# UK Nuclear Activity

July 2016 Issue 37

In this issue,



Newsletter archive: http://npg.dl.ac.uk/OutreachNewsletter/index.html

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***1. Nuclear Physics Publications for July****

If you are publishing a paper that you think would be of media value please let Wendy Ellison wendy.ellison@stfc.ac.uk , STFC Press Officer, know. She can help with press releases and publicity. If you get in touch with her before publication she can also get material ready in advance for the day of publication.

Rep. Prog. Phys. 79, 076301 (2016) http://iopscience.iop.org/article/10.1088/0034-4885/79/7/076301
Review of metastable states in heavy nuclei
G D Dracoulis[1,4], P M Walker[2] and F G Kondev[3]
*Published 31 May 2016

SSR 97, 361 (2016) http://www.ase.org.uk/journals/school-science-review/issue-contents/
It seems our source has run out of alphas! The odd behaviour of some americium-241 cup sources
Ralph Whitcher, Robert D. Page[+] and Peter R. Cole
*Published June 2016
[+]For more information contact Robert Page rdp@ns.ph.liv.ac.uk

Phys. Rev. Lett. 117, 012501 (2016) http://journals.aps.org/prl/abstract/10.1103/PhysRevLett.117.012501
First Measurement of Several β-Delayed Neutron Emitting Isotopes Beyond N=126
R. Caballero-Folch[1,2], C. Domingo-Pardo[3,*], J. Agramunt[3], A. Algora[3,4], F. Ameil[5], A. Arcones[5], Y. Ayyad[6], J. Benlliure[6], I. N. Borzov[7,8], M. Bowry[9], F. Calviño[1], D. Cano-Ott[10], G. Cortés[1], T. Davinson[11], I. Dillmann[2,5,12], A. Estrade[5,13], A. Evdokimov[5,12], T. Faestermann[14], F. Farinon[5], D. Galaviz[15], A. R. García[10], H. Geissel[5,12], W. Gelletly[9], R. Gernhäuser[14], M. B. Gómez-Hornillos[1], C. Guerrero[16,17], M. Heil[5], C. Hinke[14], R. Knöbel[5], I. Kojouharov[5], J. Kurcewicz[5], N. Kurz[5], Yu. A. Litvinov[5], L. Maier[14], J. Marganiec[18], T. Marketin[19], M. Marta[5,12], T. Martínez[10], G. Martínez-Pinedo[5,20], F. Montes[21,22], I. Mukha[5], D. R. Napoli[23], C. Nociforo[5], C. Paradela[6], S. Pietri[5], Zs. Podolyák[9], A. Prochazka[5], S. Rice[9], A. Riego[1], B. Rubio[3], H. Schaffner[5], Ch. Scheidenberger[5,12], K. Smith[5,21,22,24,25],

*Also including missed publications from previous months.

E. Sokol[26], K. Steiger[14], B. Sun[5], J. L. Taín[3], M. Takechi[5], D. Testov[26,27], H. Weick[5], E. Wilson[9], J. S. Winfield[5], R. Wood[9], P. Woods[11], and A. Yeremin[26]
*Published 29 June 2016

Phys. Rev. C 93, 065807 (2016) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.93.065807
Coulomb dissociation of $^{20,21}$N
Marko Röder *et al.* (R3B Collaboration)
*Published 30 June 2016

Chemosphere 154, 55 (2016) http://www.sciencedirect.com/science/article/pii/S0045653516303721
Soil radioactivity levels, radiological maps and risk assessment for the state of Kuwait
N. Alazemi[a,b], A.D. Bajoga[a,c,d,], D.A. Bradley[a], P.H. Regan[a,d], H. Shams[a,b]
Published July 2016

J. Phys. G: Nucl. Part. Phys. 43, 073002 (2016)
http://iopscience.iop.org/article/10.1088/0954-3899/43/7/073002
P A Butler
Published July 2016

Phys. Rev. C 94, 014307 (2016) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.94.014307
Identification of the $J^{\pi}=1^{-}$ state in $^{218}$Ra populated via α decay of $^{222}$Th
E. Parr[1,2,*], J. F. Smith[1,2], P. T. Greenlees[3], M. Smolen[1,2], P. Papadakis[3], K. Auranen[3], R. Chapman[1,2], D. M. Cullen[4], T. Grahn[3], L. Grocutt[1,2], A. Herzáň[3], R.-D. Herzberg[5], D. Hodge[4],U. Jakobsson[3,6], R. Julin[3], S. Juutinen[3], J. Konki[3], M. Leino[3], C. McPeake[5], D. Mengoni[7], A. K. Mistry[5], K. F. Mulholland[1,2], G. G. O'Neill[5], J. Pakarinen[3], J. Partanen[3], P. Peura[3], P. Rahkila[3],P. Ruotsalainen[3,8], M. Sandzelius[3], J. Sarén[3], M. Scheck[1,2], C. Scholey[3], J. Sorri[3], S. Stolze[3],M. J. Taylor[4], and J. Uusitalo[3]
Published 12 July 2016

Phys. Rev. C 94, 014320 (2016) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.94.014320
Evidence for a 3.8 MeV state in $^{9}$Be
R. Smith[1,*], C. Wheldon[1], M. Freer[1], N. Curtis[1], Tz. Kokalova[1], S. Almaraz-Calderon[2], A. Aprahamian[2], N. I. Ashwood[1], M. Barr[1], B. Bucher[2], P. Copp[3], M. Couder[2], X. Fang[2], G. Goldring[4], F. Jung[2], S. R. Lesher[3], W. Lu[2], J. D. Malcolm[1], A. Roberts[2], W. P. Tan[2], and V. A. Ziman[1]
Published 25 July 2016

Phys. Rev. Lett. 117, 052501 (2016) http://journals.aps.org/prl/abstract/10.1103/PhysRevLett.117.052501
Radii and Binding Energies in Oxygen Isotopes: A Challenge for Nuclear Forces
V. Lapoux[1,*], V. Somà[1], C. Barbieri[2], H. Hergert[3], J. D. Holt[4], and S. R. Stroberg[4]
Published 27 July 2016

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***2. News to Report***

**a. Report from the 86th NuPECC meeting, June 17-18 2016**

NuPECC met for a day and a half in Uppsala, Sweden. It was a good meeting - despite the rain!

As usual, the first half-day focussed on the science programme in the host country. Sweden, with a population of about 10m people, has among the highest fractional spends on science of all countries. While there is no national nuclear physics facility, their main focus is GSI and FAIR, but there are hopes to develop a fundamental physics programme at the European Spallation Source and at the MAX-IV x-ray light source, both in Lund. The morning featured in-depth presentations of the on-going Swedish nuclear structure, theory and hadron physics work. The remainder of the meeting was dominated by discussion of the Long Range Plan, but also included updates on the Horizon 2020 Framework Programmes ENSAR2 and Hadron Physics Horizon, and on the and ECT*.

**NuPECC Long Range Plan (LRP)** The Long Range Plan is beginning to take shape. Updates were presented from each of the six working groups (essentially, one working group per major theme of work). Final drafts are due before the next NUPECC meeting in October 2016, and a Town Meeting to present and discuss the overall document is scheduled to be held in Darmstadt, 11-13 January 2017. As the writing is developing, topics such as

boundaries and overlaps in content were discussed, as were cross-theme issues. One such item that became clear was the need for a strategy for more computation for theory, as this was raised by several groups. The US long range plan has recently been completed, and it was noted that this had as its main relevant recommendations: to complete and exploit existing major US projects and maintain existing user facilities; the construction of an Electron Ion Collider to be the highest priority after FRIB construction is completed; increased investment in small and mid-scale projects; and investment in computation for nuclear theory. The US plan foresees no major increase in DOE budget, rather a 1.6% annual increase above inflation, and hence proposed project investment is sequenced. It's thought that the NSF is likely to increase funds for equipment as some operating costs will reduce.

**ENSAR2** European Nuclear Science and Applications Research 2 started March 1st 2016. It total it involves ~3000 scientists and engineers. Its core aim is to provide access to eleven world-class large-scale facilities: GANIL-SPIRAL2 (F), joint LNL-LNS (I), CERN-ISOLDE (CH), JYFL (FI), ALTO (F), GSI (D), KVI-CART (NL), NLC (P), IFIN-HH/ELI-NP (RO) and to the theoretical physics facility: ECT* (I). It will last 4 years with a total budget of 10 M€. A new aspect is transnational access (TNA) for non-EU persons based on agreements.

**HADRON PHYSICS HORIZON** The case has been submitted and the outcome is now awaited. While the proposal is dominated by Germany and Italy, there are four UK institutions involved who are asking for ~1% of the 10 M€ budget. Funds for ECT* are also included in the bid.

**ECT*** A total of 22 proposals have so been made for meetings or workshops in 2017, with further submissions still welcomed. These will be considered by the ECT* Board. Discussions with the Foundation Bruno Kessler has resulted in an agreement to offset some expected budget reductions in 2017, which will allow a senior researcher to be recruited in low energy nuclear theory.
*Contribution by Paul Nolan P.J.Nolan@liverpool.ac.uk (Liverpool) and Alexander Murphy a.s.murphy@ed.ac.uk (Edinburgh)*

**b. Rutherford Medal and Prize for 2016**
Professor John Simpson, Head of STFC's Nuclear Physics Group, has been awarded the prestigious Rutherford Medal and Prize for 2016 by the Institute of Physics (IOP) for his outstanding contributions to nuclear physics. The Rutherford Medal and Prize is awarded every two years to an outstanding nuclear physicist, and Professor Simpson now joins the ranks of other distinguished recipients of this accolade, who include Nobel Prize winners Professor Peter Higgs, Sir John Cockcroft and Professors Aage and Niels Bohr. Professor Simpson, who is also a visiting professor at the University of Liverpool, has received the award for his outstanding leadership in the development of new gamma ray detector technologies, which have transformed the field of nuclear spectroscopy. He is also recognised for his significant contributions to our understanding of the structure of atomic nuclei through his experimental nuclear physics research within the UK and internationally.
Professor Simpson said: "I'm delighted and honoured to be recognised by the Institute of Physics with this award. I feel very grateful to those I have worked with, at STFC and across the UK, and through international collaborations, all of which are playing their part in revolutionising what we understand about nuclear structure today."
Professor Simpson has played a lead role in a number of international collaborations, most notably in the formation of a 12 country collaboration to build the AGATA detector, which led to unprecedented insights into nuclear structure. He is also exploiting the instrumentation and technical advances resulting from these collaborations in areas of societal importance, particularly medical imaging, security systems, waste and environmental monitoring.
Professor Susan Smith, Head of STFC's Daresbury Laboratory, said: "I'm thrilled that Professor Simpson has been awarded the Rutherford Award and Prize by the Institute. This is well-deserved recognition of his outstanding scientific work that has contributed significantly to the health and vitality of world-leading nuclear physics research over the past four decades, and for his inspirational contributions that are revolutionising what we understand about nuclear structure today."

The full list of award winners can be found on the Institute of Physics website.
*Contribution from http://www.stfc.ac.uk/news/rutherford-medal/ by Wendy Ellison wendy.ellison@stfc.ac.uk (STFC Daresbury)*

**c. L'Oreal UNESCO for Women in Science Fellowship Programme**

Dr Tzany Kokalova Wheldon from the University of Birmingham has been highly commended at the L'Oreal UNESCO For Women in Science Fellowship programme receiving a prize with £1000 bursary.
The programme, founded by L'Oreal and UNESCO, is designed to promote and highlight the critical importance of ensuring greater participation of women in science.
Dr Kokalova Wheldon was short-listed from a group of over 400 candidates and her proposed research project entitled, 'Spinning nuclei to understand element formation', was well received by the nine-member panel, earning her the Highly Commended award.
Tzany said, "It was a great honour to be short-listed amongst some of the best female scientists in the UK. The bursary will allow me to pursue my research and I'd like to thank the panel for their consideration". The L'Oreal UNESCO awards provide practical help to promising scientists to continue to undertake research in their chosen fields.

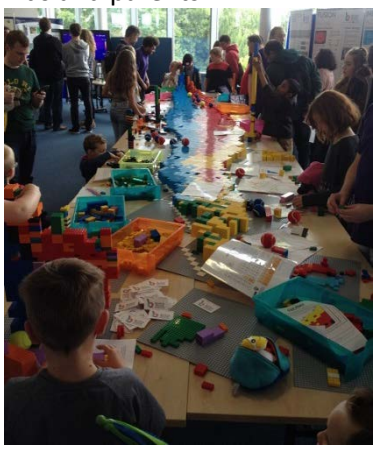

*Left to right: Dr Tatiana Habruseva, Dr Nathalie Vriend and Dr Tzany Kokalova Wheldon receiving their awards.*
*Contribution by Carl Wheldon c.wheldon@bham.ac.uk (Birmingham)*

**d. Daresbury Open Week**
http://www.stfc.ac.uk/news/dl-open-week/

**Binding Blocks at DOW**

On Saturday 9th July, 10 members of the Binding Blocks team from the University of York showcased nuclear physics at Daresbury Laboratory's public open day.
The event was open to the public from 8:30am – 5:30pm, with a preliminary count of ~7500 people attending the exhibitions across the Daresbury site.

By midday, the chart was completed by lots of enthusiastic children and adults alike. During the afternoon, parts of the chart was taken apart and rebuilt while discussing nuclear physics, including fusion, medical applications and fission. The Daresbury event was the first time the full chart was built at a public event, using roughly 27000 bricks! Feedback from parents and guardians, as well as attendees with in depth knowledge of physics, was very positive. Clearly the kids were very interested, and throughout the morning the whole circumference of the chart were packed with excited kids and parents.



The purpose of this three-dimensional chart is to explain nuclear phenomena to the general public and schools. This ranges from young children, whom are very enthusiastic about the LEGO, to visitors who are young at heart. The chart has a variety of colours to explain different properties. The black blocks represent stable nuclei, yellow alpha decay, red beta+ decay, orange proton decay, light blues beta- decay and dark blue (at the beginning) neutron decay, with the height of the blocks representing the available energy per kg material (in units of 25TJ/kg).

**Medical Teaching and Research Laboratory**

On the public open day of the Daresbury Open Week Samantha Colosimo and her student Lucy McAreavey (Liverpool), gave

tours of the MTRL (Medical Teaching and Research Laboratory) along with Ian Lazarus and Janet Groves. Around 450-500 people had a tour of the facility and saw the SPECT/CT medical scanner (pictured below with Samantha and Lucy) that is jointly operated by Liverpool and STFC Daresbury for the Medical Physics programmes at Liverpool.

Members of the public got a close up view of a GE Hawkeye Infinia scanner and were able to experience the basics of its operation excluding the radiation dose.
Samantha said "we enjoyed speaking about our research projects to the families that attended and it was really rewarding to see so many people interested in our work at the facility!"

**Nuclear Physics Masterclass**
During the Daresbury Open week Andy Boston and Paul Nolan ran a Nuclear Physics Masterclass based on gamma-ray detection. They took a series of detectors to Daresbury and supported by Marc Labiche and Christine Mills ran a series of practical sessions for over 60 Y12 students. The students used a Geiger counter and then made spectroscopic measurements using sodium iodide detectors. They investigated samples including salt, a smoke detector, a glass coloured with uranium and a Cornish rock. Once the students had their results they could then use the portable germanium detector to see a state of the art high resolution analysis of their samples. Each 40 min session started with a 10 min presentation which covered the basic atomic and nuclear physics, radioactive decay and the origins of the radioactivity that was to be measured later.

**LHC Roadshow**
Numerous nuclear and particle physicists helped to staff the LHC roadshow during the schools and public days of the Daresbury Open Week.
Almost 200 students were taken through the exhibition on the schools days. They learnt about the science behind the LHC, the safety equipment and procedures for going into the tunnel and the spin-off technologies developed as a result of building the LHC.
A huge thank you to everyone who helped bring the LHC to Daresbury.

*Contributions by John Simpson john.simpson@stfc.ac.uk (STFC Daresbury), Thomas Sanders tjs529@york.ac.uk (York), Samantha Colosimo sjc@ns.ph.liv.ac.uk (Liverpool), Paul Nolan P.J.Nolan@liverpool.ac.uk (Liverpool) and Elizabeth Cunningham elizabeth.cunningham@stfc.ac.uk (STFC/Surrey)*

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***3. Outreach Activity***

**Nuclear Physics Headstart Summer School**
The Nuclear Physics Group from the School of Physics and Astronomy at The University of Manchester hosted another Nuclear Physics Headstart Summer School for 40 (25 girls) sixth form pupils in July. The four days of activities included undergraduate level lectures, experimental and simulation labs plus visits to Daresbury Laboratory and Jodrell Bank. The visit to Daresbury included a tour of the EMMA and ALICE facilities.
We are very grateful to Wendy Cotterill and all the staff at the lab for making the pupils feel so welcome and answering all their questions.

Preparations are already underway for next year's Summer School.
*Contribution by John Roberts j.w.roberts@manchester.ac.uk (Manchester)*

**Building Blocks**
In addition to the Daresbury event, we have used the chart at several other events in the last month. On the 24th and 25th June, our partial Binding Blocks chart featured as part of the University of York Open day for the Physics Departments stall, attended by prospective University students. On the 27th June, the full chart was built with enthusiastic physics students attending the Schools Physicists of the Year Awards at University of York, organised by the Ogden Trust. On the 28th June part of the chart made its way to the Big Bang Fair at the Doncaster racecourse, attended by Y10 students and above, and on 12th July the chart was built with two separate groups of students from across the country for a widening participation event.

**Electromagnetic spectrum workshop at the Bishop of Winchester Academy**
On 12th July Chantal Nobs ran a "Physics of Light" workshop for over 200 year 7 students at the Bishop of Winchester Academy. The workshop is designed to help students gain a better understanding of what the electromagnetic spectrum is, and its applications in the real world, by solving a murder mystery. The students are provided with a laser, an infrared torch and an ultraviolet torch to search for clues and identify which of the three suspects they believe committed the murder. This is the second time Chantal has provided this workshop, the first time was with a group of 60 year 6 students at Langley Green Primary school. The students provided lots of positive feedback at both of these events:
"The activities were quite fun. I now enjoy science a little more." – from one of the year 7 students.
"I loved it, it was one of the best days of my life" – from one of the year 6 students.
*Contribution by Chantal Nobs*
c.nobs@brighton.ac.uk (Brighton)

**Guest speaker at the UTC@Harbourside STEM College first prize giving evening**
On 21st July Chantal Nobs attended the first prize giving evening at the UTC@Harbourside College as an invited speaker to give an inspirational speech to the initial cohort of students. The college opened in September 2015 for 14 to 18 year olds with a real interest in science, technology, engineering, maths and computing. All of the students come from very different backgrounds, and for one reason or another have found that main-stream education is not suited to them. This technical college provides an alternative route to gaining GCSE and A-level qualifications, by undertaking real projects set by employers to gain real experience of work and develop the skills that they need to succeed. Chantal shared with the students her own experiences of the challenges, benefits and opportunities associated with pursuing a career in STEM, hoping to inspire each student to have the confidence to continue down the STEM path.

*Contribution by Chantal Nobs*
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**4. Media Interactions**

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