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NB. EMail addressed to ghpexec@anl.gov 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 GHP 2013: 5th Workshop of the GHP

10-12 April 2013

Planning is fully underway for the Fifth Workshop of the APS Topical Group on Hadron Physics. The meeting will be held in Denver, Colorado, immediately prior to and in the same venue as the April APS meeting:

April 10-12, 2013
 Sheraton Denver Downtown Hotel
 1550 Court Place
 Denver, Colorado, 80202

Rooms are available at a discounted rate until March 10th, 2013. Registration and housing information are available at the conference web page:

<https://sites.google.com/site/ghpworkshop/>

We encourage you to book soon as rooms are limited. Information for an alternate hotel options are provided on the workshop's website.

Note that registration for students is only \$40 (\$20 for GHP members), and there is no deadline for the discounted registration. We encourage any students who plan to attend the April APS meeting to come early and attend the GHP meeting as well.

The GHP workshop offers an excellent opportunity for nuclear and particle physicists to meet and discuss their common interests in hadronic interactions and for students and postdocs to get a broad overview of hadronic physics research. So please plan on attending.

There will be six three-lecture Plenary Sessions and six blocks of parallel sessions. Topics to be discussed include:



GHP13
Fifth Workshop of the APS Topical Group on Hadronic Physics
 April 10-12, 2013
 Denver, CO

Topics to be Discussed
 Light and heavy quark mesons and baryons
 Exotic hadrons
 Nucleon spin physics and hadronic structure
 AdS/QFT, novel phenomena
 Future facilities
 Lattice QCD
 Physics of the quark-gluon plasma
 Physics of gluon saturation

The workshop immediately precedes the 2013 April APS meeting and will take place at the same venue, the Sheraton Denver Downtown Hotel, on the downtown pedestrian mall and near several museums. The GHP workshop provides a great opportunity for nuclear and particle physicists to meet and discuss their common interests in hadronic interactions.

Organizing committee
 John Arrington (ANL, co-chair), Matthias Burkhardt (New Mexico State, co-chair), Ramona Vogt (LLNL and UC Davis), Peter Felczak (BNL), Craig Roberts (ANL), Matthias Grosse Perdekamp (UIUC), Susan Schadmand (FZ Juelich), Jianwei Qiu (BNL), Mike Loitch (LANL), Volker Crede (Florida State), Wally Melnitchouk (JLab), Peter Tandy (Kent State)

Website: <https://sites.google.com/site/ghpworkshop/>
 Email: ghpworkshops@gmail.com
 Hotel: Sheraton Denver Downtown Hotel, 1550 Court Place, Denver, CO
<http://www.sheratondenverdowntown.com>

Jefferson Lab
 Thomas Jefferson National Accelerator Facility

BROOKHAVEN
 NATIONAL LABORATORY

- AdS/QFT, novel phenomena
- Exotic hadrons
- Future facilities
- Lattice QCD
- Light and heavy quark mesons and baryons
- Nucleon spin physics and hadronic structure
- Physics of the quark-gluon plasma
- Physics of gluon saturation

On Thursday, April 11th, a reception/workshop dinner will be held at
[Marlowe's, 501 16th st, Denver, CO](#)

and a GHP business meeting is scheduled for Wednesday Evening, April 10th.

We have a limited amount of travel funds that we intend to use to support the travel of some junior scientists. The formal abstract submission deadline is passed, but late abstracts are still being accepted and will be accommodated if the schedule permits. Abstracts may be submitted from the conference web site and email inquiries may be sent to:

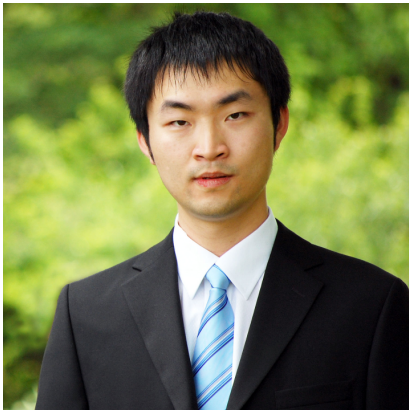
Workshop Email: ghpworkshops@gmail.com

John Arrington and Matthias Burkardt are co-chairing the Organizing Committee, which is constituted from the entire Executive and selected members of GHP:

Organizing committee:

- John Arrington (johna@anl.gov)
- Matthias Burkardt (burkardt@msu.edu)
- Volker Crede (crede@fsu.edu)
- Jianwei Qiu (jqiu@bnl.gov)
- Mike Leitch (leitch@rcf.rhic.bnl.gov)
- Ramona Vogt (rlvogt@lbl.gov)
- Craig Roberts (cdroberts@anl.gov)
- Wally Melnitchouk (wmelnitc@jlab.org)
- Peter Tandy (tandy@kent.edu)
- Matthias Grosse Perdekamp (mgp@illinois.edu)
- Peter Petreczky (petreczk@quark.phy.bnl.gov)
- Susan Schadmand (ghpworkshops@gmail.com)

As past meetings have demonstrated, the GHP workshop offers a very good opportunity for nuclear and particle physicists to meet and discuss their common interests in hadronic interactions. So please mark these dates and the location in your calendar, and plan on attending.



Dr. Jin Huang, Winner of the
Inaugural GHP Dissertation Award.

2 Thesis Prize

Nominations for the *Inaugural GHP Dissertation Award* closed on October 8, 2012, and here we are pleased to announce that the winner is

Dr. Jin Huang

who received his PhD from the Massachusetts Institute of Technology, Department of Physics, in October 2011, [for the first measurement of double spin asymmetries in charged pion production from deep inelastic scattering on a transversely polarized \$^3\text{He}\$ target.](#)

Jin received a B. S. degree from University of Science and Technology of China in 2006. He then went to MIT, and studied under the guidance of Professor William Bertozzi and Dr. Shalev Gilad. While working on his thesis experiment, E06-010 at Jefferson Lab, he twice received the Jefferson Science Associates/Jefferson Lab Graduate Fellowship. Jin is now a postdoctoral fellow at Los Alamos National Laboratory, working on the forward silicon detector upgrade for the PHENIX experiment at Brookhaven National Laboratory and studying proton spin structure through W -boson and Drell-Yan production. He is also serving as co-spokesperson for the E12-11-007 experiment at Jefferson Lab, which will expand his thesis measurements to much higher precision and kinematic coverage.

The GHP Dissertation Award is a prize of \$1000 and a travel allowance of up to \$1500, in this case to attend the 2013 Meeting of the GHP meeting. The award will be presented at the meeting.

As 2012 Chair of GHP, Ramona Vogt led the Dissertation Award Committee, whose full composition was:

Volker Crede	Mike Leitch	Wally Melnitchouk	Jianwei Qiu	Ramona Vogt
FSU	LANL	JLab	BNL	LLNL & UCD
crede@fsu.edu	leitch@rcf.rhic.bnl.gov	wmelnitc@jlab.org	jqiu@bnl.gov	rlvogt@lbl.gov

The dissertations were evaluated according to the following criteria: the quality of the written dissertation (40%), the contribution of the student to the research (30%), the impact of the work (15%), and the broader involvement of the student in the community (15%).

The GHP Dissertation Award was made possible by 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 current endowment enables GHP to present the Dissertation Award biennially. In order

to maintain that endowment and, perhaps, to expand the Award, the Executive encourages our members to donate to the award fund. For information on how to proceed, please see: <https://www.aps.org/memb-sec/profile/DonationFunds.cfm>

3 Fellowship



John Arrington (left) and Nora Brambilla (right), GHP's 2012 Fellows.

We take this opportunity to congratulate John Arrington (ANL and current GHP Chair) and Nora Brambilla (T. U. München), both of whom in 2012 were elected to Fellowship in the APS under the auspices of the GHP:

John “For his extensive and systematic work in understanding the electromagnetic form factors of the nucleon and the role of short distance phenomena in nuclei;”

and Nora “For contributions to the theory of heavy-quark-antiquark systems, including the development of new effective field theories, and for contributions to the field of heavy-quarkonium physics through the founding and leadership of the Quarkonium Working Group.”

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 neighbourhood of 500 members, we are allocated TWO Regular nominations.

The Executive urges members of GHP to be prepared in 2013 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.

The instructions for nomination may be found at <http://www.aps.org/programs/honors/fellowships/nominations.cfm>
The entire process is now performed on-line.

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

- Ensure the nominee is a member of the Society in good standing. The on-line 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 on-line 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 up-loaded 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, in practice it is preferable that sponsors be APS Fellows.
- The nomination process should be complete prior to GHP's deadline:

Saturday 1st June 2013

The APS will subsequently forward the nominations to the GHP Fellowship Committee, which this year is

2013 GHP Fellowship Committee

Curtis Meyer cmeyer@cmu.edu	Peter Petreczky petreczk@quark.phy.bnl.gov	Ramona Vogt rlvogt@lbl.gov
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Peter Petreczky is Chair. Do not hesitate to contact Peter or his colleagues on the committee if you have questions.

The Executive urges members of GHP to react quickly to this call for nominations.

4 Elections

Elections for three posts in the GHP Executive closed on 16th December 2012. The new Executive Committee is listed at the top of this newsletter.

On behalf of GHP, the Executive thanks the people who entered their names on the ballots.

In addition, we thank Volker Crede and Ronald Gilman for their efforts in the GHP Executive on behalf of hadron physics and beyond.

Elections will open again in November 2013. We will fill two positions on GHP's Executive Committee:

- Vice-Chair (Matthias Burkardt will become Chair and Peter Petreczky will become Chair-Elect, leaving the position of Vice-Chair vacant. Naturally, John Arrington will become Past-Chair, whilst Ramona Vogt will refocus on oppressing charmonium, as she has done on and off throughout her career.)
- and one Member-at-Large (Jianwei Qiu will by then have completed his stint.)

It is planned that in September, 2013, the Nominating Committee will solicit input from the GHP membership. The nomination of candidates will likely close on Fri. 4 October and an electronic ballot will subsequently be held over a five week period: 1 November – 6 December.

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, who is

Ramona Vogt (rlvogt@lbl.gov)

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

We urge GHP members now to begin considering whom they would like to see filling the two open positions in 2013 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.

5 Membership

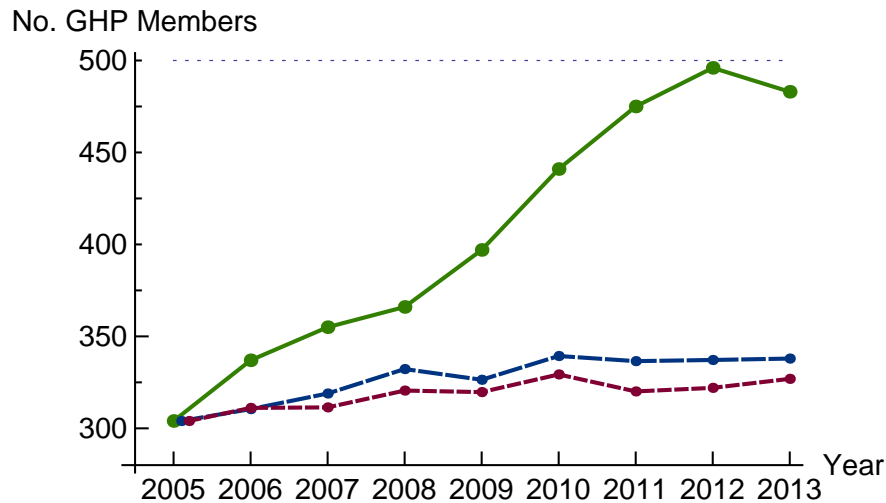


Figure 1: *Solid line* – GHP membership, true value, with “2013” representing the current APS Official Count; *long-dashed* – DNP membership normalized to GHP’s value in 2005 (2401 → 304); and *short-dashed* – DPF membership normalized to GHP’s value in 2005 (3291 → 304).

As of January 2013, the GHP had 483 members, which represents 0.97% of APS membership. Of these people, 278 are also in DNP (Division of Nuclear Physics) and 243 are in DPF (Division of Particles and Fields). Whilst the number of members shared with DNP grew by 11, we lost 28 members that we had shared with DPF.

GHP recovered some of the ground lost during the Summer of 2012, when our membership fell to 469. Nevertheless, we lost 2.6% of our membership during 2012. In this connection, it is notable that membership in DNP is static (2669, grew by just 6 members = 0.2%) but DPF has seen growth (3539, grew by 53 members = 1.5%).

Despite the funding crises, there are probably more Hadron Physics researchers who are now not involved with GHP than there were at the beginning of 2012. Hopefully, this will change as the 5th *Workshop of the GHP* approaches, especially given the structuring of registration fees. Still, our membership to approximately 500. So we will be able to make two regular-fellowship

nominations this year, which is an excellent boost for Hadron Physics. (See Sec. 3.)

There are now twelve Topical Groups, of which the GHP is the 8th largest, as it was in January 2012. Four other Topical Groups declined in membership. The most rapidly growing is the newest; namely, *Physics of Climate*, established in 2012.

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;
- and provides a vehicle for community action on topics that affect the way research is conducted and funded.

Whether one considers the APS alone, or takes a broader perspective, the impact GHP 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.

Membership is only \$8. Of this, GHP receives \$5 from the APS. (The remainder stays with the APS and covers the many services they provide. They were very helpful, e.g., in connection with GHP11 and also with our preparations for GHP13.) 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. 2; the organization of meetings – such as the forthcoming GHP2013, see Sec. 1; the preparation of publications that support and promote the GHP’s 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 you’re already a member, please circulate this newsletter to your colleagues 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>.

6 APS April Meeting, 2013

13 – 16 April, Denver, CO

<http://www.aps.org/meetings/april/index.cfm>

6.1 GHP Program

A topical group is invited to participate in planning the program of major APS meetings. At this year’s meeting in Denver, we have four invited sessions, all shared with the Division of Nuclear Physics:

GHP/DNP: The Search for the QCD Critical Point

Saturday, April 13 at 15:30, Chair: Agnes Mocsy (Pratt Institute)

- Swagato Mukherjee (BNL) *The Search for the QCD Critical Point*
- Michael Lisa (Ohio State) *Condensed matter approach to a partonic system - The energy scan at RHIC*
- Marlene Nahrgang (Duke) *New advances in the hydrodynamic description of the QCD critical point in heavy-ion collisions*

GHP/DNP: Initial State Fluctuations and Transport in the Quark-Gluon Plasma

Sunday, April 14 at 10:45, Chair Peter Jacobs (LBNL)

- Paul Sorensen (BNL) *Measurement of initial state fluctuations at RHIC*
- Raimond Snellings (NIKHEF) *Measurement of Initial State Fluctuations at LHC*
- Kevin Dusling (NCSU) *Theory of Initial State Fluctuations, Thermalization, and CGC*

GHP/DNP: Exploring Low Energy QCD with Rare Meson Decays

Sunday, April 14 at 13:30, Chair: Susan Schadmand (Forschungszentrum Jülich)

- Daniel Coderre (Forschungszentrum Jülich) *Light Meson Decays at WASA-at-COSY*
- Bastian Kubis (HISKP, Univ. of Bonn) *What Can We Learn from Hadronic and Radiative Decays of Light Mesons?*
- Liping Gan (UNC-Wilmington) *PrimEx Experiments and the Prospects of Rare Meson Decays at GlueX*

GHP/DNP: New Development in Baryon Resonance Spectrum

Tuesday, April 16 at 10:45, Chair: Latifa Elouadrhiri (Jefferson Lab)

- Michael Dugger (Arizona State) *Latest results from the CLAS N^* polarization program*
- Victor Mokeev (Jefferson Lab) *$\gamma_v NN^*$ Transition Amplitudes and Excited Baryon Structure from CLAS*
- Andrey Sarantsev (Universität Bonn) *The Bonn-Gatchina PWA: Search for New States and Study of Resonance Properties*

In addition, the GHP has three contributed sessions and two more contributed sessions shared with the DNP. We anticipate, too, that the following session will be of interest to many GHP members:

DNP/DPF: Exotic Hadron States

Saturday, April 13, 2013, at 1:30PM, Chair: Volker Crede (Florida State University)

- Eric Swanson (Pitt) *Review of XYZ States*
- David Richards (JLab) *Light-Quark Spectroscopy on the Lattice*
- Ryan Mitchell (Indiana U.) *Prospects for Future Studies of the XYZ: BESIII, GlueX, Panda*

6.2 Lunch with the Experts

Finally, the GHP will sponsor one table at “Lunch with the Experts” on Sunday, April 14 from 12:00 noon to 1:30 pm.

The expert in question is John Arrington, GHP Chair, whose focus is *Nuclear Physics: nuclei, nucleons and quarks*. If you have students interested in this topic, encourage them to sign up for our table so that John won’t have to eat lunch alone.

6.3 April 2014

Moving on to next year, **Matthias Burkardt** will serve as Chair of the GHP’s 2013 Program Committee:

2013 GHP Program Committee, preparing for April 2014

Harut Avakian avakian@jlab.org	Matthias Burkardt mburkardt@physics.nmsu.edu	Jianwei Qiu jqiu@bnl.gov
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The 2014 April Meeting is scheduled for

April 5-8, 2014 – Savannah, GA.

<http://www.aps.org/meetings/meeting.cfm?name=APR14>

7 Unit Convocation

The Convocation is the gathering of unit officers. It provides for their familiarization with the ways of the APS, and is also an excellent opportunity for unit officers to learn from each other. This year, the Convocation will be held at the American Center for Physics (APS Headquarters) in College Park, Maryland on

Friday 22nd February – Saturday 23rd February.

For the past year, the APS Presidential Line, Executive Board and Staff have been working to initiate implementation activities related to the recently adopted Strategic Plan for the APS. The APS Presidential Line and Operating Officers feel it is vital to the success of the Strategic Plan to have discussions about implementation with unit leaders, and therefore have scheduled the February Executive Board meeting to overlap with the Leadership Convocation. Starting late Friday afternoon through Saturday morning, led by the Presidential Line and Operating Officers, the unit leadership will have an opportunity to hear about the major APS implementation undertakings, to ask questions, and discuss unit activities that can interface with new APS initiatives.

This year two members of the GHP’s Executive are volunteering their time and will take part: Peter Petreczky and Susan Schadmand.

In addition, APS is urging Convocation participants to spend Thursday, 21 February, before the Unit Convocation, on Capitol Hill, meeting with their Congressional representatives to discuss the contributions that physics and physical science make to the nation. For those involved, this is not always entertaining but usually enlightening.

8 Science Funding

In a letter from the Office of Science and the National Science Foundation, dated 5th April 2012, the Nuclear Science Advisory Council (NSAC) was asked to provide advice on implementing the the priorities and recommendations of the 2007 NSAC Long Range Plan (LRP, available at <http://science.energy.gov/np/nsac/>) in light of tightening budget constraints and for guidance on developing a plan to implement the highest priority science in the context of likely available funding and world-wide capabilities.

The subcommittee formed by NSAC, in order to respond to this charge, communicated their report to NSAC on 28th January 2013, and the report was transmitted to the Office of Science and National Science Foundation on 1st February 2013.

In preparing the report, the subcommittee received substantial input from the nuclear science community. The report provides a forward look at the science capabilities that will follow from investment in each of the four areas put forward in the 2007 LRP. Some of the investments are well underway, others are beginning to occur. The report also discusses the program that can be carried out under several budget scenarios and provides the priorities for how to move forward under these scenarios. The complete document “Report to NSAC on Implementing the 2007 Long Range Plan” is available at <http://science.energy.gov/np/nsac/reports/>.

Whilst this report makes sober reading, even its worst case scenario might be too optimistic, given that a growing number of people view sequestration as a real possibility. Indeed, on Tuesday 19th February, President Barack Obama found it necessary to use the threat of cuts to emergency services in order to increase pressure on Congress to avert the automatic spending cuts looming to take effect in just a few days. Obama said that the “meat cleaver approach” of the sequester would “jeopardize our military readiness, it will eviscerate job creating investments in education and energy and medical research.”

In the event that sequestration hits, the GHP Executive urges our membership to be ready with the message that science and technology have paid huge economic dividends for our Nation, providing the foundation for innovation, new industries and jobs for Americans, and to deliver that message to Congress.

9 Meeting Summaries

9.1 Light Cone Cracow 2012

(Communicated by Wojciech Broniowski <b4bronio@cyf-kr.edu.pl> and Chueng Ji <ji@ncsu.edu>.)

The 2012 edition of the Light Cone conference: “Modern approaches to nonperturbative gauge theories and their applications,” was held in the Polish Academy of Arts and Sciences, Cracow, Poland, 8-13 July 2012. <http://indico.ujk.edu.pl/conferenceDisplay.py?ovw=True&confId=4>.

It covered several topical themes relating to the nonperturbative structure of hadrons and light-cone dynamics:

- ADS/CFT – theory and applications

- Light-cone field theory
- Lattice field theory
- Hadron structure
- The impact of LHC on strong interaction physics
- Effective approaches to hadron structure

There were 73 participants from 17 countries, and 63 presentations, divided into 11 topical sessions: “AdS/CFT,” “Aspects of gauge theory,” “Dyson-Schwinger approach,” “Effective models and experiment,” “GPD, TMD, TDA,” “Hadron structure,” “Large N_c ,” a special session “From the light front to AdS/CFT,” “Light-front phenomenology,” “Light-cone basics,” and “Phenomenology.”

Proceedings will be published this year in *Acta Physica Polonica B*.

9.2 Hadron 2012(China)

(Communicated by Jian-ping Chen <jpchen@jlab.org> and Haiyan Gao <gao@tunl.duke.edu>.)

Hadron 2012(China), the Fourth Workshop on Hadron Physics in China and Opportunities in the US (<http://www.ciae.ac.cn/eng/hadron2012/index.htm>), was held at the Kavli Institute for Theoretical Physics in China (KITPC), Beijing, July 16-20, 2012.

The workshop has been held annually since 2009, aiming to promote the development of hadron physics in China and to enhance the collaboration between the Chinese and the US hadron physics communities. The previous gatherings were in

- Lanzhou (2009) <http://www.jlab.org/conferences/hadron-china/>;
- Beijing (2010) <http://www.jlab.org/conferences/hadron-china/>;
- and Weihai (2011) <http://hepg.sdu.edu.cn/THPPC/conference/weihai2011/Home.html>.

The 2012 workshop formed part of a KITPC program (three weeks) on nucleon structure (QCD and hadron physics) (<http://kitpc.itp.ac.cn/program.jsp?id=PF20120611>). Preceding the workshop, the first two weeks’ program had in-depth discussions on hadron spectroscopy and nucleon structure. The workshop provided updates on recent progress in both experimental and theoretical activities, including experimental results from JLab, BNL, BES and other facilities, as well as theoretical developments in understanding nucleon spin, TMDs, GPDs, hadron spectroscopy, and confinement. Future programs with the 12 GeV energy-upgrade at JLab were presented and discussed.

Collaborations between Chinese institutions and JLab were also considered at the Workshop, with a focus on the first large scale collaboration on the JLab SoLID program (<http://hallaweb.jlab.org/12GeV/SoLID/>). The SoLID program includes five approved and highly-rated experiments using a common Solenoidal Large Intensity Device (SoLID) spectrometer, which has a large acceptance and is capable of handling high luminosity, so as to allow precision measurements of SIDIS-TMDs (three experiments) and PVDIS (one), as well as threshold J/Ψ -production (one). The Chinese groups plan to make significant contributions

in building detectors (the GEMs and the MRPC) for the SoLID as well as being major partners in the SoLID physics program.

All presentations are available from the workshop web site:

http://www.ciae.ac.cn/eng/hadron2012/program/program-3rdweek_%20final_v6.htm.

The workshop attracted many participants, about 100 physicists, and roughly half were students and young physicists (postdocs). The growth, from the initial tally of about 50 in 2009 to about 100 in 2012, shows the increasing interest in hadron physics by the high-energy nuclear physics community in China. The large number of students and young physicists reflects a healthy trend in this relatively young field in China.

The next workshop will be take place at Huangshan University in the beautiful Huangshan (Yellow Mountains) area in eastern China, July 2-6, 2013:

<http://hepg-work.ustc.edu.cn/hadron2013Test/index.html>.

9.3 Confinement X

(Communicated by N. Brambilla – nora.brambilla@ph.tum.de.)

The tenth edition of the Conference “Quark Confinement and the Hadron Spectrum (ConfX)” took place in the period 8-12 October 2012 at the Garching Research Campus, hosted by the Physics Department of the Technical University of Munich (TUM) (<http://www.physik.tu-muenchen.de/>) with support from the Excellence Cluster *Origin and Structure of the Universe* (<http://www.universe-cluster.de/>).

About 400 participants, theorists and experimentalists, from all over the world, convened in Munich to discuss developments in the theory of strong interactions, including fields at the boundaries, such as Theories beyond the Standard Model with a strongly coupled sector and “QCD approaches” to Nuclear Physics and Astrophysics.

The tenth conference in the series was an important occasion for a reconsideration of what has been accomplished in the past editions; and, on the other hand, since it occurred at a particularly important time for physics, with the observation of a Higgs-like particle at CERN, it represented a precious opportunity to discuss the perspectives and future of strongly coupled theories.

The series of conferences has established itself as an important reference point, connecting people working with strong interactions in approaches ranging from lattice QCD to perturbative QCD, from models of the QCD vacuum to QCD phenomenology and experiments, from the mechanism of confinement to deconfinement and heavy ion physics, and from effective field theories to physics beyond the Standard Model.

The scientific coverage of the conference is indeed broad, being distributed in seven main scientific sessions whose foci are determined by the corresponding conveners:

- Section A: Vacuum Structure and Confinement [M. Faber (TU Vienna), M. Polikarpov (ITEP, Moscow)]
- Section B: Light Quarks [R. Alkofer (Univerität Graz), B. Ketzer (TU München), J. Goity (JLAB, Newport News), H. Sazdjian (IPN Orsay), H. Wittig (JGU Mainz)];
- Section C: Heavy Quarks [G. Bodwin (Argonne National Lab), P. Pakhlov (ITEP, Moscow), J. Soto (University of Barcelona), A. Vairo (TU Mnchen)];

- Section D: Deconfinement [P. Arnold (University of Virginia), Y. Foka (GSI, Darmstadt), H. Meyer (JGU Mainz), J. Rafelski (University of Arizona)];
- Section E: QCD and New Physics [S. Gardner (University of Kentucky), H. W. Lin (University of Washington), F. Llanes Estrada (UC Madrid), M. Snow (Indiana University)];
- section F: Nuclear and Astroparticle Physics [M. Alford (Washington University in St. Louis), T. Cohen (University of Maryland), L. Fabbietti (TU München), A. Schmitt (TU Vienna)];
- Section G: Strongly Coupled Theories [J. Erdmenger (MPP Munich), E. Katz (Boston University), E. Pallante (University of Groningen), A. Szczepaniak (Indiana University)].

These subjects are relevant for the physics of B-Factories (Belle and BABAR), tau-charm factories experiments (BESIII), LHC experiments (LHC-b, CMS, ATLAS), heavy ion collisions experiments (RHIC, ALICE), the future experiments at FAIR-GSI (Panda, CMB), and generally to many low energy experiments (JLAB, COSY, MAMI, etc.) and to parts of experimental astrophysics.

During the poster session participants could enjoy tasting cheese and wine from a large variety of bottles brought from all the countries by the participants.

The full programme of the meeting is available at <http://www.confex.de/>

9.4 Workshop on the Proton Radius Puzzle

(Communicated by Randolph Pohl <randolf.pohl@mpq.mpg.de>, Gerald A. Miller <miller@phys.washington.edu> and Ron Gilman <rgilman@physics.rutgers.edu>)

A workshop on the Proton Radius Puzzle was held with 47 participants at ECT* in Trento, Italy, from 29 October – 2 November 2012. The organisers were Randolph Pohl (Max-Planck-Institute of Quantum Optics, Garching, Germany), Gerald A. Miller (University of Washington, Seattle, WA, USA), and Ronald Gilman (Rutgers University, New Brunswick, NJ, USA). Conference web pages are at

<http://www.mpg.de/~rnp/wiki/pmwiki.php/Main/WorkshopTrento>.

Further details are provided in the summary of the workshop in the ECT* annual report.

The main focus was the determination of the rms proton charge radius R_p from three types of measurement: Elastic electron-proton scattering, spectroscopy of “regular” electronic hydrogen H, and the recent measurement of the Lamb shift (2S-2P energy difference) in the muonic hydrogen atom. The latter differs by 7 standard deviations from the value of R_p obtained in scattering and H. This so-called “proton radius puzzle” has attracted a lot of interest, but no satisfactory explanation has been found. The workshop has brought together the leading researchers in the field, generating lively discussions on a variety of key issues:

- Recent experiments: Muonic hydrogen; Elastic electron-proton scattering
- Extraction of proton form factors and R_p from elastic e-p scattering
- Polarizability of the proton, deuteron and helium nuclei
- Theory of muonic hydrogen energy levels

- Physics beyond the Standard Model
- New projects: Rydberg constant from hydrogen and H-like ions, very low Q^2 cross section and polarization measurements, muon-proton elastic scattering

Traditionally, R_p has been determined from the slope of the proton charge form factor, $G_E^p(Q^2)$, at $Q^2 = 0$. Since about 1995, precision laser spectroscopy of transition frequencies in hydrogen atom have produced an even more accurate value. Newer electron scattering extractions yield $R_p=0.879(8)$ fm from MAMI at Mainz, and $R_p=0.875(10)$ fm from JLab E08-007, confirming the accepted 2006 CODATA value $R_p=0.8768(69)$ fm. The 2010 CODATA value is $R_p=0.8775(51)$ fm.

A measurement of the Lamb shift (2S-2P energy splitting) in muonic hydrogen, μp , an H-like atom formed by a proton and a negative muon, provides a significantly more precise way to determine R_p . The muon's mass is 200 times the electron mass, yielding a Bohr radius about 200 times smaller, so finite size effect on the S states in muonic hydrogen, and thus the sensitivity to R_p is a 200^3 times larger. In 2010, the first measurement of the Lamb shift in muonic hydrogen produced a ten times more precise value, $R_p = 0.84184(67)$ fm, which differs from the CODATA-2010 value by 7 standard deviations.

A wealth of papers has investigated various ways to explain the discrepancy. The workshop covered all facets of the proton radius puzzle: Review of experiments and data, methods of fitting electron scattering data, theory in muonic hydrogen, aspects of nuclear polarizability, and physics beyond the standard model explanations of the discrepancy.

The workshop's opening session was dedicated to a review of the three recent experiments: The extensive set of precise cross-section measurements from MAMI A1 and the polarization transfer measurements of the form factor ratio $G_E^p(Q^2)/G_M^p(Q^2)$ at low Q^2 from JLab E08-007. New data for a second transition in μp was presented, which confirms the previous value from μp , yielding a combined μp value of $R_p=0.84087(39)$ fm as well as an extraction of the 2S hyperfine splitting.

The electron scattering data and radius extractions were reviewed on day 2. There were extensive discussions of the issues involved in extracting a reliable radius: fitting directly to cross sections and polarization measurements rather than extracted form factors, matching the Q^2 range of the data and the functional form used in the fit used, evaluating the robustness of the fitting function, and accounting properly for experimental systematic uncertainties, especially normalizations. These will have to be examined more closely in future analyses aimed at understanding or explaining the discrepancy.

Several talks focused on the theory required to extract R_p Lamb shift measurements. For μp , no large missing or wrong theory terms have been identified. Non-perturbative all-order numerical calculations confirm the standard perturbative approach. Weak interaction contributions have been shown to be negligible. In summary, the QED part seems solid. For hydrogen, some QED contributions exist, which have only been calculated by one group and a confirmation would be welcome. Unexpectedly large contributions from higher-order QED corrections can also only be excluded by new calculations.

Theory in neutral helium is becoming advanced enough to be able to extract the nuclear charge radii of the lightest helium isotopes from data measured in helium atoms. This may shed new light on the puzzle when combined with the planned measurement of the Lamb shift in muonic helium ions.

Two-photon exchange (TPE) effects were another major focus, as they appear to be the only

possibility to significantly change the μp result, and are believed to cause the discrepancy between Rosenbluth and polarization transfer extractions of the form factors. The standard calculations yield a change in the Lamb shift in muonic hydrogen that is about ten times smaller than the 0.31 meV discrepancy, though there is some concern about a subtraction term needed to make an integral in the dispersion relations converge. Several calculations, including a recent heavy-baryon chiral perturbation result, have evaluated the contribution of this subtraction term to be about 0.004(1) meV. However, only the value at $Q^2=0$ and the large- Q^2 behaviour ($1/Q^2$) are directly known. It remains to be seen whether an unexpected Q^2 dependence, consistent with all other data, could dramatically change this correction. Planned measurement of the Lamb shift in $\mu^3\text{He}$ and $\mu^4\text{He}$ will require precise calculations of the polarizability contributions. Preliminary results of NLO calculations were presented, and NNLO calculations are on the way.

Physics beyond the Standard Model (BSM) BSM effects have been proposed to explain the proton radius puzzle, motivated also by the long-standing discrepancy between theory and experiment of the anomalous magnetic moment of the muon. Several constraints from experiment exists, e.g. from $(g-2)$ of the electron, x-ray spectroscopy in muonic Si and Mg, neutron scattering, pion and kaon decay. A new scalar particle with a mass around 1 MeV or a new vector force coupling to right-handed muons could explain the muonic hydrogen discrepancy and be still compatible with all observations, but they require fine tuning of couplings and cancellations. Testable predictions have been made for the Lamb shift in muonic deuterium and muonic helium ions. PNC experiments in muonic atoms, muon scattering or radiative muon capture experiments may be able to test the gauged right-handed muon hypothesis.

On the atomic physics side, several projects will soon provide improved values of the Rydberg constant, R_y , which is required to extract R_p using the ultra-precisely measured 1S-2S transition frequency in hydrogen. One- and two-photon transitions in hydrogen will improve the measurements that determine the present value of R_y . New ideas and techniques have been presented that will, for the first time, allow measurements of R_y in He, in H-like He+, and in highly excited Rydberg states of H-like ions, like Ne9+. In addition, a new measurement of the classical Lamb shift in electronic hydrogen will provide an improved value of the proton charge radius that does not depend on the R_y .

A wealth of new experiments will also give new data on (elastic) electron scattering. The CLAS-TPE (JLab) and OLYMPUS (DESY) experiments have already taken e^+p and e^-p scattering data to extract TPE effects with unprecedented accuracy. Phase II of E08-007 used a polarized target to extend form factor ratio measurements down to much lower Q^2 values. The new JLab experiment E12-11-106 will extend precise elastic electron scattering measurements to $Q^2 \approx 10^{-4} \text{ GeV}^2$, which will avoid the issues associated with large extrapolations to $Q^2=0$. Low- Q^2 data on the deuteron will be measured at MAMI, providing a better charge radius of the deuteron. The g2p experiment E08-027 will provide inelastic structure functions that are very relevant to the polarizability contribution in hydrogen and muonic hydrogen. The MUSE experiment, recently proposed at PSI, will, for the first time, measure elastic muon scattering on the proton at low Q^2 . This will be a crucial experiment to test both BSM physics and unexpected polarizability contributions. The MUSE experiment will use a superior differential measurement technique in order both to compare the scattering of electrons and muons, and positive and negative muons (electrons) on the proton.

Muonic atoms will also contribute new data. Lamb shift measurements in muonic deuterium will provide important cross checks. A measurement of the ground state hyperfine splitting in muonic hydrogen is being prepared. The Lamb shift in muonic helium ions will be measured in

10 State of the Laboratories

10.1 The Year 2012 at JLab

(Communicated by R. D. McKeown – bmck@jlab.org.)

Thomas Jefferson National Accelerator Facility (JLab) successfully completed the 6 GeV experimental program on May 18, 2012, in preparation for a long scheduled shutdown to complete the installation of the remaining hardware for the 12 GeV upgrade in the accelerator tunnels. In this update, a summary of the experiments completed in 2012 will be presented, followed by a report on the 12 GeV construction project. Finally, the 12 GeV science program and progress towards a future electron ion collider is briefly discussed.

Hall A

Hall A was configured to run with a transversely polarized proton target to enable measurements of g_2^p and G_E^p/G_M^p at low Q^2 . These measurements will provide critical new data related to the recent controversy surrounding the determination of the proton radius. The recently reported value from muonic hydrogen studies at PSI differs by 5σ from the values obtained from fits to atomic physics data and previous electron scattering data.

Unfortunately, the superconducting coils for the polarized target quenched during tests leading to irreparable damage. The Jefferson Lab target group successfully modified coils from the Hall B polarized target to enable the Hall A experiment to successfully run during 2012. This rather extensive modification of the Hall B coils was completed in time to start the experiment in March. The collaboration had revised their run plan to re-optimize the physics with particular attention to the high-impact low- Q^2 region, and were able to achieve their most important physics goals.

Hall B

The CLAS was employed with the HDice target to study baryon resonance parameters with a polarized deuterium target. These data will provide crucial information on polarized neutrons to complement previous studies on polarized protons and complete the approved 6 GeV dataset for the baryon resonance program.

The HDice target has been a significant technical challenge. However, the HDice target group completed the preparation of the target apparatus in time for the start of running in November. They were successful in acquiring data with a polarized photon beam and polarized target (although with reduced polarization) and partially tested the capability of the target with a low intensity electron beam. The demonstration of operation of a polarized HDice target with an electron beam would be a very significant technical milestone and would enable important experiments in the future 12 GeV program. The implications of the electron beam test results and the future plans for the HDice target are still under discussion.

In addition to several other parasitic tests in Hall B, there was a very successful test of the Heavy Photon Search (HPS) test apparatus. A future test run for HPS with electron beam must be scheduled during the 12 GeV era.

Hall C

The Qweak experiment will determine the weak charge of the proton to unprecedented

precision and provide stringent constraints on the standard electroweak theory and its proposed extensions. Qweak continued to run successfully through the May shutdown, routinely taking data with the full $180\mu\text{A}$ of polarized beam, setting records for both the beam and the high power cryogenic hydrogen target. The experiment acquired a dataset that should produce a result for the proton weak charge that is very close to the proposed statistical precision.

12 GeV Upgrade

The 12 GeV upgrade project made excellent progress during 2012. The goal of this project is to double the beam energy to 12 GeV, implement enhanced experimental hardware in the existing experimental halls, and construct a new Hall D to include the GlueX experiment. The project was approximately 80% complete at the end of 2012. In addition, the new Technology and Engineering Development Facility, a modernization and enlargement of the existing Test Lab building, is nearing completion, achieving CD-4a status in March 2012.

During the 6 month shutdown in 2011, two high performance cryomodules of the new "C-100" design for 12 GeV were installed in the south linac tunnel and commissioned. On May 18, 2012, one of these cryomodules was operated with 108 MeV of accelerating gradient at $465\mu\text{A}$ of beam current. This milestone is the required specification for these C100 cryomodules and represents a major success for the project.

In May 2012 we began a planned long shutdown to complete the refurbishment and installation of arc magnets, the installation of the remaining set of 8 C-100 cryomodules in fully powered zones, and commissioning of the new Central Helium Liquefier. We now anticipate beginning beam commissioning in FY14 in preparation for the successful completion of the CD-4A DOE milestone "accelerator project completion and start of operation" on schedule in December 2014.

The experimental equipment scope includes the new spectrometer for Hall B (CLAS12) replacing the current CLAS, the new 11 GeV spectrometer for Hall C (SHMS) that will complement the existing 8 GeV HMS spectrometer, and the GlueX experiment in Hall D.

The GlueX superconducting solenoid installation in Hall D was completed during 2012, in preparation for its first cooldown and test (now expected in early 2013). The barrel calorimeter modules for GlueX were completed at the U. of Regina and delivered to JLab. Other detector systems are also making good progress, especially the central drift chamber (CDC) which finished wire stringing at Carnegie Mellon University.

The CLAS12 project requires fabrication of two superconducting magnets: a solenoid for charged particles at large scattering angles and a toroid for forward angles. The delivery schedule for these magnets is on the critical path. Construction of the torus magnet is now planned to be a collaboration between JLab and Fermilab. A contract for the solenoid has been placed with a vendor. Construction of the 18 new drift chamber sectors is about two thirds complete, with stringing of the region 2 chambers now complete at Old Dominion U. Other detector subsystems are also making good progress. The venerable CLAS toroid was removed from Hall B.

The SHMS project in Hall C is proceeding, with the five sets of superconducting magnet coils and cold masses under fabrication and the support structure components arriving on site. Detector construction is in progress at several collaborating institutions.

The actual FY12 budget appropriation (\$50M) for the 12 GeV project was significantly below the project funding profile (\$66M). Even so, we are hopeful that because the accelerator project is well advanced, it will proceed without significant delays. However, the experimental

hardware schedule requires nearly \$20M in additional procurements and other critical expenditures during these last few years of the project. A DOE review of the project in November 2012 recommended strengthening of the JLab effort on the superconducting magnets, and a more detailed re-evaluation of the estimated cost to complete. It is anticipated that the project will be re-baselined during the spring of 2013.

12 GeV Physics Program

During the last few years, the JLab user community, in collaboration with JLab staff, has developed an impressive set of experiment proposals for the 12 GeV program. These have been reviewed by the Jefferson Lab Program Advisory Committee (PAC), resulting in a total of 52 experiments being approved. All these experiments have been assigned a nominal recommended beamtime allocation and scientific priority. These proposed experiments represent over 3000 PAC-days of approved beamtime which translates into more than 7 years of running at full simultaneous 3-hall operation during the 12 GeV era of CEBAF.

In preparation for the NSAC subcommittee activity during 2012, we prepared a white paper describing the approved 12 GeV experimental program: *Physics Opportunities with the 12 GeV Upgrade at Jefferson Lab*, which was published in the European Journal of Physics (Eur. Phys. J. A48 (2012) 187). The authors of this document were Jozef Dudek, Rolf Ent, Rouven Essig, K.S. Kumar, Curtis Meyer, R.D. McKeown, Zein-Eddine Meziani, Gerald A. Miller, Michael Pennington, David Richards, Larry Weinstein, Glenn Young, and Susan Brown.

MEIC

Excellent progress on the design of a medium-energy electron ion collider for Jefferson Lab was realized during 2012. The design of this novel figure-8 colliding beam facility is optimized for highly polarized beams, high luminosity, and full acceptance for reaction products. A design report was produced (*Science Requirements and Conceptual Design for a Polarized Medium Energy Electron-Ion Collider at Jefferson Lab*), and is available at [arXiv:1209.0757](https://arxiv.org/abs/1209.0757).

A white paper for the electron ion collider was also produced in 2012, by a writing team that was a combination of authors from the JLab and BNL-RHIC communities. This document describes the physics case for such a collider in some detail, and will provide an important foundation for discussions in the nuclear physics community regarding the potential for establishing an EIC as a recommended future construction project. The white paper (*Electron Ion Collider: The Next QCD Frontier - Understanding the glue that binds us all*) is available at [arXiv:1212.1701](https://arxiv.org/abs/1212.1701).

Acknowledgment: I would like to thank Rolf Ent, Allison Lung and Glenn Young for their assistance in preparing this report.

10.2 BNL Physics at the begining of 2013

(Communicated by Peter Petreczky <petreczk@quark.phy.bnl.gov> and Dave Morrison <dave@bnl.gov>.)

Despite the fearsome snow storm that recently hit the Northeast, the official start of Run 13 of RHIC got underway as planned on February 11, 2013. The preparations for the RHIC run begin with cooling down the nearly 2000 superconducting magnets that form the 4km main ring of the accelerator to nearly absolute zero. Collisions for physics data taking are expected to follow soon afterward. Run 13 is anticipated to provide 15 weeks of high quality data taking for PHENIX and STAR, RHIC's two large collider experiments.

The upcoming RHIC Run will largely focus on collisions of polarized protons at a collision

energy of 510 GeV, and this provides a great experimental opportunity to advance our understanding of how the proton’s “spin” is distributed amongst its constituents in the infinite momentum frame. It’s been known for years that the intrinsic spin of the quarks cannot account for the entirety of the proton’s spin. Results from STAR and PHENIX indicate for the first time that the gluons are responsible for a non-zero fraction of the proton’s spin. The data being taken this year is part of a two year program to accumulate enough data to tease apart the flavor-dependent contribution to the proton spin by looking at the production of W -bosons. W -bosons can decay into a muon and a neutrino, and the energetic muon can be tracked and identified in the PHENIX muon spectrometers. Positive and negative W -bosons couple very differently to up and down quarks, owing to the parity violating properties of the weak interaction. By measuring asymmetries in the rate of W^\pm -boson production, one may hope to unfold the separate contributions of u -, d -, \bar{u} -, \bar{d} -quarks to the spin of the proton in the infinite momentum frame.

To improve these measurements, PHENIX has installed new shielding inside the experiment and in the RHIC tunnel, large new resistive plate chambers (RPCs) and new trigger electronics, and a very precise forward silicon tracker (FVTX). All of this new instrumentation is aimed at making the best possible use of the highly polarized, high luminosity beams of protons that are now available at RHIC. The development of these beams is itself the result of a long process of improved operations and improved technology, spearheaded by the BNL Collider-Accelerator Department. RHIC is the only polarized proton collider in the world and it is natural to work toward exploiting its capabilities to the fullest.

For Run 13 the STAR collaboration will use the forward GEM (gaseous electron multiplier) detector for tracking the W -bosons. This detector was tested during the previous runs and now is ready for use. In the current run the STAR collaboration will test the partially installed muon telescope detector (MTD) that was invented to track di-muons from heavy quarkonia (J/ψ and Υ) decays and other sources; e.g. thermal radiation. The MTD is expected to be fully operational in FY14–FY15 and will play an important role in quantifying the properties of matter created in heavy ion collisions. Run 13 also marks the start of the commissioning of the Heavy Flavor Tracker (HFT), a major upgrade of the STAR detector. The HFT is an extremely precise silicon tracker, designed to follow the decays of heavy flavor hadrons and to answer the question of how strongly the heavy (c and b) quarks interact with the deconfined medium created at RHIC. This will enable a better estimate of the heavy flavor diffusion constant providing better insight into the nearly perfect liquid that appears to be created in heavy ion collisions.

There is a possibility that Run 13 will also provide a few weeks of heavy ion collisions at an energy of 15 GeV, as part of the RHIC beam energy scan (BES) program. The aim of the BES is to map out the QCD phase diagram and, if possible, find evidence for the existence of the critical end-point on QCD phase diagram. This search requires an accelerator with the ability to deliver collisions over a broad range of energies, a capability that is unique to RHIC. At very high energies or, equivalently, very low net baryon densities, it is known that the transition to a new state of deconfined matter, the strongly coupled quark-gluon plasma, is a smooth crossover transition and not a more familiar first- or even second-order phase transition. On solid grounds, many theorists believe that at higher net baryon densities the transition becomes a first order phase transition. The point on the phase diagram where this happens is called the critical end-point, as the phase transition exactly at this point is second order and is characterized by an infinite correlation length. Finding the critical point, or ruling out its existence, is a crucial step toward understanding the QCD phase diagram.

The Collider-Accelerator Department of BNL made significant improvements to the RHIC

accelerator complex in Run 12. For Run 13, the source of the polarized protons is a new Optically Pumped Polarized Ion Source (OPPIS) developed by Anatoli Zelenski of BNL C-AD and his team over the last three years. The OPPIS system uses a laser to polarize negatively charged electrons, which then interact with protons, transferring their spin. The new system is expected to significantly increase the polarization of the proton beams.

There have been important theoretical developments too. BNL physicist Raju Venugopalan and his co-workers believe they have found an explanation for a striking and novel phenomenon observed in proton- and deuteron-nucleus collisions, called the “ridge,” which is based on first principle QCD calculations and the notion of gluon saturation. The prototype BlueGene/Q supercomputers, called QCDCQ, developed jointly by lattice gauge theorists at Columbia University, BNL and researchers at IBM, are operational and are used for large-scale lattice-QCD calculations. A commercial 512 node BG/Q supercomputer that belongs to the USQCD consortium is expected to be operational soon and will serve the wider lattice-QCD community in US.

With all the exciting new experimental capabilities and the anticipation of a large polarized proton data set and the physics investigations it will enable, we are eagerly looking forward to Run 13 in 2013. Rather than fearing the number thirteen, the entire RHIC community has a case of triskaidekaphilia.

11 Forthcoming Hadron Physics Meetings

Meetings of interest to GHP’s membership are listed at Mark Manley’s page: <http://cmr2.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. Wksp. on Determination of the Fundamental Parameters of QCD (Nanyang, Singapore, Mar. 18-21, 2013): <http://www.ntu.edu.sg/ias/QCD>
- Neutrino Geoscience 2013: Fifth Int. Conf. on Neutrino Geoscience (Takayama, Japan, Mar. 21-23, 2013): <http://www.awa.tohoku.ac.jp/geoscience2013/>
- Fifth Workshop of the APS Topical Group on Hadron Physics (GHP13) (Denver, CO, Apr. 10-12, 2013): <http://sites.google.com/site/ghpworkshop>
- APS April Mtg. (Denver, CO, Apr. 13-16, 2013): <http://www.aps.org/meetings/april/>
- 9th International Workshop on Heavy Quarkonium 2013 (IHEP, Beijing, P. R. China, 22 - 26 April 2013) <http://bes3.ihep.ac.cn/conference/QWG2013/>
- LIGHTCONE 2013: Venturing off the lightcone – local vs. global features (Skiathos, Greece, 20-24 May 2013): <http://www.tp2.rub.de/lc2013/>
- NSTAR 2013: 9th Int. Wksp. on the Physics of Excited Nucleons (Peiscola, Spain, May 27-30, 2013): <http://ifc.uv.es/nucth/nstar/>

- Jefferson Lab Annual User Group Mtg. (Newport News, VA, May 29-31, 2013): https://wiki.jlab.org/cugwiki/index.php/Annual_User_Group_Meeting
 - INPC2013: Int. Nuclear Physics Conf. 2013 (Florence, Italy, Jun. 2-7, 2013): <http://www.inpc2013.it/>
 - Baryons 2013: Int. Conf. on the Structure of Baryons (Glasgow, Scotland, Jun. 24-28, 2013): <http://nuclear.gla.ac.uk/Baryons2013/>
 - NNPSS 2013: National Nuclear Physics Summer School (Stony Brook, NY, Jul. 15-26, 2013): <http://www.int.washington.edu/NNPSS/>
 - Lattice 2013, 31st International Symposium on Lattice Field Theory (Mainz, Germany, 29/July - 3/August 2013): <http://www.lattice2013.uni-mainz.de/>
 - MENU 2013: 13th Int. Conf. on Meson-Nucleon Physics and the Structure of the Nucleon (Rome, Italy, Sep. 30-Oct. 4, 2013): <http://menu2013.roma2.infn.it/>
 - DNP13: American Physical Society DNP Mtg. (Newport News, VA, Oct. 23-26, 2013)
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