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Formal Aspects of
Computing Science
Specialist Group

The Newsletter of the
Formal Aspects of Computing Science
(FACS) Specialist Group

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About FACS FACTS

FACS FACTS (ISSN: 0950-1231) is the newsletter of the BCS Specialist Group on Formal Aspects of Computing Science (FACS). *FACS FACTS* is distributed in electronic form to all FACS members.

Submissions to *FACS FACTS* are always welcome. Please visit the newsletter area of the BCS FACS website for further details (see <http://www.bcs.org/category/12461>).

Back issues of *FACS FACTS* are available for download from: <http://www.bcs.org/content/conWebDoc/33135>

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Wikipedia: <http://en.wikipedia.org/wiki/BCS-FACS>

If you have any questions about BCS-FACS, please send these to Paul Boca <paul.boca@googlemail.com>.

Editorial

Welcome to the 2013 issue of *FACS FACTS*.

Our 2013 AGM took place on December 2nd 2013 where **Jawed Siddiqi** stepped down as Chair and was replaced by **Jonathan Bowen** (our previous treasurer). Jawed will become our new Treasurer and our Secretary (**Paul Boca**) was re-elected unanimously. I am stepping down as FACS Editor and have been replaced by co-editors **Tim Denvir** and **Brian Monahan** and we would like to welcome them to our Committee. In addition we would also like to welcome **Eerke Boiten** of the University of Kent as the FACS CryptoForma representative. (See <http://www.cryptoforma.org.uk/>.)

In this issue you will see information about the evening seminars which have now become an established part of BCS-FACS time-tabled events. Professor Phillipa Gardner of Imperial College presented our *FACS/LMS* seminar on October 8th 2013 and our annual *Peter Landin* seminar is presented by Professor Richard Bornat of Middlesex University on December 2nd 2013. The seminar follows the FACS AGM. We have also timetabled a joint FACS/CryptoForma seminar for January 15th 2014 given by Cedric Fournet of Microsoft Research, Cambridge.

Later in this issue Tim Denvir presents a report on the 2012 Peter Landin Seminar which was given by Professor Sir Tony Hoare.

This year is the 25th Anniversary of *Formal Aspects of Computing Journal* and John Cooke has written a short piece about some international recognition of a FACS Journal article. We have recently learned that it may possible to include in future issues of *FACS FACTS* some of the content of the FACS Journal. We will keep you informed of this matter.

In March of this year, John Cooke and I attended a meeting in Committee Room G, House of Lords on Computer Science Education and an account is given in this newsletter. The venue of the event was interesting and certainly new to your Editor! There was an unusual addition to the meeting – viz. the interruption from time to time of the division bell, whereupon several of the audience hurried to vote. An account of this meeting is provided in this issue.

Many of FACS seminars take place in the offices of the British Computer Society in the Davidson Building, Southampton Street. These excellent facilities are conveniently situated in Central London close to Covent Garden and we would like to thank them for making these available to us.

Margaret West
Editor, **FACS FACTS**

FACS FACTS in 2014

This coming year we aspire to publishing **two** issues of the newsletter (in June and in December).

We are always very interested in your thoughts and musings broadly related to the past, present and future of Formal Methods, Mathematics and Computing, Programming and Logic; we also ponder what impact such ideas have within the wider world of computing in industry and education – and how that could be improved.

The world in 2014 and beyond is clearly facing an unprecedented demand for high-quality computing systems and automation. The public's expectations of what computing systems and services can deliver, as provided by the likes of Google, Amazon, and Facebook, etc., have never been higher. How can all these systems be created, maintained and managed in a credible way with performance, security and integrity?

We would be delighted to hear from all of you on these and other topics!

Tim Denvir (timdenvir@bcs.org)

Brian Monahan (brianqmonahan@googlemail.com)

PS: We may accept contributions in a wide variety of formats such as MS Word, LaTeX, or ordinary text, and reserve the right to make editorial changes. However, we will draw the line at contributions given on hardened granite or goats cheese!

Peter Landin Annual Semantics Seminar

Professor Sir Tony Hoare

(December 3rd 2012)

Reported by: Tim Denvir

In his introduction to this seminar, Peter O'Hearn very ably summarised Peter Landin's work on programming language theory and gave an excellent biography of the speaker, Tony Hoare. There can be few people better qualified to give the Peter Landin Semantics Seminar than Tony Hoare. In 1969 his ground-breaking paper on the semantics of computer languages, "An Axiomatic Basis for Computer Programming" appeared in the Communications of the ACM. These axioms consisted of logical rules relating to propositions about imperative programs or program statements. The propositions were triples of the form $P\{Q\}R$ where Q is a program or program statement and P and R are assertions. Thus the rule of composition is:

$$\text{If } \vdash P\{Q_1\}R_1 \text{ and } \vdash R_1\{Q_2\}R \text{ then } \vdash P\{Q_1;Q_2\}R$$

There are corresponding rules for loops and conditional statements (though not the latter in the original paper). Together, these rules form a logical calculus that provides a deduction system enabling one to prove programs correct.

Sixteen years later in 1985 Tony gave his inaugural lecture at Oxford University. The lecture was titled *The Mathematics of Programming* and now gave axioms for programs in an algebraic form. Thus, $;$ is treated as a composition operator:

$$x ; (y ; z) = (x ; y) ; z$$

and *SKIP* is an identity:

$$\text{SKIP} ; x = x = x ; \text{SKIP}$$

In 1998, Tony Hoare and He Jifeng extended these ideas substantially in their Prentice Hall book, *Unifying Theories of Programming*, and in the Peter Landin Memorial Semantics Seminar, Tony expounded many of the principles to be found in that book.

The first part of Tony's lecture presented the main ideas of algebraic axioms for programs, in a way that would be readily understandable for a mathematically and software literate newcomer to the subject. He displayed some notation:

Variables: p, q, r, \dots

Binary composition operators: $;$ (semicolon) \parallel (parallel)

and the Identity: I .

Thus one has expressions such as $(p \parallel q)$ etc.

Then algebraic laws such as associativity of $;$ and \parallel , commutativity of \parallel , and the Identity I as a unit for $;$ and \parallel , apply. This algebraic treatment expands the scope of Tony's original "axioms of programming" to include parallel computation, among much else.

Tony introduced the idea of *duality*, showing how interchanging certain terms in the axioms leaves the axioms unchanged. In this way one has "theorems for free" (a phrase Tony attributed to Phil Wadler, who succeeded Robin Milner as Director of the LFCS). If one proves a theorem, then one obtains an extra theorem by making certain substitutions, confident that the second theorem can also be proved by making the same substitutions throughout the proof. Applying this principle of duality is a further development since Unifying Theories of Programming where the authors touch upon it only briefly.

Next Tony introduced the refinement operator \Rightarrow . One might write $p \Rightarrow q$ where p is a program and q its specification. The operator \Rightarrow is a partial order.

Towards the end of the lecture Tony gave some indications of the way the work continued: frame rules for parallel computation:

$$\frac{\{p\}q\{r\}}{\{p \parallel f\}q\{r \parallel f\}}$$

(monotonicity). These frame rules, including the original rules of consequence and composition for imperative statements, and the modularity rule for parallel computation, can be proved from the algebraic laws (associativity, monotonicity etc.) for $;$ and \parallel .

He described the relationship between refinement and sequence of behaviours ($e \rightarrow f$) which can mean e causes f , or e happens before f , or f depends on e . He defined several other operators and relations over behaviours. The approach can accommodate both CSP and CCS processes and styles of communication.

After time for questions, there was a very enjoyable reception at the BCS London offices in the Davidson building.

References

C. A. R. Hoare: '*An Axiomatic Basis for Computer Programming*', Comm. ACM, vol 12, no.10, pp 576–580, 1969

C. A. R. Hoare: '*The Mathematics of Programming*', Clarendon Press 1986.

C. A. R. Hoare, He Jifeng: '*Unifying Theories of Programming*', Prentice Hall 1998.

The first two papers can also be found in:

C. A. R. Hoare, C. B. Jones: '*Essays in Computing Science*', Prentice Hall 1989.

Tim Denvir

www.denvir.net/Tim/

**Meeting at House of Lords:
UK Science Education in the 21st Century
Reporting Turing's Legacy
Reported by: Margaret West**

On March 20th 2013, John Cooke and I attended a meeting in the House of Lords on Computer Science Education. This took place in Committee Room G, and was opened by **The Lord Empey of Shandon Kt OBE**. The venue of the event was interesting and certainly new to me! There was an unusual addition to the meeting – viz. the interruption from time to time of the division bell, whereupon several of the audience hurried to vote in the House.

The first speaker was **Yva Thakurdas**, (CEO, Financial Services) who spoke of our moral obligation to the youth of today: she high-lighted the fact of youth unemployment and that at the same time there is an IT skills crisis. The latter problem is likely to worsen for there is a dried up pipeline of new recruits to IT with a decrease in Computer Science (CS) graduates. Yva quoted **Eric Livingstone** (Co-Author, Next Gen report): “*You know something is wrong when you have half a million young people unemployed and 100000 jobs vacant in IT*”. She also quoted **Eric Schmidt** (Google):

“The country that invented the computer is throwing away its great computer heritage by failing to teach programming in schools. I was flabbergasted to learn that today computer science isn't even taught as standard in UK schools ... Your IT curriculum focuses on teaching how to use software, but gives no insight into how it is made.”

According to **John Harris** (of the Corporate IT Forum Education and Skills Commission) employment in the IT industry is expected to grow at nearly five times the UK average in the next decade. The skills crisis will potentially result in a weakening of the UK economy: unless the supply of suitable candidates increases there is a danger that employers would be forced to recruit from outside the UK. Yva opined that the standard CS educational curriculum has steadily declined at all levels from school through to university over the past 10-15 years. She suggested a further reason for the lack of recruits was the erroneous image problem – that the sector was only for “geeky guys”.

The skills gap is not confined to the UK – for the European Commission has projected a deficit of at least 700,000 skilled IT workers by 2015. This has implications on EU growth for the IT sector contributes to 5.3% of the EUs GDP and is the EUs most innovative and research-intensive sector. The importance of CS is such that it should be regarded as the fourth science.

Yva then presented some of the UK wide initiatives which are intended to deal with the lack of take up of the subject. Among others these include CAS (Computing at School), Geek Gurl Diaries and NextGen skill campaign. It was also time for employers to step up: she said that corporates need to incorporate half day release alternatives into their existing CSR programmes for IT employers, to enable skills transfer between industry and academia at all levels. In other words success would be achieved by long term collaboration and commitment between government, academia and industry. The full version of her presentation can be downloaded from the Computer Weekly website: [Yva Thakurdas Talk at House of Lords](#)

Simon Peyton-Jones is a principal researcher at Microsoft Research in Cambridge. He is a founder member and Chair of the UK Computing at School Working Group, whose goal is to put the excitement and rigour of CS back into the school curriculum. The talk concerned the work of CAS and an interview with the speaker about this subject can be accessed online via: <http://www.infoq.com/interviews/peyton-jones-cas>

The talk commenced with a video clip of children “walking through” a sorting algorithm. He notes that children have enquiring minds and the new approach introduces them to computational thinking and in particular to understand what algorithms are for.

The proposed curriculum change is as follows: the old “ICT” subject has now been replaced by “Computing” – the syllabus running from Key Stage 1 (KS1 ages 6-7) through KS 2 (ages 8-11) to KS3 (ages 12–14). It is concise, taking up 2 sides of A4. Apparently the UK are the first country in the world to introduce a syllabus of this nature.

In order for the transition from ICT to CS to take place, current IT teachers need to be suitably equipped. A “hub” has been established for support of such teachers comprising a BCS network of excellence. Over 650 schools and over 70 universities belong to this network where the Universities deliver Continual Professional Development (CPD) to their neighbouring schools.

The speaker concluded by setting out a challenge to MPs and Peers – he said most political problems are (a) intractable and (b) expensive. In contrast this problem is (a) soluble and (b) cheap.

Nicki Maddens (Advanced Skills Teacher in ICT, Hartsdown Technology College) went on to explain how even young children were interested in CS. She went on to demonstrate Kodu – a visual programming language designed to be accessible to children from KS2 upwards, (See <http://fuse.microsoft.com/projects/kodu>) Kodu is used to create games involving an environment, characters, and the means of programming the characters within the environment. It introduces conditions and sequences, which teaches cause and effect – it also demonstrates that programming is a creative medium for narrative and storytelling. The Kodu kit is available for PCs using mouse and keyboard as well as with Xbox. There is a national competition where winners attend MS workshops.

Jonathan Bowen (now Professor of Computer Science, Birmingham City University) spoke about CS Education in Universities. Alan Turing, whose centenary was celebrated in 2012 is regarded as the “Father of Computer Science”. The annual Turing Award is regarded as the CS equivalent of the Nobel Prize which makes the decline of CS in the UK all the more invidious.

CS is a young discipline – the first University department was established in 1962 and is one of the **STEM** subjects of study (**S**cience **T**echnology **E**ngineering **M**aths). Unfortunately since universities introduced fees of £9,000 per annum, the number of courses available is down 18%. This means that students choices have narrowed in an increasingly restrictive market (the number on offer has declined by 27% since 2006).

The UK is not unique in its lack of CS graduates. In the US the number of CS degrees increased from 1995 during the Dot com boom and this continued until the early 2000s. After the Dot com crash the number of CS graduates decreased. It is now increasing but has not approached its highest level at the height of the boom (around 22, 500 at its height and 15, 000 now). This can be compared to China's increasing numbers of CS students – for the number of universities with CS departments in 2007 was 598. This represented an increase of 75% from 484 in 2002 with over 430,000 undergraduates.

In the UK there is a marked disparity in the ratio of female to males studying CS – with reduced numbers between 2007/8 and 2011/12 and apparently continuing to decline. Despite using IT on mobile phones, playing computer games and using social network sites CS does not appear attractive to females. The image of CS in the US is somewhat different; however in spite of that there were 37% of females in CS in 1985 compared with 18% in 2010, a reduction of 51%. The question remains as to how to produce incentives for a better gender balance.

Jonathan then went on to discuss the curriculum for CS courses – and how the BCS is currently developing a curriculum for schools. He wondered if they should also review CS at universities for in the US and elsewhere both the ACM and IEEE are influential on courses. There is a *Software Engineering Body of Knowledge* so maybe there should also be a comparable *Computer Science Body of knowledge*. In China programmes of study are split into *computer system structures, computer software and theory* and *applied computer science*.

In this country there were very few CS graduates teaching in schools and there seemed to be little incentive for them to do so, compared with (for example) Maths and Physics graduates. To combat this situation the BCS had set up the network for knowledge transfer between schools and universities (described by Yva Thakurdas in this report). The speaker also pointed out the difficulties of collaboration with non EU countries and the difficult and bureaucratic process of obtaining visas.

The role of Industry was then discussed – that liaison was needed (via the BCS or other) between Industry and educational institutions. The different contributions of Education and Training needed to be established for CS is a very fast-changing field. The foundations of CS appear to be stabilising.

However applications change constantly and there is a need to ensure both long and short term relevance of the subject. The speaker returned to Alan Turing for his last remark – the publication of a book: *The Turing Guide* (Oxford University Press), planned for 2014, to commemorate the 60th anniversary of his death.

Paul Coby (IT Director John Lewis) reiterated and emphasised the points made by previous speakers – of the shortage of IT skilled people. He particularly spoke of the means by which **e-skillsUK** was attempting to rectify the problems.

e-skillsUK is the Sector Skills Council for Business and Information Technology in the UK which with its partners works to develop the IT expertise necessary for today's global digital economy. Partners include employers, government, universities and schools. (See more online at: <http://www.e-skills.com/about-e-skills-uk/>)

Paul had been CIO of BA and was current IT Director of John Lewis Partnership and as such he emphasised the importance of IT in business. Air travel was increasingly booked online and 28% of retail purchases were online.

One problem addressed by the speaker was that of gender imbalance in Technology which starts with the shocking lack of girls gaining ICT qualifications in schools – only 9% of A Level students are girls – and only 15% carry on to study CS at university. In order to help address the gender imbalance e-skillsUK had introduced Computer Clubs for Girls – CC4G. This is a programme run by e-skillsUK to encourage girls to consider careers in IT by bringing technology to life. More than 150,000 girls in 4,500 schools have taken part in the activities of CC4G since 2005, and 84% report being more likely to consider further IT studies or careers as a result.

The speaker then went on to address the problem of lack of interest in IT of school students. He thought that GCSE content should be made more contemporary – for example by the introduction of **Cyber City** *animés* (animated productions). The relevance and challenge of security was already being presented in schools where the government backed scheme Cyber Security Challenge had been introduced at Key Stage 4 level. The challenge involves students both learning to break coded messages and producing their own for other schools to crack. The end result is a face-to-face competition to decide the Cyber Security Challenge Schools Champion. (See <https://cybersecuritychallenge.org.uk/education.php>)

The speaker rounded up by discussing various initiatives for improving the employability of young people in IT. The first was the IT Management for Business (ITMB) degree. The course of study is designed with the help of employers, and, apart from providing students with necessary skills, also gives them the chance to network with industry leaders. So far ITMB graduates have been highly employable in that 100% of those graduating have found employment. The e-skills Council is also promoting an IT apprenticeships scheme with frameworks at differing levels and different occupations. Employers who register with the scheme are required to show they are compliant with the appropriate regulations for Apprentices laid down by the National Apprenticeship Service (NAS). The speaker finished by reiterating the

thoughts of previous speakers – to solve the skills-gap required cooperation between Industry, Government and Academia.

The evening finished with questions and discussion. Among topics discussed were the gender imbalance and the employability of CS graduates. After the main meeting we enjoyed excellent House of Lords refreshments and continued our discussion. The lack of girls studying IT in schools was associated with the bullying some of them encountered by their peers. The point was made that graduates with a strong CS element in their degree were much more likely to gain employment.

During and after the meeting some of us availed ourselves of the House of Lords Gift Shop and I impressed my grandchildren with a gift of chocolate suitably wrapped in paper decorated with the House of Lords insignia!

BCS-FACS/LMS Evening seminar

Professor Philippa Gardner

(Imperial College London)

October 8th 2013Formal Aspects of Computing
Science Specialist Group**LMS** Advancing
Mathematics
London Mathematical Society**BCS-FACS Evening Seminar**
Joint event with the London Mathematical Society**Tuesday 8 October 2013, 6:00pm**Professor Philippa Gardner
(Imperial College London)**Views: Compositional Reasoning for Computer Programs**

Mathematical reasoning has the potential to provide much needed guarantees about what computer programs do. It is important that the reasoning is compositional. Compositional reasoning means that we consider each program component (such as a program fragment, a library function or a concurrent thread) in isolation without having knowledge of the program context (such as the rest of the code, a client program using the library or the environment thread) in which it will be placed. It means that the reasoning scales and can therefore be applied to industrial code.

This talk presents a mathematical theory of *views* for reasoning compositionally about sequential and concurrent programs. A program's *view* provides abstract partial knowledge of the current state of the machine and the program's right to change that state. Views can be composed as long as their knowledge and rights do not conflict. The theory of views is simple but highly applicable; traditional concurrent reasoning methods such as rely-guarantee and Owicki-Gries, modern methods centering on separation logic, and many type theories can all be seen to fit within this theory. In this talk I will demonstrate these ideas by reasoning about simple algorithms including the Sieve of Eratosthenes, fine-grained list-locking algorithms and concurrent tree algorithms.

The venue is the London Mathematical Society, De Morgan 57-58 Russell Square, London WC1B 4HS Refreshments will be available from 5.30pm.

The seminar is free of charge and open to everyone. If you would like to attend, please register at computerscience@lms.ac.uk.

Peter Landin Annual Semantics Seminar: Rationalism v Hardware

Professor Richard Bornat

(Middlesex University)

December 2nd 2013

Peter Landin (1930–2009) was a pioneer whose ideas underpin modern computing. In the 1950s and 1960s, Landin showed that programs could be defined in terms of mathematical functions, translated into functional expressions in the lambda calculus, and their meaning calculated with an abstract mathematical machine. Compiler writers and designers of modern-day programming languages alike owe much to Landin's pioneering work.

Each year, a leading figure in the area of semantics will pay tribute to Landin's contribution to computing through a public seminar. This year's seminar will take place on 2nd December 2013 and will be given by Richard Bornat .

Programme

- 5.15pm FACS AGM followed by Coffee
- 6.00pm Welcome and introduction (Professor George Couloris)
- 6.05pm Peter Landin Semantics Seminar:

Rationalism v Hardware

Professor Richard Bornat (Middlesex University)

- 7.20pm Close and vote of thanks (Prof. Jonathan Bowen)
Followed by Drinks reception

Seminar details

Peter Landin's great contribution was to show that programming could be abstracted from hardware and made the subject of mathematical study. That work was fundamentally rationalist: his thesis was that unless programming fits the lambda calculus, we could never understand it. But empiricism cannot be defeated, and hardware inevitably pricked rationalist complacency with fixed size integers, array overflow, null dereference and lots, lots more.

Now the primacy of the rationalist approach has been challenged afresh with the rise of multiprocessors. In the pursuit of speed, execution is no longer sequential and memory is no longer simply shared. A multicore processor is a distributed system, and different designers make different arbitrary choices in

an attempt to make their systems programmable. The risks are obvious, and the remedy isn't clear.

Rationalists are fighting back, and we already have rational models of hardware that cover the range of modern processors. But we are far from winning, and the attempt to define C and C++ as hardware-independent concurrent languages seems to be flawed.

This talk will survey the state of the battle – trying not to frighten you too much – and will include a presentation of my own attempt to produce a program logic for multiprocessor concurrency (joint work with Jade Alglave, Peter O'Hearn and Matthew Parkinson). Although Peter Landin did not approve of program logic, I hope he would have approved our attempts to lift programming once again above the level of what he always called 'instrumentation'.

FACS Journal: News

High Praise for FACS paper in
International Assessment of Computing Literature

In their attempt to compile a definitive list of the best Computing articles published in 2012, and recognising the difficulty in doing this, the ACM has released a list of 'notable' items [1].

Within the Software section there are only seven entries (of which two are themselves review papers) and included there is a paper published in volume 24 of the 'FACS journal' i.e. "Formal Aspects of Computing".

In fact it is the very first paper in that volume and is included within a special issue on Refinement. It is by Carroll Morgan and entitled "Compositional noninterference from first principles" [2].

Later, starting in issue 24.4, there are some 25 papers spreading over several issues which amount to a Festschrift for Carroll in celebration of his 60th birthday. This is well worth a look.

Such international recognition has prompted me to remind FACS members about the journal which we initiated 25 years ago. Indeed newer members might not even be aware that this journal even exists or that they can subscribe to it at greatly reduced rates. And members with academic connections can probably access it at zero cost courtesy of the local university library if they have a multi-journal consortia deal with Springer; many do. Whichever route you take please take a look and download a few papers. Increased activity in support of the minority sport of 'formal methodism' would not go amiss.

Of course, the journal welcomes the submission of research papers for which we offer online submission, traditional peer reviewing, quick online publication of accepted papers and subsequent hard copy availability [3].

John Cooke
Associate Editor, Formal Aspects of Computing

[1] http://www.computingreviews.com/recommend/bestof/notableitems_2012.cfm#list

[2] Morgan, C. *Compositional noninterference from first principles*. *Formal Aspects of Computing* 24.1 (Jan. 2012), 3-26.
<http://link.springer.com/article/10.1007/s00165-010-0167-y>

[3] <http://link.springer.com/journal/165>

Recent and Forthcoming Events

BCS FACS Seminars: Unless stated otherwise, these take place at:

BCS London Offices,
1st Floor, The Davidson Building,
5 Southampton Street,
London WC2E 7HA.

Major formal methods events are also included below.

Views: Compositional Reasoning for Computer Programs Professor Philippa Gardner (Imperial College) <i>Joint FACS / LMS lecture</i>	8 th October 2013
Rationalism v Hardware Professor Richard Bornat <i>Peter Landin Annual Semantics Seminar</i>	2nd December 2013
Implementing TLS with Verified Cryptographic Security Dr. Cedric Fournet (Microsoft Research / INRIA) <i>FACS / Cryptoforma meeting</i>	15 th January 2014

For further conference announcements, please visit:

- Formal Methods Europe (FME):
www.fmeurope.org
- The European Association for Theoretical Computer Science:
www.eatcs.org
- The Formal Methods Wiki Virtual Library:
formalmethods.wikia.com/wiki/Meetings

FACS Committee



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Brian Monahan
Co-Editor, FACS FACTS

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FACS is always interested to hear from its members and keen to recruit additional helpers. Presently we have vacancies for officers to help with fund raising, to liaise with other specialist groups such as the Requirements Engineering group and the European Association for Theoretical Computer Science (EATCS), and to maintain the FACS website. If you are able to help, please contact the FACS Chair, Professor Jonathan Bowen at the contact points below:

BCS-FACS

c/o Professor Jonathan Bowen (Chair)
Birmingham City University

Email info@bcs-facs.org.uk

Web www.bcs-facs.org

You can also contact the other Committee members via this email address.

Please feel free to discuss any ideas you have for FACS or voice any opinions openly on the FACS mailing list <FACS@jiscmail.ac.uk>. You can also use this list to pose questions and to make contact with other members working in your area. Note: only FACS members can post to the list; archives are accessible to everyone at <http://www.jiscmail.ac.uk/lists/facs.html>.