of the Chinese People's Political Consultative Conference (CPPCC)
- Standing Committee Member of National People's Congress
- Senior member of International Bridge and Structural Project Association
- Foreign Academician issued by the National Academy of Sciences in USA (wahay! not China for once).

His accomplishments

- Earned a bachelor's degree in civil engineering in Jiaotong University's Tangshan Engineering College in 1916
- Earned a Master's degree from Cornell University
- Earned the first Ph.D ever granted by the Carnegie Institute of Technology (now Carnegie Mellon University) in 1919
- The first dual-purpose (road and railway) bridge designed and made by the Chinese: the Qiantangjiang Bridge
- China's first modern bridge: Wuhan Yangtze Bridge
- The structural design of the Great Hall of the People in Beijing which withstood an earthquake
- Wrote many articles such as "On Bridge" and "China's Arch Bridges"

Charlotte Cheng (Year 11)



BIKE SHELTER

In January this year Balshaw's became the owners of a brand new bike shelter. If you have visited school recently or driven along Church Road you would have noticed the 60 bike shelter at the front of school. The shelters were supplied and installed by Broxap and paid for with money

obtained through a school travel plan and a Safer Routes to School scheme. The new design and secure storage has led to a much higher number of the student body choosing to cycle to school, which is a fun and healthy way to start off the day.

BALSHAW'S 1782-2007

*Wit's an unruly engine, wildly striking
Sometimes a friend, sometimes the engineer*

George Herbert 1593-1633: The Church Porch

225 years of Balshaw's! I wonder what Richard Balshaw would have said about us becoming an engineering specialist school. He was said to have been living in Hemel Hempstead when he founded a trust for a charity school in Leyland on 14 June 1782. There is a Memorial Marble to him in St Giles, Charing Cross, London that describes him as of "Golden Hill, Leyland, Lancashire". The epitaph says "Of whom it may be justly said he was a truly benevolent and charitable man.

Technology was taught if you include knitting and sewing! As the foundation plaque says:-

"This charity school was founded, endowed and erected by Richard Balshaw, Gentleman for Instructing the Children of the Poor only of this Parish, in Reading, Writing and Arithmetic, in the English Tongue. And in the principles of the Church of England as by law established. The girls to be taught also to Knit, Sew and Mark".

The original endowment was 11 acres of land in Leyland,

and land and property in Middlesex.

In 1784 the school was in Golden Hill. A new school in Golden Hill was built in 1904 and on our present site



in 1931. From Charity School to Grammar School to Comprehensive embracing Engineering Status and the Christian Ethos. Who could want more from a school. The Silver Griffin on the badge with the words "Non sibi sed aliis" (Not for self but for all) embraces the Christian ethos. The Houses of Clayton, Cuerden, Farington and Worden have certainly been around for most of the years even if not all of them. With 13 Headteachers, only one a woman! In 225 years this must be some kind of record.

Here's to the next 225 years and continuing to provide an excellent education which combines traditional values, forward thinking ideas embraced within the Christian family.

TRIP TO BLACKBURN ROVERS

During April, a group of Year 8 pupils had the opportunity of going on a mathematics visit to Ewood Park.

The day was spent undertaking a variety of maths based activities around the ground. Pupils enjoyed the chance to pace the pitch, visit the changing rooms and even sit in the press room as potential new signings for the club. In the afternoon, they went down to the training complex to develop their football skills with some of the trainers at the club. The five a side games became very competitive, even the staff got involved! Pupils took prizes home such as key rings, a teddy and some were even lucky enough

to get tickets for the next match. A great day was had by all and we would like to take this opportunity to thank Blackburn Rovers for giving us such a memorable day out.



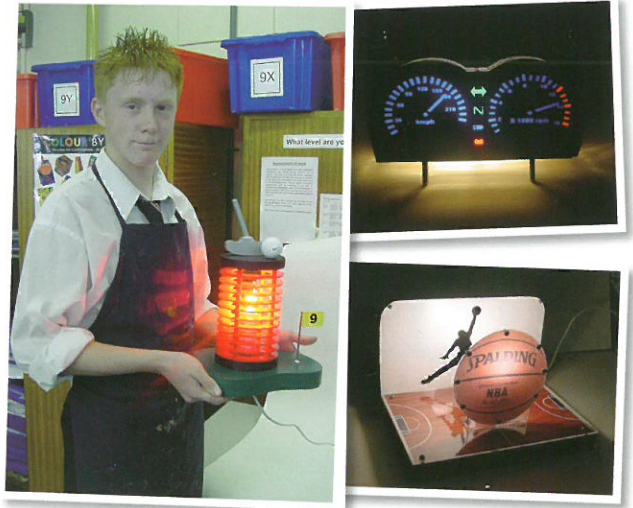
ICT MAKES ALL THE DIFFERENCE IN DESIGN AND TECHNOLOGY

Y11 pupils in Resistant Materials are among just some of the pupils who have reaped the benefit of a £28, 000 investment in ICT equipment in Design and Technology.

They have been able to fit more computer generated work into their GCSE coursework and as a result the standard of both designing and making has soared.

Each pupil designed part of the product they were making on computer (CAD) and then made it on the department's laser cutter (CAM). These components were made to such a high quality that the pupils tried their hardest to make sure the rest of their project matched them. A wide selection of other skills including using an engineering lathe, metal casting system and traditional power and hand tools were used to complete their project. So impressed were the examination board with the quality of the work they sent an examiner along to photograph some of the completed projects.

The examiner explained to Mr Melling, the Head of D&T, that a lot of schools were doing CAD/CAM wrong with their pupils. They were either doing too much of it or too little and what impressed the board about the Balshaw's



pupils work was not only the excellent standard but the right mix between CAD/CAM and more traditional skills. The exam board intends to send photographs of what they want to see to over 1000 secondary schools and it is very likely that among the photographs will be ones taken at Balshaw's.

You can see some of the fantastic products produced this year and a very proud Adam Cairns with his grade A golf themed lamp.

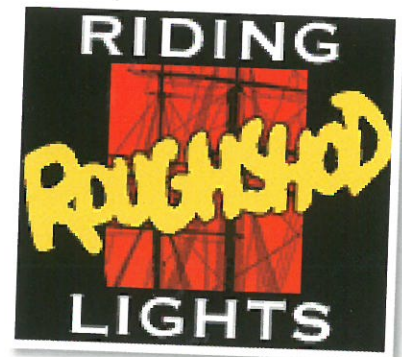
RIDING LIGHTS ROUGHSHOD THEATRE COMPANY

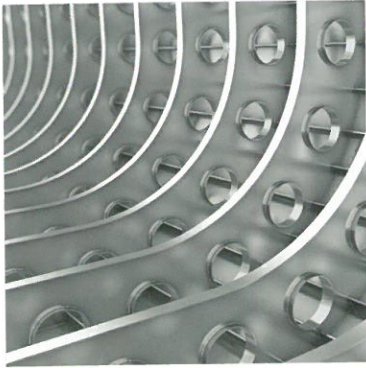
The RE Department were pleased to welcome Riding Lights to Balshaw's.

They put on two performances of 'The Pressure Cooker'. This involved pupils participating in a series of games and ended with a drama performance to help pupils discover their sense of unique value in the world. Pupils particularly enjoyed playing the 'zip, zap, bong, reflector game'!

As part of this production the group brought with them an unusual prop – a multi-folding table that was then used and transformed into a variety of different objects.

This included being used as the inside of a bus, a picnic bench, a table in a restaurant, a desk, a stage and a slave ship, complete with slaves going down inside the hold! Pupils were genuinely moved by the performance and the actors were congratulated on their efforts.





NUCLEUS

BALSHAW'S SCIENCE NEWS

An update of past and future trips, new exciting technology and facilities in the Science Department

NATURE'S ENGINEERING – DNA!

As part of their GCSE, Year 11 pupils study the structure and function of the chemical of life - DNA.

Its full name is Deoxy Ribo Nucleic Acid! In a tasty twist, pupils made models of DNA strands using raspberry laces, gummy fruits and cocktail sticks! They then had to produce a key to show what sweeties they had used for each part of the DNA strand!

They almost look too good to eat!



YEAR 11 PUPILS MEET FAMOUS RUSSIAN COSMONAUT

On 15th March, Year 11 pupils visited the University of Manchester as part of National Science and Engineering Week to hear a lecture by two famous Russian cosmonauts.

A video of life on the international space station showed Alexander Volkov and his everyday life in space. Pupils were amazed as Alexander and his compatriot Dr Alexy Martynov explained how they had coped with life at zero gravity. Even the simple task of sleeping is difficult for cosmonauts as they need to be strapped into a sleeping bag lying vertically against a wall! After the lecture pupil's watched a live link-up to Michigan University in America to speak to future astronauts and other physicists.



Dr Martynov and Alexander Volkov at the University of Manchester



Alexander Volkov in his days as a Russian cosmonaut

BALSHAW'S WIN SALTER'S CHEMISTRY PRIZE!



On Wednesday 23rd May a team of Year 8 pupils tasted University life in Liverpool when they took part in the Salter's Chemistry Festival. They enjoyed two practical activities and a fun lecture given by Dr Helen Aspinall. Over 100 pupils from all over the North West took part and the Balshaw's team won the prize for the "Best Chemistry Method" sponsored by Epichem. Well Done to Richard Bullen, Alison Bird, Jack Hepworth and Jessica Potts.

MANCHESTER – A BRAND NEW CITY!

On Saturday 9th June, Year 10 pupils visited the City of Manchester to see the wealth of engineering that has gone on in the past 10 years to totally revamp this once ailing northern place into a cosmopolitan, vibrant haven of modern architecture and bustling city life. First stop was the Museum of Science and Industry where the Doctor Who exhibition provided much familiarity and awe as we discovered the miniscule sets that are used to film some



of the scenes with special effects and viewed some of the original costumes worn by the cast. We then took a trip up the magnificent Beetham Tower, home to the Hilton Hotel and luxury apartments. The Tower is the largest building in Manchester with 48 floors and is 169 metres in height. The Penthouse Flat – on the top floor is the highest living space in the whole of Britain! A fantastic day was had by all!

MEET THE SCIENCE DEPARTMENT'S LATEST ADDITION...

This state of the art Digital Compound Microscope is now part of the Biology Department at Balshaw's. The Holmes Hines Foundation kindly provided funding for this University level equipment costing over £400. The microscope



will allow pupils to see mini-beasts such as Daphnia and Rotifer – both often found in lakes and ponds, with clarity and on the big screen! Which Balshaw's pupil will be the first to follow in the footsteps of the famous cell microbiologist Robert Hooke?!!

STICK INSECTS ARRIVE AT BALSHAW'S!

On Monday 30th April, Jennifer Dobson from Liverpool World Museum's "Bug House" visited Balshaw's Science Club to deliver and talk about 10 Indian stick insects called *Carausius morosus*. These stick insects are a female only species that reproduce asexually. This means that they lay eggs which hatch after 3 months. Every new stick insect will be an identical clone to its parent! The stick insects will shed their skin 7 times until they reach adulthood and they have a lifespan of between 1-2 years. The Indian stick insects can be found in Room 26 so come along and say hello!



PREFECTS VISIT ALTON TOWERS

Saturday 5th May was the Prefects' Annual Trip to Alton Towers.

Alton Towers, originally home to the Earl of Shrewsbury, became a theme park in 1980 when John Broome constructed the UK's first double corkscrew rollercoaster. Broome continued to push the boundaries of engineering and theme park thrills by adding rides including the UK's first rollercoaster in the dark (The Black Hole), the Sky Ride and a monorail, all of which still feature in today's Alton Towers ride list. Since the Tussauds Group takeover in 1990 Alton Towers has become the best loved family day out in the UK. In 1994 a spectacular and genius piece of engineering costing £10,000,000 to build was opened. "Nemesis" was the world's most sophisticated rollercoaster with a zero-gravity roll and top speeds of 50 mph.

In 1998 the world's first (and still only one of two in the world) vertical rollercoaster "Oblivion" opened. This 87 degree drop reaching speeds of 68mph had people

flocking to try it out.

In 2002 Alton Towers engineer John Wardley again broke the mould, installing the world's first Aerial Inversion Ride or AIR. This new generation flying rollercoaster gave riders the feel that they were actually flying.

Future plans for Alton Towers include a wooden rollercoaster and officials have promised something "major and exciting" will be opening in 2008.

Miss Venn, Miss Hodgson, Miss Molyneux and Miss O'Brien ride "Rita, Queen of Speed" – the ride races from 0-100kph in 2.5 seconds!



The Sky Ride at Alton Towers. Opened in 1987 and carries almost 3000 people per hour



YEAR 8 FRENCH TRIP

At 5am on Friday 29th June, a group of 40 year 8 pupils headed off to France.

Their first 3 nights were spent in the grounds of a historic chateau where they were able to take part in many different activities such as water sports, rock climbing and many more. On their first full day they had a chance to visit the Market in Rue – a small town near the chateau where they were able to buy souvenirs and presents and have a chance to talk to the local people. In the afternoon, they visited an aquarium close by. They came face to face with creatures from the deep and some had the opportunity to touch the stingrays and other exotic fish down at the touch pool. Everyone thoroughly enjoyed the experience and they all had a great time. Until Monday, everyone stayed within the grounds of the chateau. Activities such as kayaking and canoeing were organized by the staff. Talent shows and quizzes were arranged for the evening and in any spare time; football and other sports were played. On Monday they all had an early rise. Within a couple of

hours, they were on the coach heading down to Paris. After lunch, they went up the Eiffel Tower – this was organized by the technology department. After exploring the Tower top to bottom, they all went sightseeing down the River Seine. They got some spectacular views of the Notre-Dame Cathedral and other famous landmarks. Everyone really enjoyed the visit to Paris and would love to go again. The evening was spent at a Disneyland Hotel, where they stopped overnight and headed off to Disney the next day. After spending many hours in the park it was time to leave and the coach didn't arrive back at school until three o'clock in the morning!

