UK Nuclear Activity

July 2014 Issue 13

In this issue,

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

Nuclear Physics Public Engagement Website: www.stfc.ac.uk/NuclearPhysicsForYou

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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.

J. Radioanal. Nucl. Chem. 300, 1253 (2014) http://link.springer.com/article/10.1007%2Fs10967-014-3029-x
Monte Carlo characterisation of a Compton suppressed broad-energy HPGe detector
R. Britton, J. L. Burnett, A. V. Davies, P. H. Regan
*Published June 2014

Nucl. Data Sheets, 120, 12 (2014) http://www.sciencedirect.com/science/article/pii/S0090375214004463
Total Absorption Study of Beta Decays Relevant for Nuclear Applications and Nuclear Structure
A. Algora[a,b], E. Valencia[a], J.L. Taín[a], M.D. Jordan[a], J. Agramunt[a], B. Rubio[a], E. Estevez[a], F. Molina[a], A. Montaner[a], V. Guadilla[a], M. Fallot[c], A. Porta[c], A.-A. Zakari-Issoufou[c], V.M. Bui[c], S. Rice[d], Zs. Podolyák[d], P.H. Regan[d], W. Gelletly[d], M. Bowry[d], P. Mason[d], G.F. Farrelly[d], J. Rissanen[e], T. Eronen[e], I. Moore[e], H. Penttilä[e], J. Äystö[e], V. Eloma[e], J. Hakala[e], A. Jokinen[e], V. Kolkinen[e], M. Reponen[e], V. Sonnenschein[e], D. Cano-Ott[f], T. Martínez[f], E. Mendoza[f], A.R. Garcia[f], M.B. Gomez-Hornillos[g], V. Gorlychev[g], R. Caballero-Folch[g], F.G. Kondev[h],
*Published June 2014

J. Nucl. Science Technol. http://www.tandfonline.com/doi/full/10.1080/00223131.2014.929985
Recommended decay data and evaluated databases – international perspectives
A.L. Nichols[ab*]
*Published 23 June 2014

*Also including missed publications from June.

Phys. Rev. C 89, 064314 (2014) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.89.064314
Fast-timing lifetime measurements of excited states in ^{67}Cu
C. R. Niţă[1,2,*], D. Bucurescu[1], N. Mărginean[1], M. Avrigeanu[1], G. Bocchi[3,4], S. Bottoni[3,4], A. Bracco[3,4], A. M. Bruce[5], G. Căta-Danil[1], G. Coló[3,4], D. Deleanu[1], D. Filipescu[1], D. G. Ghiţă[1], T. Glodariu[1], S. Leoni[3,4], C. Mihai[1], P. J. R. Mason[6,7], R. Mărginean[1], A. Negret[1], D. Pantelică[1], Z. Podolyak[6], P. H. Regan[6], T. Sava[1], L. Stroe[1], S. Toma[1], C. A. Ur[8], and E. Wilson[6]
*Published 25 June 2014

Phys. Rev. Lett. 113, 012502 (2014) http://journals.aps.org/prl/abstract/10.1103/PhysRevLett.113.012502
Evidence for Triangular $\mathcal{D}_{3h}$ Symmetry in ^{12}C
D. J. Marín-Lámbarri[1], R. Bijker[2], M. Freer[1], M. Gai[3,4], Tz. Kokalova[1], D. J. Parker[1], and C. Wheldon[1]
*Published 30 June 2014

Comput. Phys. Commun. 185, 2195 (2014) http://dx.doi.org/10.1016/j.cpc.2014.04.008
The TDHF Code Sky3D
J.A. Maruhn[a], P.-G. Reinhard[b], P.D. Stevenson[c], A.S. Umar[d]
Published July 2014

Phys. Rev. A 90, 012102 (2014) http://journals.aps.org/pra/abstract/10.1103/PhysRevA.90.012102
Environment-induced dephasing versus von Neumann measurements in proton tunneling
A. D. Godbeer[*], J. S. Al-Khalili[†], and P. D. Stevenson[‡]
Published 2 July 2014

Phys. Rev. C 90, 014301 (2014) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.90.014301
^{19}Mg two-proton decay lifetime
P. Voss[1,2,3,*], T. Baumann[2], D. Bazin[2], A. Dewald[4], H. Iwasaki[1,2], D. Miller[1,2,†], A. Ratkiewicz[1,2,‡], A. Spyrou[1,2], K. Starosta[3], M. Thoennessen[1,2], C. Vaman[2], and J. A. Tostevin[5]
Published 8 July 2014

Phys. Rev. Lett. 113, 022702 (2014) http://journals.aps.org/prl/abstract/10.1103/PhysRevLett.113.022702
Half-Life Systematics across the N=126 Shell Closure: Role of First-Forbidden Transitions in the β Decay of Heavy Neutron-Rich Nuclei
A. I. Morales[1,*], J. Benlliure[1], T. Kurtukián-Nieto[1,†], K.-H Schmidt[2], S. Verma[1,‡], P. H. Regan[3,4], Z. Podolyák[3], M. Górska[2], S. Pietri[3,§], R. Kumar[2,5], E. Casarejos[1,¶], N. Al-Dahan[3], A. Algora[6,7], N. Alkhomashi[3,**], H. Álvarez-Pol[1], G. Benzoni[8], A. Blazhev[9], P. Boutachkov[2], A. M. Bruce[10], L. S. Cáceres[2], I. J. Cullen[3], A. M. Denis Bacelar[10], P. Doornenbal[2], M. E. Estévez-Aguado[1], G. Farrelly[3], Y. Fujita[11], A. B. Garnsworthy[3], W. Gelletly[3], J. Gerl[2], J. Grebosz[12], R. Hoischen[13], I. Kojouharov[2], N. Kurz[2], S. Lalkovski[10], Z. Liu[14], C. Mihai[15], F. Molina[6,††], D. Mücher[9,‡‡], B. Rubio[6], H. Shaffner[2], S. J. Steer[3], A. Tamii[16], S. Tashenov[2], J. J. Valiente-Dobón[17], P. M. Walker[3], H. J. Wollersheim[2], and P. J. Woods[14]
Published 11 July

Phys. Rev. C 90, 017301 (2014) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.90.017301
High-spin structure of odd-odd ^{172}Re
D. J. Hartley[1], R. V. F. Janssens[2], L. L. Riedinger[3], M. A. Riley[4], X. Wang[4,*], S. Miller[4], A. D. Ayangeakaa[5,†], M. P. Carpenter[2], J. J. Carroll[6], J. Cavey[1], C. J. Chiara[2,7,8], P. Chowdhury[9], U. Garg[5], S. S. Hota[9,‡], E. G. Jackson[9], F. G. Kondev[8], T. Lauritsen[2], M. Litz[6], W. C. Ma[10], J. Matta[5], E. S. Paul[11], E. E. Pedicini[1,§], J. Simpson[12], J. R. Vanhoy[1], and S. Zhu[2]
Published 11 July 2014

Phys. Rev. C 90, 014317 (2014) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.90.014317
Laser spectroscopy of francium isotopes at the borders of the region of reflection asymmetry
I. Budinčević[1,*], J. Billowes[2], M. L. Bissell[1], T. E. Cocolios[2], R. P. de Groote[1], S. De Schepper[1], V. N. Fedosseev[3], K. T. Flanagan[2], S. Franchoo[4], R. F. Garcia Ruiz[1], H. Heylen[1], K. M. Lynch[1,2,5], B. A. Marsh[3], G. Neyens[1], T. J. Procter[2,†], R. E. Rossel[3,6], S. Rothe[3], I. Strashnov[2], H. H. Stroke[7], and K. D. A. Wendt[6]
Published 23 July 2014

Phys. Rev. C 90, 014319 (2014) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.90.014319
States at high excitation in ^{12}C from the ^{12}C (^{3}He, ^{3}He) 3α reaction
C. Wheldon, Tz. Kokalova, M. Freer, A. Glenn, D. J. Parker, T. Roberts, and I. Walmsley
Published 24 July 2014

Phys. Rev. Lett. 113, 042502 (2014) http://journals.aps.org/prl/abstract/10.1103/PhysRevLett.113.042502
Monopole-Driven Shell Evolution below the Doubly Magic Nucleus ^{132}Sn Explored with the Long-Lived Isomer in ^{126}Pd
H. Watanabe[1,2,*], G. Lorusso[2], S. Nishimura[2], T. Otsuka[3,4], K. Ogawa[2], Z. Y. Xu[3], T. Sumikama[5], P.-A. Söderström[2], P. Doornenbal[2], Z. Li[6], F. Browne[2,7], G. Gey[2,8], H. S. Jung[9,†], J. Taprogge[2,10,11], Zs. Vajta[2,12], J. Wu[2,6], A. Yagi[13], H. Baba[2], G. Benzoni[14], K. Y. Chae[15], F. C. L. Crespi[14,16], N. Fukuda[2], R. Gernhäuser[17], N. Inabe[2], T. Isobe[2], A. Jungclaus[11], D. Kameda[2], G. D. Kim[18], Y. K. Kim[18,19], I. Kojouharov[20], F. G. Kondev[21], T. Kubo[2], N. Kurz[20], Y. K. Kwon[18], G. J. Lane[22], C.-B. Moon[23], A. Montaner-Pizá[24], K. Moschner[25], F. Naqvi[26], M. Niikura[3], H. Nishibata[13], D. Nishimura[27], A. Odahara[13], R. Orlandi[28,‡], Z. Patel[29], Zs. Podolyák[29], H. Sakurai[2], H. Schaffner[20], G. S. Simpson[8], K. Steiger[17], H. Suzuki[2], H. Takeda[2], A. Wendt[25], and K. Yoshinaga[27]
Published 25 July 2014

Phys. Lett. B 735, 112 (2014) http://www.sciencedirect.com/science/article/pii/S0370269314004109
$K^+\Lambda$ and $K^+\Sigma^0$ photoproduction with fine center-of-mass energy resolution
T.C. Jude[a,,1], D.I. Glazier[a,2], D.P. Watts[a,], P. Aguar-Bartolomé[b], L.K. Akasoy[b], J.R.M. Annand[c], H.J. Arends[b], K. Bantawa[d], R. Beck[e], V.S. Bekrenev[f], H. Berghäuser[g], A. Braghieri[h], D. Branford[a], W.J. Briscoe[i], J. Brudvik[i], S. Cherepnya[j], B.T. Demissie[i], M. Dieterle[k], E.J. Downie[b,i], L.V. Fil'kov[j], R. Gregor[g], E. Heid[b], D. Hornidge[l], I. Jaegle[k], O. Jahn[b], V.L. Kashevarov[b,i], I. Keshelashvili[k], R. Kondratiev[m], M. Korolija[n], A.A. Koulbardis[f], S.P. Kruglov[f], B. Krusche[k], V. Lisin[m], K. Livingston[c], I.J.D. MacGregor[c], Y. Maghrbi[k], D.M. Manley[d], Z. Marinides[i], T. Mart[o], M. Martinez[b], J.C. McGeorge[c], E.F. McNicoll[c], D.G. Middleton[l], A. Mushkarenkov[h], B.M.K. Nefkens[i], A. Nikolaev[e], V.A. Nikonov[f], M. Oberle[k], M. Ostrick[b], P.B. Otte[b], B. Oussena[b,i], P. Pedroni[h], F. Pheron[k], A. Polonski[m], S. Prakhov[i], J. Robinson[c], G. Rosner[c], T. Rostomyan[h], A.V. Sarantsev[e], S. Schumann[b], M.H. Sikora[a], D.I. Sober[p], A. Starostin[i], I. Strakovsky[i], I.M. Suarez[i], I. Supek[n], M. Thiel[g], A. Thomas[e], M. Unverzagt[b], D. Werthmüller[k], L. Witthauer[k], F. Zehr[k]
Published 30 July 2014

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2. News to Report

a. Notre Dame-Europe Symposium on Nuclear Science and Society. On October 27-29th 2014, the first of a series of annual meetings devoted to the applications of nuclear physics will be held at the Notre Dame London Centre. Future meetings in the series will be held at Notre Dame's campus in Indiana or at the London centre. The aim will be to discuss current trends in applied nuclear science and the primary focus in this first meeting will be on medical physics and energy applications.
Nuclear physics has a long history at Notre Dame and the originators of this series of meetings are all well known to the UK nuclear physics community. Ani Aprahamian, Umesh Garg and Michael Wiescher are old acquaintances for many of us. Notre Dame is expanding its involvement in applications with new faculty members and two accelerators devoted mainly to applications. This fits well with the increasing emphasis on applications in the UK community. Nuclear physics has always been a prolific source of applications but the work done has not always had the attention it merits. Developments such as the assessment of impact of research in the Research Excellence framework will enhance its visibility and remind us of its importance in terms of funding for nuclear physics. This series of meetings may well lay the groundwork for new collaborations and open opportunities for the UK community. Further information will be circulated to the community via the usual mailing lists.
Contribution by Bill Gelletly, w.gelletly@surrey.ac.uk (Surrey)

b. Observation of the *β*-Delayed *γ*-Proton Decay of ^{56}Zn. Alpha-, beta- and gamma-decay; we do not quite learn about them at our mother's knee but certainly every schoolboy/girl learns something about radioactivity. What they do not learn is that they may be the main modes of decay for nuclei near stability but once we move to exotic nuclei there are many other decay modes. ^{11}Li is an excellent example since it decays by βn, β2n, β3n, βt, βd and 2α +3n, ^{6}He+α + n and many other channels. As soon as we are far from stability the decay Q values are large and well above the separation energies for p-, n- and α-particles so many decay possibilities exist. As part of a programme of measurements of the beta decays of Tz =-2, -1 nuclei in the fp-shell and above, where we are comparing the measured B(GT) values with the strengths of the corresponding mirror transitions in Charge exchange processes to test how well isospin

symmetry holds, we encountered the rare decay form of beta-delayed gamma-proton emission. In the decay of ^{56}Zn there is strong beta decay to the Isobaric Analogue state (IAS) in ^{56}Zn. Normally this state, well above the separation energy for protons would decay by emitting a proton but it turns out that gamma decay competes.
A simple estimate suggests that the proton decay should be 10^3 times faster than the gamma decay. However the proton decay is isospin forbidden. Even this is not enough to explain what we see since the IAS is mixed with another state. One has to look at the microscopic structure of the states involved and the hindrance of the proton decay also depends on that. A detailed explanation awaits a full shell model calculation.
Meanwhile you can read all about it in *'Observation of the β-Delayed γ-Proton Decay of ^{56}Zn and its Impact on the Gamow-Teller Strength Evaluation',* Phys. Rev. Lett. 112, 222501 (2014).
Contribution by Bill Gelletly, w.gelletly@surrey.ac.uk (Surrey)

c. Journal of Physics G. Focus Issue: Open problems in nuclear reaction theory.
Nuclear structure physics is going through an exciting time. There have been tremendous improvements in experimental techniques at new facilities worldwide and detailed high precision reaction experiments, often coupling charged-particle detection with neutron and/or gamma-ray detection, are now commonplace. At the same time, on the theory side, recent leaps in solving the many-body problem and dealing with the underlying force have enabled the structure community to make quantitative predictions in many regions of the nuclear chart extending well beyond stability. Embedded in this context, there has been strong activity in the domain of nuclear reaction theory, but progress has been slow and great challenges remain.
The goal of this special focus issue: open problems in nuclear reaction theory, is to provide a snapshot of the ongoing discussions, the difficulties faced in addressing the problems, identifying obstacles to progress, as well as the many opportunities for advances in the field. An important objective is to provide a guide for the younger generation as they move the field forwards. We hope that the broader community will find this compilation helpful as we embrace the opportunities that lie ahead.
Contribution by Ron Johnson, r.johnson@surrey.ac.uk (Surrey)

d. Innovative Instrumentation for EURISOL.
The 5th EURISOL topical meeting was held on the 15-17th July at the University of York http://eurisol5.iopconfs.org/home. The meeting reviewed the instrumentation and techniques presently used at the ISOL facilities and discussed possible future ideas and developments for the EURISOL facility.

There were about 45 attendees and 27 talks, with 17 invited speakers. The event was supported by EURISOL Users Group, NP IoP group, CAEN, Hamamtsu and AP Technologies.
Contribution by Andrei Andreyev andrei.andreyev@york.ac.uk (York)

e. NuPECC Committee Meeting report. The Nuclear Physics European Collaboration Committee, NuPECC, is an expert committee of the European Science Foundation. Its 80th meeting was convened on the 13-14 of June at the University of Jyväskylä, Finland. As usual, the format of the meeting was a mini workshop on the morning of the first day, consisting of short talks describing the research activities of the hosting nation, and then the afternoon session and the next day's morning was given over to committee business.
Highlights of the mini workshop included Paul Greenlees describing the extensive programme of nuclear structure research being carried out at the JYFL accelerator laboratory. Past achievements include the discovery of many new proton-dripline nuclei and excited states, typically through the recoil decay tagging technique. Facilities being used include many that have been delivered through UK support and investment, e.g. SAGE, LISA, GREAT, UoYTube and the DPUNs plunger. The IGISOL group perform decay

studies and precision mass and laser spectroscopy relevant to nuclear structure and nuclear astrophysics. The collinear laser spectroscopy of ground state yttrium isotopes, led by the Liverpool and Manchester groups was presented. Significant new accelerator capability and instrumentation is presently being built. Yuha Äystö described the activities of the Helsinki institute of Physics, focusing on contributions to CERN (CMS), FAIR (the Super FRS) and ESA-Planck. Jouni Suhonen presented Finnish theory activity, mainly in the areas of spherical and deformed nuclei, weak interaction processes for double neutrino beta decay, CKM-mixing calculations, the electromagnetic responses of r-process nuclei, and energy density functionals, and Jan Rak described the Finnish contributions to ALICE, emphasizing roles in high Pt probes of the QGP and the resulting modifications of parton properties resulting from the de-confined medium.

A UK-led run at the laboratory was briefly interrupted for a tour of the JYFL facilities.

During the main NuPECC meeting, there were updates and discussion of Horizon2020 initiatives, and the status of the future FAIR, SPIRAL2 and EURISOL facilities. The continuing extensive programme of schools at workshops at the ECT* was presented, and ideas for new meetings welcomed (contact Professor Wolfram Weise, weise@ectstar.eu). Updates were also received on the situation in the US from NSAC, and from the new sister-organisation to NuPECC, ANPhA, on the status of nuclear physics in Asia. Significant activities of NuPECC include production of the Nuclear Physics News magazine, and topical reports such as the recent publication on Nuclear Physics in Medicine. These were discussed. Finally, development of a new online website providing a high-quality free database of knowledge on nuclear physics was presented, NUPEX, presently hosted by the Liverpool group. Angela Bracco was re-elected as Chair of NuPECC for a second 3 year term
The next NuPECC meeting will be at the University of Edinburgh, on the 10th and 11th October.
Contribution by Alexander Murphy a.s.murphy@ed.ac.uk (Edinburgh)

f. Triangulating Carbon-12. Investigations performed by members of the nuclear physics group at the MC40 cyclotron in Birmingham have uncovered a resonance at high-energy, the properties of which suggest that the protons and neutrons are clustered into three alpha particles arranged at the vertices of an equilateral triangle. This is the first time such a symmetry has been observed in nuclei and also a significant step into finally revealing the long sought after structure of the Hoyle state – the nuclear gateway for the synthesis of all heavier elements in the stars.
Carbon-12's pivotal role.
Carbon-12 plays a key role in nucleosynthesis and the forging of the elements in stars. The Hoyle state is an excited state of carbon-12 and was discovered experimentally in 1954. Since then scientists all over the world have been trying to establish its underlying structure. It is known that the state is built from three alpha particles, but the precise arrangement of those (*e.g.* the deformation) is still unknown. Since the experimental discovery of the state there have been many theoretical predictions from a variety of models, both for the ground state and the Hoyle state of carbon-12. In the early 60's it was suggested that the Hoyle state may possess a structure in which the alpha particles are situated in a linear chain whereas recently, *ab inito* calculations described its structure as more like a bent arm.
Contemporary experimental challenge.
The group at Birmingham used an energetic beam of helium-4 from the MC40 cyclotron to bombard a carbon target. The carbon-nuclei were excited to high energies before disintegrating; ultimately into three alpha-particles. Detecting the energy and direction of the emitted alpha particles enabled the originating excited state in carbon-12 to be reconstructed. The data available indicate a characteristic sequence of states with spins and parities built on the lowest energy level of carbon-12, namely: 0^+, 2^+, 3^-, $4^\pm$ and 5^-. It is the latter of these predicted states, the 5^- resonance, that was observed in the

Birmingham experiment and provides the compelling evidence for the triangular structure [Physical Review Letters: http://dx.doi.org/10.1103/PhysRevLett.113.012502]. The group have since confirmed the experimental data, in a second measurement using a different reaction [Phys. Rev. C: http://dx.doi.org/10.1103/PhysRevC.90.014319].

Expanding triangles.

The properties of this band of states has been predicted by only one theoretical model developed by Iachello and Bijker that assumes a D_{3h} symmetry, *i.e.* an equilateral triangular spinning top. The new results confirm a triangular arrangement of the alpha-particles in carbon-12, the first time such a symmetry has been observed in nuclear physics.

Herein lies an important clue to understanding the precise nature of the Hoyle state. The model that predicts the triangular symmetry of the ground-state sequence of levels also predicts the structure of the excited Hoyle resonance to be a stretching mode in which the alpha-particle triangle expands.

The current work and future experiments planned by the group in Birmingham, may finally uncover the exotic behaviour of one of nature's most unusual isotopes.

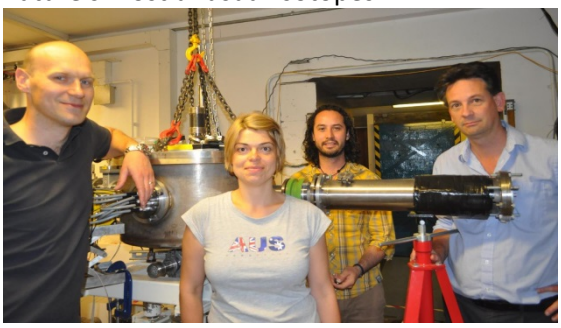

Photo (from left to right): Carl Wheldon, Tzany Kokalova Wheldon, Daniel Marín-Lámbarri and Martin Freer

Contribution by Tzany Kokalova Wheldon t.kokalova@bham.ac.uk (Birmingham)

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3. Outreach Activity

The Ogden Trust celebrates the School Physicist of the Year 2014 at The University of Manchester, together with the Nuclear Physics Group. The Ogden Trust is an educational charity dedicated to promoting physics teaching and learning. One of their initiatives is the annual School Physicist of the Year award, presented to Year 12 students who have been selected by their school for their outstanding achievements or progress in Physics.

The first Manchester SPOTY awards were presented at The University of Manchester on 2nd July at an event organised by Dr Emma Nichols (Ogden Science Officer) for the Ogden Trust. Twenty-six students from schools and colleges in Manchester and across the North West were put forward by their schools. In addition to their prize and certificate, as SPOTY winners they become alumni of the Ogden Trust, a prestigious affiliation that can provide support and networking opportunities in their future – including a means-tested £1500 annual bursary if they go on to study physics at university.

Of the 26 prizewinners, 23 were able to attend the ceremony with their parents and nominating teachers and enjoyed a talk by Dr Thomas Elias Cocolios from the Nuclear Physics Group, who addressed the students with a motivational presentation titled 'Why Physics?' The students and their parents were very enthusiastic, some even inquiring about possible summer internships.

More information on the Ogden Trust: http://www.ogdentrust.com/

Contribution by Emma Nichols emma.nichols@manchester.ac.uk and Thomas Cocolios thomas.cocolios@manchester.ac.uk (Manchester)

Nuclear Physics Headstart Summer School. Forty sixth formers from all over the UK recently attended a Headstart Summer School organised by the Nuclear Physics Group at the University of Manchester. The four day programme consisted of undergraduate level lectures, visits to Daresbury Laboratory and Jodrell Bank Observatory, a Q&A Session on

university life and laboratory and simulation sessions which allowed the students to experience real hands-on nuclear physics. The pupils showed enormous enthusiasm for the subject and a very high level of understanding, far beyond the A-level curriculum.

Many thanks to Dr David Sharp and Dr Mike Taylor for the experimental sessions which were the highlight of the week.
Contribution by John Roberts
j.w.roberts@manchester.ac.uk (Manchester)

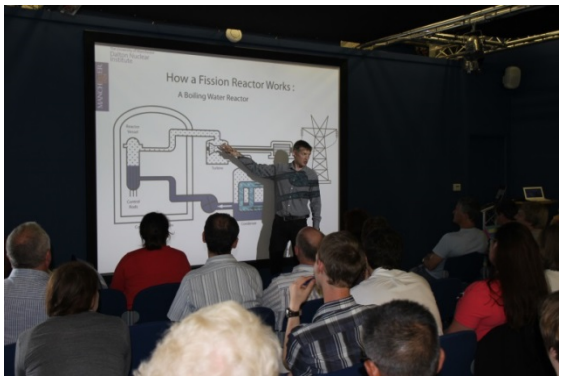
School Talk. On 2nd July, Tzany Kokalova Wheldon gave a talk at Northfield Manor Primary School in Birmingham to approx. 60 Y5 children about what it is like to be a scientist and the research she is doing at the University. Prior to the talk the children made pictures of what they think a scientist will look like. After the talk there were a lot of questions about the atom, the nucleus and how it is possible to be a mum at home and a nuclear physicist at work. This was the first of series of talks.
Contribution by Tzany Kokalova Wheldon
t.kokalova@bham.ac.uk (Birmingham)

Nuclear Physics masterclass. A nuclear physics masterclass was held at University of Surrey on the 3rd July. A total of 20 A Level students from four local schools attended. This event combined nuclear physics activities developed for previous 'taster days' at Surrey and elements from the nuclear physics masterclass held at the University of Liverpool in February. The event was a collaboration between STFC and the South East Physics Network (SEPnet) and was run by the SEPnet outreach officer Sarah Barnes.
The day consisted of two lectures from Surrey nuclear physicists; the first was an introduction to nuclear physics, including an overview of the element polonium-210, given by Paddy Regan; the second talk, given by Arnau Rios Huguet, was about the nuclear physics needed to understand neutron stars. The students had two opportunities to use Surrey's undergraduate radiation teaching laboratory during the morning radiation lab and an afternoon workshop. Three PhD students from the Surrey group, Rosh Sellahewa, Michael Hodgson, Vytas Astromskas and a PhD student from the Brighton group, Chantal Nobs, spoke to the students about their careers and research and Daniel West from the Atomic Weapons Establishment (AWE) also gave an industry career talk. The day finished with a 'making ice cream from liquid nitrogen' activity, and while it was not directly related to nuclear physics, it was very well received.

The overall feedback from the students was very positive, 100% of those who attended said they found the masterclass useful, 95% said they enjoyed the event and 75% said they had been motivated to find out more about nuclear physics. All the teachers said they would bring students back next year.
Contribution by Elizabeth Cunningham
elizabeth.cunningham@stfc.ac.uk
(STFC/Surrey)

Teach the Teachers Workshops. Over the past month nuclear physics teacher continuing professional development (CPD) events have been held at Science Learning Centre North West in Manchester on 25th June, STFC Rutherford Appleton Laboratory (RAL) on 3rd July and University of Liverpool on 18th July. This programme of workshops was started by David Jenkins (York) when he was a STFC public engagement fellow and still run by him and John Roberts (Manchester). The aim of these events is to give secondary school teachers a greater understanding of curriculum linked topics in nuclear physics, astrophysics, energy and medicine and to increase their confidence when teaching these subjects in the classroom. The one day events consist of a combination of lectures by

UK nuclear physicists, radiation laboratory sessions and hands on activities.



John Roberts spoke about nuclear energy at all three events, while David Jenkins gave his nuclear astrophysics talk at the RAL and Manchester events. Other speakers included Laura Harkness-Brennan (Liverpool), Peter Cole (Liverpool), Samantha Colosimo (Liverpool) and Elizabeth Cunningham (STFC/Surrey). At the Liverpool event teachers got a chance to work in the new radiation labs, while at RAL they had a tour of the ISIS accelerator facility and made cloud chambers in the IOP workshop:

http://www.iop.org/education/teacher/support/network/cpd-sessions/page_44093.html.

In total 84 teachers attended the events and feedback has been very positive. At the RAL event all the teachers said they found the workshop useful and enjoyable, and they all agreed to recommend the course to their colleagues next year. All the talks and resources presented at the RAL event can be found here: www.stfc.ac.uk/NuclearPhysicsForYou.

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4. Media Interactions

Carbon-12 Caught in a Triangle.

Read more: APS Synopsis
Physics World article