Happy New Year from Innovations
India–UK collaborative industrial research and development competition: Clean-tech, affordable healthcare and ICT

Innovate UK and the Government of India are to invest up to £3.4 million in collaborative industrial research and development projects that propose new commercial solutions to critical challenges impacting the socio-economic growth and development of India in relation to its clean-tech, healthcare and ICT sectors.

The UK investment has been made possible through the Department for Business, Innovation and Skills-managed Newton Fund.

The aim of the competition is to bring together companies (small to medium-sized companies and/or larger businesses), research organisations, academics and other collaborators from India and the UK for the joint research and development of new solutions to key socio-economic challenges, in the form of innovative products, processes or services. The principal market a project must consider is India.

Projects must be collaborative, involving both UK and Indian participants with both a UK lead partner and an Indian lead partner. On the UK side, the lead partner must be a business but other businesses or research organisations can collaborate as partners in the consortium. The lead partner in India must be a business. Academic institutions, research hospitals, other R&D institutes that are headquartered and operate in India are encouraged to participate as co-investigators/partners.

We expect to fund mainly industrial research projects. For UK participants, small or micro businesses could receive up to 70% of their eligible project costs, medium-sized businesses 60% and large businesses 50%.

We expect total UK project costs to range in size from £350,000 to £450,000, and for projects to last for up to 24 months.

The UK lead partner must submit an application on behalf of the entire consortium to Innovate UK. The Indian lead partner must submit an identical application, again on behalf of all participants, to the Global Innovation & Technology Alliance (GITA).

This competition opens for applicants on 9 November 2015. The deadline for applications is at noon UK time on 20 April 2016. UK applicants must register by noon on 13 April 2016, one week before the application deadline.

Register & Apply

Supporting documents & links
India–UK collaborative industrial research and development competition - competition guidance
The Knowledge Transfer Partnership (KTP) scheme helps businesses to innovate and grow. It does this by linking them with a university and a graduate to work on a specific project.

Each KTP is a three-way partnership between a business, an academic institution and a graduate. The academic institution employs the recently-qualified graduate who works at the company. The graduate, known as the ‘associate’, brings new skills and knowledge to the business.

A KTP can last between 6 months and 3 years depending on the project and the needs of the business. It is part-funded by a grant. The amount businesses need to contribute is different for SMEs and larger companies.

Find out if you’re eligible to apply for innovation funding

• you can apply as a business if you are a company of any size or a not-for-profit organisation
• you can apply as an academic partner if you are a university, college or research technology organisation
• you can apply as an associate if you are a high-calibre recent graduate. You must have the knowledge and skills to lead an innovative and strategic business project

KTP for businesses

A KTP is part-funded by a grant. You will need to contribute to the cost of the supervisor and the salary of the associate. The amount you will need to contribute depends on the scale and length of the project. It will also depend on the size of your company.

If you already have a working relationship with a university, you should contact them. Otherwise, you should get in touch with your local KTP adviser.

KTP for academics

Contact the KTP office at your university to find out how to take part. They will work with you and the business to scope out the project. They will also help you with your application to Innovate UK.

KTP for graduates

You should contact the KTP office at your university to find out how to take part. They will help with preparing applications and provide support during the project. You can also find adverts for the latest KTP vacancies online and in:

• university departments
• career offices
• recruitment websites
• local newspapers

See here for full information on Knowledge Transfer Partnership (KTP) scheme.
Smart 2015/16

Support for innovative SMES

***Please read the guidance for applicants carefully as the rules about multiple and repeat applications have changed***

Smart is a grant scheme which offers funding to small and medium-sized enterprises (SMEs) to engage in R&D projects in the strategically important areas of science, engineering and technology, from which successful new products, processes and services could emerge.

The scheme supports SMEs carrying out R&D which offers potentially significant rewards and that could stimulate UK economic growth.

Three types of grant are available:

- Proof of market
- Proof of concept
- Development of prototype.

Any UK SME undertaking research and development may apply; applications are accepted on a rolling basis for assessment by independent experts.

- Project costs for applicants
- Guidance for Applicants - Development of Prototype
- Guidance for Applicants - Proof of Concept
- Guidance for Applicants - Proof of Market
- Administration support costs
- Smart FAQs

The new batch assessment dates for Smart scheme applications during the financial year 2015/16, which starts on 26 March 2015, are:

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Smart responsive mode is ‘always open’. However to assist Innovate UK in the processing of these applications, we assign them into batches for final assessment and funding.

Register & Apply
The next meeting of the Projects Peer Review Panel (PPRP) will take place in Polaris House, North Star Avenue, Swindon, SN2 1SZ on the 19th and 20th January 2016. The Panel will be reviewing 3 project proposals.

Members of the science community should contact Tahmina Aziz on telephone 01793 442058 or e-mail Tahmina.Aziz@stfc.ac.uk if they are likely to attend the open presentation.

The proposals being reviewed are as follows:

19th January 2016

10.00 – 11.00 – ProtoDUNE

The Deep Underground Neutrino Experiment (DUNE) is the flagship of the future US domestic particle physics programme. It is designed to discover CP violation for neutrinos. A powerful beam of neutrinos will be fired 1300 km from Fermilab, near Chicago, towards a huge underground detector in South Dakota. This underground detector, built in four modules, will contain over 65,000 tons of liquid argon at a temperature of 87 K (-186 degree Celsius).

This proposal seeks support for two years to take a leading role in the development of a large scale engineering prototype of the DUNE far detector. The prototype will be constructed at CERN.

14.30 – 15.30 – HERA (Hydrogen Epoch of Reionization Array)

HERA represents the next experimental step in HI 21cm cosmological experiments. HERA is a low-frequency radio interferometer experiment targeted specifically at studying the Epoch of Reionization (EoR) via the redshifted 21-cm line. The telescope is currently under construction in the SKA radio quiet preserve in South Africa. The instrument consists of an array of 14m parabolic antennas operating from 100MHz to 200MHz.

This proposal seeks support for the UK involvement in HERA, to extend the development array to 37 antennas (currently 19 antennas), to develop and implement a Bayesian analysis pipeline for HERA, to develop and implement advanced imaging pipeline software and support array calibration.

20th January 2016

09.30 – 10.30– LBNF/DUNE

The Long Baseline Neutrino Facility (LBNF)/Deep Underground Neutrino Experiment (DUNE) is the flagship of the future US domestic particle physics programme. The scientific objective is to discover CP violation for neutrinos. A powerful beam of neutrinos will be fired 1300 km from Fermilab, near Chicago, towards a huge underground detector in South Dakota.

This proposal seeks support to design and develop a target system for the generation of the LBNF neutrino beam, as well as physics optimization studies to provide input to the engineering. The objective of this programme of work is to design and optimise the pion production target and other key elements of the LBNF neutrino beamline in collaboration with the international LBNF community and Fermilab colleagues.
The STFC Innovations Club jointly with the STFC Nuclear Security Science Network is hosting a knowledge exchange and network launch event with industry and government agencies on current developments and novel applications of radiation detectors and detection techniques as applied to nuclear security. Nuclear security continues to be a high priority to the UK’s government. For these reasons the STFC Nuclear Security Science Network was set up to promote knowledge exchange and collaboration between academic researcher and stakeholders in industry and government agencies. This area requires a highly multidisciplinary approach and effective end-user engagement.

This event is intended for:

- Industry interested to know more about current knowledge exchange and commercialisation opportunities from UK radiation detection community
- All stakeholders and researchers who are interested in participating in the Nuclear Security Sciences network
- Industrial and Government researchers looking for academic partners for specific development projects
- STFC funded researchers working in radiation detectors developments wanting to get more involved in knowledge exchange and the funding available
- Academic researchers from allied fields looking to find partners or develop capability in nuclear detection.

Key topics for this workshop include:

- Radioisotope detection and identification
- Localisation, imaging and tracking
- Detection Technologies and Techniques

The workshop will also launch the STFC Nuclear Security Science Network, and highlight forthcoming Network meetings for researchers and end-users, including research funding and knowledge exchange opportunities in nuclear security.

For more information contact:
Dr Vlad Skarda, STFC (vlad.skarda@stfc.ac.uk) or Professor Paul Sellin (p.sellin@surrey.ac.uk)

Register for the event: [here](#)
Connecting Industry and Researchers in Physics

A South East Physics Network (SEPnet) Event

SEPnet's Graduate Network (GRADnet) is organising its 4th networking evening to facilitate greater collaboration and links between industry and physics postgraduate research students (PGRs) and researchers. We anticipate approximately 60 employers, physics PhD students and academics attending this event.

Who should attend

• SEPnet PGR students who want to meet small and medium sized enterprises (SMEs) and employers from physics-related industries to find out about career opportunities, make contacts and explore research and business ideas.

• SEPnet partner researchers who want to build links with industry to explore how their research can create impact.

• SMEs, businesses and employers in physics-related industries interested in recruiting physics graduates.

During the evening:

• Hear from panellists including Maya Dillon, Community Manager, Pivigo Academy; Iain Duncan, Founder, Mousetrap Innovation; Phil Edwards, Managing Director, Weald Technology; Anke Lohmann, KTN Head of Photonics & Quantum Technologies and others talk about the benefits of knowledge exchange and what physics postgraduates and postdocs can offer industry

• Participate in a speed networking session

• Build ongoing relationships between industry and researchers through placements, mentoring or research collaboration

• Refreshments will be provided.

How to register:

This event is FREE to attend. Places are limited so please book early by clicking on the following link: http://bit.ly/1id46BC

(PGR students are requested to attend a networking workshop at 16.00).

Banners:

If you would like to bring a banner for display let us know and we will reserve you a space.

For enquiries, contact gradnetadmin@sepnet.ac.uk

This event is supported by The Institute of Physics

Veronica Benson, Employer Liaison Director
South East Physics Network (SEPnet)
Email: veronica.benson@sepnet.ac.uk
www.sepnet.ac.uk
UK invests £72 million on cutting edge particle physics research

Cutting edge particle physics research in the UK will receive £72m over the next four years enabling researchers to focus on answering some of the big questions we still have in understanding the Universe such as the mysteries of Dark Matter - the 'stuff' that is believed to make up a big percentage of our Universe but that cannot be seen.

Announced today by STFC this funding will support 17 UK university research teams to actively work on some of the “…unfinished business with understanding the universe” that Professor Tara Shears, who leads the University of Liverpool LHCb group, has talked about as being one of the current research challenges.

Professor John Womersley, particle physicist and Chief Executive of STFC said of the funding announcement “The UK’s Particle physicists are world leaders in expanding our understanding of some of the biggest and deepest questions in science. The support we are announcing today will enable this incredibly successful research community not only to analyse the new data coming from CERN but also to work on developing new applications for particle physics technology and to continue to inspire future generations with the excitement of discovering how the universe works.”

Particle physics research is largely international and collaborative in nature, and the UK research teams are working on twelve particle physics experiments, including contributing to the work at CERN involving the exploitation of the Large Hadron Collider as well as other major international experiments in the US, Canada and Japan.

The key questions these research projects are looking at include why do we see more matter than antimatter; what is the nature of the force that binds quarks, and nucleons, together; what are the limits of this force; are forces unified at high energies; where does the mass of particles come from; what is the missing dark matter which seems to make up about a quarter of the Universe; and what is the ‘Dark Energy’ which may drive the expansion of the Universe?

STFC funded physicists are working on the exploitation and development of all four of the LHC (Large Hadron Collider) detectors ATLAS, CMS, LHCb and ALICE, although the latter is funded through the STFC’s nuclear physics programme. They are also actively involved in some of the ground breaking experiments in the study of neutrino masses and mixing such as T2K (Tokai-to-Kamiokande in Japan), MICE (Muon Ionisation Cooling Experiment in the UK) and preparation for the next generation of experiments – the Deep Underground Neutrino Experiment (DUNE) at Fermilab in the USA, and Hyper-Kamiokande in Japan.

The UK has also invested in leading roles in the SNO+ (Canada) and SuperNEMO (France) neutrinoless double beta decay demonstrator experiments, which continue to receive support along with experiments in precision muons, electric dipole moment and quark flavour physics.

STFC also supports an active theory community, fundamental to the progress and understanding of experimental particle physics, both in the short term in relating to currently operational experiments, as well as in the longer term of proposing new ideas which will become the focus experiments in the future.
Scientists in the UK and Italy are working together to solve a mystery surrounding centuries-old swords by investigating whether they are genuine or counterfeit.

Over a thousand years ago, an unusual and very expensive kind of steel, known as crucible steel, was being produced in many areas of the Indian subcontinent, Iran and central Asia. The material was so strong – unequalled in Europe – many people tried to replicate it and pass their swords off as the real thing.

The question is - which ones? Some of the swords lack the tell-tale ‘watered-silk’ pattern of crucible steel, known as ‘Damascus’, almost certainly due to over-polishing by 19th century dealers, whilst others may be counterfeits with the pattern falsely etched on the surface of cheaper metal.

Using STFC’s ISIS neutron and muon source, the UK’s centre for studying the properties of materials on the atomic scale, conservationists are trying to establish if material in a series of swords featured in the prestigious Wallace Collection in London are made from the crucible steel, or are replicas.

The ongoing research is expected to help them to accurately catalogue what amounts to over a thousand items of armoury. This is the latest research to benefit from a well established UK-Italy partnership that for the last 30 years has seen the development of neutron instruments designed especially for cultural heritage studies at the ISIS facility in Oxfordshire.

Sir Richard Wallace, an English art collector in the 19th century, built up a large collection of Indo-Persian swords which are now housed at the Wallace Collection in London.

Dr Alan Williams and Mr David Edge from the Wallace Collection are working with Dr Francesco Grazzi from the Italian National Research Council (CNR) to solve the mystery surrounding these swords. Using neutrons on the ISIS instrument known as INES, they are investigating the quality and type of steel used in a selection of sixteen Indo-Persian swords from the Wallace Oriental Armoury Collection. Due to its non-destructive nature, neutron scattering provides the perfect solution for studying ancient swords and detecting hidden patterns on the blades.

This is just one study made possible by a long-standing working relationship between STFC’s ISIS Neutron and Muon Source and the Italian National Research Council (the CNR).

"INES and the STFC-CNR collaboration, along with other collaborations with international facilities are crucial for the scientific Italian community as there are no neutron sources in Italy," said Dr Antonella Scherillo, ISIS instrument scientist for INES.

Speaking following a ceremony in Italy to mark the 30th anniversary Dr Andrew Taylor, Executive Director from STFC, said: "This is a flagship European partnership of which both Italy and the UK can be proud. The mutual exchange of scientific and technical expertise has provided ISIS users with a set of world-leading scientific instruments and led to world class science results covering everything from new methods of drug delivery to cultural heritage applications. We look forward to the continued success of this partnership."
Blood-based biomarkers for detecting Alzheimer’s Disease (AD)

The invention relates to a group of proteins found in peripheral blood that function as a biomarker panel for detection and prediction of Alzheimer’s disease. Alzheimers is the commonest form of dementia, which affects over 36 million people worldwide and costs health and social services more than cancer and cardiac disease combined. Disease modification therapies are being developed and will almost certainly be dependent on biomarkers for early detection in both drug development and clinical utility phases. Currently, biomarkers including CSF analysis of proteins and PET imaging are becoming an essential component of clinical trials and are used increasingly in clinical practice. However, both approaches have limitations, which are relatively invasive and not universally available. As a consequence, there is considerable value in blood as a source of biomarkers for neurodegenerative conditions such as AD.

A diagnostic for dementia that is fit for purpose
Despite the increasing prevalence of dementia in an aging society, current diagnostic methods are limited. Early diagnosis has become a priority in the UK and other countries and in clinical trials early detection and measurement is a critical component of the disease modification drug development process. Current clinical practice of diagnosis using psychometric tests and structural brain imaging, best trials practice using CSF markers of amyloid and tau and PET imaging of amyloid have considerable limitations. These include cost, limited access, effectiveness especially in the early stages and invasiveness and discomfort for the patient. Better biomarkers are needed for diagnosing cognitive decline, particularly those that can identify AD at very early stages of the disease and have some prognostic value.

A protein signature that is easy to obtain and easy to quantify
Researchers in the department of medicine at Oxford University have identified a blood-based protein signature that exhibits increased levels in patients experiencing cognitive decline. The proteins can be used to quantitatively measure the onset of Alzheimer’s disease. The key component of the protein signature includes the Dickkopf (DKK) family of proteins, while others, such as clusterin can be used in conjunction with the DKK proteins. These proteins have been shown to be central to the pathogenic process of Alzheimer’s disease. The elegance of the method is in the possibility to quantify the biomarker proteins by existing simple antibody or mass-spectrometry based assays.

Advancing the nature of Alzheimer’s detection and prognosis
Early diagnosis of Alzheimer’s is a realistic prospect with this biomarker set, similarly important to its potential use as a prognostic tool, both of which would pose clear benefits to the medical community. We anticipate the biomarkers being particularly attractive as a companion diagnostic for measuring the efficacy of novel therapeutics, whereby they may be used to measure patient response to treatment with high sensitivity. As such, the method is particularly complimentary to any trials or programs involving the treatment of cognitive decline. The method is also suited to the production of a kit that includes all the necessary components to detect levels of the biomarkers in the blood.

Patent
A patent application covering the use of a DKK family-based protein signature found in the blood as a biomarker for cognitive decline is currently in PCT phase (PCT/GB2014/052149). Isis Innovation would like to speak to companies interested in developing this method.

http://isis-innovation.com/about/contact-us/#contact-form?referer=13594
Ice matters

The satellite age has revolutionised our understanding of Earth, giving us accurate information to help critical agreements on climate change such as at the current COP21 conference in Paris. Diminishing polar ice is one of the most visible indicators of change, but how much have we learnt over the last decades?

Spectacular feats of polar exploration actually go back to the 1800’s when early expeditions offered a rare glimpse into these icy regions. However, it is only relatively recently that we have understood the importance of ice in the climate system and have evidence that these frozen expanses are becoming a casualty of climate change.

Arctic sea ice, for example, is particularly sensitive to our warming climate and is often cited as a barometer of global change. Ice that forms and melts in the ocean only has a very tiny effect on sea level – the melting of ice sheets and glaciers that overlie land are the main causes of sea-level rise, along with the thermal expansion of the water.

However, sea ice does affect how much sunlight is reflected back out to space, it affects global heat transport by insulating the relatively warm ocean from the cold polar atmosphere, and it significantly influences ocean circulation patterns, which play a role in our global climate system. Because of the remoteness, extreme cold and hostile conditions of the Arctic, it is impossible to acquire frequent all-weather measurements any other way than from space.

Each year, the polar oceans experience the formation and then melting of vast amounts of sea ice. Around the North Pole, an area roughly the size of Europe melts every summer and then freezes again the following year. Scientists have been using radar measurements from satellites such as ERS-1, ERS-2 and Envisat for more than 25 years to study this seasonal change in ice extent. They have found that since 2000 the area of the Arctic Ocean covered by ice in the summer has reduced drastically.
For example, in September 2007, it was discovered that the sea ice had shrunk to its lowest level since satellite measurements began, opening up the Northwest Passage, a long-sought shortcut between Europe and Asia that had been historically impassable.

The extent of ice reached the lowest on record in September 2012. However, the area of the ocean covered by ice is only part of the story. It is also essential to have measurements of the thickness of the ice to work out how the actual volume is changing. Launched in 2010, ESA’s CryoSat satellite has shed new light on diminishing polar ice.

ESA’s CryoSat mission manager, Tommaso Parrinello, said, “By measuring the height of the ice, both of that floating in the polar oceans and of the vast ice sheets covering Greenland and Antarctica, CryoSat is providing essential information on how the ice thickness is changing. It was difficult to assess the volume of Arctic sea ice before CryoSat. For example, we now know that between 2010 and 2012 the volume of summer sea ice decreased by around 10%. Measurements made during October and November 2014 showed that the volume stood at about 10 300 cubic kilometres, a small drop compared to 2013’s 10 900 cubic kilometres.”

With the Paris COP21 meeting at the forefront of climate discussions, the animation gives an idea of how much ice there was floating in the Arctic in October this year, in terms of ice cubes the size of the Eiffel Tower.

It would take 0.005 cubic kilometre of ice to encase one Eiffel Tower, 1 cubic kilometre would encase 192 Eiffel Towers and, hence, 8000 cubic kilometres of ice to encase 1.7 million towers. This is roughly about the same volume of ice that was floating in the Arctic Ocean at the beginning of November 2015.
First STFC supercomputing conference a great success

The UK’s newest supercomputing conference and exhibition, Computing Insight UK, was held this week at the Ricoh Arena in Coventry. Organised by the Science and Technology Facilities Council’s (STFC) Scientific Computing Department and Hartree Centre, the event attracted delegates from all parts of Britain as well as international exhibitors and sponsors.

“I believe this is the only UK conference that’s completely focused on High Performance Computing, Big Data Analytics and Cloud Computing,” said Dave Cable, one of the organisers from STFC’s Daresbury Laboratory. “It brings together technology providers in these markets with a community of expert users and people responsible for the procurement and running of systems, in an environment where they can easily network and share information.”

More than 200 delegates and 50 industry exhibitors participated in this first Computing Insight UK (CIUK) conference.

CIUK 2015 evolved from the Machine Evaluation Workshop, a technical workshop which ran for 25 years. Its original focus was entirely on academia and had a small number of exhibitors who would make available their systems for delegates to try out. By running their own codes in the week before or after the event, delegates could then see which system worked best for them.

“It was born out of a time when people were just starting to buy these systems and needed a forum to understand the technology,” said Cable. “Nowadays the range of hardware is less diverse and people have more experience of using it so the focus has shifted to looking at partnerships between institutions, between academia and the commercial world, and between academia and technology providers.”

The event has attracted a solid base of clients from academia, with delegates from 26 UK universities attending CIUK 2015. For future years the organisers would also like to see more commercial organisations taking advantage of this event, which can help to create partnerships and add value to businesses.

Colin Bridger from Mellanox Technologies, one of the event’s sponsors, said, “The conference is a great opportunity to meet all of our end-users in one place, and continue building the relationships with our partners…It’s been a tremendous success.”
There was a good mix of presentations from both academics and industry representatives. These included using data analytics to predict where archaeological sites and burial grounds are likely to be, saving on time and costly excavations for construction and civil engineering companies; the challenges of merging HPC and cloud technologies to deliver a High Performance Cloud Computing service, and the impact that is now having on biomedical research; and how industries use high performance computing in their innovation plans.

Richard Noble from the Bloodhound Project enthused and inspired delegates with his account of the big data challenges involved in developing a supersonic car, and his vision of it reaching 1,000 mph in 2016.

Data that can be accessed in real time is a proven stimulus for schools and enthusiasts so the Bloodhound team has installed more than 300 sensors and three video streams which will transmit live through a single channel from the car. Noble said that the Hakskeen Pan desert track in South Africa, where the Bloodhound car will attempt the land speed record, is now one of the most connected regions on Earth. “It now has better 4G than we have in London!” he said.

Noble and his team are working with the UK Government to inspire the next generation of engineers and scientists. They have set up an education programme that now involves 6,000 schools in 220 countries. Interest in the Bloodhound Project in the UK has led to the demand for mechanical engineering courses to exceed places available at one university.
Developing new forensic techniques with the help of neutrons

New forensic techniques to help with the positive identification of unknown victims based on their burned skeletal remains are being developed by bone experts working beside neutron scientists.

The research, which took place at STFC’s ISIS neutron and muon source, could also help shed light on archaeological discoveries of bones, both human and animal.

When human remains are found, some of the first questions asked are ‘what was the sex and age at death of the individual?’ By measuring the bones and matching their parameters to those of a missing person, forensic anthropologists may help forensic pathologists to make a positive identification.

However, if bones are subjected to burning they change in structure and often shrink in size. This poses a problem when establishing the biological profile of an individual with conventional forensic techniques, some of which are based on metrics of unburned bone. As a result, they cannot be directly applied to burned bones in a reliable manner.

Scientists from the University of Coimbra in Portugal are trying to solve this problem by investigating the changes in the atomic structure of human bones Credit: STFC
Developing new forensic techniques with the help of neutrons

bones, such as the degree of crystallinity, before and after burning. Using the ISIS instrument, MAPS, they have been able to understand the effects of burning on bones, by analysing the structure of unburned bone and comparing it to the structure of burned samples from the same skeleton and type of bone.

From the neutron scattering data, combined with other spectroscopic measurements such as infrared and Raman, scientists expect to be able to derive an accurate relationship that will allow them to return bones to their pre-burned dimensions, enabling the application of metric references obtained from unburned skeletons. As a result, the biological profile would then be estimated with much more confidence.

“We are at present quite confident [in this study],” says Prof Maria Paula Marques, from the University of Coimbra. “The data we have got for the bones burned at 900°C matched very highly, almost 99%, to the hydroxyapatite reference, which means it’s a completely clean spectra from which we can get important and accurate relationships.”

The bones used in the study were taken from unclaimed skeletons from public cemeteries, which form part of the 21st Century Identified Skeletal Collection at the University of Coimbra. Looking at the humerus and femur from three different skeletons, the team experimentally burned the bones under controlled conditions, at 500, 700 and 900°C to see how heat-induced changes in bone structure vary at different temperatures.

The bones were then powdered before submitting them to the neutron beam at ISIS to investigate how burning affects the crystal structure of bioapatite within the bone.

Along with forensic applications, results from this research will also increase understanding of bone in archaeological settings. Just like nowadays, cremation was a very popular funerary practice in the past and burned skeletal remains are often found in archaeological contexts.

“Bone is a remarkable material that’s ubiquitous across millions of species. It’s a biological mop that can soak up so much of the organism when

it’s alive but also the environment when an organism dies,” commented Professor Phil Manning, from the University of Manchester who is also an STFC Fellow. “I think this work will have huge implications for understanding burial environments in the past as well as less savoury events in our more recent past where human remains have been altered through various processes,” Manning added.

This work was completed by Maria Paula Marques and Luis Batista de Carvalho, Research Unit ‘Molecular Physical Chemistry’, Faculty of Science and Technology, University of Coimbra, Portugal in collaboration with David Gonçalves, CIAS – Research Centre for Anthropology and Health, University of Coimbra, Portugal.

Research date: November 2015

Further Information

This study has featured on BBC News and the BBC World Service Science in Action Podcast (approx. 11:35min)
Borrow the Moon

You can borrow samples of Moon rock and Meteorites, in STFC’s Loan Scheme.

Valuable samples of moon rock and soil were brought back to Earth by NASA’s Apollo astronauts. STFC is the only authorised source for the loan of this precious material to educational or scientific organisations within the United Kingdom. Five educational packages are available free of charge (including special security delivery/collection) for short term loans of lunar samples and meteorites.

The samples were collected during NASA’s manned space missions to the Moon in the late 1960s and early 1970s. During these missions the Apollo astronauts brought back to earth 382 kilograms of lunar material. NASA decided to use a small proportion of the rock and soil to develop lunar and planetary sciences educational packages.

Please give us at least four months’ notice for booking the lunar samples.

How to Apply

For further information and how to apply for a loan, read the security rules for borrowers and then view the frequently asked questions.

The application form will not fully display until you have agreed to the security rules.

Key facts

About the samples

- The lunar samples are presented in encapsulated discs and thin sections for viewing through a microscope*
- They are of interest to everyone from a young child to a geology student
- Each package also contains different examples of meteorites, put together by the Natural History Museum, NASA and STFC
- Some sets have sectioned samples, and every set has chunk-sized pieces of meteorite that can be handled
- Comprehensive support material is included with each loan. Hundreds of schools, colleges, universities, museums and astronomical societies throughout the UK have enjoyed the samples since the scheme began

* The thin sections are only available to University level students.
There are five educational packages available to borrow from STFC.

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Contacts
Public Relations Service
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Exploring the physics of a chocolate fountain

A mathematics student based at University College London (UCL) has worked out the secrets of how chocolate behaves in a chocolate fountain, answering the question of why the falling ‘curtain’ of chocolate surprisingly pulls inwards rather than going straight downwards. The results are published in European Journal of Physics.

“Chocolate fountains are just cool, aren’t they,” says Adam Townsend, an author on the paper, which is based on his MSci project. “But it’s also nice that they’re models of some very important aspects of fluid dynamics.”

The conundrum of the converging curtain was solved by looking at some classic work on ‘water bells’. “You can build a water bell really easily in your kitchen,” says Dr Helen Wilson, the other author of the paper, and supervisor during Townsend’s MSci project at UCL Mathematics. “Just fix a pen vertically under a tap with a 10p coin flat on top and you’ll see a beautiful bell-shaped fountain of water.”

The physics of the water bell is exactly the same as the falling curtain of chocolate, and the reason the chocolate falls inwards turns out to be primarily surface tension.

They also looked at the flow up the pipe to the top of the fountain, and the flow over the plastic tiers that form the distinctive chocolate fountain shape. “Both the chocolate fountain and water bell experiments are surprisingly simple to perform,” Wilson continues. “However they allow us to demonstrate several aspects of fluid dynamics, both Newtonian and non-Newtonian.”

The researchers were also pleased to see that their work allowed them to engage with the public.

“‘It’s serious maths applied to a fun problem,” Townsend continues. “I’ve been talking about it at mathematics enrichment events around London for the last few years. If I can convince just one person that maths is more than Pythagoras’ Theorem, I’ll have succeeded. Of course, the same mathematics has a wide use in many other important industries – but none of them are quite as tasty as chocolate.”

Townsend and Wilson don’t consider the chocolate fountain licked; there is a lot more to learn from looking at the way the curtain changes over time.

“This was only an undergraduate project – modelling the chocolate fountain completely would need a lot more detail. Thankfully, individual strands – like the screw-pump flow up the pipe – have applications well beyond chocolate, and international teams are working on them now,” Wilson says.

Townsend is now finishing a PhD investigating suspensions of solid particles in fluids, supervised by Wilson in the Department of Mathematics at UCL.
IPS Grants awarded September 2015

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Professor Paula Chadwick Durham University joint with Professor Timothy Greenshaw:
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Dr Graeme Burt Lancaster University joint with Dr Hywel Owen The University of Manchester:
Probe: Proton Beam Extension for Imaging and Therapy

Professor Ruben Saakyan University College London:
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External Innovations and Innovations Club

The External Innovations team manages the activities that aim to realise the impacts and benefits that flow from STFC’s investments in science and technology towards commercialisation through one to one brokering, events and a range of funding schemes.

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The Innovations Club newsletter contains a selection of articles drawn from our partner organisations that we think you will find interesting. We welcome your comments innovationsclub@stfc.ac.uk