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from the IOP HEPP
committee!*



IOP Institute of Physics

Joint APP and HEPP Annual Conference

26-28 March 2018, University of Bristol, Bristol, UK



The annual joint meeting of the IOP High Energy Particle Physics group and the IOP Astroparticle Physics group.

Dates: 26 - 28 March 2018

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Report from our chairman

Dr. Yoshi Uchida, Imperial College London

Welcome to the HEPP group newsletter for 2017. This year I am delighted to be able to introduce two new members who have joined our committee following the elections held earlier on; Agni Bethani of the University of Manchester, and Chris Parkinson of the University of Birmingham. They are both Research Associates and have jointly taken on the roles of newsletter editor and social media representative—and I would like to thank them for the stellar job they have done. Thanks are also due to Jarek Nowak, who edited the newsletter for the last couple of years.

As we welcome new members, we do have to say farewell to others, but this year it is for a reason that we can celebrate, as our two student reps move on after obtaining their PhDs. Kevin Maguire and Darren Scott have served the committee admirably since they joined four years ago, influencing our discussions and giving us a social media presence. I am delighted that Kevin and Darren have written pieces in this issue about their experiences as experimental and theoretical PhD students respectively. Our committee discussions span everything from outreach activities to funding matters, and individual welfare to long-term planning for the field, and it is important to have a good mix of perspectives, from students and early-career physicists to academics both junior and senior. With these departures, there will soon be an election for new student members (as well as a new Chair, but more on that later) which you will be notified of early in 2018, and we look forward to receiving your nominations.

Speaking of students and early-career physicists—as always, I would like to remind you all that the IOP offers funding for travel to international conferences where you are giving talks; these are the Research Student Conference Fund and Early Career Researchers Fund respectively, and one of the committee's roles is to assess the applications for these awards. I strongly urge anyone to apply who would benefit from some additional funding for international travel. From the particle physics perspective, the quarterly deadlines may seem difficult to meet, as they mean that sometimes you would need to know about your conference talk three months in advance. My suggestion if that is the case would be to apply anyway, with an explanation stating why it was not possible to meet the deadline, and we will do our best to be flexible. One other new development has been the setting up of a group dedicated to early career researchers and it is expected that the new group will be up and running by this time next year.

Another, very different, form of award from the IOP tends to go to more senior physicists, with the Gold and Silver Medals being among the most prestigious prizes in the field. Dave Charlton of the University of Birmingham is awarded the Glazebrook Medal this year for his leadership on UA1, OPAL at LEP and of course ATLAS. For the subject prizes, Nigel Glover of Durham University is winner of the John William Strutt, Lord Rayleigh Medal for his work on Perturbative QCD calculations which have been critical in understanding hadron collider data, and Guy Wilkinson of the University of Oxford is awarded the James Chadwick Medal for his outstanding contributions to

heavy quark and CP-violation physics, and in particular his leadership of LHCb. Warm congratulations to all our winners.

We also award prizes at the group level, and I would like to congratulate Marco Gersabeck of the University of Manchester for winning our main Group Prize this year for his work on Charm Physics at LHCb, and Anita Nandi of the University of Oxford and LHCb who won the Poster Prize at the annual meeting at Sheffield in April.

The meeting at Sheffield was a success, making very good use of the impressive facilities at their newly-opened Diamond building. We saw lively discussions being held at the plenary and parallel talks as well as the poster session, and the banquet was held at the magnificent Cutlers' Hall. I would like to thank the local organisers, Matthew Malek and Trevor Vickey, as well as the industrial exhibitors, for their contributions.

Next year's annual meeting will be held at the University of Bristol from the 26th till the 28th of March. The HEPP Committee holds its autumn meeting at the venue of the conference for the following year, and so this past November we sat down with the local organisers in the beautiful HH Wills Physics building to discuss plans. The annual meetings are a tradition that goes back well over half a century, but it is the innovations that local organisers bring in which keeps them fresh and worthwhile, and whilst I cannot reveal too much, I am able to say that next year's organisers are certainly introducing some new ideas that may eventually become traditions of their own, especially those which add more value for our PhD-student participants.

Something that will be continued from Sheffield is that those who are presenting parallel talks—most often, but not restricted to, senior students and postdocs—are strongly encouraged to also present a poster so that everyone has a chance to see your work and discuss it with you, as this is something that is not possible through just the parallel talks. The conference is also where our Annual General Meeting and STFC Town Meeting are held, which for 2018 will be on the middle day of Tuesday 27th. Members who cannot come for the full conference but do plan go to Bristol on this day for these meetings are very welcome to register to join us for the Poster Session and Banquet, which will be held later that day.

Finally, on a personal note—my term as a member of the committee comes to an end next year, so this will be my last newsletter contribution as Chair. So much of our day-to-day lives are defined by the institutions and collaborations we belong to, or the labs we work at, and indeed our funding agencies; which is why I believe that the work of the IOP, which cuts across all of these and encourages us to work together as physicists, whatever our individual specialisations are, is so vital. The work of the committee itself looks outwards to other areas of physics as much as it looks inwards within particle physics, and I believe it is these links in both directions that make its contributions meaningful. One of the important ways in which the committee can contribute, which is support for half-day and one-day meetings on topics that might not be easy to find funding for otherwise, can be increased further if these meetings are also sponsored by another IOP group. Please do not hesitate to contact the committee if you are interested in organising a meeting. Of course, the committee can only work as well as its composition allows, so please do think about nominating yourself when vacancies are announced in the future.

Looking back, IOP-related business over the years has taken me to all but one of the universities in the UK and Ireland which participate in experimental particle physics—if I have not miscounted—and many of the theoretical groups too, and I have met many of you whom I would not have otherwise. It has been a joy to be a part of the committee and to have had the privilege to be its Chair for the last four years. I wish the committee and its as-yet-undetermined new Chair well for the future.

Well, that's enough from me—I hope you enjoy the rest of the newsletter and I look forward to seeing many of you at the conference (and AGM) in Bristol in March!

IOP HEPP group prize winners

Dr. Marco Gersabeck, University of Manchester, winner of the IOP HEPP group prize for his leadership in the area of Charmed Meson physics

Charm the challenge champion

Charm appears in many disguises. A range of composite particles containing charm quarks provide unique opportunities for probing the strong and weak interactions in the standard model and beyond.

About 15 years ago excited charm mesons were discovered that could not be matched onto expected states. About five years ago the observation of the charged $Z_c^-(3900)$ state again provided more questions than answers. The most recent discoveries in the charming particle zoo, added by the LHCb experiment, are the Pentaquark states $P_c^-(4380)$ and $P_c^+(4450)$ as well as the first doubly-heavy baryon Ξ_{cc}^{++} .

The combination of two measurements by the BaBar and Belle experiments led to first evidence for mixing in neutral charm mesons (D^0) about ten years ago. This mixing can be driven by a difference in mass or decay width of the physical eigenstates of neutral D mesons. Ten years on, these combinations by the Heavy Flavour Averaging Group now include over 30 input measurements, yet only the width difference has been established as being non-zero (see Figure 1).

The mass difference is awaiting further input from experiments and is currently top of the target list for new measurements. A non-zero mass difference leads to the periodic transformation of a D^0 meson into an anti- D^0 meson and back. However, what we do know for sure is that it takes at least 1000 D^0 lifetimes for D^0 mesons to undergo a full oscillation.



Marco Gersabeck was an STFC Ernest Rutherford Fellow from 2012 until 2017 and is now Lecturer at the University of Manchester. He is a member of the LHCb collaboration, where he works on charm physics and the Vertex Locator, and he leads the charm group of the Heavy Flavour Averaging Group.

The theoretical predictions for charm mixing are challenged by themselves. The short-distance contributions cancel almost perfectly due to a combination of CKM suppression and GIM cancellation. The long-distance contributions on the other hand are inherently difficult to calculate. Recently, advances have been made that allow for an optimistic outlook on the possibility of having a theoretical calculation of charm mixing in the foreseeable future. In particular, these include determinations of lifetimes based on Heavy Quark Expansion and the treatment of multi-particle final states in Lattice QCD.

Experimentally, there is not enough charm in the universe to observe a full oscillation so more sophisticated approaches are required. In many measurements the sought-for mass difference is obscured by a poorly-constrained strong-phase difference of the processes involved. The key here is the use of multi-body final states whose interference pattern gives access to phase differences.

The discovery of matter-antimatter asymmetries (CP violation) is probably the greatest challenge of all in charm physics. Predictions for the size of CP violation vary but there is agreement that the absence of significant CP violation signals to date is no surprise. There are two types of CP violation, one where a decay rates of charm and anti-charm hadrons to a specific final state differ, and another one, linked to mixing and therefore relevant only to neutral D mesons, where the lifetimes of the physical D states differ.

CP violation in decay obviously varies from one decay mode to the next. However, once discovered, sum rules allow the identification of patterns pointing to the underlying source of the asymmetry. Recently, an analysis of the decay of D^0 mesons into four charged pions have shown hints of possible CP violation, albeit not yet at a statistically significant level.

Mixing-related CP violation is universal within the Standard Model and therefore benefits from the combination of all relevant measurements. Two-body decay modes are selected with high efficiency and have great statistical power, but on their own they always only give access to a combination of the underlying variables. Multi-body final states once again allow for measurements of the individual theory parameters through direct access to interference patterns in their phase-space distributions.

Within the Standard Model the fact that tree-level dominated processes are not CP violating can be exploited to reduce the parameter set from four to three, thereby greatly enhancing the sensitivity. Nevertheless, while measurements are approaching sensitivities of 10^{-4} there is currently no indication for mixing-related CP violation.

This level of precision is owed to the huge datasets produced at the LHC where nearly one-in-ten of all collisions will produce charm-anticharm quark pairs. These huge datasets mean that charm physics is at the forefront of many experimental challenges. Storage is the first one, meaning that online selections have to produce samples of

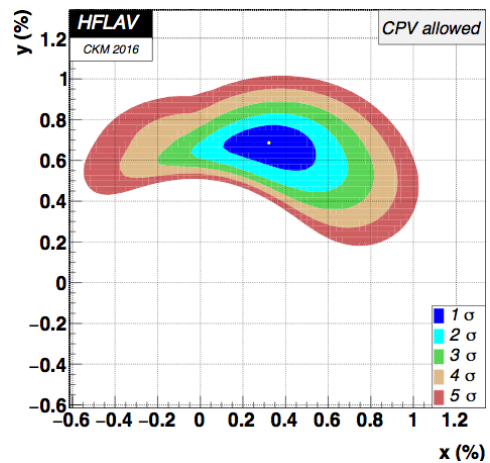


Figure 1: Latest combination of mixing parameters showing the lifetime difference against the width difference, each relative to the average decay width.

high purity and in recent years most charm events are only recorded with a reduced set of information at LHCb. Common fitting approaches are challenged by the size of the datasets, and systematic uncertainties have to be controlled to unprecedented levels, often revealing second order effects that become important. Also, the production of sufficiently sizeable simulation samples is no longer possible with the out-of-the-box full detector simulation, thus driving innovative concepts to save computing time and storage capacity.

There is another current big player in charm physics that has not been mentioned yet and this is the BESIII experiment in Beijing. They are a key contributor to spectroscopy, but crucially for mixing-related measurements, they can produce quantum-entangled D^0 - anti- D^0 meson pairs. This makes BESIII the only experiment that has access to strong phase differences directly. This is important input to the high-precision measurements and may be ever more important in the future as explicit models struggle to describe the phase motion across the phase space of multi-body decays. Recently, Manchester and Oxford have been accepted as the first UK groups of BESIII with the aim of strengthening the output related to quantum-entangled D^0 states.

With the ever-increasing datasets of the LHCb experiments and soon of Belle II the challenges for charm physics keep on coming. But through driving innovation in particle physics data processing and analyses, there is a huge physics potential ahead. The elusive width difference should be pinned down in the coming year or two. CP violation is harder to predict, but it is conceivable that first evidence will be obtained latest in the early 2020s. Determining the exact nature of the origin of CP violation will require even greater precision with currently only the LHCb Upgrade II programme being capable of delivering this. Once more, charm will be the challenge champion leading to entirely new detector concepts, data acquisition structures, analysis techniques, as well as deep insights into the physics of the up-quark sector.

**Anita Nandi (LHCb), University of Oxford,
winner of the HEPP group poster prize**

One of the key aims of the LHCb experiment is to continue to improve the precision on direct measurements of the CKM angle γ through measurements of CP violation in B decays to a variety of final states. This world leading precision is bringing us closer to revealing possible non-unitarity of the CKM matrix, which would provide evidence of physics beyond the Standard Model. At the Joint HEPP and APP conference in Sheffield this year, I presented promising results of CP violation measurements with γ -sensitive B to DK^* decays, which was the first investigation of this channel using the LHCb detector



Anita Nandi (Oxford)

as well as being one of the first CP violation measurements from LHCb to use data collected in Run 2. Many exciting results from all areas of particle physics were presented at the conference. It was very interesting to discuss the latest research in neutrino physics, dark matter, collider physics and many more.

This year's IOP Half-Day Workshops

The IOP HEPP committee has funding available for half-day meetings on any topic of interest to the HEP community in the UK. We have had many interesting and fruitful meetings on topics including Higgs Physics, LHC extensions, Neutrinoless Double Beta Decay, Status and Prospects, The future of Long Baseline Neutrino Oscillation Experiments, Dark Matter, Neutrino Interaction Physics, Gravitational Waves, Exotic hadrons spectroscopy, Exotic phenomena in neutrino physics and many more.

You can apply for up to £500 to fund speakers travel, coffee and lunch if funding allows (attendees travel could also be funded from this but the maximum award is £500 total). To apply simply email the organiser Melissa Uchida at m.a.uchida@imperial.ac.uk and write in your email: title, venue, organisers, date (can be tentative) and give a short abstract explaining the topic, remit and benefit of the meeting.

Particle detectors and instrumentation (Institute of Physics)

Sam Henry

On 25 September 2017 the Instrument Science and Technology (ISAT) Group held its first half-day meeting on *Particle Detectors and Instrumentation* at the Institute of Physics in London. This was also supported by the High Energy Physics Group. The aim of the event was to bring together particle physicists, those developing detectors for other applications, and the wider sensors and instrumentation community. There were a total of eight engaging talks on the state-of-the-art of particle detector technology. It also provided an opportunity for many to make new contacts over lunch and coffee. The meeting was attended by thirty people.

The meeting began with a talk by Andreas Korn from UCL about the upgrade plans for the LHC detectors. The upgraded LHC will collide protons at a rate over ten times current design, leading to intense radiation levels, and putting greater demands on the detectors. This was followed by talks on some of the new silicon technologies under development to meet these challenges including: depleted CMOS sensors (Daniela Bortoletto), 3D silicon detectors (Cinzia da Via), and MAPS (Laura Gonella). Nigel Allinson and Simon Jolly gave talks on the application of particle detector technology to medicine through monitoring radiation levels for proton therapy. There are further applications in astroparticle physics. Jon Lapington described silicon cameras for the Cherenkov Telescope Array (CTA). Peter Hobson gave a talk on high temperature diamond detector, explaining how this detector material is of interest for industrial applications in extreme environments.

The presentations are available at the web page for the meeting:

<https://indico.cern.ch/event/654712/>

New dimensions in silicon pixel detectors (Manchester University)

Mark Williams

The University of Manchester hosted an IOP half-day meeting on "New Dimensions in Silicon Detectors" on October 19th 2017. This meeting discussed the prospects for adding precision (<1ns) timing information to silicon pixel detectors, and brought together potential users of the technologies (from high energy physics, materials science, chemistry, and medical science) with the experts currently developing technologies which might achieve these goals (Low-Gain Avalanche Detectors, 3D silicon, CMOS, Timepix ASICs). The meeting was fully subscribed with around fifty registrants, eleven presentations, and fruitful discussions during the coffee breaks and at lunch. The organisers hope that this meeting represents a starting point for future collaborations between users from different fields, and between research and industry.

The presentations are available at the web page for the meeting:

<http://indico.hep.manchester.ac.uk/event/NewDimensions2017>

Advances in radiation-hard monolithic pixel detectors (University of Birmingham)

Phil Allport

The School of Physics and Astronomy of the University of Birmingham hosted an IOP HEPP supported half-day meeting on Advances in Radiation-Hard Monolithic Pixel Detectors on 19th July 2017. This meeting grew out of the UK community meeting on CMOS Sensors for Particle Tracking hosted at Cosener's House in Abingdon on 10th March 2016, which identified a large community of UK groups involved in the rapidly evolving area of monolithic sensors for particle physics applications based on HV and HR CMOS processes.

At the IOP meeting, recent major developments in this technology were reviewed for applications in nuclear, medical and particle physics. The use of CMOS Imaging Sensors (CIS) is ubiquitous in digital cameras, mobile phones etc, largely replacing CCDs in many applications since they offer the significant cost advantages associated with large-scale microelectronics production. Although important for many areas of nuclear, medical and particle physics, radiation hardness is not a priority for commercial CIS suppliers. However, process variants which bring benefits to other aspects of the device properties have recently been shown to also allow significant improvements in radiation hardness to be achieved, meeting typical requirements of even LHC tracker upgrade projects.

The programme included presentations on applications at the LHC, including a presentation on the pioneering work of the ALICE experiment by Walter Snoeys of CERN. Other colleagues covered developments within the RD50 and ATLAS collaborations, along with R&D for LHCb and work targeting experiments at both ILC/CLIC and future hadron colliders. As well as the international context, UK specific developments at the national laboratories and universities were emphasised. A particular theme of the meeting was applications outside particle physics with plans for the EIC reviewed by Laura Gonella, potential for hadron therapy covered by Nigel

Allinson (Lincoln University Computer Science and lead on the Proton Radiotherapy Verification and Dosimetry Applications consortium) and Richard Hugtenburg (Swansea University Medical School) describing IMRT applications of a UK developed very large format CMOS detector.

In total there were 12 presentations concluding with a lively discussion among the 40 participants, led by Daniela Bortoletto and chaired by Steve Worm, to discuss how in an environment of shrinking budgets to retain UK competitiveness in an area of greatly increased overseas investment. It was noted that the UK is still enjoying a significant lead in current silicon detector construction projects based on investments in the 1980s and 1990s, but lack of resources threatens future leadership. Potential funding options outside particle physics were discussed along with a number of community led initiatives which have attempted to tap into these opportunities. The determination of the UK particle physics community to work coherently and capitalise on its strong expertise in this technology was an overwhelming theme, underlining the highly collaborative spirit among the different groups and experiments represented at this meeting.

The presentations are available at the web page for the meeting:

<https://indico.cern.ch/event/640107/>

Pion 70th Anniversary Symposium (University of Bristol)

Joel Goldstein

On 13th September 2017, a symposium celebrating the 70th anniversary of the discovery of the pion was held at the University of Bristol. The celebration included the unveiling of a plaque celebrating the designation of the H.H. Wills Physics Laboratory as a site of historical interest, for the work done by Cecil Powell and his group. The event was attended by a diverse group of about fifty people: active and retired physicists, family members of Powell, ex-members of the group and other interested parties. It was supported by the IOP High Energy Particle Physics, History of Physics and Astroparticle Physics groups.

One set of talks covered the history of the pion discovery itself, and other related research. Brian Pollard talked about the work of Powell's group up to and including the first electron-sensitive emulsions, and included never-before-seen archive photographs. Robin Marshall covered the contemporaneous research on cosmic rays in Manchester, and Giuseppe Fidecaro joined by video link to describe his discovery of the electron decay mode of the pion at CERN a few years later.

Other talks explained how the legacy of Powell is still felt today. Christine Davis gave the audience an overview of the pion's central role in modern calculations and theoretical developments, and Alan Watson summarised seven decades of progress in cosmic ray experimentation. Stunning results from modern emulsion techniques were shown by Akitaka Ariga. Finally, Brian Foster and Dave Newbold described how particle physics activities in Bristol have progressed from Powell's cosmic ray emulsions to today's experiments at the LHC and beyond.

The EPS plaque was unveiled by Hugh Brady, the Vice-Chancellor of the University of Bristol, and the historical importance was emphasised in speeches by Michael Berry

and the president of the EPS, Rudiger Voss. The event was closed by Frank Close's public talk entitled "Bristol Cream - Fame and Infamy at the Heart of the Atom", in which he skilfully wove together different strands from the colourful history of particle physics at Bristol.

The presentations are available at the web page for the meeting:

<https://indico.cern.ch/event/645926>

Research student conference fund

The Institute of Physics provides financial support to research students to attend international meetings and major national meetings.

Eligibility: Research Student Conference Fund (RSCF) bursaries are available to PhD students who are a member of the Institute and of an appropriate Institute group. For example, if an applicant is a member of the Women in Physics Group only then they could only seek support to attend a conference related to women in physics and not to low temperature physics. To be eligible for that meeting, the applicant would also need to be a member of the Low Temperature Group.

More details can be found at:

http://www.iop.org/about/grants/research_student/page_38808.html

Early-career researchers fund for HEPP group members

The Institute of Physics provides financial support to early career researchers to attend international meetings and visit international facilities.

Eligibility: For the purpose of this fund, an early career researcher is defined as an individual within three years of beginning their first paid contract of employment in industry or academia, either full-time or part-time, where research and/or the application of physics is the primary function of their role. This excludes any career breaks.

Early career researchers may apply for up to £300.

More details can be found at:

http://www.iop.org/about/grants/early-career/page_67022.html

Messages from the new and outgoing members of the HEPP committee

This year the HEPP group committee has welcomed two new members, Chris Parkinson and Agni Bethani, and says goodbye to both our theory and experimental student representatives, Darren Scott and Kevin Maguire.

Agni Bethani (new ordinary member)

I am currently a post-doctoral research associate with the University of Manchester and a member of the ATLAS collaboration. My main physics interests are Higgs physics and physics BSM. My favourite particle is the tau lepton.

I consider participation in the physics community a significant part of being a researcher and I am delighted to have the opportunity to contribute as a member of the IOP HEPP committee. I have been a member of many research groups and physics societies in different countries and I hope that my experience will be a positive influence to the community I care about in the UK.

In the months to follow, Chris and I will be the people behind the HEPP group social media activity. Follow us for IOP updates and exciting physics news!

Our big yearly event, the IOP HEPP conference is taking place in Bristol, 26-28 March 2018. I am very excited to welcome you all there!

Chris Parkinson (new ordinary member)

I am currently a research associate with the University of Birmingham, working on data analysis and detector operations for the NA62 experiment at CERN. In the past I've also been involved in data analysis as a member of the LHCb collaboration.

Since joining the committee, alongside Agni, I've begun taking responsibility for the newsletter (which I hope you're enjoying) and the social media presence which was established by Kevin.

In the past I've enjoyed attending the IOP HEPP and APP joint conference, both for the talks and posters, but also to meet other physicists working in the UK. As a member of the HEPP committee I'm keen to help run, and hopefully improve, the conference for the years ahead. The 2018 conference in Bristol is shaping up to be another great meeting; I hope to see you all there!

Darren Scott (outgoing theory student representative)

I've had the pleasure of being a student representative on the IOP High Energy Particle Physics (HEPP) committee for roughly the past 3 years. However, I recently completed my PhD and, as such, my time on the committee is coming to an end.

The committee has been fun and I've had the chance to work with many interesting and



Darren Scott (Durham)

enthusiastic people who try to promote as much engagement across the discipline as possible. The committee really does some nice work, aiding local organising committees with the annual IOP HEPP conference each year, promoting and sponsoring half-day meetings, and providing travel funding to PhD students to aid in access to meetings. The next conference takes place in Bristol, which I had the privilege of visiting on my last committee meeting, and I wish the local organising committee and HEPP Comm all the best with its organisation and running.

Having being a theory student at Durham, it's also a pleasure to thank the committee for their continued support and enthusiasm for the annual Young Theorists Forum (YTF) meetings in Durham each year. The YTF (this year will be the 10th!) is a great opportunity for PhD students working in theoretical (particle) physics to come together once a year and present their work to each other. During my own PhD I was able to work on a number of different topics; resummation for top quark pair production, Higgs decays in the SM Effective Field Theory, and even a slight exploration into Left-Right symmetric models. As such I'm excited to see updated results for top quark pair production, not just now, but over the lifetime of the LHC and in particular looking into the tails of these high energy distributions. For my own part, I'm always interested in techniques and calculations we can do to further reduce the uncertainties in observables related to top physics, so it's something I hope to be involved in for a good while to come.

In mid-September I started a postdoc at the University of Amsterdam (but can most often be found across the road at Nikhef!) and have really been enjoying my time here so far. I'm sure whoever joins the committee in my place will get as much out of it as I had - all the best to them. But for now, thanks to everyone I met both on and through the committee and at the same time I'd like to wish all my friends in the community back in the UK all the very best!

Kevin Maguire (outgoing experimental student representative)

I first joined the committee during the IOP HEP conference in Manchester in 2015, when I was a first year PhD student. The out-going experimental student representative was a Manchester PhD student like me. I'm hoping that the person taking over from me is from a different institute so that students from other groups have more representation.

Apart from representing students like myself to the committee, I was tasked with making students aware of the funding opportunities available to them in the form of the conference travel fund. As I work on LHCb, it was difficult to interact with groups of UK students outside the CERN community. I predominantly used Facebook groups as my way of contacting these students, but was not particularly successful.



Kevin Maguire (Manchester)

During my tenure the committee set up social media accounts to communicate information about the annual conference and the activities of the committee and the community. I was monitoring and administrating these accounts during my tenure. This was quite an enjoyable part of my time in the committee.

Meet your committee



Yoshi Uchida (Imperial): Chair



Agni Bethani (Manchester)



Franz Muheim (Edinburgh): Treasurer



Chris Parkinson (Birmingham)



Sinead Farrington (Warwick)



Melissa Uchida (Imperial): Half days & PAB group cross-member



Celine Boehm (Durham): Astroparticle physics cross-member



Jarek Nowak (Lancaster)



Mrinal Dasgupta (Manchester)



Trevor Vickey (Sheffield): Honourary secretary

We have ex-officio/cross members to provide links with other IOP and STFC groups:

Claire Shepard (STFC, co-opted as chair of PPAP)

Elizabeth Cunningham (STFC, co-opted as head of particle physics outreach)



Helen Heath (Bristol)

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