

27th International Young Physicists' Tournament



3rd-10th July 2014 / Shrewsbury School

IVPT

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Headmaster's Welcome



It is a great privilege for all of us here at Shrewsbury School to be able to host the International Young Physicists' Tournament 2014. Shrewsbury is a school with a strong scientific tradition stretching right back to the time when Charles Darwin was one of our pupils. Since that time, the school has continued to encourage and promote scientific enquiry.

It is a particular pleasure to be able to welcome boys and girls from so many different nations around the world. We are constantly reminded about how science has facilitated in the 'shrinking' of the globe and how it has provided a common language.

We hope that all our visitors attending this prestigious tournament will enjoy the atmosphere, traditions and history both of Shrewsbury School and our beautiful town. We hope very much that they will enjoy a high level of competition, learn a great deal and, perhaps even more importantly, develop friendships that will allow the sharing of scientific ideas around the world in the future.

A tournament of this size and prestige can only be achieved through a huge amount of meticulous organisation. I am most grateful to everybody who has worked so hard to bring the IYPT to Shrewsbury and the United Kingdom.

Mark Turner



Shrewsbury School

Message from Daniel Kawczynski



I am delighted that Shrewsbury School has been chosen to host the 27th International Young Physicist's Tournament and welcome students from the UK and across the world. The Tournament is famous for showcasing the best and brightest of the world's young physicists and I am excited to see what these talented young students will bring forward.

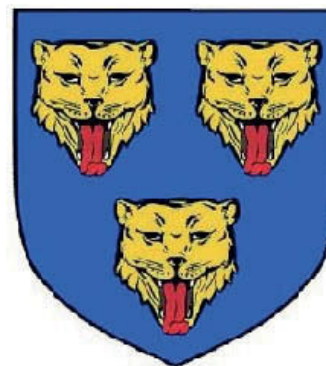
This Tournament will build upon the already stellar reputation that Shrewsbury School has for science. Indeed, Charles Darwin, one of the greatest contributors to modern science was a student here at this very school. It is fitting, therefore, that these brilliant boys and girls should be competing here where Darwin himself studied science.

The UK Government recognises the benefits of science and believes that if we want the UK to remain a world leader in research and technology we will need a future generation that is passionate about, and skilled in, science, technology, engineering and maths (STEM).

Physics is a vital part of the education of young people because the young physicists of today will be the innovators and inventors of future technologies tomorrow.

I wish all students in the competition the best of luck.

Daniel Kawczynski
MP for Shrewsbury and Atcham



"Scientists have become the bearers of the torch of discovery in our quest for knowledge" – Professor Stephen Hawking

Message from President of IYPT



Welcome to the 27th International Young Physicists' Tournament. I first visited The Shrewsbury School in 2005 and thought what a wonderful venue for an IYPT it would make! The town and the School resonate with a long history and tradition of excellence in education. The Shrewsbury School represented the UK for the first time two years earlier in Sweden.

The eminent Charles Darwin studied here and then changed the world! Like the research that will be presented here, with his “The Origin of the Species” Darwin challenged the way people thought. His ideas were not universally welcomed and great was the opposition to his conclusions. Still today, despite the enormous wealth of evidence, some people can not accept his explanations! Explaining and getting understanding is the challenge of Science!

I find it amazing that a copy of a book written by an old boy of this School sits on my bookshelf and was bought at a visit to the Nobel Museum during that IYPT in 2003, the year the UK were first represented at the event.

IYPT now welcome students from all corners of the world, bringing their research to present and discuss. The beauty of IYPT is that all this research will be opposed and reviewed. The quality of the ideas will be subjected to the scrutiny of the researcher's peers. Perhaps none of these ideas will challenge to the extent that Darwin's work did but each will be unique and add to our understanding of the Universe.

To borrow a few words from Darwin “whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being evolved”. Physics seeks to understand the very beginnings of the Universe and the interactions that determine its form.

IYPT seeks to get our competitors to recognise the joys of this search for understanding.

Nine years on from my first visit, I look forward to the first IYPT to be held in the UK and a return to The Shrewsbury School. I wish you success and enjoyment in the search!

I think we are all going to have a wonderful week here!

Alan Allinson

Message from Chair of LOC



It was back in 2002 that I was first made aware of 'a Physics Competition' that was being publicised in the UK by Sue Fryer from the Institute of Physics. Tantalisingly, we were told that if we were lucky enough to win the UK round, we would have the opportunity to travel to Sweden and represent the country. It was an amazing prospect; physics teachers just don't normally get to do that sort of thing!

I was a team leader, as was my long-suffering colleague, Mr Steve Adams, who is Head of Science at Shrewsbury School and another veteran of IYPT now. Initially the problems looked quite strange and rather unapproachable but by doing some research and tackling them carefully one by one, we managed to perform successful experiments and put together some credible presentations. We were eventually victorious in our national competition and in July 2003 we flew to Stockholm en route to Uppsala.

We really did not know what to expect at the international competition and were very excited about our awaiting adventure. We faced a steep learning curve but soon got the hang of it and amazingly finished 5th in our first international tournament. We also met some amazing people who are still friends to this day. Sadly, two of them, Gunnar Tibell and Zdenek Kluber are no longer with us. I will never forget their friendship and total commitment to IYPT and to physics education around the world.

We loved seeing different countries and cultures, the physics and the camaraderie; we had caught the IYPT bug. Soon after IYPT 2003, Sue Fryer passed the mantle of IOC member for the UK over to me and since then, I have been involved in ten successive IYPTs. I have been a team leader, IOC member, EC member and Independent Juror. I have enjoyed every aspect of the tournament and hope to do so for many years to come.

It was only a matter of time before we would have the pleasure of reciprocating the welcome and the kindness that we have received from so many of you in your respective host countries.

Well here we are in 2014 and it is indeed with great pleasure that I welcome you all to the 27th International Young Physicists' Tournament in the United Kingdom and at Shrewsbury School in particular.

John Balcombe

Message from Founder of IYPT



Dear young physicists / Dear colleagues, I congratulate you on the opening of the 27th International Young Physicists' Tournament. There are events in the World that affect a large number of people. Such events are powerfully embedded in our society, change the World for the better, inspire new hopes, broaden the horizons of human communication, and promote the development of science. Our World would be inconceivable without such events.

I am thrilled and happy that the Tournament has become one of such special global events. I am proud that in 2014, the IYPT again attracts wonderful talented young people from around the globe. You will have a great opportunity to discuss physics with each other, to hear each other, to argue with each other, and to learn.

Two years ago, the IYPT celebrated its quarter-century anniversary. Since 1988, the line of annual Tournaments connects different countries on different continents.

This year we have another wonderful anniversary which consists in the fact that the 500th IYPT team is among the participants of the 27th Tournament. That means that the total number of participants, of the International Tournament only, exceeds 2,500.

How many lives and careers have been touched by the Tournament and its regional rounds? How many teachers, university students, scientists, and organizers have been attracted to the IYPT? To how many people the IYPT has become a solid platform for their professional growth and sometimes an inalienable part of life? My colleague and the IYPT archivist Ilya Martchenko says that a good estimate of extended IYPT community and our audience exceeds 100,000 people. I am happy that to many of our alumni, the Tournament has opened a pathway to science and has become a powerful motivation for their choices in life.

The British team took part for the first time at the IYPT 1991 thanks to the efforts of physics teachers from Hills Road Sixth Form College in Cambridge, Stephen Martin and late Nancy Alderson. I thank Gordon Woods, British visitor in 1991, for the photo of the UK team.

Evgeny Yunosov

Principal Guest Speaker

Martin Rees



Our principal guest speaker is the renowned astrophysicist, Professor Sir Martin Rees. Martin Rees is a Fellow (and was until recently Master) of Trinity College, Cambridge and holds the honorary title of Astronomer Royal. He served for ten years as director of Cambridge's Institute of Astronomy and for many years as a Cambridge Professor.

His research interests are in astrophysics and space science - especially the aspects that teach us about 'extreme physics', as well as cosmology, and planets. As well as his research, he has written and lectured widely to general audience. He has also been involved in policy issues, particularly as a member, since 2005, of the House of Lords and as President of the Royal Society between 2005 and 2010. He is president of the UK physics Olympiad committee, and was last year the president of the Association for Science Education.

Guest Speaker

Peter Norreys



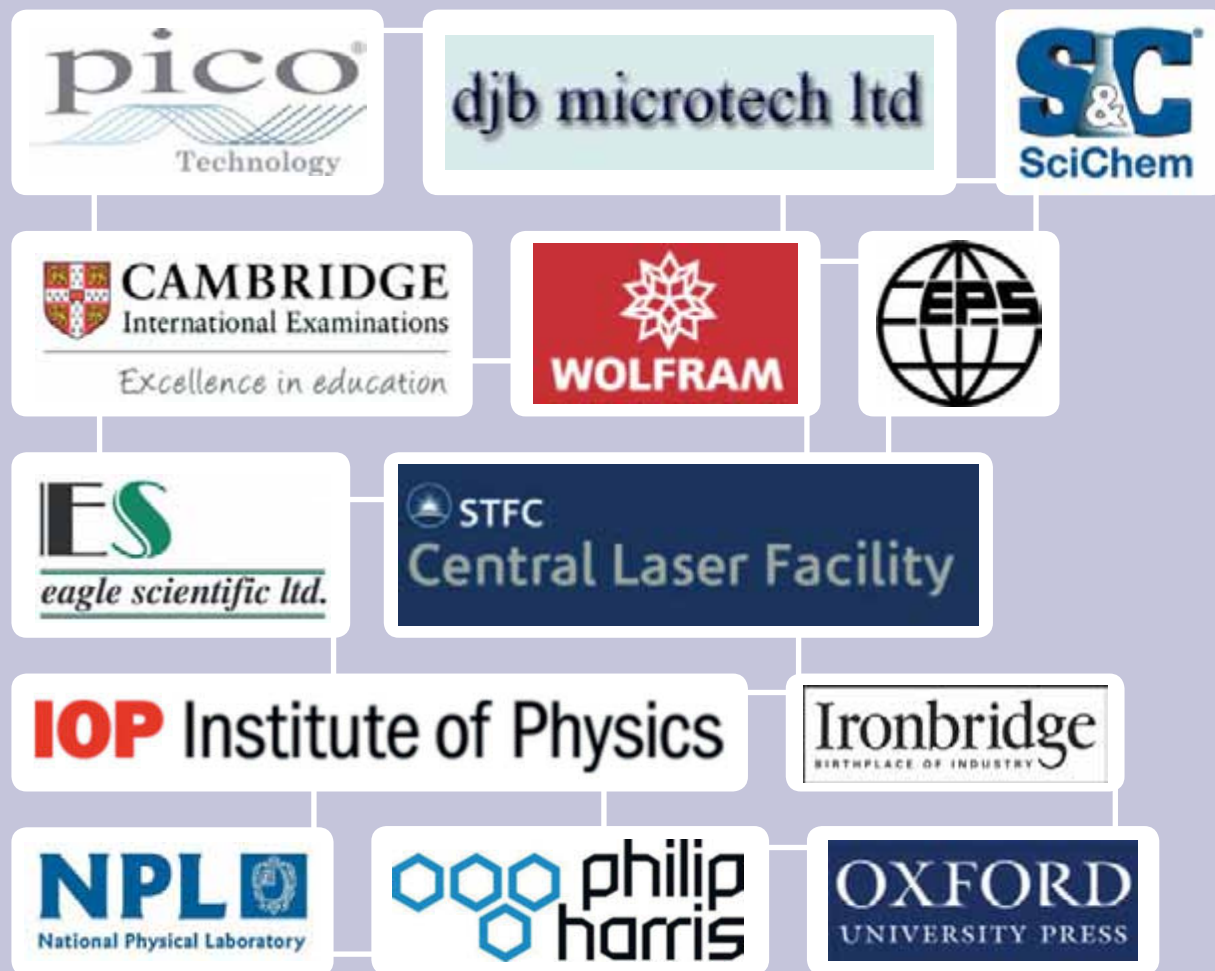
Peter Norreys studied Physics and Astronomy at Queen Mary College, University of London between 1980-1983 before going on to study for his PhD in physics at Royal Holloway College, University of London between 1984-1988. He did post-doctoral research at Osaka University in Japan. Peter then returned to the UK to take up an appointment at the Rutherford Appleton Laboratory in 1990, where he is now an Individual Merit Fellow of the UK's Science and Technology Facilities Research Council and leader of the plasma physics group at its Central Laser Facility.

In 2012, Peter was appointed to the University of Oxford as Professor of Inertial Fusion Science and in 2013 as William Penney Fellow to the Atomic Weapons Establishment, Aldermaston. Since 2011, he has been serving as Divisional Associate Editor of the American Physical Society's top journal in physics, *Physical Review Letters*. Peter is a Fellow of both the American Physical Society and the Institute of Physics. He received the Institute of Physics' 2013 Payne-Gaposchkin Medal and Prize, the American Physical Society's 2006 "Award for Excellence in Plasma Physics Research" and the 2007 Daiwa Adrian Prize for his pioneering contributions to fusion energy research and relativistic plasma physics.

To add a personal note, I would like to thank Peter for being so enormously supportive of my efforts in trying to facilitate the hosting of IYPT 2014 in the UK. He had not heard of IYPT before it was described to him by a mutual acquaintance but he immediately knew it was worth backing. I will be forever grateful for his words of encouragement and not insignificant material assistance. Thanks Peter.

John Balcombe

Sponsors and Supporters



The following individuals and companies have kindly supported IYPT 2014:

Timstar Laboratory Suppliers Ltd.

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We acknowledge the generous support of the following past UK team members:

Mr Ben Carson (Sweden, 2003)

Mr Kelvin Yuen (Sweden, 2003)

Mr Andrew Firth (Switzerland, 2005)

Mr Arthur Lancelyn Green (Slovakia, 2006 and Korea, 2007)

Mr Oliver Qu (Korea, 2007)

Mr Tony Tang (Korea, 2007)

Philipp Legner (China 2009)

The 27th IYPT could not take place without the continued support of the physics faculty at Shrewsbury School and the Head of Faculty, Mr Martin Kirk.



The Town of Shrewsbury

The town of Shrewsbury is the principal town of the county of Shropshire in the region of England known as the West Midlands. It is a thriving town with a population of over seventy thousand. The history of the town dates back to around 800AD when it first became an Anglo-Saxon settlement; probably little more than a wooden fortification at that time. It was also important in the Roman era along with the nearby village of Wroxeter that has some of the most important Roman remains in Britain.

The name of Shrewsbury derives from the Old English 'Scrobbesbyrig' which means something like 'town in the bushes'. Like all good towns in England, Shrewsbury has a castle, in this case built in 1071 out of local red sandstone. Also like many places in Britain, it had a famous battle; the Battle of Shrewsbury that took place in 1403 between the army of King Henry IV and the rebel leader Harry Hotspur. The area on the outskirts of town known as Battlefield and its famous church built in 1409 commemorate the event to this day. The town supported the Royalists in the English Civil War but fell to the Parliamentarians when they were let in through the city walls. The place is still referred to as 'Traitor's Gate' although very little of the original town walls remain. Throughout history Shrewsbury has also been a busy market town and a centre of business, industry and education.

The Shrewsbury Drapers Company was founded in 1462 and the Drapers' Hall built in 1576 is still in use today but mostly as part of the hotel and restaurant to which it is attached. The Old Market Hall, built for weekly wool sales in 1595, is now a coffee shop and cinema. One of the town's great intellects was the naturalist Charles Darwin. The town celebrated the bicentenary of his birth back in 2009 and the house where he was born is still there to be seen not far from the school he attended; Shrewsbury School.





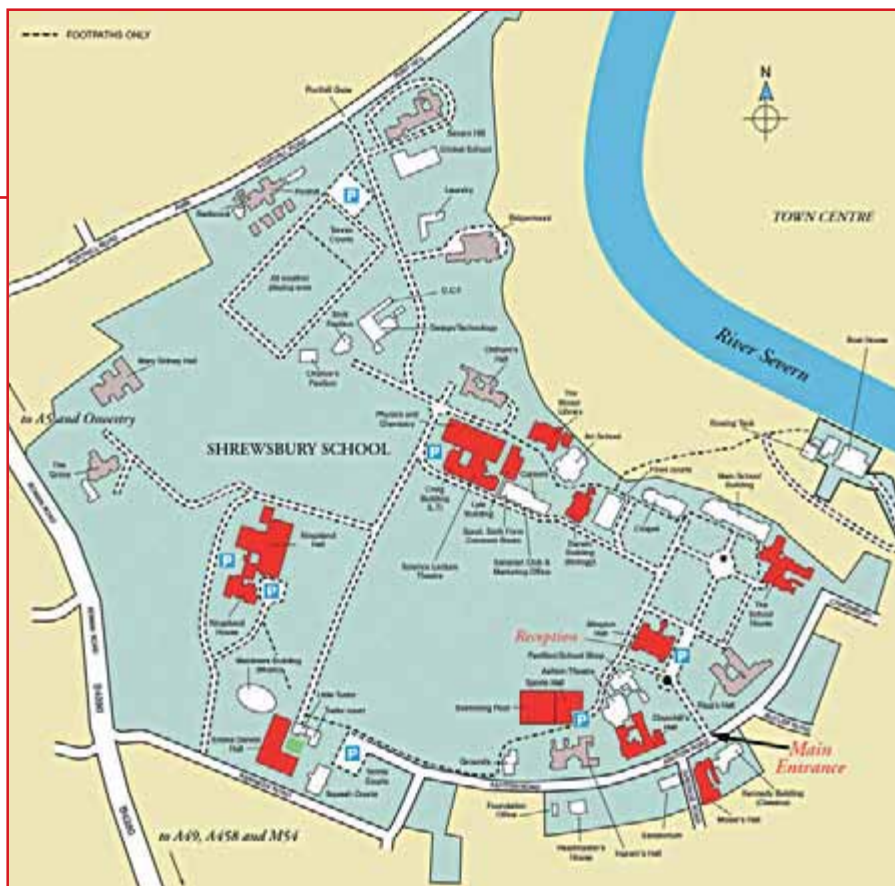
Shrewsbury School

After the dissolution of the monasteries between 1536 and 1541, Shrewsbury was in need of improved schooling for its people. The merchants of the town petitioned the Lord Chancellor and eventually, in 1552, King Edward VI granted a charter for the founding of a 'Free Grammar School' that is now the Shrewsbury School that we know today. Many of the original school buildings can be found in the town including the main building that is now the town library.

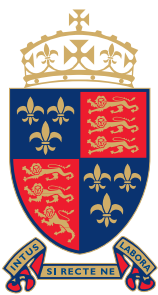
The school has educated many famous people over the last 462 years. The statue you see as you enter the school is that of Sir Philip Sidney (1554-86), soldier, statesman, diplomat and poet who was killed at the battle of Zutphen. The statue is the school's memorial to those who died in the 1914-18 war. The town of Shrewsbury is twinned with the town of Zutphen in the Netherlands and maintains friendly links these days. You will also see Charles Darwin who was commemorated by a new statue in front of the main school building to celebrate the year 2000. The school eventually outgrew its cramped quarters in the town and moved to its present location in 1882.

The school now enjoys spacious facilities including a stretch of the River Severn which it uses for the popular activity of competitive rowing. The school has extensive sports fields for soccer, rugby and cricket as well as all-weather courts for tennis and five-a-side. You will also see where Eton Fives is played; a game which is almost unique to English schools like Shrewsbury. It also has the oldest cross-country running club in the world; the Royal Shrewsbury School Hunt. For over 450 years, Shrewsbury School was a boarding school for just boys. Sixth form girls have attended Shrewsbury since 2008 and in September 2014, girls will be entered throughout the school for the first time in its long history.





*Shrewsbury School site map
and an aerial photograph
showing the majority of the school*

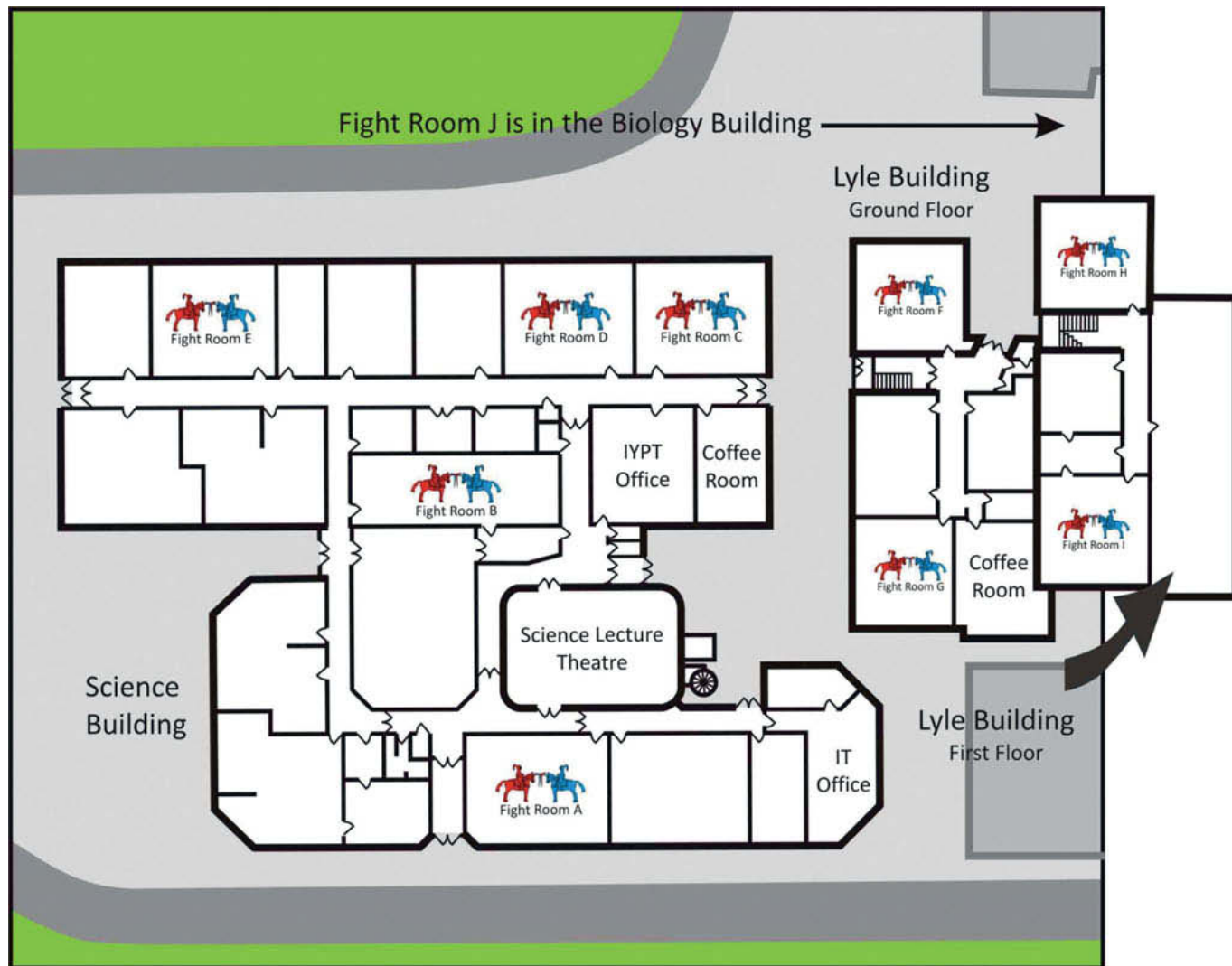


Shrewsbury School

Important buildings on campus:

Kingsland Hall (KH)	dining room, welcome meal , farewell dinner and party
Physics and Chemistry Building	fight rooms A, B, C, D, E and Science Lecture Theatre (SLT)
Lyle Building	fight rooms F, G, H, I
Moser Library	display of rare books
Darwin Building	fight room J
School House	student accommodation
Churchill's Hall	student accommodation
Moser's Hall	student accommodation
Emma Darwin Hall	team leader accommodation
Alington Hall (AH)	opening ceremony and awards ceremony

Floor Plans



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John Balcombe
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Prapun Manyum Member
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for the duration of IYPT 2014*

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We have also provided transport for Shrewsbury School for a number of years and have a strong working relationship with the School.

We are very pleased to provide sponsorship for this worthwhile event.

For any travel requirements please phone **01743 861999** or take a look at our webpage www.longmyndtravel.co.uk

Schedule for IYPT 2014

- July 3rd** Arrival Day
Breakfast from 07:30 – 08:30 as required
Lunch in KH from 13:00 – 14:00 as required
Welcome meal for all in Kingsland Hall (KH) 18:30 – 20:00
- July 4th** Breakfast from 07:30 – 08:45 in KH or in hotel
Opening ceremony in the Alington Hall from 10:00 – 12:00
Juror Meeting in Science Lecture Theatre (SLT) from 12:30 – 13:00
Lunch in KH from 13:00 – 14:00
First round of tournament 14:30
Dinner in KH 18:30 – 20:00
- July 5th** Breakfast from 07:30 – 08:45 in KH or in hotel
Second round of tournament 09:00 or 08:30 for four team rounds
Lunch in KH from 13:00 – 14:00
Third round of tournament 14:30
Dinner in KH 18:30 – 20:00
- July 6th** Breakfast from 07:30 – 08:45 in KH or in hotel
Fourth round of tournament 09:00 or 08:30 for four team rounds
Lunch in KH from 13:00 – 14:00
Activities
Town tour with guides depart at 14:30
Cosford RAF Museum depart at 14:30
Dinner in KH 18:30 – 20:00

- July 7th** Breakfast from 07:30 – 08:45 in KH or in hotel
Fifth round of tournament 09:00 or 08:30 for four team rounds
Lunch in KH from 13:00 – 14:00
Activities
Town tour with guides depart at 14:30
Cosford RAF Museum depart at 14:30
Dinner in KH 18:30 – 20:00
- July 8th** Breakfast from 07:30 – 08:45 in KH or in hotel
Full day excursion to Ironbridge Gorge and Museums 09:30
Packed lunch for all on excursion
Dinner in KH 18:30 – 20:00
- July 9th** Breakfast from 07:30 – 08:45 in KH or in hotel
Final of tournament in the Alington Hall 09:00
Lunch in KH from 13:00 – 14:00
Awards and Closing ceremony in Alington Hall 15:30
Farewell Dinner and Party 20:00 – 22:30
- July 10th** Breakfast from 07:30 – 08:45 in KH or in hotel
Teams depart
IOC meeting in SLT
Lunch for IOC in KH 13:00 – 14:00
IOC meeting in SLT
Dinner for IOC in KH 18:30 – 20:00
- July 11th** Breakfast for IOC in hotel 07:30 – 08:30
IOC meeting in SLT
Lunch for IOC in KH 13:00 – 14:00
Annual IOC Dinner in Peterson Room 19:30 for 20:00
- July 12th** Breakfast for IOC in hotel 07:30 – 08:30
IOC depart

Problems 2014

1. Invent yourself

It is known that some electrical circuits exhibit chaotic behaviour. Build a simple circuit with such a property, and investigate its behaviour.

2. Hologram

It is argued that a hologram can be hand made by scratching a piece of plastic. Produce such a 'hologram' with the letters 'TYPT' and investigate how it works.

3. Twisted rope

Hold a rope and twist one end of it. At some point the rope will form a helix or a loop. Investigate and explain the phenomenon.

4. Ball sound

When two hard steel balls, or similar, are brought gently into contact with each other, an unusual 'chirping' sound may be produced. Investigate and explain the nature of the sound.

5. Loaded hoop

Fasten a small weight to the inside of a hoop and set the hoop in motion by giving it an initial push. Investigate the hoop's motion.

6. Bubble crystal

A large number of very small, similar air bubbles float on the surface of a soapy liquid. The bubbles will arrange themselves into a regular pattern similar to a crystalline lattice. Propose a method to obtain bubbles of a consistent size, and investigate the formation of such a bubble crystal.

7. Pot-in-pot refrigerator

The 'pot-in-pot refrigerator' is a device that keeps food cool using the principle of evaporative cooling. It consists of a pot placed inside a bigger pot with the space between them filled with a wet porous material, e.g. sand. How might one achieve the best cooling effect?

8. Freezing droplets

Place a water droplet on a plate cooled down to around $-20\text{ }^{\circ}\text{C}$. As it freezes, the shape of the droplet may become cone-like with a sharp top. Investigate this effect.

9. Water bombs

Some students are ineffective in water balloon fights as the balloons they throw rebound without bursting. Investigate the motion, deformation, and rebound of a balloon filled with fluid. Under what circumstances does the balloon burst?

*When throwing pebbles into water, watch the ripples;
Otherwise throwing the pebbles becomes a futile pastime.*

Kozma Prutkov

10. Coefficient of diffusion

Using a microscope, observe the Brownian motion of a particle of the order of micrometre in size. Investigate how the coefficient of diffusion depends on the size and shape of the particle.

11. Candle Power Plant

Design a device that converts the heat of a candle flame into electrical energy. Investigate how different aspects of the device affect its efficiency.

12. Cold balloon

As air escapes from an inflated rubber balloon, its surface becomes cooler to the touch. Investigate the parameters that affect this cooling. What is the temperature of various parts of the balloon as a function of relevant parameters?

13. Rotating saddle

A ball is placed in the middle of a rotating saddle. Investigate its dynamics and explain the conditions under which the ball does not fall off the saddle.

14. Rubber motor

A twisted rubber band stores energy and can be used to power a model aircraft for example. Investigate the properties of such an energy source and how its power output changes with time.

15. Oil stars

If a thick layer of a viscous fluid (e.g. silicone oil) is vibrated vertically in a circular reservoir, symmetrical standing waves can be observed. How many lines of symmetry are there in such wave patterns? Investigate and explain the shape and behaviour of the patterns.

16. Magnetic brakes

When a strong magnet falls down a non-ferromagnetic metal tube, it will experience a retarding force. Investigate the phenomenon.

17. Chocolate hysteresis

Chocolate appears to be a solid material at room temperature but melts when heated to around body temperature. When cooled down again, it often stays melted even at room temperature. Investigate the temperature range over which chocolate can exist in both melted and 'solid' states and its dependence on relevant parameters.

AUTHORS:

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Epigraph selected by Evgeny Yunosov

Regulations

The Regulations of the International Young Physicists' Tournament

I. International Young Physicists' Tournament

The International Young Physicists' Tournament (IYPT) is a competition among teams of secondary school students in their ability to solve complicated scientific problems, to present solutions to these problems in a convincing form and to defend them in scientific discussions, called Physics Fights (PF).

II. The problems of the IYPT

The 17 problems are formulated by the International Organizing Committee (IOC) and sent to the participating countries not later than in October. These problems may be used in any competition that could lead to selection of a national team. They may be used in International tournaments that involve foreign teams not taking part in IYPT.

III. The participants of the IYPT

1. *The national teams*

Any invited country, as well as the host country, is represented by one team. A country can only take part in the IYPT if it is nominated and accompanied either by the country's IOC representative or by the representative of a candidate IMO.

2. *The membership of the teams*

A team is composed of five secondary school students. All members of the team must either be citizens of the country they represent, or be enrolled as students in a school of the country they represent. Secondary school graduates can participate in the IYPT in the year of their graduation. The participation of university students is not allowed. The LOC may allow participation of teams of four or three students. The composition of the team cannot be changed during the Tournament. The team is headed by a Captain who is the official representative of the team during the PFs.

3. The team is accompanied by one or two team leaders.

IV. The Jury

The Jury is nominated and organized by the LOC in cooperation with EC. The Jury consists of at least five members, if possible from different countries. Team leaders, at least one from each team, are included in the Jury. The team leaders cannot be members of the Jury in the PF where their teams participate and should not, if possible, grade the same team more than twice.

V. The agenda of the IYPT

The IYPT is carried out in a period determined by the LOC (from May to July).

All teams participate in five Selective PFs. Selective PFs are carried out according to a fixed schedule as detailed in the attachment to these Regulations. Numbers are ascribed to teams by lot. The best teams participate in the Final PF.

The host country provides a cultural program for the participants.

VI. The Physics Fight regulations

Three or four teams participate in a PF, depending on the total number of teams. In the course of a PF the members of a team communicate only with each other.

Before the beginning of a PF, the Jury and the teams are introduced.

The PF is carried out in three (or four) Stages. In each Stage, a team plays one of the three (four) roles: Reporter, Opponent, Reviewer (Observer). In the subsequent Stages of the PF, the teams change their roles according to the schemes:

<i>Three teams P F</i>				<i>Four teams PF</i>				
Stage	1	2	3	Stage	1	2	3	4
Team				Team				
1	Rep	Rev	Opp	1	Rep	Obs	Rev	Opp
2	Opp	Rep	Rev	2	Opp	Rep	Obs	Rev
3	Rev	Opp	Rep	3	Rev	Opp	Rep	Obs
				4	Obs	Rev	Opp	Rep

VII. The Stage regulations

The performance order in the Stage of a PF: Reserved time in minutes

The Opponent challenges the Reporter for the problem 1

The Reporter accepts or rejects the challenge 1

Preparation of the Reporter 5

Presentation of the report 12

Questions of the Opponent to the Reporter
and answers of the Reporter 2

Preparation of the Opponent 3

The Opponent takes the floor, maximum 4 min.
and discussion between the Reporter and the Opponent 14

The Opponent summarizes the discussion 1

Questions of the Reviewer to the Reporter
and the Opponent and answers to the questions 3

Preparation of the Reviewer 2

The Reviewer takes the floor 4

Concluding remarks of the Reporter 2

Questions of the Jury 5

In the Final PF the procedure of challenge is omitted.

The official language of the IYPT is English.

VIII. The team performance in the Stages

The Reporter presents the essence of the solution to the problem, attracting the attention of the audience to the main physical ideas and conclusions.

The Opponent puts questions to the Reporter and criticizes the report, pointing to possible inaccuracy and errors in the understanding of the problem and in the solution. The Opponent analyses the advantages and drawbacks of both the solution and the presentation of the Reporter. The discussion of the Opponent should not become a presentation of his/her own solution. In the discussion, the solution presented by the Reporter is discussed.

The Reviewer presents a short estimation of the presentations of Reporter and Opponent.

The Observer does not participate actively in the PF.

During one PF only one member of a team takes the floor as Reporter, Opponent or Reviewer; other members of the team are allowed to make brief remarks or to help with the presentation technically. No member of a team may take the floor more than twice during one Selective PF or, as Reporter, more than three times in total during all Selective PFs. During the Final PF any team member can take the floor only once.

The LOC must inform about the devices available for presentations not later than two months before the IYPT.

IX. The rules of problem-challenge and rejection

1. All problems presented in the same PF must be different.

2. *Selective P F*

The Opponent may challenge the Reporter on any problem with the exception for a problem that:

- was rejected by the Reporter earlier;
- was presented by the Reporter earlier;
- was opposed by the Opponent earlier;
- was presented by the Opponent earlier.

If there are less than five problems left to challenge, the bans d), c), b), a) are successively removed, in that order.

During the Selective PFs the Reporter may reject the challenge of three different problems in total without penalty. For every subsequent rejection the coefficient of the Reporter (see section X) is decreased by 0.2. This reduction continues to apply during the following selective PFs.

The following special rules apply to the last Selective PF:

- The procedure of challenge is omitted. All teams may choose the problem to present. The only exception is that a team may not present a problem, which they presented earlier in the Selective Fights, and all problems presented in one group must be different. In case teams of one group choose the same problem, priority is given to the team with the higher TSP (see section XI).
- Teams must choose their problems for the last Selective Fight as soon as possible after the results of the preceding Selective Fight are official. The choice must be made public immediately.
- The problem which a team presents in this PF may not be presented again in the Final PF by the same team.

3. *Final PF*

Within four hours after the announcement of the results of the Selective PFs the teams participating in the Final choose their problems. In the case teams choose the same problem, priority is given according to the order of presentation in the Final (see section XII). The choice should be made public immediately.

X. The grading

After each stage the Jury grades the teams, taking into account all presentations of the members of the team, questions and answers to the questions, and participation in the discussion. Each Jury member shows integer marks from 1 to 10. The mean of the highest and the lowest marks is counted as one mark which is then added to the remaining marks. This sum is used to calculate the mean mark for the team. The mean marks are multiplied by various coefficients: 3.0 or less (see section IX) for the Reporter, 2.0 for the Opponent, 1.0 for the Reviewer and then transformed into points.

XI. The resulting parameters

1. For a team in the PF

The sum of points (*SP*) is the sum of mean marks, multiplied by the corresponding coefficients and rounded to one decimal.

2. For a team in the Tournament

The total sum of points (*TSP*) equals the sum of *SP* of the team in all Selective PFs. The number of fights won (*FW*) is the number of Selective PFs, in which a team received the highest *SP* from all three or four teams participating in the same PFs.

XII. The Final

The three teams having the highest *TSP* in the Selective PFs participate in the Final. In case teams have equal *TSP*, their participation in the Final is decided by *FW*. If team(s) winning all their Selective PFs (*FW*=5) did not reach the Final by *TSP*, the best of them (determined by *TSP*) takes part in the final as fourth team.

The order of presentation in the Final is determined by position by entering the final: the higher the *position*, the lower the number in the scheme of section VI.

XIII. The final team ranking of the IYPT

Students in the top half (rounded up) of participating teams receive medals. The students of the team winning the Final are awarded the winners' cup. If two or three teams have the same *SP* result in the Final, the winner is nominated according to the highest *TSP*, in case of equality by *FW*. All teams participating in the final are awarded 1st place certificates and gold medals. The five best teams not participating in the final are awarded 2nd place certificates and silver medals. 3rd place certificates and bronze medals are awarded to students in all other teams finishing in the top half. All other students receive certificates of participation. Team leaders obtain certificates indicating the ranking of their team.

XIV. The status of the regulations of the IYPT

The regulations are established by the IOC and may be changed only by the IOC.

Accepted in Hualian on 1st August 2013

Excursions / Town Tours

For the purpose of half-day excursions, half of our guests will do a town tour on 6th July and will visit RAF Cosford Museum on 7th July. The other half will visit Cosford on the 6th July and will do the town tour on the 7th. Cosford is about half an hour away from Shrewsbury by bus. The town is just ten minutes walk from the school campus.

6th/7th July Town Tours

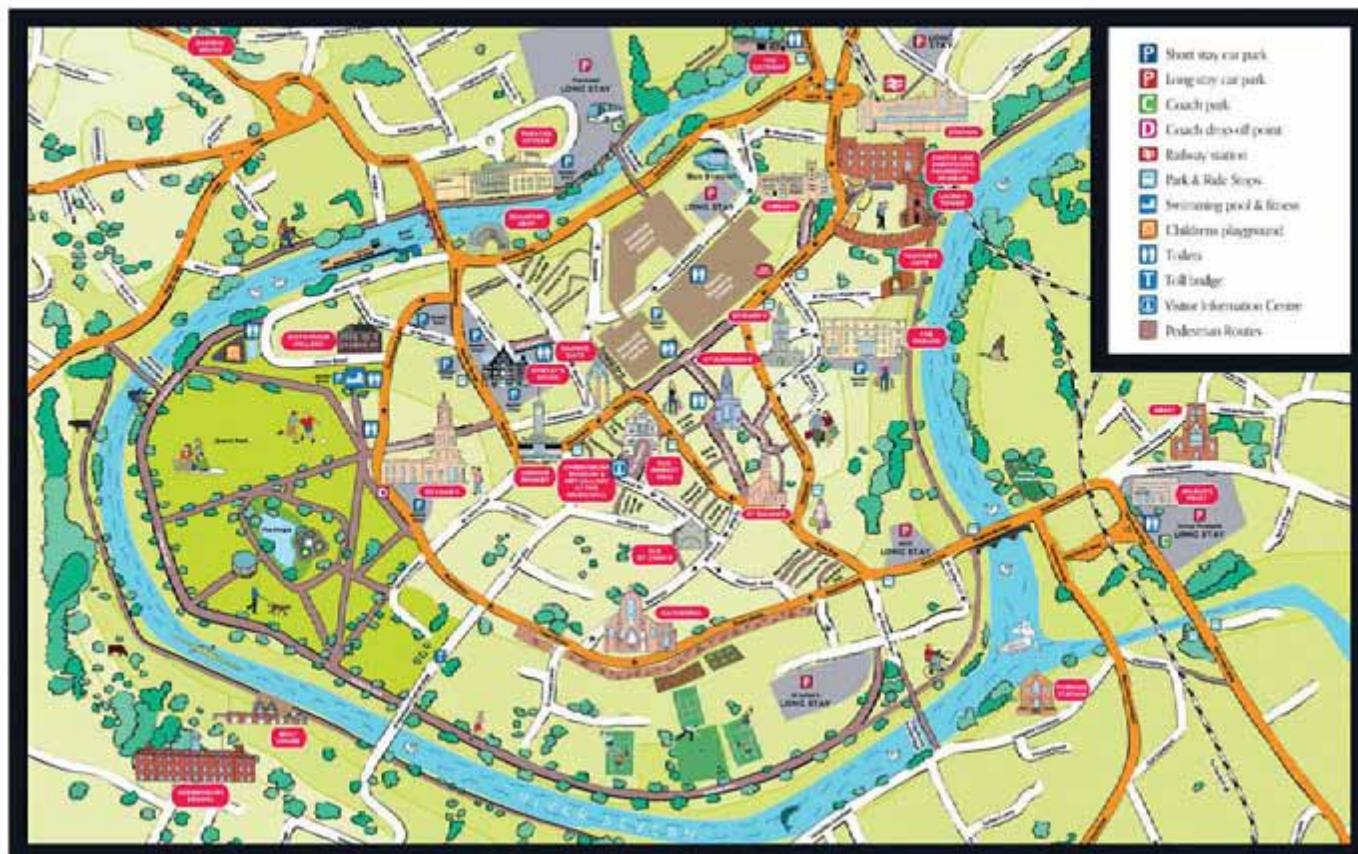
There will be an opportunity to see Shrewsbury and to be given a tour and a historical account of the town by official town guides. You will also get an opportunity to look around our brand new Museum and Art Gallery that opened its doors for the first time in April this year. You may also have a wander around the shops at your leisure before a pleasant walk back to the school for dinner.



Map of Shrewsbury

A MAP OF ONE-OFFS


SHREWSBURY
THE ORIGINAL ONE-OFF



Excursions / RAF Cosford Museum

6th/7th July RAF Cosford Museum

The Royal Air Force has two museums in the UK; one in London and one just half an hour away from Shrewsbury. The museum is modern and spacious and contains a huge number of aeroplanes, vehicles, missiles and all sorts of aeronautical memorabilia. It also houses the award winning National Cold War Museum. Many of the exhibits are unique and of enormous historical importance. It will make for a very interesting afternoon. Photography is allowed everywhere in the museum.

Excursions / Ironbridge Gorge and The Museums

8th July Ironbridge Gorge and The Museums

The full-day excursion is to Ironbridge Gorge and The Museums. The small town of Ironbridge is about 30 minutes by bus from Shrewsbury. Ironbridge Gorge was given the status of UNESCO World Heritage Site in 1986. The gorge is an area of outstanding natural beauty as well as the location of the famous iron bridge and no less than ten different museums. The 'Iron Bridge' across the river at Ironbridge was the first to be built entirely out of cast iron. It was built by Abraham Darby III in 1779. This area of Shropshire rightly describes itself as the 'Birthplace of Industry'. Neighbouring Coalbrookdale has had ironworks since around the beginning of the seventeenth century. In 1709, in Coalbrookdale, Abraham Darby I was one of the very first to successfully establish a blast furnace fired using coke. There is still a foundry on the same site but now making stoves for Aga-Rayburn. The many museums each celebrate different aspects of the industries that were set up in the area. The highlight has to be Blists Hill Victorian Town that recreates the look and feel of a Victorian town in every aspect.

Have a great day out...



YPT remembered... a reminiscence

All of a quarter-century ago an intriguing and unannounced TELEX arrived in college forwarded, in no little puzzlement, from the University Engineering Department in Cambridge. Even more intriguingly, it bore an invitation to come to Moscow in the New Year of 1990 as an observer at the All-Union final of the YPT and please bring five students along for good measure!

С НОВЫМ ГОДОМ!

On New Year's Day, 1990 I set off from a very foggy Heathrow in the company of my good friend and colleague Nancy Alderson and five students. Air France change at Paris and before long we were in another world! Sheremetyeva airport was just a little different in style from anything we had seen before and it was snowing, Moscow-style, outside. And we were there all alone, wondering 'what next?'

After just long enough had elapsed to get a little nervous, our guide, Olga, bounced onto the scene with the warmest of embraces and a miraculously huge bunch of flowers to greet and welcome us. Then off by minibus, out into countryside with snow for which life in East Anglia cannot prepare you! But where were we going? Deeper and deeper into the countryside, with no Moscow in sight! And behold! A security post and then the Hotel Olympiets! This was to be our home for the next ten days. We were wonderfully looked after

and experienced young people's physics in a way quite beyond anything we could ever have imagined and which has stayed with us ever after.

A day or two later we were still quite in awe of all this, and rather curious as to who our beneficent host might be: we were told that 'Yunosov' would greet us soon but with this amazing event to run, he was a trifle busy! Who was the mysterious host 'Yunosov' ? It was worth the wait. We eventually met Dr Evgeny Yunosov and formed a friendship with him and his family which has lasted 25 years. By the end of our visit, we had seen the wonders of Young People's Physics, the wonders of Moscow, some truly awesome Russian hospitality and we had started an exchange between our college and Moscow State University which must have touched the lives of at least 1 000 people over the following twelve years. Some students still keep up with their partners even to this day.



Those first students are now middle aged, the young Head of Physics (said by Prof Potemkin to be ‘too young to be head of anything’) has now retired, but the world will not let him give up teaching Physics, and Nancy is but a dear memory to both Evgeny and myself.

But now in 2014, the IYPT has come to Shrewsbury! Evgeny Yunosov’s enduring legacy to the world is still as vital and fresh as ever, so we can look forward to an exciting week of what I am sure he will forever describe as ‘physics battles’. Old friends are re-united, new friendships are yet to be forged: let us make this a truly memorable week which can give us all pleasure and new enterprises for another quarter century!

Dr Steve Martin

*Retired Head of Physics,
Hills Road Sixth Form College, Cambridge.*

*Evgeny Yunosov meets the
Duke of Edinburgh
in Cambridge in 1991.
The young chap on the
right is Steve Martin*

Eating Out in Shrewsbury

If you fancy a change from the excellent food that the school provides.....

Like all towns in England, Shrewsbury boasts a whole range of options when it comes to finding restaurants and bars. You can try traditional British fare or go for French, Italian, Indian, Chinese, Thai and so on. You can go for an expensive restaurant or something rather cheaper; a pizza or good old 'fish and chips'. Most public houses or 'pubs' also serve a range of food. You can get a decent meal from around £10 but you can also pay well over £20; it is up to you!

Just a word or two about alcohol in the UK.....

It is an offence to buy alcoholic drinks including beer, wine etc. if you are under eighteen and also an offence to buy a drink for somebody who is under eighteen. However if you're sixteen or seventeen and accompanied by an adult, you can drink (but not buy) beer, wine or cider with a meal. You should therefore be prepared to provide ID with proof of age if you want to buy a drink and are challenged by bar staff. Smoking is not permitted in any public building in the UK and that includes the whole of the school campus.



Useful Information

Phone numbers

International dialling code for the UK is **44**. Shrewsbury numbers all start with **01743** followed by six digits so you would dial **+44 1743 xxxxxx**. The '+' is replaced with the code associated with your country.

For emergency services when urgent response is required including fire, ambulance and police dial **999**

For non-emergency police e.g. to report a crime dial **101**

For non-emergency medical e.g. for medical advice dial **111**

Chemist shops (Pharmacies) provide a limited number of non-prescription medicines.

Fires are always emergencies!

The school switchboard is **01743 280500**

John Balcombe's home number is **01743 356764**
and his mobile is **07976 131409**

Electricity

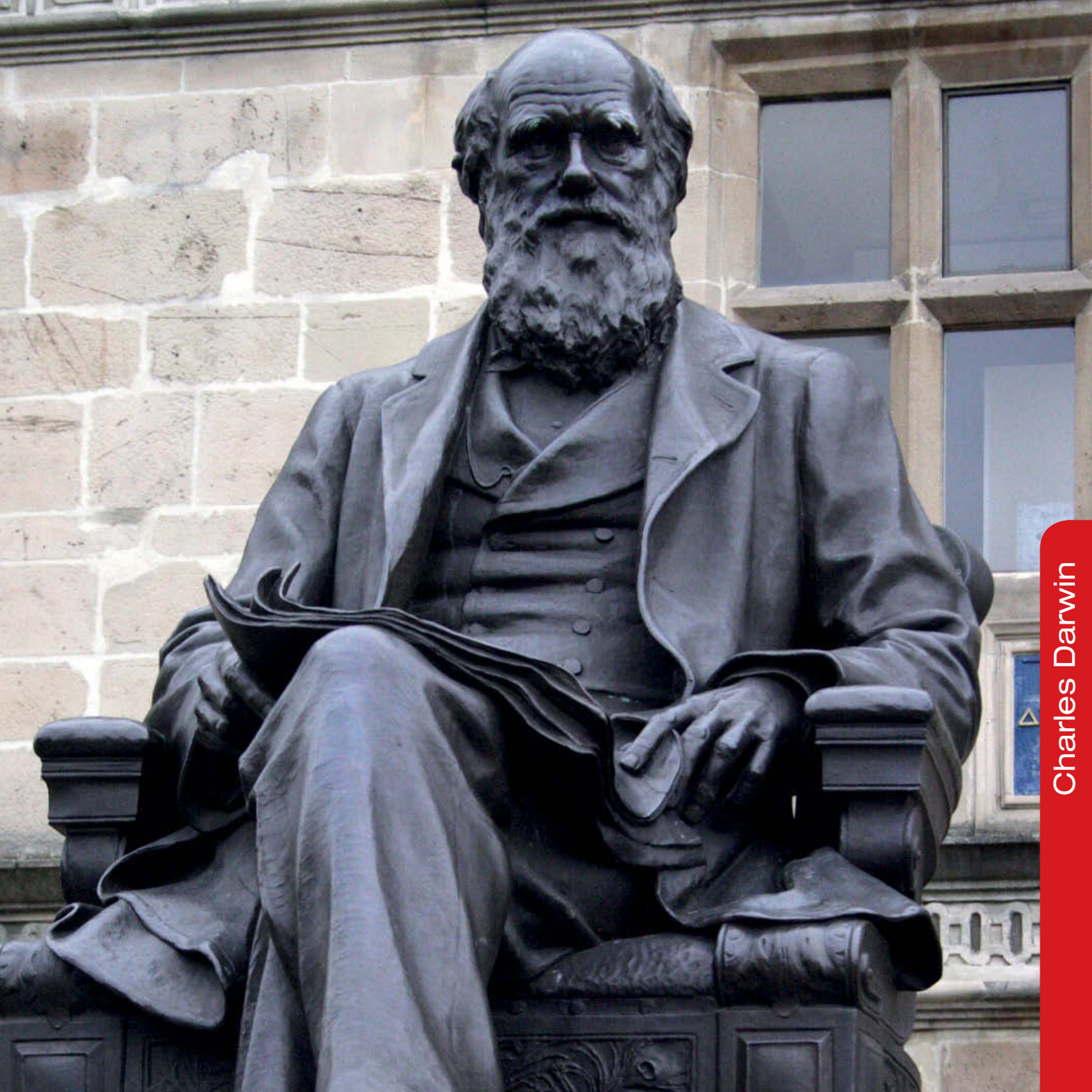
The UK uses the same voltage and frequency as most of Europe, Africa, Australia etc. i.e. 230V @ 50Hz Most mains adapters for laptops etc. are fairly tolerant of different inputs so do not be too concerned about that. The problem is that UK plugs and sockets are quite different to most of the rest of the world (except Kenya for example!). You will therefore most likely need a UK visitor mains adapter. They can be bought at airports and travel shops.

Currency

One British Pound is worth about 1.2 Euro or about 1.7 US Dollar. There are 100 pence in one pound.



Notes



Charles Darwin

Shrewsbury School

The Schools

Shrewsbury

SY3 7BA

www.shrewsbury.org.uk

www.iypt.org.uk



IYPT