A weighty problem solved

Sussex physicist and team reveal answer to 30-year-old scientific puzzle

New research by an international team of physicists, including Professor David Wark from CPES, has solved a 30-year-old scientific puzzle and challenged the so-called 'Standard Model', which has been used to understand the nature of matter since the 1970s.

"It is incredibly exciting to see such intriguing results coming out of our first data analysis – with so much more to come," says David, who is the UK co-spokesman for the project and the team member with main responsibility for the software used to analyse the data.

The 'Standard Model' in physics describes the different particles that make up matter and the forces that govern their interaction. Included in the model are neutrinos, which are sub-atomic particles of three types (or 'flavours', as physicists call them) - electron-neutrinos, muon-neutrinos and tau-neutrinos.

Electron-neutrinos are emitted in massive numbers by the nuclear reactions taking place in the Sun, but only a third of the predicted number are detectable on Earth. This was the puzzle of the 'missing solar neutrinos': either scientists' theoretical models of the workings of the Sun were at fault, or the neutrinos were changing type as they travelled to Earth.

The team used the unique Sudbury Neutrino Observatory in Ontario, which contains a neutrino detector the size of a ten-storey building, situated 2km underground to shield it from interference from cosmic rays. The detector is a huge vessel containing heavy water (water whose molecules have two deuterium atoms instead of hydrogen atoms, hence the symbol D₂O instead of H₂O).

Neutrinos react with the heavy water to produce flashes of light called Cherenkov radiation. This light is then detected by an array of over 9,000 detectors mounted on a support structure surrounding the vessel. Only around ten such hits per day occur, so the experiment had to run for many days to collect sufficient data.

In this way, the team has solved the mystery by revealing that the neutrinos are in fact changing type and that the number of electron-neutrinos produced in the Sun is just as predicted by the theoretical models. The transformation between neutrino types means that neutrinos must have mass, something that contradicts the 'Standard Model'.

"It's one thing to believe something is true, but another thing to be able to prove it," says David. "This is now an observed fact of nature rather than just speculation."

"In a similar way to how Einstein showed that Newton's model breaks down at the extremes, this research shows that the Standard Model, while still a useful framework, also breaks down," adds Dr Robert Smith, Reader in Astronomy in CPES.

In closely related research, Sussex is one of only three UK universities participating in the Main Injector Neutrino Oscillation Search (MINOS) project. This involves firing a beam of muon-neutrinos from Fermilab, near Chicago, 730 km to a detector in Minnesota, which will determine whether and in what way they might have changed their 'flavour' en route. Sussex will host a meeting of MINOS participants in September.

Media Technology Lab opens in EIT

The School has started last month of the Media Technology Lab in the School of Engineering and Information Technology (EIT).

The Vice-Chancellor, Professor Alasdair Smith, found himself part of a live webcast during the opening event.

The School has started two new BSc degree programmes - Information Technology Systems and Multimedia and Digital Systems - and the new Media Technology Lab (MTL) developed in Engg 2 is underpinning these programmes.

The Lab, funded through a HEFCE Capital Allocation project, offers students a wide range of activities linked to computer technology and new media, including digital video production, sound recording and webcasting.

The new development, led by Professor Paul Lister, has grown out of the research activities of the Centre of VLSI and Computer Graphics, of which Paul is the director. His colleagues Katerina Mania, Paul Newbury and Martin White helped to run the opening event, along with students on the new degrees. Major credit for the technical design of the MTL studio and the launch goes to Phil Watten, the recently appointed Media Technology Manager in EIT.

Declaring the MTL open, the Vice-Chancellor said he was pleased to see how successful the new degrees are proving so early on, with interest coming from prospective students both in the UK and abroad. It was also good, he said, to see how the portfolio of what the School offers is evolving in a way that responds to the changing demands of the outside world.
First class

Christopher Freeman, Professor Emeritus and former director of SPRU, will receive an honorary Doctor of Science in Social Science from the University of Edinburgh on Wednesday (11 July).

Tara Gould, who is taking an MA in Creative Writing, Arts and Education at Sussex, is one of nine students nationwide who will take part in a Young Writers' Apprenticeship, involving a five-day masterclass with three published authors, followed by a six-month mentoring scheme. Tara's name was put forward for the course, run by the Arvon Foundation in Devon, by her lecturers at Sussex.

Harry's 'Desert Island Discs'

If he should ever find himself on a desert island, Professor Sir Harry Kroto would be fairly content so long as he had the Adagio from Mahler's fourth symphony to listen to and a copy of Feynman's Quantum Electro Dynamics Physics to read.

His happiness would be enhanced, he told 'Desert Island Discs' presenter Sue Lawley, if he could take an airbrush computer graphics set as his luxury.

Sir Harry, professor of chemistry and 1996 Nobel prize-winner, was a guest on the legendary Radio 4 programme on 24 June (repeated 29 June).

Through a choice of music as diverse as Mussorgsky's Pictures at an Exhibition and 'Journey of the Sorcerer', performed by the Eagles, he talked about his discovery of the C60 carbon atom that earned him the Nobel prize, his early life in Bolton, and the reasons why he had rejected the Judaism of his German refugee parents in favour of atheism, Amnesty Internationalism and humanism.

He also lamented the demise of the toy building kit, Meccano, at the expense of Lego ('99 per cent of engineers were brought up on Meccano'), and related it to a lack of interest among today's younger generation in seeing science as a creative process.

And when asked about his knighthood, he recalled the day he received the letter asking him if he would accept the honour: "I'm something of a republican, but it shows how thin the veneer is. I didn't hover too long over it."

The other records Sir Harry would take with him to a desert island were:

• 'Hamish', by Richard Farina ('It takes me back to Sheffield University where I learned three chords on a guitar');
• the theme from the film Paris, Texas, played by Ry Cooder, because it reminds him of the time in Texas when he and his colleagues made the C60 discovery;
• 'Dust in the Wind', by Kansas, because he loves California;
• 'Hyperdrive', by Jefferson Airplane, because it reminds him of holidays in San Francisco with his wife, Marg;
• and John Lennon's 'Imagine', "because if we could get rid of our worries about heaven and hell, and national boundaries, the world would be a better place".

Double farewell

Owen Richards showered Carolyn Morris with gifts (above) at a farewell party on 27 June to mark her retirement as Director of the Career Development Unit (CDU), after 27 years at Sussex.

A new director is being appointed to manage a combined CDU and Student Employment Office, which will be known as the Career Development and Employment Centre (CDEC).

The retirement of possibly the longest-serving member of Sussex staff had been celebrated in a dramatic fashion a week earlier when current students performed Act 3 of The Dragon by Evgenyi Shvarts, in the original Russian.

The festivities in honour of Professor Robin Milner-Guilland, bowing out after 39 years (yes, really!) of teaching Russian Studies at Sussex, also included a poetry reading, seminar presentations by former graduate students, and a party hosted by the Modern Languages and History of Art subject groups as well as the School of European Studies.

Poetry prize winners announced

This year's winner of the Robin Lee Poetry Prize is postgraduate Androula Pistolas. Rodney Hillman, chair of the judges, would not be drawn on the reasons for the panel's choice, saying only, "We thought Androula's four poems were the best. They were very good indeed, actually." Joint runners-up were postgraduates Jeni Townsend and Sarah Wardle.

Rodney and his fellow judges from the English Subject Group - Tony Inglis, Stephen Medcalf and Dr George Walter - also commended Simon Clayton (the lone undergraduate on the shortlist), Andy Daniell (the only member of staff to feature) and postgraduate students John McCullough, Philip Mulligan and Neil Palmer.

The annual competition was established in memory of Robin Lee, who studied at Sussex in the 1960s. It is open to all students and staff of the University (except teaching faculty). Cash prizes are awarded to the winner and runner-up.
Dear Editor,

How ironic that the Vice-Chancellor raises the arts/science divide in an issue of the Bulletin alongside details of the 40th-birthday celebration. Those brave undergraduates in that first intake can tell him all about the pioneering arts-science courses for undergraduates in the ‘60s. I still remember Asa Briggs’s excellent lectures for science undergraduates, among others, on history.

The arts-science component was one of the many things that set Sussex apart from other universities back then. The whole thing fell apart, I seem to recall, when the arts mob decided that they were too busy to worry about things like science. Of course, this caused some mirth among science undergrads, with their somewhat heavier timetable of lectures and lab work.

Michael Kenward
BSc Physics, 1963–66

Local teachers go back to the classroom

Teachers from local schools and colleges went back to the classroom on Friday (29 June) in BIOLS.

Alumni news

Claire Hillman
Alumni Officer

Fair-weather friends
The refectory was packed on 23 June with 250 former students who had come back to campus to celebrate the 10th anniversary of their year group starting at Sussex. Alumni had flown in especially from around the globe (including Australia, Canada, France and Greece) to that rarest event—a hot evening in the UK. Claire Simons (ENGG 1992–95), who works at the Alumni Centre and organised the reunion, commented, “The fabulous weather was the icing on the cake; although I organised everything else, I cannot claim credit for that!”

Some alumni had to be dragged away from the Grapevine and East Slope bars, where they were busily reliving Saturday nights of ten years ago. After the drinks reception and buffet, the dancing continued well into the small hours and many of the guests were last seen departing on the 85

nightbus, presumably to continue the revelry in town.

Stephanie Clarke (ENGG 1991–94) summed up the evening: “Thank you for arranging it—it was fantastic.”

Eurostars
Students on the MA in Contemporary European Studies attended a reception last month as part of a week-long study tour to the Belgian capital. The event featured a series of presentations by Brussels-based alumni on topics such as administrative reform of the European Commission and job opportunities in Brussels. Korrina Stewart, Brussels Liaison Officer, also talked to the postgraduates about the role of the South East Brussels Office, where the reception was held.

This annual event, which has been running since 1996, is very popular with students as it enables them to network and make contacts in an informal atmosphere.

To many animals, campus must resemble a collection of cliffs in a woodland glade. As a result, some of the species living here can also be seen on cliffs along the Sussex coast.

One that is obvious on sunny days is the black-and-white Zebra Spider. It runs up and down walls or rocks, stalking insects before jumping on them at the last moment. If you approach one slowly, it will raise its leaflet to watch you with its four pairs of eyes. One pair is much larger than the others—and the spider’s brain!

Larger cliff-dwellers on our buildings include the multi-coloured Feral Pigeons. These familiar birds are descended from escaped domestic pigeons, which were in turn derived from the wild Rock Doves of sea cliffs. The birds hybridise freely and there are probably no ‘pure’ Rock Doves left in Britain.

As their name suggests, House Martins have almost entirely abandoned cliffs in favour of buildings as sites for their mud nests. Campus once had a thriving colony of these summer visitors, which are distinguished from Swallows by their much shorter tails and white rumps. Only a few pairs remain, such as those nesting on the Pevensey building.

Herring Gulls are, however, nesting on flat roofs on campus in increasing numbers. Sadly, these majestic birds can be serious nuisances: not only are they noisy and messy, but they are also aggressive when defending their chicks.

One of the inevitable consequences of colonies of seabirds is the fertiliser effect of the large quantities of guano. If you have ever been moved to ask the question, ‘Where were the weeds before there were fields?’, here at least is part of the answer. Chickweed is one such plant, common on campus, as almost everywhere else where the soil has been enriched and a characteristic bird island plant. Another plant characteristic of sea-bird colonies is the lichen, Xanthoria, which paints the cliffs a vivid orange, including the artificial cliffs and tree boughs of campus.

The orchid of the month in June was the White Helleborine. This month our large deep-pink Pyramidal Orchids are in full bloom among the long grass of the wooded edges on the south side of the Science Car Park. This is one of the commonest of chalk downland orchids and can also be a strikingly beautiful sight along recently established roadside verges, like those on the Kingston roundabout, confounding those punters who preach that all orchids take years to establish.

The red colour and the long spur at the back of the flower proclaim that the plant is pollinated by butterflies or day-flying moths, such as Burnet Moths. However, it has a trick up its sleeve: it produces no nectar, relying on the insects’ experience with the similar-looking, but nectar-rich, Fragrant Orchids that flower earlier.

Below: Pyramidal Orchids are in full bloom among the long grass of the wooded edges on the south side of the Science Car Park.

A walk on the wild side

David Harper and David Streeter BIOLS

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Below: Pyramidal Orchids are in full bloom among the long grass of the wooded edges on the south side of the Science Car Park.
New study on the plight of Jewish refugees

Barbara Einhorn, Senior Lecturer in Women's Studies in CCS, is to undertake research this summer in New Zealand on the experiences of Jewish refugees who fled from Hitler's Germany.

"My parents were refugees from Hitler who went to New Zealand in Spring 1939 and stayed there and I've always wanted to do something on my family history," says Barbara, who will be based at the Stout Research Centre at Victoria University in Wellington. Barbara hopes to tie in her own family history with research on German-Jewish Marxist refugees who fled from Hitler but returned to Germany after the war with the aim of building socialism. This research looks specifically at the issue of identity formation in relation to nation, particularly in displaced people.

"Germany has changed four times in these people's lifetime," says Barbara. "They grew up in the Weimar Republic, fled from Nazi Germany, returned to build the socialist German Democratic Republic, and ended up in a unified post-Cold War Germany."

"When they returned to Germany after the war it was a huge decision because for many of them, they knew that their relatives had all been murdered in concentration camps and so to go back in the name of this political commitment they had to overcome enormous personal qualms and fears," explains Barbara.

Another aspect of the research is the relationship of landscape to identity formation. "My mother retains a very close and sentimental relationship to the landscape of Hessen in Germany, where she grew up, and this comes up in interviews with other women as well," says Barbara.

"Many of them, when asked why they returned, mention the German landscape, especially the forest, even when they didn't come from areas of Germany where there was any forest," she adds. "Combined with the Nazi notion of 'blood and soil' [the idea that it is race – not place – that forms the German identity], this creates a problematic identification with landscape."

Next year Barbara will expand and add to her life-history interviews while based at the Centre for Interdisciplinary Women's Studies at Humboldt University in Berlin on a Leverhulme Study Abroad Fellowship.

Small ads

TO LET: Three-bed house in Lewes near University. Vac. July/Aug or Sep. Tel. 474738 eves.

HOUSE FOR SALE: Ashurst Rd, B'ton (close to campus and Falmer station). 3 beds, 24' lounge/diner, double glazing, GCH, alarm, large garden and garage. £134,950. Tel. 698634.

ACCOMMODATION WANTED: Mature Danish student and Swiss husband looking for 1-bed flat/studio, or poss. double room in shared house/flats. In B'ton/Hove.

Lectures, seminars, colloquia

Wed 18 Jul
12 noon–1pm CRC Psychosocial Oncology Group Seminar: Neil Aaronson (Netherlands Cancer Institute, Amsterdam).

The value of health-related quality of life assessment in daily clinical practice in oncology: Results of a prospective, randomized study. IDS 221.

Gardner Arts Centre
Box office: (01273) 685861

Performance
Fri 6 Jul
7pm Prodigal Theatre - The Story Thief
Someone is stealing the stories from children's heads: Who will stop them? Two performances from the same root, devised by children in Brighton and Ghana.

Sat 7 Jul
8pm Bread and Roses (15)

Sun 8 Jul
8pm The Apartment (PG)

Cinema

Exhibitions

Until Thu
12 Jul
Education Action Zone

Staff vacancies

Apply by 10 July
Information Support Officer, Computing service (ref 204)

Apply by 20 July
Lecturer in Education, USIE (ref 207). For an informal discussion, contact Pat Drake on ext. 7843, email p.drake@sussex.ac.uk

Nursery Nurse, Creche
(ref 197)

Nursery Nurse, Nursery (pl/pl, ref 198)

Apply by 28 Sep
RM Phillips Chair of Medical Research
Further details are available from Prof A.L. Moors on ext. 8224.

Bulletin

The fortnightly Bulletin is written and produced by Alison Field and Peter Simmons, with regular contributions from Jacquie Bealing. We welcome any news, story ideas, letters or small ads from staff and students of the University. The next issue will be out on 20 July, with a copy deadline of 1pm on 13 July. Please contact the Press and Communications Office in Sussex House on ext. 8888, or email Bulletin@sussex.ac.uk.