GHP Newsletter March 2019

American Physical Society Topical Group on Hadronic Physics

http://www.aps.org/units/ghp/

Executive Officers

Chair	*Chair-Elect*	*Vice-Chair*
David Richards dgr@jlab.org	Garth Huber huberg@uregina.ca	Ian Cloët icloet@anl.gov

Past-Chair	*Secretary/Treasurer*	*Members at Large*	
Tanja Horn hornt@jlab.org	Ramona Vogt rlvogt@lbl.gov	Tim Hobbs tjhobbs@mail.smu.edu	Ann Sickles sickles@illinois.edu

NB. EMail addressed to ghpexec@aps.org will reach all members of the Executive.

Join GHP by following a link on the lower-right of our web page; namely, from: http://www.aps.org/units/ghp/.

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1 Elections

The 2018 elections for Vice Chair, Secretary-Treasurer, and Member-at-Large were completed in December 2018. Ian Cloët was elected Vice Chair, Ramona Vogt was elected to a second term as Secretary-Treasurer, and Tim Hobbs became Member-at-Large. We thank the other candidates for agreeing to stand for elections and hope that they will remain actively interested in the mission of the GHP.

The 2018 Nominating Committee that selected the candidates was:

2018 Nominating Committee

Paul Reimer (*Chair*)
reimer@anl.gov

Victoria Greene	Wally Melnitchouk	Julie Roche	Karl Slifer
senta.v.greene@vanderbilt.edu	wmelnitc@jlab.org	roche@ohio.edu	karl.slifer@unh.edu

Elections will be held for two posts in the GHP Executive (Vice Chair, Secretary/Treasurer, and Member-at-Large) in 2019. Tanja Horn (Past Chair), and Anne Sickles (Member-at-Large) will have completed their terms.

We urge GHP members now to begin considering whom they would like to see filling the two open positions in 2019 and encourage members with ideas to contact the *Chair of the*

Nominating Committee and pass on their suggestions. There is strength in diversity and so the Executive would like to see nominations from across the entire spectrum of GHP's membership.

Our rules state that: *the Committee shall nominate at least two candidates for the offices of Vice-Chair and for the open position of Member-at-Large; the slate of candidates will be balanced as much as possible to ensure wide representation amongst the various fields of physics included in the GHP's membership; the Nominating Committee shall be chaired by the immediate Past Chair*,

Tanja Horn (hornt@jlab.org)

this year; *and shall include four members in addition to its Chair, one of whom shall be appointed by the APS.*

Attracting and serving a diverse and inclusive membership worldwide is a primary goal for APS. In calling for nominations, we wish to remind you how important it is to give full consideration to qualified women, members of underrepresented minority groups, and scientists from outside the United States.

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2 Membership

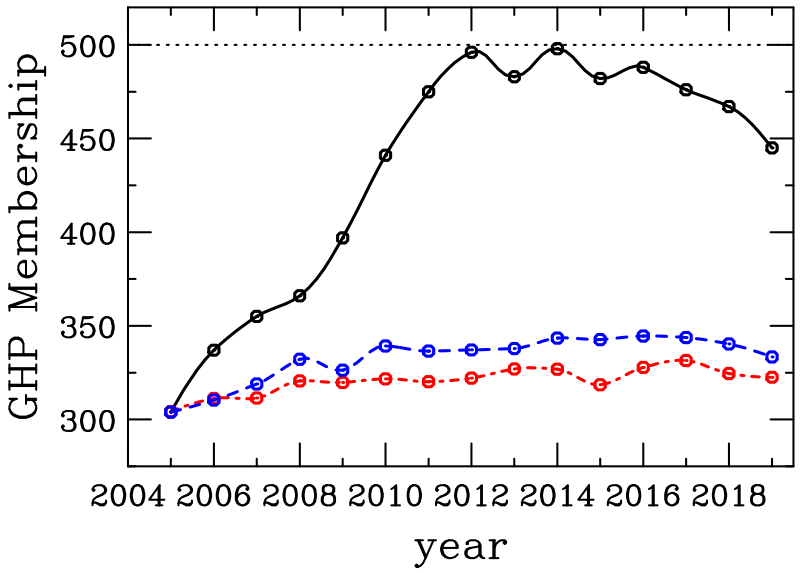

Figure 1: Solid line GHP membership, absolute value, with 2019 representing the APS Official Count at the beginning of 2019; dashed DNP membership normalized to GHPs value in 2005 (2401 $\longrightarrow$ 304); and dot-dashed DPF membership normalized to GHPs 2005 value (3291 $\longrightarrow$ 304).

At the beginning of 2019, the APS Unit Membership Statistics lists GHP with 445 members, which represents 0.8% of APS membership. This represents a loss of 22 members since January 2018, a significant number.

If a Topical Group has a membership of 3% or more of the APS members, it can apply to

become a Division. The Soft Matter Topical Group, formed in 2015, is currently at 3.5% of APS membership and could soon transition to Division status, joining the 16 existing Divisions. Interestingly, three of the existing Divisions, Polymer Physics, Physics of Beams, and Laser Science are now below the 3% criteria. Of the divisions, most lost members in 2018, with increases between 2018 and the start of 2019 only in Quantum Information (reached Divisional status in 2017), Polymer Physics, Gravitation (reached Divisional status in 2016), Computational Physics, and Biological Physics. The Divisions with the most overlap with the GHP membership, Nuclear Physics and Particles & Fields, both lost members. As might be expected from the size of the March Meeting, the largest division is Condensed Matter Physics with 12.1% of APS members belonging to this division.

While the GHP membership has decreased somewhat in the last several years, the APS as a whole has been gaining members, starting off 2019 with 55,158 members, a small decrease since 2018.

There are currently thirteen Topical Groups. Of these Groups, GHP is now one of the smallest, ranked 10^{th} in terms of membership with 0.8% of the total APS membership. Only Few Body Systems, Plasma Astrophysics and Shock Compression are smaller. In addition to the increase of the Soft Matter Topical Group, Statistical & Non-Linear and Magnetism both have more than 2% of the APS membership and could also transition to Divisions in the future.

Membership in the Forums and Sections, free to join (at least for the first two forums), is generally rather high. Of the forums, the smallest, with 3.5% of APS members, is Outreach & Engaging the Public. While this may not be indicative of interest APS members have in communicating their passion and enthusiasm for physics to the broader community, it is an interesting detail to note. On the other hand, the Forum on Physics & Society is one of the largest, with 10.4% of APS members. (The Industrial & Applied Physics Forum is currently largest with Graduate Student Affairs a rather close second.) A look at the distribution of Section membership clearly reflects the overall distribution of US physicists, with the largest sections on the coasts.

The GHP has 99 student members and 16 early career members (a decrease in both in 2018), compared to 273 regular members. (The membership categories are regular, senior, student, early career, and life.) Noting that the number of student and early career members of GHP has decreased, it is clear that the GHP should be trying to attract and retain more such members. Encouraging students to join GHP and to maintain their membership in the unit after graduation is a good practice.

In terms of gender diversity, the GHP ranks 9^{th} among the Topical Groups in members that stated 'female' as their gender, with 11.7%. (About 4% of members declined to state a gender.) Encouragingly, 20% of the Forum on Graduate Student Affairs (FGSA) are female. The Groups on Medical Physics and Physics Education Research are both $\sim 30\%$ female.

So long as GHP membership remains at its current level, we will be able to nominate two regular Fellows, an excellent boost for Hadron Physics, see Sec. 3. Currently, 127 GHP members are Fellows, 28.5% of our membership. Thus the GHP is doing well in this category.

Membership in a strong GHP brings many benefits. A vital GHP

- establishes and raises the profile of Hadron Physics in the broader physics community, e.g., by nominating members
  - to APS governance committees,
  - to APS prize and award selection committees,

  - for election to Fellowship in the APS

- has a greater role in planning the program for major APS meetings;
- can continue to present the only topical group-sponsored dissertation award to outstanding graduate students in hadronic physics;
- and provides a vehicle for community action on topics that affect the way research is conducted and funded.

As stated many times before, The Executive feels strongly that the GHP should be growing rather than declining in membership. As mentioned in the list above, we are currently the only topical group that has a dissertation award for deserving students in hadronic physics. We are also one of the few topical groups that holds a lively biennial meeting, in addition to taking part in the April meeting, with invited sessions as well as having our own sorting categories. In addition, given that the next new facility built in the US, the EIC, will be primarily a hadronic physics facility with a large user base, GHP membership should be increasing.

Whether one considers the APS alone, or takes a broader perspective, the impact GHP that can have is primarily determined by the number of members. (It is also influenced by the energy of the Executive.) The Executive urges existing members to encourage their colleagues to join us. We know there are absent-minded people who have overlooked the opportunity to join GHP but many will react positively to a little gentle prodding.

Unit membership is now $10. Of this, GHP receives $5 from the APS. The remainder stays with the APS and covers the many services they provide. They have been very helpful, *e.g.*, the last five GHP meetings have been co-located with the APS April meeting which results in substantial savings for us. With this support we can be an active force for Hadron Physics. The money can be used, for example, to assist with: the GHP Dissertation Award see Sec. 4; the organization of meetings such as GHP2019, see Sec. 5; the preparation and publication of manuscripts that support and promote the GHPs activities; and participation in those fora that affect and decide the direction of basic research.

Hence, if you are reading this newsletter but are not a member of GHP, please join. On the other hand, if youre already a member, please circulate this newsletter to your colleagues and students and encourage them to join. Current APS members can add units online through the APS secure server by following a link on the lower-right of our web page; namely, http://www.aps.org/units/ghp/index.cfm.

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3 Fellowship

This is a good time to remind the GHP that each year the APS allocates a number of Fellowship Nominations to a Topical Group. That number is based primarily on membership. Since we are in the neighborhood of 500 members, we are allocated TWO Regular nominations.

The instructions for nomination may be found at
http://www.aps.org/programs/honors/fellowships/nominations.cfm
The entire process is now online.

A few things to know before proceeding, however. One must

- Ensure the nominee is a member of the Society in good standing as well as a member of

GHP. The online site will do this for you but it's best to check beforehand, to save yourself time or get your nominee to join APS and GHP.

- A nomination requires a sponsor and a co-sponsor. During the online nomination process, you will be required to provide details for a co-sponsor. After you complete a nomination, the co-sponsor will be notified by EMail. It would be best to coordinate with the co-sponsor beforehand.
- In addition to the nomination letters, you will require supporting letters, that will need to be uploaded to the APS web site. Two letters of support are sufficient. Individuals providing letters of support do not have to be members of the APS, however the sponsor and co-sponsor should be APS members.
- The nomination process should be complete prior to GHP's deadline:

Monday 3rd June 2019

The APS will subsequently forward the nominations to the GHP Fellowship Committee, chaired by GHP Vice-Chair Ian Cloët.

Fellowship Committee

Ian Cloët (*Chair*)
icloet@anl.gov

Cynthia Keppel	Richard Milner	Jen-Chieh Peng
keppel@jlab.org	milner@mit.edu	jcpeng@illinois.edu

The Executive urges members of GHP to nominate colleagues who have made advances in knowledge through original research and publication or made significant and innovative contributions in the application of physics to science and technology. They may also have made significant contributions to the teaching of physics or service and participation in the activities of the Society.

Here it is worth reiterating that currently 28.5% of the GHP members are Fellows. Of the $\sim 12\%$ of GHP membership identifying themselves as female, $\approx 27\%$ of female GHP members are Fellows, on par with the level of male Fellows. In terms of the percentage of female Fellows in overall membership, GHP is actually doing better in this regard than many units. Maintaining a diversity in our Fellows can broaden the impact of the GHP.

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4 Dissertation Award

The GHP Dissertation Award was established in February 2012, thanks to significant contributions from Brookhaven Science Associates (the management contractor for the Brookhaven National Laboratory), Jefferson Science Associates, LLC (the management contractor for Jefferson Lab), Universities Research Association (the management contractor for Fermi National Accelerator Lab) and personal contributions from some of our members.

The Award is currently a biennial prize of $1000 and a travel allowance of up to $1500. We are in the process of raising funds to increase the Award to $1500 to match current APS guidelines for Dissertation Awards. Concurrently, we are hoping to increase the frequency of

the Award from biennial to annual, see the November 2018 newsletter for more details concerning our efforts.

To donate to the fund, please see the APS donation page, https://www.aps.org/memb-sec/donation/DonationFunds.cfm and select "Dissertation Award in Hadronic Physics". Once can also send a check payable to American Physical Society at:

APS Development Office
One Physics Ellipse
College Park, MD 20740

Please note, "GHP Dissertation Award" in the memo field. For more information on making a gift, please reach out to Mariam Y. Mehter, APS Campaign and Donor Relations Manager at (301) 209-3639 or mehter@aps.org.

4.1 2019 Dissertation Award

The winner of the 2019 Dissertation Award is Dr. Jacob Ethier, currently a postdoctoral researcher at Nikhef and Vrije Universiteit in the Netherlands. His citation reads: *For achievements in developing a new approach to global analyses of parton distribution functions with modern statistical methods.*

Jacob attended Stetson University from 2009-2013, graduating with a B.S. in physics and minor in mathematics. In 2012, he participated in a Science Undergraduate Laboratory Internships (SULI) program at Jefferson Lab. He then pursued graduate studies under the guidance of Wally Melnitchouk at the College of William & Mary and Jefferson Lab, completing his PhD degree in 2018. From his PhD research, Jacob received College of William& Marys Distinguished Dissertation Award in the Natural & Computational Sciences among other rewards. He now holds a postdoctoral position at Vrije Universiteit and Nikhef, the Dutch National Institute for Subatomic Physics, in Amsterdam. His research involves using rigorous Monte Carlo and machine learning techniques to extract reliable information about the nonperturbative structure of hadrons and nuclei.

In addition to his plenary talk at GHP2019, Jacob will also give an invited parallel talk at the workshop, describing the NNPDF collaboration's work on nuclear parton distribution functions.

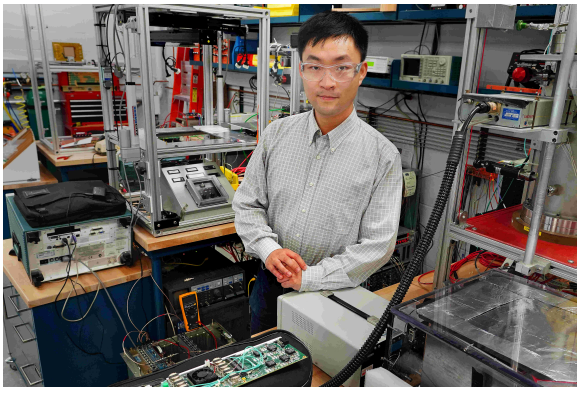
We would like to thank Tanja Horn and the members of her Dissertation Award Committee (Anne Sickles, Jo Dudek, Karl Slifer and Michael Birse) for their work in selecting Jacob as the recipient. The next Award is scheduled to be given in 2021, with nominations due in October 2020, provided we raise enough funds to at least increase the endowment maintain a biennial award schedule.

4.2 Highlights from Previous Recipients[1]

To remind our members the importance of the Dissertation Award and the positive effect it may have on the younger generation of GHP as a whole, in the following we provide highlights from our first two Dissertation Award recipients, Dr. Jin Huang of BNL (2013) and Prof. Daniel Pitonyak (2015) of Lebanon Valley College. We look forward to updates from further recipients in future newsletters.

4.2.1 Dr. Jin Huang (2013)

My journey in the Hadronic Physics Group (GHP) started in 2008 with my Ph.D. thesis work at Massachusetts Institute of Technology working on the Jefferson Lab (JLab) 6-GeV Transversity experiment. In this experiment, we performed the first measurement of double spin asymmetry A_{LT} in semi-inclusive deep inelastic scattering (SIDIS) on a high luminosity, transversely-polarized He-3 target [1]. It provided the first indication of a non-zero transverse momentum dependent (TMD) g_{1T} effect in the neutron, a correlation between the quarks helicity, its transverse momentum and the nucleon's transverse spin. The success of this exploratory measurement led to the proposal and approval of a high precision measurement using the Solenoid Large Intensity Device (SoLID) with the 12-GeV beam of JLab (experiment E12-11-007). After graduation, I joined Los Alamos National Lab as a postdoctoral researcher with a focus on the PHENIX experiment at the Relativistic Heavy Ion Collider (RHIC). I had an opportunity to significantly contribute to the commissioning of the PHENIX Forward Silicon Vertex Detector (FVTX), a precision vertex detector with streaming readout electronics. We had successful data taking from the RHIC runs from 2012 to 2016 which resulted in rich data sets with an enhanced Heavy Flavor (HF) capability in the polarized proton-proton ($p+p$), proton-nucleus ($p+A$) and nucleus-nucleus ($A+A$) collisions. In 2014, I joined Brookhaven National Lab (BNL) as a tenure-track Assistant Physicist and I was promoted to Associate Physicist in 2016. Since then, I am also enthusiastically working on the R&D and construction of the sPHENIX experiment, which consists of high rate, large acceptance, hadronic and electromagnetic calorimetry, and precision tracking. I am currently taking multiple responsibilities in the PHENIX and sPHENIX collaborations, including the co-convener for the sPHENIX heavy flavor topical group, managing the construction project of the data acquisition for the sPHENIX time projection tracker, and the coordinator for sPHENIX simulations. I am also honored to serve in the Executive Committees for both the PHENIX and sPHENIX collaborations, contributing my inputs to the scientific decision making of both collaborations.



In 2013, it was my great honor to receive the Inaugural GHP Dissertation Award for the experimental exploration of the TMD g_{1T} distribution via SIDIS. Since then, I am excited to find this work connecting to the hadronic physics programs in both JLab and RHIC. In the 12-GeV era of JLab, multiple experiments have been proposed to precisely map out the SIDIS A_{LT} observables in the SoLID run group and in CLAS-12. Meanwhile, RHIC provides a unique opportunity to probe

[1] Thanks to Xiaochao Zheng for help with this section.

the TMD effects in DY-type boson production in polarized $p+p$ collisions. It is powerful to combine both SIDIS and DY data to test the modified universality of the TMD distributions as they are fundamentally connected to the non-Abelian nature of QCD. In Ref. [2], Kang, Vitev, Xing and I realized that because the W-bosons couple only to the left-handed quarks, W-boson production at RHIC has a strong sensitivity to the g_{1T} distribution and leads to a parity-violating transverse spin asymmetry. Unlike the Sievers function, one does not expect the PT-even g_{1T} function to change its sign from SIDIS to the DY-type of processes. Therefore, it would be a convincing test for the TMD theory to verify the sign-changing behavior for both g_{1T} and the Sievers functions in SIDIS and DY-type processes.

I am also passionate about using the proton spin as a tool to study QCD matter. In recent years, novel emerging phenomena were observed in small system collisions in both RHIC and the LHC, such as fluid-like collective behavior. Modification of the transverse single spin asymmetries (TSSA) could provide a unique means of understanding the nuclear effects in $p+A$ collisions. With recent TSSA measurements at PHENIX, we did have a few surprises. In the TSSA of J/Ψ productions from $p+p$ to $p+A$ collisions, we found an indication that a non-zero asymmetry may emerge below a transverse momentum of 2 GeV/c in both the forward and backward directions [3]. This measurement indicates that new mechanisms such as electromagnetic effects may become dominant for the low transverse momentum J/Ψ production in $p+A$ collisions. Another surprising ongoing development is the suppression of charged hadron TSSAs when comparing $p+A$ collision to $p+p$ collisions in the pseudorapidity range of 1.2-2.2. The modification of hadron TSSAs is sensitive to the modification of the initial gluon field in the nucleus and multiple scattering of the parton when it traverses and fragments through the nuclear matter. This result was first reported in the 2018-DIS conference [4] and we are preparing the final publication of this result.

In the coming years, I look forward to many new adventures in the experimental investigation of both cold and hot QCD matter. With the planned sPHENIX experiment starting early 2020s, we will measure jets, heavy flavor, and other rare processes to study the microscopic nature of strongly-interacting matter ranging from nucleons to the quark-gluon plasma. Hopefully my journey would lead me to the future Electron-Ion Collider, for which I could bring my experience with a large-scale nuclear collider and the passion for unlocking the secrets of hadrons.

[1] J. Huang *et al.* (Jefferson Lab Hall A Collaboration), Beam-Target Double Spin Asymmetry A_{LT} in Charged Pion Production from Deep Inelastic Scattering on a Transversely Polarized He-3 Target at $1.4 < Q^2 < 2.7$ GeV^2, Phys. Rev. Lett. **108**, 052001 (2012).

[2] J. Huang, Z.-B. Kang, I. Vitev, and H. Xing, Spin asymmetries for vector boson production in polarized $p+p$ collisions, Phys. Rev. D **93**, 014036 (2016).

[3] C. Aidala *et al.* (PHENIX Collaboration), Single-spin asymmetry of J/ψ production in $p+p$, p+Al, and p+Au collisions with transversely polarized proton beams at $\sqrt{s_{NN}} = 200$ GeV, Phys. Rev. D **98**, 012006 (2018).

[4] J. Bok (PHENIX Collaboration), Transverse Single Spin Asymmetries of charged hadron from $p+p$ and p+Au collisions in PHENIX, PoS DIS2018, 153 (2018).

4.2.2 Prof. Daniel Pitonyak (2015)

Obtaining a PhD in theoretical physics was my main goal and focus since I was a freshman in college. My dissertation, *Exploring the Structure of Hadrons through Spin Asymmetries in*

Hard Scattering Processes, was the culmination of five years of tireless work and substantial growth as a physicist. Through the guidance of my adviser, Andreas Metz, I was able persevere through the many challenges one faces in such a pursuit to receive my doctoral degree from Temple University in May 2013.

Even though at the time I felt I had reached the summit, I knew there was still a long, arduous road ahead to sustain a successful career as a physicist. After I graduated from Temple University, I started a postdoc at the RIKEN-BNL Research Center (RBRC) at Brookhaven National Lab (BNL) in September 2013. At BNL I continued to delve deeper and extend the work in my dissertation, especially on the origin of transverse spin asymmetries A_N in pion production from proton-proton collisions at RHIC. The outcome was a significant breakthrough in our understanding of the source of A_N as not from initial-state effects in the proton but from final-state effects as partons fragment into the pions.

About a year later, in April 2015, I won the GHP Dissertation Award in recognition of my original research in the area of hadronic physics during the time of my graduate studies. This award was a tremendous honor for a young physicist like myself to receive. The recognition of the senior physicists on the committee of my work gave me the confidence that I could become a leading expert in the field and pursue other areas of research outside of my doctoral studies. I began to investigate with colleagues what happens to the quark and gluon spin at small x as a potential resolution of the infamous "spin crisis" of how the spin-1/2 of the proton arises from its partons. After receiving the GHP Dissertation Award, I felt that I definitely could achieve my ultimate goal of becoming a physics professor.

After I finished my postdoc at RBRC, I was hired in September 2016 as a postdoc at Penn State Berks and Old Dominion University within the TMD Topical Collaboration, which is funded by the U.S. Department of Energy to study the 3-dimensional structure of hadrons. In addition to this research, I also had the opportunity to teach undergraduate physics classes and speak to the general public about hadronic physics research. In March 2018, I was invited to give the 7^{th} *Annual George J. Losoncy Lecture in Physics* in Reading, PA, titled "Stranger Things: The World of Subatomic Particles," aimed to inform and engage non-scientists about the current state of hadronic physics and impact of basic research on our everyday lives.

From these valuable experiences, I knew ultimately I would like to pursue a career in teaching young, passionate undergraduate physics students and involving them in high-level research. After two years in the aforementioned TMD Collaboration postdoc position, I began this past fall as an Assistant Professor of Physics at Lebanon Valley College, a small college in central Pennsylvania.

I credit the GHP Dissertation Award as a main factor that helped me rise above other candidates to be hired as an assistant professor. The main focus of my work now is on obtaining a global fit of transverse spin observables in semi-inclusive DIS, electron-positron annihilation, and proton-proton collisions. I also enjoy fostering, through teaching and research, young undergraduate scientists in their pursuit of careers as physicists.

5 GHP 2019: 8th Workshop of the GHP

The Eighth Workshop of the APS Topical Group on Hadron Physics will be held the three days immediately before the April APS meeting.

10-12 April 2019

The meeting will be held at the Sheraton Denver Hotel, the same location as the GHP meetings in 2009 and 2013. The meeting website can be found at https://www.jlab.org/indico/event/282. Email inquiries can be made to ghpworkshops@gmail.com.

The program is online at https://www.jlab.org/indico/event/282/other-view?view=nicecompact. A book of abstracts can also be found on the website. Talks will be posted to the indico page. The Program Committee is chaired by David Richards and Garth Huber, the GHP Chair-Elect and Vice Chair respectively. The remainder of the Program Committee includes members of the GHP executive and other GHP members. The full Program Committee is:

- David Richards (co-chair) dgr@jlab.org
- Garth Huber (co-chair) huberg@uregina.edu
- Abhay Deshpande abhay.deshpande@stonybrook.edu
- Tanja Horn hornt@jlab.org
- Swagato Mukherjee swagato@bnl.gov
- Spencer Klein srklein@lbl.gov
- Paul Reimer reimer@anl.gov
- Susan Schadmand s.schadmand@juelich.de
- Anne Sickles sickles@illinois.edu
- Ramona Vogt rlvogt@lbl.gov

The topics covered include:

- Light- and heavy-quark mesons & baryons
- Exotic hadrons
- Neutrino-hadron interactions
- Hadron tomography and hadronization
- Transverse and longitudinal structure of hadrons
- QCD effects in nuclei
- Physics of the quark-gluon plasma
- Physics of gluon saturation
- EFT approaches in hadron physics
- Lattice QCD and other non-perturbative approaches

- Future facilities

Confirmed plenary speakers include the 2018 GHP Fellows Oscar Rando-Aramayo and Moskov Amarian as well as the 2019 GHP Dissertation Award winner, Jacob Ethier. The Friday afternoon prize session closing the meeting also includes the 2017 and 2018 Bonner Prize recipients, Charles Perdrisat and Barbara Jacak.

The organizing committee has put together an outstanding program covering all areas of hadronic physics. We will have well over 100 participants, including significant international participation.

5.1 Business Meeting

We will have a business meeting on Wednesday evening, 10 April, after the sessions have ended, to present our new fellows and the Dissertation Award winner, and discuss other business. The schedule is as follows:

- Welcome (David Richards)
- Report from DOE (Tim Hallman)
- Report from NSF (Bogdan Mihaila)
- BNL Report (Berndt Mueller)
- JLab Report (Bob McKeown)
- GHP Activities (David Richards)
- Secretary-Treasurer's report (Ramona Vogt)
- Presentation of Fellowships and Dissertation Award (Garth Huber)
- Any other business (all)

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6 GHP Program at the APS April Meeting, 2018

Columbus, OH
http://www.aps.org/meetings/april/

GHP participates in the annual APS April Meeting, which is also the primary meeting of the unit in even years. Roughly 100 of our members attend the APS April meeting each year.

GHP is allocated two invited sessions at the April meetings. We often organize joint sessions with other units, in order to raise our profile by increasing the number of sessions sponsored by the GHP. (The maximum currently possible is four.)

The program committee for the 2019 APS April meeting is

GHP Program Committee

David Richards (*Chair*)
dgr@jlab.org

Tanja Horn	Garth Huber
hornt@jlab.org	huberg@regina.edu

The Program Committee has prepared an excellent program for the April 2019 meeting. There will be two co-sponsored invited sessions: one with DNP and one with DCOMP and one standalone GHP session. In addition, there will be five contributed sessions shared between GHP and DNP.

We also point out some other invited and contributed sessions that may be of interest to GHP members at the April meeting.

6.1 GHP invited:

DNP/GHP: Meson and Baryon Spectroscopy
Session B06, Sheraton Governor's Square 15, Saturday 13 April 10:45-11:21, Chair: David Richards (Jefferson Lab)

- Thomas Britton (Jefferson Lab) *Meson Spectroscopy: a Perspective from GlueX*
- Stefan Meinel (University of Arizona) *Theory of heavy-quark spectroscopy*
- Steffen Strauch (University of South Carolina) *Nucleon-resonance studies with CLAS and CLAS12*

GHP: Three-dimensional Structure of Hadrons
Session G06, Sheraton Governor's Square 15, Sunday 14 April 08:30-10:18, Chair: Tanja Horn (Catholic University of America)

- James Puckett (University of Connecticut, Storrs) *Experimental Studies of Transverse Momentum Dependent Parton Distributions*
- Michael Engelhardt (New Mexico State University) *Three-dimensional imaging of hadrons and quark orbital dynamics is Lattice QCD*
- Nicole d'Hose (CEA Saclay) *TBD*

DCOMP/GHP: New Developments in Computing Hadron Structure
Session Q06, Sheraton Governor's Square 15, Monday 15 April 10:45-12:33, Chair: Swagato Mukherjee (Brookhaven National Laboratory)

- Nikhil Karthik (BNL) *Parton distribution inside the pion from lattice QCD*
- Kostas Orginos (College of William and Mary) *Non-perturbative studies of Parton Distribution Functions*
- Raza S. Sufian (Jefferson Lab) *Hadron structure from current-current correlation functions in Lattice QCD*

6.2 Other invited sessions of interest for GHP members:

DNP: Early Results From JLab 12 GeV
Session J05, Sheraton Governor's Square 14, Sunday 14 April 13:30-15:18, Chair: Julie Roche (Ohio University)

- Gerassimos G. Petratos (Kent State University) *First results from the MARATHON Jefferson Lab Tritium DIS Experiment*
- Colin Gleason (Jefferson Lab) *Recent Results from GlueX*
- Daniel S. Carman (Jefferson Lab) *CLAS12 First Experiments and Hadron Structure*

DNP: Intersections of Nuclear and Nucleon Structure
Session L05, Sheraton Governor's Square 14, Sunday 14 April 15:30-17:18, Chair: Douglas Higinbotham (Jefferson Lab)

- Eli Piasetzky (Tel Aviv University) *Bound Nucleon Structure in Neutron Rich Nuclei*
- William Detmold (MIT) *The partonic structure of nuclei from lattice QCD and effective field theory*
- Gerald A. Miller (University of Washington) *Bound Nucleon Structure in QCD and Quark Confinement*

DNP/DPF: Honoring Burton Richter
Session T03, Sheraton Plaza E, Monday 15 April 15:30-17:18, Chair: JoAnne Hewett (Stanford University)

- Roy F. Schwitters (University of Texas Austin) *Early physics, the construction of SPEAR, and the launch of the 1974 November Revolution*
- Jonathan Manne Dorfan (SLAC) *Burton Richter: Post-SPEAR through 1999*
- Steven Chu (Stanford University) *Burt Richter: Public Service without Smoke or Mirrors but with Unique Charm*

6.3 GHP contributed sessions cosponsored with the DNP:

GHP/DNP: 3D Quark and Gluon Structure of the Proton
Session C09, Sheraton Governor's Square 11, Saturday 13 April 13:30-14:54, Chair: David Richards (Jefferson Lab)

DNP/GHP: Meson Electro- and Photo-production
Session D09, Sheraton Governor's Square 11, Saturday 13 April 15:30-17:18, Chair: Latifa Elouadrhiri (Jefferson Lab)

DNP/GHP: Hadronic Interactions
Session H09, Sheraton Governor's Square 11, Sunday 14 April 10:45-12:33, Chair: Kenneth Hicks (Ohio University)

GHP/DNP: Proton Charge Radius and Low-Energy Properties
Session R09, Sheraton Governor's Square 11, Monday 15 April 13:30-15:06, Chair: Tim Hobbs (Southern Methodist University)

GHP/DNP: Valence- and Sea-Quark Structure of the Nucleon
Session X09, Sheraton Governor's Square 11, Tuesday 16 April 10:45-12:21, Chair: Ramona Vogt (LLNL and UC Davis)

6.4 Other contributed sessions that may be of interest to GHP members:

DNP: Mini-Symposium on Hard Probes in Heavy-Ion Collisions I
Session J15, Sheraton Plaza Court 4, Sunday 14 April 13:30-15:18, Chair: Julia Velkovska (Vanderbilt University)

- Invited speaker: Dennis V. Perepelitsa (University of Colorado Boulder) *Developments in hard probes of heavy-ion collisions*

DNP: Mini-Symposium on Hard Probes in Heavy-Ion Collisions II
Session L15, Sheraton Plaza Court 4, Sunday 14 April 15:30-17:18, Chair: J. Matthew Durham (LANL)

- Invited speaker: Ralf F. Rapp (Texas A & M University) *Heavy Flavor Probes of Hot QCD Matter*

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7 The National Academy of Sciences Assessment of U.S.-Based Electron-Ion Collider Science

(Communicated by Christine Aidala, NAS Committee Member caidala@umich.edu.)

A National Academy of Sciences consensus study recently found that an Electron-Ion Collider (EIC) could uniquely address three high-priority science questions:

- How does the mass of the nucleon arise?
- How does the spin of the nucleon arise?
- What are the emergent properties of dense systems of gluons?

An EIC as envisioned in the report would be a unique facility worldwide, pushing the frontiers in accelerator science and technology. The report furthermore finds that the realization of an EIC would help the U.S. maintain international leadership in nuclear physics as well as accelerator science, and it would boost the U.S. workforce in science, technology, engineering, and math.

The study was performed by the National Academies in response to a charge from the Department of Energy requesting an independent assessment of the scientific justification of a U.S.-based EIC. It took slightly over a year and a half to complete. The 15-member committee was co-chaired by Gordon Baym (UIUC) and Ani Aprahamian (Notre Dame) and consisted of a broadly constituted group of scientists with expertise ranging from experimental nuclear physics to theoretical physics, astrophysics, and accelerator science. Committee members were Christine Aidala (Michigan), Peter Braun-Munzinger (GSI), Haiyan Gao (Duke), Kawtar Hafidi (ANL), Wick Haxton (UC Berkeley), John Jowett (CERN), Larry McLerran (University of Washington), Lia Merminga (FNAL), Zein-Eddine Meziani (Temple), Richard Milner (MIT), Thomas Schaefer (NCSU), Ernst Sichtermann (LBNL), and Michael Turner (University of Chicago). The committee met in person four times during 2017, with additional subcommittee meetings by phone and further discussions via e-mail. The first phase of the study focused on information gathering. There were briefings by representatives of the DOE and NSF and discussions with Congressional staffers; the EIC User Group gave their perspective on the science questions to be addressed; there was a report on the 2015 NSAC Long Range Plan that provided context for the EIC within the broader U.S. nuclear physics community; and a report was given on a recent assessment of the accelerator R&D needed to meet different possible performance specifications of an EIC. The committee furthermore invited scientists from the U.S., Europe, and Asia to present on various topics, providing context at the international level. The next phases of the study involved extensive discussions within the committee and, finally, drafting of the report.

The final report was released in July 2018, after revisions based on comments on a draft version received from independent reviewers. The findings were presented by Gordon Baym in a public webinar on July 24, with opportunities to ask questions of a panel consisting of a subset of the committee. The final report is available at https://www.nap.edu/catalog/25171/an-assessment-of-us-based-electron-ion-collider-science.

The report presented nine findings:

Finding 1: An EIC can uniquely address three profound questions about nucleonsneutrons and protonsand how they are assembled to form the nuclei of atoms:

- How does the mass of the nucleon arise?
- How does the spin of the nucleon arise?
- What are the emergent properties of dense systems of gluons?

Finding 2: These three high-priority science questions can be answered by an EIC with highly polarized beams of electrons and ions, with sufficiently high luminosity and sufficient, and variable, center-of-mass energy.

Finding 3: An EIC would be a unique facility in the world and would maintain U.S. leadership in nuclear physics.

Finding 4: An EIC would maintain U.S. leadership in the accelerator science and technology of colliders and help to maintain scientific leadership more broadly.

Finding 5: Taking advantage of existing accelerator infrastructure and accelerator expertise would make development of an EIC cost effective and would potentially reduce risk.

Finding 6: The current accelerator R&D program supported by DOE is crucial to addressing outstanding design challenges.

Finding 7: To realize fully the scientific opportunities an EIC would enable, a theory program will be required to predict and interpret the experimental results within the context of QCD, and furthermore, to glean the fundamental insights into QCD that an EIC can reveal.

Finding 8: The U.S. nuclear science community has been thorough and thoughtful in its planning for the future, taking into account both science priorities and budgetary realities. Its 2015 Long Range Plan identifies the construction of a high-luminosity polarized EIC as the highest priority for new facility construction following the completion of the Facility for Rare Isotope Beams (FRIB) at Michigan State University.

Finding 9: The broader impacts of building an EIC in the United States are significant in related fields of science, including in particular the accelerator science and technology of colliders and workforce development.

In the public webinar releasing the report, the bottom line presented by committee Co-Chair Gordon Baym stated, "The committee unanimously finds that the science that can be addressed by an EIC is compelling, fundamental, and timely."

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8 Leadership Convocation

(Communicated by Tim Hobbs tjhobbs@mail.smu.edu.)

The 2019 APS Leadership Convocation was hosted in downtown Washington, D.C. January 31 – February 2nd. In attendance from the GHP Executive Committee were Ian (Vice-Chair), David (Chair), and Tim (Member-at-Large).

The 2019 APS Award for Outstanding Achievement in Research was presented to Bertrand Halperin of Harvard University "[f]or his seminal contributions to theoretical condensed matter physics, especially his pioneering work on the role of topology in both classical and quantum systems."

Novel APS initiatives presented at the 2019 Meeting:

- The 2019 APS Strategic Plan: Initial preparation for this document began at the 2018 Leadership Meeting and the result is now available at https://www.aps.org/about/strategicplan/index.cfm. The goal is to provide coherence to the Society's various activities going forward. Please take a few minutes to review it.
- APS 'Engage' platform/interface: a tool to facilitate improved communication among the executive committees/leadership of individual APS units, https://engage.aps.org/home
- One of the more compelling features of Engage will be its ability to serve as a repository/historical database for the leadership of individual units, providing stability as volunteers rotate through executive committees. The broader goal, however, is to streamline communications within the APS Leadership, and, ultimately, among the Society membership.
- Initially, executive committee personnel are invited to begin using/beta-testing this platform. There is a tentative aim of releasing it more broadly among the membership around Fall 2019.
- Innovation Fund ("if"). This is a new APS drive to award grants of $25-$100K per year for up to two years for 3-5 projects that align with the 2019 Strategic Plan. Proposals should advance the core interests of the physics community (e.g., science advocacy, industry engagement, education). The due date for preliminary submissions is 18 March 2019. More information can be found at https://www.aps.org/programs/innovation/fund/.
- A possible new/expanded Annual Meeting. The gist of this idea is to build upon the current annual Leadership Convocation as a basis for an enlarged annual meeting to, e.g., better influence policy makers. To that end, this extended meeting might rely upon unit members identified by Unit Executive Committees as having produced highly impactful or visible work that could generate strong public interest — especially interest that might be leveraged in a dedicated 'press day' and with Congressional visits.

Additional program summary/highlights:

Developments in publishing, editorial issues, government affairs: The APS Bridge program has already proven quite successful, and is likely to be expanded further. This program aims to increase diversity in physics PhD programs by providing key support to

students at participating institutions; the deadline for 2019 applications is 15 March. Consider supporting the program or encouraging your institution to participate. See https://www.apsbridgeprogram.org/index.cfm for more information.

International Affairs: The possible addition of a dedicated international affairs point-person to Unit Executive Committees is under consideration. This would be an elected position dedicated to, among other things, handling international membership and issues.

Unit Networking: A new Topical Group for Data Science is in the offing; this group would likely have substantial cross-disciplinary appeal with our own membership in GHP.

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9 APS Strategic Plan

The APS has developed a new strategic plan for 2019, building on the previous plan, covering 2013-2017, see

The plan describes two pillars describing the APS mission: Serving Members, the Physics Community, and Society; and Ensuring a Meaningful Role in Scientific Research Dissemination. These pillars rest on two foundations: Increasing Organizational Excellence; and Securing Financial Sustainability. Below, some of the specific goals and some planned actions to meet those goals are briefly discussed, paraphrased from the plan.

A number of concrete items are listed under the pillar "Serving Members, the Physics Community, and Society". The APS will take more concrete action to embrace diversity, inclusion and equity in APS leadership as well as sponsored programs. The APS will take concrete action to attract more members in industry and private sector jobs. One of the contemplated actions is an APS-centric magazine. To attract more international members, the APS plans to establish geographically-specific international sections. This will be done in collaboration with other national physics societies. It will be interesting to see how this develops. To help members engage more effectively in science advocacy, science policy and public outreach, the APS will increase the number of Congressional Science Fellows supported by the society.

Finally, the APS will solicit proposals from members suggesting new supported programs and activities. There has already been an inaugural email solicitation, see https://www.aps.org/programs/innovation/fund/. While current pre-proposals are due 18 March 2019, presumably there will be subsequent calls. We note that each pre-proposal identifies a unit or committee to partner with so GHP members contemplating a proposal could identify GHP as the partner unit.

The pillar "Ensuring a Meaningful Role in Scientific Research Dissemination" deals primarily with publications and creating more synergies between APS meetings and journals. Activities in this pillar include engagement with the international community in the movement toward open access and open science. One thing that will have to be addressed here is how members can continue to publish in an open access environment without placing further constraints on their research activies and resources. The APS plans to further diversify and grow the APS journals by starting journals in "new and emerging fields and in interdisciplinary area" as well as trying to solicit manuscripts from more international authors. To this end, the new journal Physical Review Research, an Open Access journal addressing a broad spectrum of research,

concentrating on interdisciplinary, newly emerging areas of physics, was recently announced in the March 2019 issue of APS News https://www.aps.org/publications/apsnews/201903/new-journal.cfm. The journal is still in development and will begin accepting manuscripts for review later this year. See the website https://journals.aps.org/prresearch for more information and updates. The plan also suggests creating a new annual APS meeting in addition to the March and April Meetings.

The foundational principle of "Increasing Organizational Excellence" includes improving the APS volunteer experience by providing increased staff support and assessing and improving internal organization and communication with members. The APS has launched a platform called ENGAGE to facilitate and encourage cross-organizational collaboration. For example, it should make communications with staff easier as well as make it possible to reach unit executive committees and APS-wide committees. The foundation "Securing Financial Sustainability" seeks to make sure that APS activities can be carried out in perpetuity. This also necessitates diversifying APS revenue sources to mitigate possible effects of open access publication on APS.

We encourage members to read the plan for themselves. A PDF file of the plan may be found at https://www.aps.org/about/strategicplan/upload/APSStratPlan2019.pdf.

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10 Plan S and Open Access Publishing

As reported in the December 2018 issue of APS News https://www.aps.org/publications/apsnews/201812/plan-s.cfm, in September 2018, a coalition of funding agencies, primarily in Europe, announced formation of cOAlition S and Plan S, aimed at expediting a transition away from subscription-based scientific publishing and to Gold Open Access. See the Plan S website at https://www.coalition-s.org/. The switch to Open Access was proposed to occur already in 2020.

Plan S is summarized on the Wikipedia site https://en.wikipedia.org/wiki/Plan_S. The key idea is that research funded by public grants must be published in Open Access journals. Plan S includes ten principles for publications and ten criteria for publication compliance.

The ten principles for publication are:

1. Authors should retain copyright on their publications, which must be published under an open license such as Creative Commons.
2. The members of the coalition should establish robust criteria and requirements for compliant open access journals and platforms.
3. They (coalition members) should also provide incentives for the creation of compliant open access journals and platforms if they do not yet exist.
4. Publication fees should be covered by the funders or universities, not individual researchers.
5. Such publication fees should be standardized and capped.
6. Universities, research organizations, and libraries should align their policies and strategies.

7. The time line for books and monographs may be extended beyond 2020.
8. Open archives and repositories are acknowledged for their importance.
9. Hybrid open-access journals are not compliant with the key principle.
10. Members of the coalition should monitor and sanction non-compliance.

Many journals today, including many of the APS Physical Review journals, are hybrid open access, meaning that the journals are based on subscriptions but authors have the option to publish OA and paying the article processing charge (APC). Of the APS journal portfolio, only three – Physical Review X, Physical Review Accelerators and Beams, and Physical Review Physics Education Research – are fully OA. All the rest are published under the hybrid model. (High energy physics articles are published OA in Physical Review D and C, as well as Physical Review Letters, through the SCOAP3 agreement with CERN.) In 2009, APS issued a policy statement on OA: "APS supports the principles of Open Access to the maximum extent possible that allows the Society to maintain peer-reviewed high-quality journals, secure archiving, and the Society's longterm financial stability, to the benefit of the scientific enterprise." (https://www.aps.org/policy/statements/09_2.cfm) For more information on APS policy on Open Access, see the Special Commentary in the February 2018 Edition of APS News, "Open Access and the Integrity of Science", by the APS Publisher and the Editor-in-Chief, Matthew Salter and Michael Thoenessen, respectively https://www.aps.org/publications/apsnews/201802/commentary.cfm.

Society published journals, in physics and other fields, are usually published under the subscription model. Such hybrid journals would have to switch to OA or have plans to be in compliance by 2023 under Plan S. For profit journals, such as those published by Elsevier and IOP, would be non-compliant and off limits under Plan S as well. The large subscription fees for journals published by these companies has led to backlash on some campuses. In fact, recently the University of California failed to come to agreement with Elsevier in their subscription package negotiations. See https://www.vox.com/science-and-health/2019/3/1/18245235/university-of-california-elsevier-subscription-open-access.

The ten criteria set forth for Plan S compliance by Open Access journals and other publishing platforms are:

1. All scholarly content must be immediately accessible upon publication without any delay and free to read and download, without any kind of technical or other form of obstacles.
2. Content needs to be published under CC BY, CC BY-SA or CC0.
3. The journal/platform must implement and document a solid review system according to the standards within the discipline, and according to the standards of the Committee on Publication Ethics (COPE).
4. The journal/platform must be listed in the Directory of Open Access Journals (DOAJ) or be in the state of being registered.
5. Automatic article processing charge waivers for authors from low-income countries and discounts for authors from middle-income countries must be provided.
6. Details about publishing costs (including direct costs, indirect costs and potential surplus) impacting the publication fees must be made transparent and be openly available on the journal website/publishing platform.

7. DOIs must be used as permanent identifiers.
8. A long-term digital preservation strategy by deposition of content in a archiving program such as LOCKSS/CLOCKSS must be followed.
9. The full text must be made accessible in a machine-readable format (e.g. XML or JATS) to foster Text and Data Mining (TDM).
10. There must be a link to raw data and code in external repositories.
11. Platforms must provide high quality and machine readable article level metadata and cited references under a CC0 public domain dedication.
12. Machine-readable information on the Open Access status and the license of the article must be embedded.

The biggest consideration is the cost and how it is to be covered. OA mandates place the responsibility for publication costs on the authors, through payment of APCs, rather than on the subscribers. To not place an undue burden on individual authors, an equitable funding model has to be worked out. If the funding agencies mandate OA, they should then assure that their funding levels reflect publication costs. Mandating full or partial APC waivers for authors from low to middle-income countries will mean increased costs for authors from high-income countries, effectively requiring funders to subsidize authors outside their area of purview. The questions become even more complicated when considering that OA would be required for all disciplines with sometimes vastly different funding models.

According to the Wikipedia page, the organizations in cOAlition S include the European Research Council and funding agencies in fifteen countries. The Gates Foundation is the only US-based funder signing on to Plan S. In addition, there are institutional statements of support from associations and organizations in a number of countries, mostly in Europe. In December, after the APS News article went to press, China and India joined Plan S.

An open letter by researchers concerned about the implementation of Plan S is available at https://sites.google.com/view/plansopenletter/open-letter. The 1400+ signatories suggest that Plan S goes too far and is too risky.

They are worried about the complete ban on high quality hybrid journals generally published by scientific societies such as APS. They specifically mention that the Dutch funding organization expects to pay the APCs for OA journals with money saved by no longer paying for subscription journals. It is not clear how this will work because subscriptions are generally held by campuses and institutions rather than individual researchers and the source of payment for these fees may not come from the same funding body as an individual's research grant. (The library subscriptions may be part of the indirect costs included in grant budgets but this should be made clear.) If they do come from the same source, would the agencies consider capping the number of papers submitted from an institution to not exceed the cost of the canceled subscriptions? How does one gain legal access to papers published in embargoed journals, either currently embargoed because they are hybrid journals or to journals with canceled subscriptions? Individual researchers may be expected to pay large fees for literature searches that were formerly free of charge or risk a large body of previous work being ignored because access is not free.

A further concern is the fact that not all agencies worldwide will cooperate with Plan S, with negative consequences for those inside and outside, creating a two-tiered system until the entire world is on board. The signatories fear consequences for individual scientists who

continue to review proposals and referee manuscripts for agencies and journals not part of Plan S. They are also concerned that, as an unintended consequence, costs of research dissemination will rise instead of decrease because the full costs of the peer review process will fall upon researchers. The importance of rigorous peer review should not be underestimated. Only once all journals are forced to convert to Gold OA will the true cost of publishing be known. The signatories are concerned about a decrease in quality of published papers since they fear that the journals will accept more manuscripts of lesser quality to make a profit. A sentiment also echoed by Salter and Thoenessen in https://www.aps.org/publications/apsnews/201802/commentary.cfm.

The signatories are also concerned by the one-size-fits-all nature of Plan S. A glance at the list of those who have signed show that they are primarily chemists. (This is also clear from the content of the letter which appears to be originated and circulated first in that community.) However, their arguments apply equally well to physics.

Overall, they believe Plan S to be a violation of academic freedom in that one should be able to choose to publish in the journals most suitable for the field, regardless of OA status. They suggest that OA be implemented in a way that minimizes increases in publication costs without jeopardizing the international nature of scientific publication.

It will be interesting to see how this issue develops. Stay tuned for more information.

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11 APS Members Advocate for Science on Capitol Hill During Congressional Visits Day

(Communicated by Tawanda W. Johnson, APS Office of Government Affairs Press Secretary tjohnson@aps.org.)

On a mission for science, about 60 APS Unit leaders recently braved the polar vortex that blanketed Capitol Hill to advocate for crucial policy issues during the Societys first Congressional Visits Day (CVD) of the new year.

Representing 25 states across the country, the volunteers visited nearly 100 congressional offices to advocate for: supporting federally funded scientific research; requesting action on climate change; rebuilding Americas research infrastructure; promoting legislation to address sexual harassment in the sciences; and making the F-1 visa “dual intent” to enable international students to simultaneously study and apply for citizenship in the United States. The Unit leaders shared personal stories related to the issues and explained to staffers how those stories affected their congressional members districts and states.

“The APS Office of Government Affairs (OGA) mobilized APS members to add their voices to these important science policy issues,” said APS President David Gross. “As stated in our newly released strategic plan, ‘APS is committed to advocating effectively for the conditions that support a robust scientific research enterprise, which enhances economic growth and trains people to address some of the urgent problems facing society.’“

Nadia Fomin, assistant professor of physics at the University of Tennessee, Knoxville, noted that she and her colleagues received favorable feedback after advocating for sustained, robust federally funded research during 10 congressional meetings. They included talking with staffers representing U.S. Sens. Lamar Alexander and Marsha Blackburn, both of whom

represent her state.

Stacy Palen, physics professor and director of the Ott Planetarium at Weber University in Utah, said her discussion about climate change went well with staffers representing U.S. Sens. Mitt Romney and Mike Lee, and U.S. Rep. Rob Bishop. Palen explained that the Hill Air Force Base, situated on a plateau in her state, is at risk because it is susceptible to flash floods, droughts and wildfires due to climate change.

"The DoD report was very helpful in making the case that climate change is a national security issue," she said. Palen added that staffers were amenable to her point and asked if they could follow up with her to gather more information.

The importance of America's research infrastructure captured the attention of a staffer during a discussion in U.S. Sen. Pat Toomeys office. Nitin Samarth, chair-elect of the APS Division of Materials Physics and head of the Physics Department at Penn State University, highlighted the positive impact of the university's user facility.

"I explained to the staffer that the Materials Innovation Platform user facility at Penn State, funded by the National Science Foundation at $20 million, is instrumental in attracting young scientists and students to careers in materials physics. The staffer reacted positively, and I stressed that we could use more facilities such as this one."

Another topic highlighted during CVD: promoting legislation to address sexual harassment in the sciences. Midhat Farooq, a Ph.D. physics student at the University of Michigan, said she was encouraged by the response she received concerning the legislation.

"My group met with the science staffer from U.S. Rep. Debbie Dingell's office, and he said that it should be a 'no-brainer' for Ms. Dingell to support a bill that addresses sexual harassment in the sciences," she recalled.

APS leaders also did their part during CVD.

Regarding the F-1 visa "dual intent" initiative, APS leadership pushed for amending Sections 101 and 214 of the Immigration and Nationality Act to help make the U.S. more attractive to international students.

"We want the U.S. to continue to attract the best and brightest students to our universities," Gross said.

To ensure that future CVDs remain effective, a survey of APS members experiences on Capitol Hill has been circulated to them.

"OGA looks forward to responses from our participants to help us continue to make sure they have an enjoyable and impactful CVD. As concerned constituents and scientific experts, APS members are some of the most effective advocates on these policy issues," said Mariah Heinzerling, science policy assistant for APS.

Moving forward, OGA plans to continue to engage members in effecting change on Capitol Hill.

"A key goal of this office is to provide APS members with as many opportunities as possible to lend their voices in support of physics and policy issues that strengthen the scientific enterprise," said Francis Slakey, APS chief government affairs officer.

This story first appeared in the March 2019 issue of APS News.

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12 State of the Laboratories

12.1 RHIC Run 19

(Communicated by Jamie Dunlop – dunlop@bnl.gov.)

Spring is almost here, and with it has come the annual RHIC revival, the beginning of the 19th year of RHIC running. This year is a rather special year, in that it is the first year of the RHIC Beam Energy Scan Phase 2 (BES-II), the culmination of many years of upgrades to scan, in detail, the structure of the QCD phase diagram as one changes the quark doping of the Quark Gluon Plasma. We expect, and have tantalizing hints, that in the range available in BES-II the nature of the phase transition between confined and deconfined matter changes dramatically with increasing quark doping, from a crossover transition to a first-order phase transition through a critical point. We have designed BES-II to make measurements of sufficient precision and incisiveness to confirm or refute these hints.

On the accelerator side, a new cooling system, Low Energy Electron Cooling (LEReC) has been installed into the collider, and is being commissioned this year. When fully operational, this system will greatly increase the luminosity, and therefore the physics reach, of the program at the highest quark doping, where previous measurements have suffered from large uncertainties due to the low rate of collisions. This system produces extremely high quality and controlled electron beams which then dance with the hadron beams to tighten the focus of the hadron beams, and therefore the rate of collisions to the detectors. While LEReC targets the lowest energies, other improvements in the collider have increased the luminosity at the higher energies of BES-II, so we will intersperse commissioning of LEReC to reach its ultimate performance with production running at the higher energies as part of a multi-year strategy.

The STAR detector has three major upgrades for the BES-II, all targeted towards increasing the ability of the detector to track and identify a larger fraction of the particles created in the collisions. The suite of upgrades have been fully installed and commissioned, and are actively taking data as I write this.

First, the inner half of the endcaps of its Time Projection Chamber has been replaced with new chambers with full areal coverage and twice as many electronics channels. This project, the iTPC project, has increased the tracking acceptance by 50%, especially significant for some critical measures that are expected to scale far beyond linearly with increasing acceptance, and for which precisely determining that scaling can distinguish critical behavior from more mundane origins. From a personal note, it's pretty amazing how much clearer the eye can pick out tracks on an event display after this upgrade, an impression that is borne out quantitatively once run through computing algorithms to find the tracks and determine their properties. See the figure for an example of the TPC performance for cosmic rays.

Second, the iTPC has been paired on one side of STAR with a new endcap Time of Flight detector, the eTOF, for particle identification for the tracks the iTPC has made available. This detector, developed for the CBM detector at GSI/FAIR and installed into STAR under the FAIR Phase 0 program, greatly improves the program of colliding beams and is essential to making full use of the fixed-target mode of the BES-II, in which STAR can probe to lower collision energies than are available with colliding beams by using a fixed target installed inside the beampipe at one end of STAR.

Third, an Event Plane Detector with broad and segmented coverage in the forward region was fully installed and commissioned last year. This detector, consisting of a set of scintillator tiles read out by Silicon Photomultipliers, was designed to increase the resolution of the

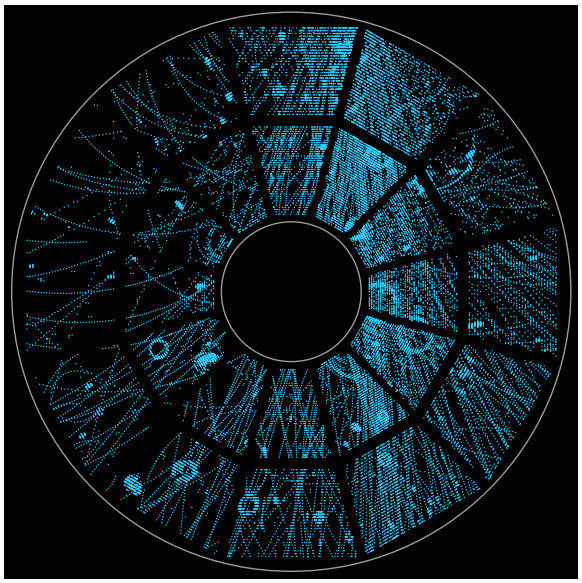

Figure 2: A cosmic ray shower as seen by the STAR TPC, at the hit level before track reconstruction. The enhanced segmentation and full areal coverage from the iTPC upgrade is clearly visible in the inner sectors.

determination of the Event Plane by approximately a factor of 2, increasing accordingly the statistical significance of any measurement including the event plane, such as the global hyperon polarization found in the first Beam Energy Scan and reported in Nature in 2017. Additionally, it provides the main "minimum bias" trigger for the detector, providing a signal of both high efficiency and high purity that an interaction occurred between Au ions of the two opposing beams.

To conclude, after many years of preparation RHIC has now begun its next major program, the Beam Energy Scan Phase 2, to scan the structure of the QCD phase diagram precisely in a region where we expect dramatic changes. The upgrades are in place, and working beautifully, and soon we'll see the physics results of the years of work that led to this point.

12.2 The Year 2018 at Jefferson Lab

(Communicated by Bob McKeown – bmck@jlab.org)

2018 was the first full year of the 12 GeV era of CEBAF operations, following the completion of the upgrade construction in fall 2017. Beam operations commenced in January 2018 with substantially improved performance with 10 weeks of beam delivery to all four experimental halls in Spring 2018. Beam was restored in October 2018 following the scheduled summer shutdown. So far we have completed 11.5 experiments, and more than 50 PhD students acquired data in last year.

Hall A

Hall A completed a suite of four experiments utilizing a gaseous tritium target, including determination of the d/u ratio with MARATHON, nucleon momentum distribution measurements for $A = 3$, a precision measurement of the isospin dependence in the $2N$ and $3N$ short range correlation region, and a search for a ΛNN resonance. Towards the end of the

year, Hall A was installing the APEX experiment, a search for a new gauge boson (A) with sub-GeV mass that couples to ordinary matter, in preparation for running in early 2019.

Hall B

During the spring run, CLAS12 ran Run Group A, accumulating a total of 125 mC charge on a hydrogen target. Run Group A continued data taking during the fall until Thanksgiving break. This was followed by a short run of Run Group K at energies of 7.5 and 6.5 GeV until the holiday break, corresponding to a total of 18 calendar days. The 2019 spring run will begin Run Group B, taking data on liquid deuterium target.

Hall C

After calibrating the new SHMS and re-commissioning the existing HMS spectrometers, Hall C went on to complete E12-10-002, a measurement of hydrogen and deuterium structure functions at large parton momentum and a portion of E12-06-107, a search for the phenomenon of color transparency in protons traversing nuclei. Additionally, E12-10-008 took data on the nuclear dependence of electron scattering on new light nuclei and E12-10-003 took data investigating deuteron electro-disintegration. Hall C continued then with successful initial running of the first post-commissioning 12 GeV era experiments completing E12-09-017, aimed at confirming the potential for Jefferson Lab to study the proton's 3D momentum tomography, and starting E12-09-011, probing the possibility that kaons can be utilized to enable the tomography of strange quarks within the nucleon and E12-09-002, a search for charge symmetry violating quark distributions via measurement of the π^+/π^- ratio in semi-inclusive deep-inelastic scattering. In early 2019, E12-16-007, a search for the LHCb charmed "pentaquark" using photoproduction of J/ψ at threshold, is scheduled to run, after which E12-09-011 and E12-09-011 continue.

Hall D

In the spring of 2018, the 2nd physics run of the GlueX-I (E12-06-102) experiment took place for 90 calendar days. The electron beam energy was 11.7 GeV. In the fall of 2018, GlueX-I data taking was completed. Two new detectors – CompCal and DIRC – have been under construction. The CompCal was installed and tested in the beam in the Fall 2018 after the completion of GlueX-I. The DIRC detector was installed before the Spring 2019 run, and two weeks are allocated for the DIRC commissioning. After that Hall D will run the PRIMEX-eta experiment till the end of the Spring run.

Science Highlights

Hall B has produced a Nature article (Nature **557**, 396-399 (2018)) on a measurement of the pressure distribution experienced by the quarks in the proton.

A strong repulsive pressure near the protons center is accompanied by a binding pressure at greater distance. The average peak pressure near the center is about 10^{35} Pascal, which exceeds the pressure estimated for the most densely packed known objects in the universe, neutron stars.

An accurate calculation of the nucleon axial charge with lattice QCD was published in Nature by a collaboration of theorists including Jefferson Lab: Nature **558**, 91-94 (2018).

A data mining project utilizing 6 GeV era CLAS data produced another Nature publication: Ultrafast Nucleons in Asymmetric Nuclei (Nature **560**, 617-621 (2018)).

The PRad collaboration reported a preliminary result for the proton radius in elastic electron proton scattering at the 2018 fall DNP meeting. This preliminary result is in good agreement

with the PSI result on muonic hydrogen, favoring a smaller value of the proton radius than previous analyses of electron scattering data.

Other Projects

MOLLER has CD0 approval from DOE and is scheduled for a Directors review in April 2019.

The Super BigBite Spectrometer construction is complete, with further work in progress on the polarized ^{3}He target required for the neutron form factor measurements.

The SoLID (Solenoidal Large Intensity Device) collaboration had a Directors Review Feb. 23-24, 2015. The collaboration has updated its pre-CDR document to address all recommendations, and is awaiting a decision on a science review by DOE Office of Nuclear Physics.

One sector of the RICH detector built to enhance the CLAS12 PID capabilities, a project led by INFN, has been installed in January 2018 for the ongoing CLAS12 program. Construction of a second RICH sector, and the Neutral-Particle Spectrometer in Hall C, are ongoing.

The Nuclear and Particle Physics LQCD Computing Initiative at JLab is installing a new GPU-based system with support from DOE. Combined with the existing system, the computational capacity will be increased by over a factor of three.

Jefferson Lab Electron-Ion Collider and Nuclear Femtography

Development of Jefferson Lab Electron Ion Collider (JLEIC) concept continues with emphasis on high luminosity ($> 10^{34}$ cm^{-1} sec^{-1}) and high polarization (including deuterons) and energy reach for electron proton collisions up to 100 GeV in the center of mass. A pre-CDR document for this design is under development and scheduled to be complete in the next few months. We have consolidated the local physics, theory and computation effort by establishing a center for these activities: Electron Ion Collider Center, or EIC2@JLab.

We have begun to establish a Center for Nuclear Femtography using funds from the state of Virginia. This will involve a consortium of Virginia Universities in a coordinated multidisciplinary effort to develop this subject to an advanced state and capitalize on the extensive new data set that will be available from operation of CEBAF at 12 GeV, and also future facilities such as an Electron Ion Collider. A successful Symposium on Imaging and Visualization in Science was held at the University of Virginia in December 2018. Initial pilot projects have been selected for 2019.

Plans are under development to enhance the Labs capabilities and expertise in advanced computation. These will include an integrated Start to End Experimental Computing Model for 12 GeV Physics Program and future EIC, computational and data science methodology and infrastructure to realize the scientific goals of Nuclear Femtography, and Machine Learning for accelerator modeling/control.

Program Advisory Committee

PAC47 will be held the week of July 29, 2019, and will review newly submitted proposals, letters of intent, and previously conditionally approved proposals. Experiments approved in 2006 and 2007 that have not been scheduled yet will be considered in Jeopardy at PAC47. The deadline for submission of proposals and updates is 8:00 a.m. EDT (Eastern Daylight Time) on Monday, June 10, 2019. Additional information is available at https://www.jlab.org/exp_prog/PACpage/.

Acknowledgment: I would like to thank Rolf Ent, Patrizia Rossi, and Jianwei Qiu for their

assistance in preparing this report.

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13 Meeting Summaries

NB. We would be pleased to receive summaries from GHP membership of meetings that they have organized or attended. Please send the summaries to the GHP Secretary-Treasurer.

13.1 Probing Nucleons and Nuclei in High Energy Collisions

(Communicated by Alexei Prokudin prokudin@jlab.org for the organizers)

This 7-week INT workshop (1 October - 16 November 2018) was dedicated to the physics of the Electron Ion Collider (EIC), the world's first polarized electron-nucleon (ep) and electron-nucleus (eA) collider to be constructed in the USA following the 2015 NSAC recommendation as the highest priority long range plan. The primary goal of the EIC is to establish the precise multi-dimensional imaging of quarks and gluons inside nucleons and nuclei. This includes (i) understanding the spatial and momentum space structure of the nucleon through the studies of TMDs (transverse momentum dependent distributions), GPD (generalized parton distributions) and the Wigner distribution; (ii) determining the partonic origin of the nucleon spin; (iii) exploring a new quantum chromodynamics (QCD) frontier of ultra-dense gluon fields, with the potential to discover a new form of gluon matter predicted to be common to all nuclei.

The program brought together both theorists and experimentalists from Jefferson Lab (JLab), Brookhaven National Laboratory (BNL) along with the national and international nuclear physics communities to assess and advance the EIC physics. It summarized the progress in the field since the last INT workshop on EIC in 2010, outlined important new directions for theoretical research in the coming years and proposed new experimental measurements to be performed at the EIC.

Physics Questions Discussed

The key physics questions addressed by the program were as follows:

- **How are the sea quarks and gluons, and their spins, distributed in space and momentum inside the nucleon?**

  GPDs, TMDs and the Wigner distribution allow us to reveal the multi-dimensional nucleon structure in impact parameter and momentum space. The transverse spin polarization of the nucleon can be used as a crucial tool helping us understand non-trivial spin-orbital partonic correlations in the proton. Longitudinal spin structure of the nucleon will be definitely explored and the EIC will allow to constrain the gluon spin contribution to the spin of the nucleon.

- **Where does the saturation of gluon densities set in?**

  The large number of partons in a nucleus may result in strong gluon fields leading to the phenomenon of gluon saturation, known as the Color Glass Condensate. This universal

regime of high-energy QCD is described by non-linear evolution equations. The program addressed the theoretical and phenomenological progress in our understanding of gluon saturation in ep, eA, along with proton–nucleus (pA) and nucleus–nucleus (AA) collisions.

- **How does the nuclear environment affect the distribution of quarks and gluons and their interactions in nuclei?**

  Nuclear PDFs, TMDs, and GPDs are interesting and important beyond small-x: the large-x structure of nuclei reflects important non-perturbative QCD dynamics in a cold nuclear matter environment, possibly providing essential information for our understanding of confinement. Cold nuclear matter can serve as a testing ground for the energy loss calculations describing propagation of an energetic quark or gluon in quark-gluon plasma (QGP) created in heavy ion collisions.

13.2 The spectroscopy program at EIC and future accelerators

(Communicated by Alessandro Pilloni apilloni@ectstar.eu)

The workshop "The spectroscopy program at EIC and future accelerators" was held at the ECT*, Trento (Italy) in December 2018 (http://www.ectstar.eu/node/4230).

Hadron Spectroscopy represents an important topic in nuclear and particle physics, as the rapid developments of lattice QCD simulations and new analysis methods give hope that the novel discoveries in hadron spectroscopy by the B-Factories, LHC, and BESIII will be finally confronted with QCD predictions. The workshop aimed at reviewing the current status of light and heavy quark spectroscopy, with particular emphasis on the results that challenged the quark model paradigm of hadrons. More specifically, the workshop explored opportunities and possibilities for a comprehensive hadron spectroscopy program at the Electron-Ion collider (EIC), which is the highest priority project for the QCD community.

This workshop had 44 participants from different communities, with a good representation of both theory and experiment. The goal was to define the physics case and discuss the technical challenges for a spectroscopy program at the Electron Ion Collider. Contributions from the communities working at the existing facilities (CERN, China, Japan and the US) provided competencies and new ideas to run a hadron spectroscopy program in the next 20 years. This workshop was timely, as at this stage of development of the EIC it is still possible to influence the design of the detectors for the specific needs of spectroscopy analyses.

The workshop was organized into four sessions with two conveners for each session:

Multiquark states: Feng-Kun Guo (CAS, China) and Ryan Mitchell (Indiana University, USA)

Gluonic states: Nora Brambilla (TUM, Germany) and Umberto Tamponi (INFN Torino, Italy)

Diffractive production of resonances: Wolfgang Schaefer (INP-PAS) and Ronan McNulty (UCD, Ireland)

Interaction of heavy flavor with media: Christian Weiss (Jefferson Lab) and Giuseppe Bruno (Politecnico di Bari, Italy)

Several ideas emerged from the program:

- In the diffractive session, differences with past and existing experiments, as LHC, COMPASS, HERA and JLab were discussed. Diffractive production can provide a tool to study the structure of excited vector resonances, as well as the structure of exotic candidates, e.g. the Y family. The need for a detector with large acceptance, able to tag the recoiling proton, emerged.
- In the Heavy Flavor in media session, the role of open and closed heavy flavor meson as probes to access QCD observables was discussed. Moreover, the propagation of heavy flavor mesons in a cold nuclear medium is crucial to understand the hadronization mechanisms, as well as the hadronic interaction which can lead to the production of exotic pentaquarks.
- In the multiquark and gluonic session, the role of amplitude analysis in the extraction of the exotic spectrum was highlighted. This calls for a detector with high acceptance and high resolution. Preliminary estimates for the cross section of exotic states show interesting opportunities for the EIC kinematics. Several interesting channels were discussed. Also, EIC will have the unique opportunity to confirm or disprove the elusive $\tilde{X}(3872)$ claimed by COMPASS.

In the coming months, we expect to collect contributions from the participants of the workshop for a white paper, which will be included in the EIC Physics case representing the manifesto of an active working group interested in pursuing hadron spectroscopy in the future.

This workshop was organized by Marco Battaglieri (INFN Genova, Italy), Alessandro Pilloni (ECT*, Italy), and Adam Szczepaniak (Indiana University and JLab, USA), with support from the ECT* in Trento, Italy.

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14 Forthcoming Hadron Physics Meetings

Meetings of interest to GHP's membership are listed at Mark Manley's page: http://cnr2.kent.edu/ manley/BRAGmeetings.html. In this connection, if there is a meeting you feel should be included, please send the appropriate information to John Arrington (johna@anl.gov) or Mark Manley (manley@kent.edu).

The following list is based on Mark's page:

- INT Workshop INT-19-73W: Weak Elastic Scattering with Nuclei, (4-8 March, 2019, INT, Seattle, WA, USA)
- FF2019: Workshop on Novel Probes of the Nucleon Structure in SIDIS, e^+e^- and pp (Durham, NC, USA, 14-16 March 2019) https://sites.duke.edu/ff2019/
- DIS 2019: The XXVII International Workshop on Deep Inelastic Scattering and Related Subjects (Torino, Italy, 8-12 April 2019) https://indico.cern.ch/event/749003/
- INT Program INT-19-1b: Origins of Correlations in High Energy Collisions (INT, Seattle, WA, USA, 29 April - 24 May 2019) http://www.int.washington.edu/PROGRAMS/19-1b/

- Continuum Functional Methods for QCD at New Generation Facilities (ECT*, Trento, Italy, 7-10 May 2019) https://indico.ectstar.eu/event/46/
- NS^3: 4$^{\text{th}}$ Nuclear Science Summer School for Undergraduate Students (East Lansing, MI, USA, 12-18 May 2019) https://nscl.msu.edu/researchers/NS3.html
- QCD Evolution (Argonne National Laboratory, USA, 13-17 May 2019) https://www.phy.anl.gov/qcd2019/
- QWG 2019: 13$^{\text{th}}$ International Workshop on Heavy Quarkonium (Torino, Italy, 13-17 May 2019) https://agenda.infn.it/conferenceDisplay.py?confid=15632
- MENU 2019: 15$^{\text{th}}$ International Conference on Meson-Nucleon Physics and the Structure of the Nucleon (Pittsburgh, PA, USA, 2-7 June 2019) https://events.mcs.cmu.edu/menu2019/
- RHIC & AGS Annual Users Meeting (Upton, NY, USA, 4-7 June 2019)
- QCD Master Class 2019: Summer School (Saint-Jacut-de-la-Mer, France, 9-22 June 2019) https://indico.cern.ch/event/739086/
- SQM 2019: 18$^{\text{th}}$ International Conference on Strangeness in Quark Matter (Bari, Italy, 10-15 June 2019) http://sqm2019.ba.infn.it/
- NSTAR2019: 12$^{\text{th}}$ International Workshop on the Physics of Excited Nucleons (Bonn, Germany, 10-14 June 2019) https://indico.cern.ch/event/739938/
- Antiproton-nucleus interactions and related phenomena (ECT*, Trento, Italy, 17-21 June 2019) https://indico.ectstar.eu/event/41/
- Initial Stages 2019: The fifth installment on the physics of the initial stages of high energy nuclear collisions (New York City, NY, USA, 24-29 June 2019) https://www.bnl.gov/is2019/
- EDS Blois 2019: The 18$^{\text{th}}$ Conference on Elastic and Diffractive Scattering; 15$^{\text{th}}$ Rencontres du Vietnam (Quy Nhon, Vietnam, 23-29 June 2019) https://indico.cern.ch/event/783891/overview
- 26$^{\text{th}}$ CTEQ Summer School on QCD Analysis and Electroweak Phenomenology (Pittsburgh, PA, USA, 16-26 July 2019) http://www.cteq.org
- INPC 2019: 27$^{\text{th}}$ International Nuclear Physics Conference (Glasgow, UK, 28 July - 2 August, 2019) http://inpc2019.iopconfs.org/home
- HiX2019: 5$^{\text{th}}$ International Workshop on Nucleon Structure at Large Bjorken x (Kolymbari, Crete, Greece, 16-21 August 2019) https://panda.gsi.de/event/hix2019-5th-intern-workshop-on-nucleon-structure-at-large-bjorken-x
- INT Program INT-19-2b: Heavy Quark Physics and Fundamental Symmetries (INT, Seattle, WA, USA, 12 August - 6 September 2019) http://www.int.washington.edu/PROGRAMS/19-2b/
- INT Workshop INT-19-74W: Hadronic contributions to $(g-2)_\mu$ (INT, Seattle, WA, USA, 9-13 September, 2019) http://www.int.washington.edu/PROGRAMS/19-74W
- Non-Perturbative QFT in Euclidean and Minkowski (Coimbra Portugal, 10-12 September 2019)https://indico.cern.ch/event/772852/

- Diquark Correlations in Hadron Physics: Origin, Impact and Evidence (ECT*, Trento, Italy, 23-27 September 2019) http://www.ectstar.eu/node/4449
- MIAPP Conference on Deciphering Strong Interaction Phenomenology through Precision Hadron Spectroscopy (Munich, Germany, 7-31 October 2019) http://www.munich-iapp.de/Hadron_spectroscopy
- DNP 2019: Fall Meeting of the APS Division of Nuclear Physics (Crystal City, VA, USA, 13-17 October 2019)
- Quark Matter 2019: 28$^{\text{th}}$ International Conference on Ultrarelativistic Nucleus-Nucleus Collisions (Wuhan, China, 4-9 November 2019) http://qm2019.ccnu.edu.cn/
- Gordon Research Conference on Photonuclear Reactions: Frontiers in Nuclear and Hadronic Physics (Holderness, NH, USA, 9-14 August 2020) https://www.grc.org/photonuclear-reactions-conference/2020/

GHP members might also be interested in other conferences and workshops listed at the following sites:

- ECT* ... www.ectstar.eu
- INT ... www.int.washington.edu/PROGRAMS/programs_all.html
- JLab ... www.jlab.org/conferences

This GHP Newsletter was edited by Ramona Vogt for the Executive Committee.