COMPUTING AT SCHOOL
EDUCATE · ENGAGE · ENCOURAGE

SWITCHEDON

COMPUTING AT SCHOOL NEWSLETTER AUTUMN 2009

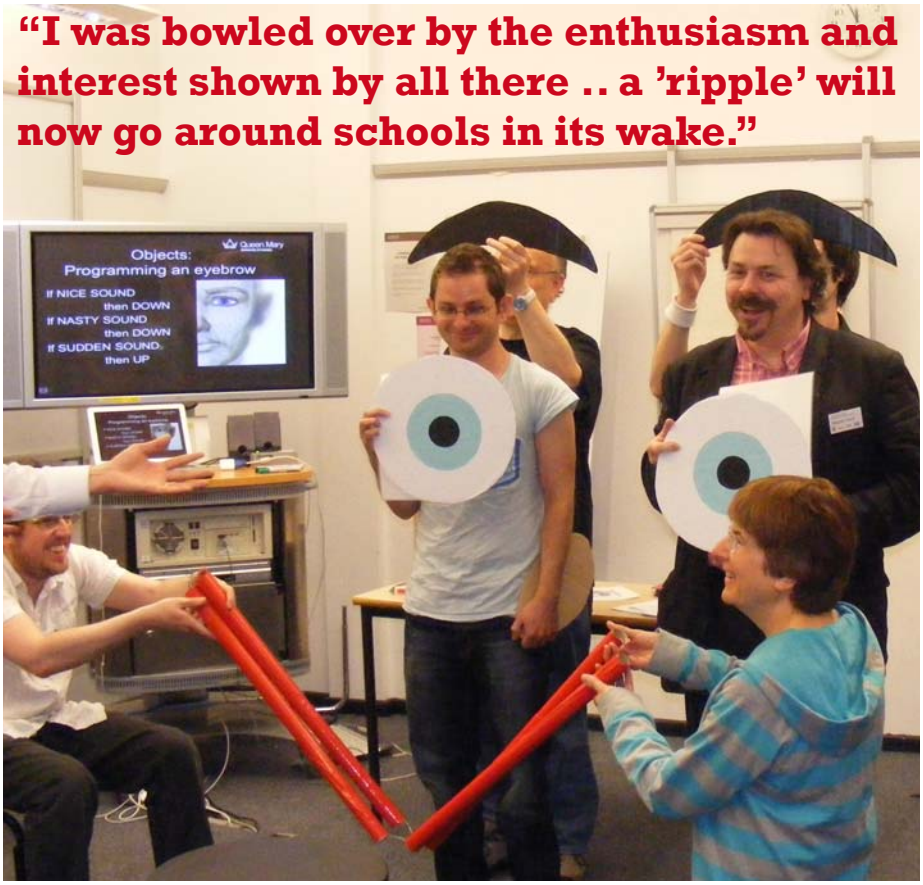
CONFERENCE 2009
COMPUTING, THE NEXT GENERATION

It was a unique event—probably the first of its kind for many years. Computing At School held their inaugural conference for teachers on 19th June at Birmingham University. Focused squarely on the classroom it sought to provide resources and ideas for those looking to engage their students in fun and exciting ways.

Over 120 people participated in a day of lively presentations, workshops and smaller discussion groups. If nothing else, we hope that the conference demonstrated to those present that they are not alone and that many excellent resources exist to help them inspire their learners to engage with Computing. We had, in the words of one attendee, 'a absolute blast'!

CAS is growing. Up and down the country individuals are joining together in an attempt to bring about real change to our curricula. It is a grand challenge. We urge you to play a part.

"I was bowled over by the enthusiasm and interest shown by all there .. a 'ripple' will now go around schools in its wake."



LET'S START PUTTING THE EXCITEMENT BACK

Computing is the most exciting subject on earth. Do you remember the thrill of getting your first program to run? Isn't it amazing that two people can agree a secret key by holding a conversation in public? Have you wondered whether a sufficiently powerful computer could ever be self aware? Do you know about the clever distributed-editing algorithms that underlies Google Wave? Computing is an incredible mix of science (doing experiments), engineering (building things), mathematics (reasoning about programs and networks), all underpinned by technology. Yet in the midst of this creative excitement, in school most pupils experience computing only in the limited form of ICT; spreadsheets, databases and word processing.

If you are frustrated about these lost opportunities, SWITCHEDON is for you. Computing at School aims to bring together teachers, university academics, people in industry, professional societies, and parents, to find ways of re-injecting the thrill of computing into the schooling of our youngsters. We have done some things already. Read about them here.

None of this can happen without you. Respond to the invitations to act. Share your ideas. Most of all, enjoy meeting others who are passionate about computing.

CAS AIMING TO INFLUENCE INITIAL TEACHER TRAINING

This year has seen a significant change in the activities that trainee teachers are undertaking at the University of Southampton to ensure that they can meet the changing requirements of the computing-based curriculum. 2009 saw the establishment of the Diploma in IT in many consortium areas, the introduction of several examination courses with modules in game authoring, the plans for a GCSE in computing and the widespread introduction of programming activities into secondary schools.

Teacher training for ICT teachers has to reflect those developments in their subject knowledge and understanding. At Southampton, in the School of Education, trainees on the PGCE programme for IT have a new directed activity. "Working collaboratively in an assigned group of 3, investigate and become skilled in presenting programming through: researching the given programming language; preparing a 5-minute presentation to the PGCE group of the programming environment and example products describing how the language could be introduced to a key stage 3 class; choosing one of these: short tutorial; worksheet; web page; video sequence or screen video to support the presentation; individually writing an evaluative statement of no more than 250 words about the affordances and challenges in using the programming environment with key stage 3 pupils; add that to the PGCE IT WIKI and comment upon at least 3 other contributions."

The programming languages that were prescribed were: Scratch, Alice, GameMaker, Flash scripting and Greenfoot. In addition to the obvious aims, the trainees were also providing evidence towards the Professional Standards for qualifying to teach: Q6 showing that they can work collaboratively and cooperatively with colleagues; Q8 showing that they have a creative and critical approach to innovation; Q14 evidence of their current subject knowledge; Q15 show their awareness of current initiatives and most importantly Q23 showing that they can develop pupils' ICT skills.

John Woollard

CAS WORKING GROUP LOOKS TO THE FUTURE

The Computing at School group is an informal group of teachers, academics, researchers, examiners and industry folk who aim to promote the teaching of computing at school. The working members of the Computing at School group held their latest meeting in Cambridge last month.

We have a number of sub-groups working on particular activities and the face to face meeting in Cambridge was an opportunity to hear about the progress of these and also to spend time together working on the body of knowledge (or curriculum issues) for computing.

The Body of Knowledge

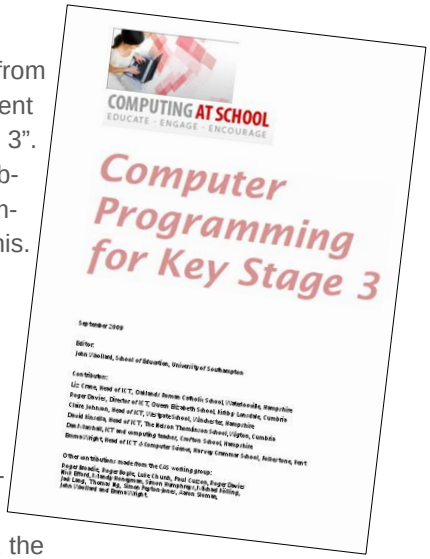
A small group have been working consistently on this and the bulk of our meeting was consumed with taking this forward. It was felt that a computer science curriculum ought to focus on conceptual rather than technology-focused knowledge and that computing should sit alongside Maths or Science rather than Technology. At this stage of our discussions we wanted to focus on the **message** i.e. the conceptual, abstract material to be covered in the classroom rather than the **medium** i.e. the computer systems, programming languages etc. We hope to be able to present a position paper before the end of the current academic year.

BCS Academy and DCSF Regional Centres for IT

Bill Mitchell (BCS) described the new BCS Academy which accords with the agenda of CAS in the promotion of Computing as a discipline, encouraging links between schools, HE and business, providing CPD for teachers and providing a forum to share best practice and resources.

Programming at KS3

John Woollard has, with contributions from secondary schools produced an excellent resource: "Programming at Key Stage 3". Copies are available from the CAS website and the group would love your comments and suggestions for adding to this.



The next six months

It seems clear, that the issue of ICT in our schools is coming under heavy scrutiny. CAS exists to support teachers, provide stimulating activities to enable leaners to engage with computing. We have a long way to go. Our targets for the next six months include, the body of knowledge, a community website for teachers, the development of a computer science teacher's association, a teacher conference for June 2010 and to consider computing at KS2. It's quite an agenda!

Simon Humphreys

SWITCHEDON: WEB SUPPLEMENT

Computer Programming For KS3, other CAS documents and links to other articles and information in this issue can be found in the web supplement: www.computingatschool.org.uk/newsletter

EDUCATE, ENGAGE, ENCOURAGE THE COMPUTING MESSAGE

CAS supporters are making their voices heard. Various opportunities have allowed us to make the case to a wider audience. Individuals have sought imaginative ways to engage in debate. Moreover, other bodies are raising the same questions that CAS is asking.

Spreading the word has been a focus for CAS since it's inception. With a membership of teachers, parents, academics, advisors, teacher trainers and people in the industry opportunities to raise the debate about promoting computing are many and varied.

PCPro has consistently campaigned to highlight the inadequate nature of much that is taught under the banner of IT in schools. Last year they ran a feature on Greenfoot. As the schools broke up for summer they teamed up again with CAS members to produce the lead article; 'Giving Your Kids The IT Edge' with a range of computing activities aimed at children 5-15 using Scratch, Javascript and Alice. These are now available online. Meanwhile Matthew Applegate recounted his experience of teaching his daughters to investigate Processing, a programming language developed at MIT in a recent article in **Wired** magazine. The **Times Educational Supplement** magazine (18 Sept) also wrote a sympathetic article 'Back To The Motherboard' quoting CAS views extensively.

But it's not just CAS members raising questions. **The Independent** ran a piece on 8th October asking 'why do our schools do such a bad job at encouraging pupils in Computing?' In Scotland a HMIE-LTS (think Ofsted/DCSF) Good Practice conference concluded that "The study of computing … has an important contribution to make to the education of young people." In October **The Royal Academy Of Engineering** published 'ICT For The UK's Future', similarly echoing CAS views and in the USA, Congress passed a resolution to establish Computer Science education as a national priority.

Many members contributed to a submission made to the **UK Computing Research Committee**. 'Computing at School: the state of the nation' is wide ranging, adding detail to the ideas expressed on the CAS website. It makes a powerful case and provides extensive links to supporting research. The report can be downloaded from the CAS website where links to all material mentioned can also be found.

CAN YOU OFFER YOUR HELP?

CAS activities continue to increase. As we expand we need help with local hubs and our proposals to run conferences for students next term. Each require colleagues to offer short presentations. Hubs provide the opportunity to share successful ideas with small groups, be it the experience of after-school clubs, particular software, starter activities etc. These meetings are proving very inspirational and are highly valued by those involved.

We are hoping to provide regional student conferences from next term. We are looking for 40 minute presentations on topics to set pupils thinking about the beauty of computer science. Contributions from industry and HE are particularly welcome for both events, as well as teachers.

However grand or modest you may think your contribution please add your name via the list on our discussion forum with a brief outline and locality. Many hands make light work. We appreciate members have busy lives so please be assured that we will not ask for your help more than once a year.

ROUND UP OF LOCAL EVENTS & ACTIVITIES

There are no shortage of ways you can get involved in CAS activities. Chris Bishop (presenter of the RI 2008 Xmas Lectures) was interviewed by BBC Cambridgeshire about teaching computing whilst Matthew C Applegate of Pixelh8 presented a talk at UCS establishing contact with teachers wishing to develop programming activities. Other CAS supporters will be speaking at Digigirlz, a one day event (27th Nov) sponsored by Microsoft aimed at encouraging girls into computing.

CAS local hubs are taking shape. Cambridgeshire hub met to enjoy a Greenfoot workshop (11th Nov) with Michael Kolling. Miles Berry will introduce using Scratch to the Kent hub (25th Nov) and Essex have a meeting (2nd Dec) to discuss Programming at KS3 with Matthew Applegate. Coventry BCS hold regular teacher workshops the most recent being at Coventry University (10th Nov) on "Computer Science Degrees—57 Varieties".

As we went to press Graveney School in (SW London) were expecting over 400 pupils to come and see "The Magic of Computer Science" presented by CS4Fn. Full report in the next issue. Many students clearly want to know what computing is about. CAS are hoping to host a series of regional student conferences in the new year aimed at KS4 upwards—see left for further details.

ENCOURAGE YOUR PUPILS WITH THESE COMPETITIONS

The New Year sees the start of **Animation10**: the 3rd annual UK schools computer animation competition, organised by Manchester University. Pupils aged 7-19 are challenged to create a one minute animation using Alice, Scratch, Greenfoot or Flash. Individual or group (max 4) projects are welcome in 4 age categories: KS2, KS3, KS4 and post-16. On-line submission can be made between 11th January and 1st April. Winners will be announced in May and a prestigious Festival and Prizegiving day will be held at The Lowry, Salford Quays in July. This competition is rapidly growing in popularity as tools such as Scratch are becoming embedded in schools. Possibly the hardest part for pupils is deciding what to do so have a few 'themes' up your sleeve to get their creative juices flowing. Once involved in a project there is no stopping them!

There is still time to register students for the **British Informatics Olympiad** sponsored by Lionhead Studios. The BIO is a well established programming competition, running annually since 1995. Aimed at pre-university students under 19 years, the first round of BIO 2010 takes place between 23rd November and 24th December. This is a three-hour exam, taken at school, in which students solve problems in a language of their choice. These are marked internally and submitted for moderation. The top 15 competitors are invited to the final during the Easter holidays. The top four then make up the team to represent Britain at the International Olympiad for Informatics. The next IOI will be held in 2010 in Canada. All participants receive a certificate acknowledging participation.

If national competitions don't float your boat why not arrange your own? Our next issue will feature suggestions from CAS supporters for smaller scale school activities. If you've organised a good competition or any other challenge that gets your learners thinking please get in touch - this newsletter is yours in which to share your secrets. See the information panel on the back page for more details. Links to the competitions can be found in the web supplement on the CAS website.

'BUILD YOUR OWN BLOCKS' LEARNING WITH SCRATCH

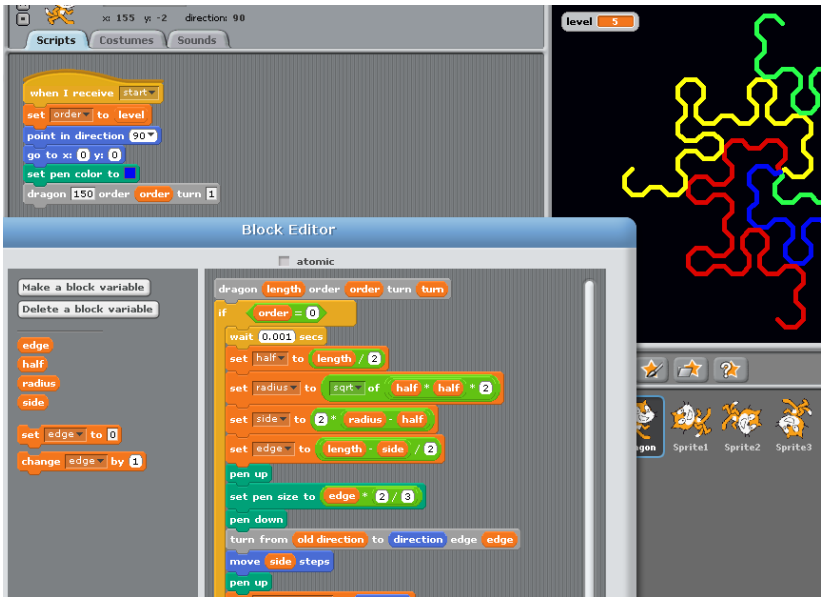
For those who don't know, Scratch is a visual language. Programming is done by manipulating visual representations of program structures (known as blocks) for selection, iteration, and sequence.

Students new to computing love it because it is very difficult to write programs with errors other than logic ones. There's hardly any typing or complicated syntax rules to remember. If it makes no sense for two blocks to be 'together' they cannot physically be placed together. Second it's visual: the main aim of most programs is moving objects (sprites) about on the screen so animations and games are particularly easy. Third, it's immediate: anything can be tried out by double clicking

It's very easy to do concurrent programming, event-driven programming, Logo-like turtle programming, connecting to external sensors, multi-user programs across a network and conventional imperative programming.

Until now it's been hard to do anything to extend **Scratch**. The only data structure is the list. There is no strong data typing, nor does the object oriented aspect allow inheritance. **BYOB** changes that. It lets the student create **new** blocks which can be used to illustrate

- (recursive) functions and procedures with their own local block variables
- composing sprites (objects) from existing ones, which retain their own methods and can execute concurrently by broadcasting and receiving messages
- synchronisation (new blocks can be marked as **atomic** so synchronisation primitives can be built)



The picture shows one demonstration project. The Stage script acts as a controller. When started it broadcasts a message to each sprite to start drawing their own sector of the dragon curve in its own colour. Variables can be 'watched' and altered on screen, and simple tracing through scripts is available. This is a significant step forward for Scratch, allowing it to be used to demonstrate far more principles in structured programming. See the web supplement for download information. *John Stout*

PUTTING COMPUTING BACK IN THE KEY STAGE 3 CURRICULUM

The revised National Curriculum offers so many opportunities to be creative. At the Harvey Grammar (Folkestone) Emma Wright started with a clean sheet and reviewed their whole approach to what could and should be taught.

	Autumn	Spring	Summer
	Business Information Technology	Computer Programming	Web Design and New Technology
Y 7	Baseline Testing Formula 1 Project	ALICE	Web Design, Graphics and Animation
Y 8	Business Systems Development	Greenfoot (JAVA)	Dynamic Web Technologies and Development
	Career options	Career options	Career options
Y 9	Advanced Systems Design and Development	Visual Basic	Mobile Application Development

First I established a set of beliefs. Computing should be taught. Programming is the hook to get pupils interested in Computer Science, but computing theory is taught later to complement this. Basic ICT should not be a discrete subject. There are opportunities for much of the national curriculum to be taught through other subjects. Advanced ICT, such as mobile application development or advanced web design is taught instead.

This is the rationale for the development of my new syllabus. The National Curriculum is covered by 3 'streams'. Some areas would be quite difficult to teach without a scheme of work in Computing so it is now taught right from year 7. By the time pupils leave key stage 3, they have knowledge of 2 programming languages, and can confidently move on to a key stage 4 GCSE course in Computing – a pilot now being offered by OCR.

The streams target 3 different types of pupils. The aim is to ensure pupils have targeted courses from the outset which help them understand more about the structure of Computing and ICT. Pupils can now make clearer choices selecting qualifications at the end of KS3. They also understand better the varied range of career opportunities available. This is dramatically different from before when pupils had no introduction to A-Level Computing even at the end of KS4! Is it any wonder demand for computing is in sharp decline in our Universities. The root of the problem lies in our secondary schools.

Since the change numbers opting to take A-Level Computing have trebled. The effort undertaken at KS3 should increase our numbers well into the future as interest in our subject is now at an all time high.

Emma Wright

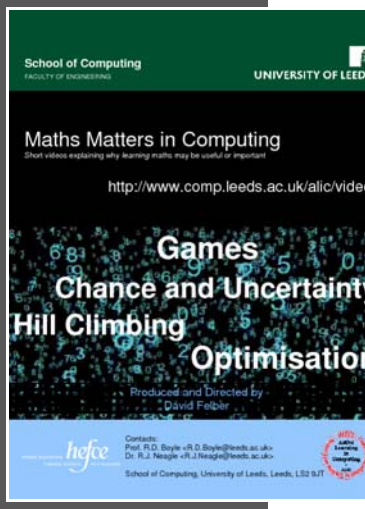
OCR GCSE COMPUTING PILOT

At last a KS4 computing qualification is on the horizon giving schools the opportunity to provide progression from activities introduced at KS3 whilst preparing the ground for A level Computing options. CAS have been involved in the consultation for this pilot course. As we went to press the OCR website was experiencing difficulties but schools interested in offering the course can contact OCR quoting reference spec Computing Pilot J275.

MATHS MATTERS IN COMPUTER SCIENCE

It's a hard fact that mathematical competence assists in the understanding of much computer science, but the mathematical strands are frequently the ones pupils and students enjoy the least. Very often, this is because they are just not persuaded of why they are being taught 'this stuff'.

An effort has been made to help. Five short videos (soon to be six) try to do the job of explaining some of the key maths. No attempt is made to teach the material, but several scenarios and applications are given that try to explain that without the maths, it just doesn't happen.



Current topics are

- Chance and Uncertainty
- Games
- Hill Climbing
- Optimisation
- Real Ethics and Virtual Reality
- Big Information (in preparation.)

The videos (each about 10 minutes) lend themselves to fragmentary use. Part of a HEFCE funded project they were produced at the University of Leeds. The URL to the videos can be found in the web supplement. *Roger Boyle*

SWITCHEDON NEEDS YOU

Done something that went well in class or found a great resource? If you are getting computing into your classroom we'd like you to share your ideas with other like minded teachers. See back page for details of how to contribute.

A PAUSE FOR THOUGHT

Most people swap the values in two variables A and B by using a temporary variable as shown below

```
X := A ;
A := B ;
B := X ;
```

How would you swap the value of the two variables without using any external variable?

How is your answer affected if the variables are strings?

A donkey is tethered to the corner of a square field of area A.

a) What is the length of tether that would enable them to graze an area of A/2?

b) What is the length if the field being grazed \is shaped like an equilateral triangle

c) And the length when the field is circular, with the donkey tethered on the edge. Advanced warning—much harder!

Answers in the web supplement.

Jack Lang

DON'T MISS THIS FREE DVD OFFER

Last year Chris Bishop presented the Royal Institution Christmas Lectures taking youngsters on an inspiring journey through the phenomenal developments in computer science. CAS are proud to be able to offer (subject to availability) a free DVD containing the complete lecture series. Don't miss out, order your copy today!

From mouse traps to cannon balls each of the five lectures is packed with dazzling demonstrations of some of the key ideas in our field. Show your pupils how microprocessors are made. Consider their impact on everyday life. Find ways to convey the workings of the internet, public key encryption and page ranking. Packed with teaching ideas this DVD should be in every school. See the CAS website for details of how to order.

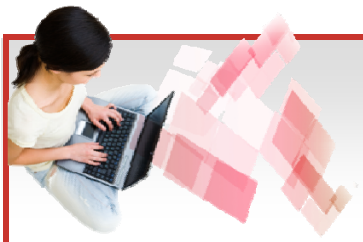
THE SECRETS OF THE WEB: CHRIS BISHOP

Babbage Lecture Theatre, New Museums Site, Cambridge
Ages: 10 to adult. 2 to 3pm, Saturday 19th December

Free admission but pre-booking essential. Further details 01223 766766

What do explosions, lasers, and the credit crunch have to do with the workings of the internet? How could solving a simple maths problem make you the richest person in the world? Find out at this lively and interactive talk by Chris Bishop.

Warning: loud bangs!



COMPUTING AT SCHOOL

EDUCATE · ENGAGE · ENCOURAGE

Computing at School is an informal group that aims to promote teaching computing at school. It was born out of our excitement with our discipline, combined with a serious concern that students are being turned off computing by a combination of factors. SWITCHEDON is published each term. We welcome comments, suggestions and items for inclusion in future issues. Our goal is to put the fun back into computing at school. Will you help us? Send contributions to **newsletter@computingatschool.co.uk**

Many thanks to the following for help and information in this issue: *Matthew Applegate, Miles Berry, Chris Bishop, Roger Boyle, Roger Davies, Nick Duffield, Simon Humphreys, Jack Lang, Margaret Low, Ian Nussey, Simon Peyton-Jones, Shahneila Saeed, John Stout, John Woollard, Emma Wright.*

SWITCHEDON WEB SUPPLEMENT: DOWNLOADS / LINKS / EXTRA INFORMATION

Links to resources and features mentioned and answers to the challenges are published in a web supplement on the CAS website. Go here to find links to all the material referred to in this newsletter.

www.computingatschool.org.uk / newsletter