

Executive Officers

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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 Thesis Prize

In April 2010, the GHP Executive Committee began working on the creation of an

American Physical Society
Dissertation Award in Hadronic Physics.

Our motivation was to recognize the outstanding accomplishments of talented young scientists in our field.

As we announced in an EMail on 14 June 2011, the APS has approved the award, *contingent* on our raising funds to endow it.

Thanks to the support of: Brookhaven National Lab; Jefferson Science Associates, LLC (the management contractor for Jefferson Lab); and a few individuals, we have already raised over half the needed funds! We are preparing to list on the GHP web site the names of those donors who are comfortable with being identified. We urge you to get behind your students and consider donating.

If all GHP members donate, we only need \$15 per member to endow the dissertation award. But not everyone will donate, so we encourage you to consider donating \$25, \$50, or even \$100. It is simple to donate with a credit card through the APS online donation web page at:

<https://www.aps.org/memb-sec/profile/DonationFunds.cfm>

More information about the award can be found at:

<http://www.aps.org/programs/honors/dissertation/hadronic.cfm>

2 Membership

As of July, 2011, the GHP had 475 members, which represents 0.98% of APS membership. This represents 9.4% growth over the past year and follows upon 9.3% growth in the preceding year.

Importantly, we are approaching 500 members. Once that level is reached, we will be able to make two Regular-fellowship nominations each year. That would be an excellent boost for Hadron Physics. (Hitherto we have typically been allowed one Regular and one Alternate nomination. This year was an exception, see Sec. 6.)

There are now twelve Topical Groups, of which the GHP is the 7th largest. (A Topical Group on Physics of Climate (GPC) is newly formed.) Neglecting the newly formed topical group, GHP is the second most rapidly growing, behind *Shock Compression (GSCCM)*, with 387 members, which grew 16.9%. Notably, membership in seven topical groups fell.

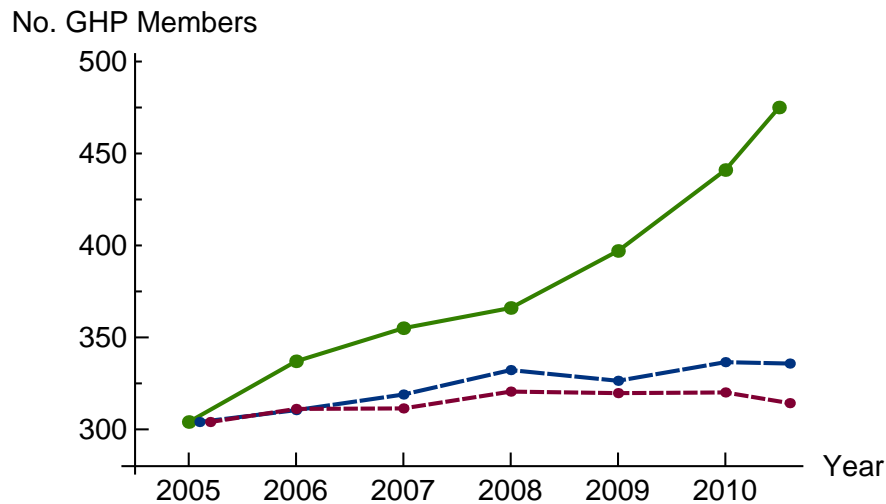


Figure 1: *Solid line* – GHP membership, as at July 2011; *long-dashed* – DNP membership normalized to GHP’s value in 2005 (2401 → 304); and *short-dashed* – DPF membership normalized to GHP’s value in 2005 (3291 → 304).

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.) With this support we can be an active force for Hadron Physics. The money can be used, for example, to assist with: the organization of meetings; 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>.

3 Elections

Elections are approaching for posts in the GHP Executive. We need to fill two positions:

- Vice-Chair (Ron Gilman will become *Past-Chair*, Ramona Vogt will become *Chair* and John Arrington will become *Chair-Elect*, leaving the position of *Vice-Chair* vacant. Stan Brodsky will leave the Executive, after four very full years.)
- and one Member-at-Large (Robert Edwards will by then have completed his stint.)

As was noted in the February newsletter, the Nominating Committee will solicit input from the GHP membership in September, 2011. The nomination of candidates will likely close on Fri. 30 September and an electronic ballot will subsequently be held over a four week period:
21 October – 18 November.

Our rules state that: *the Committee shall nominate at least two candidates for the office of Vice-Chair and also 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, which is*

Stan Brodsky (sjbth@slac.stanford.edu)

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

The Committee is now formed:

2011 Nominating Committee

Les Bland bland@bnl.gov BNL	Stan Brodsky (Chair) sjbth@slac.stanford.edu SLAC	David Richards dgr@jlab.org JLab	Susan Schadmand s.schadmand@fz-juelich.de Forschungszentrum Jülich
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4 APS April Meeting, 2012

A topical group is invited to participate in planning the program of major APS meetings. This year there will be 2 sessions of invited talks sponsored by the GHP at the April meeting in Atlanta, Georgia

31 March – 3 April 2012

<http://www.aps.org/meetings/meeting.cfm?name=APR12>

We are in negotiations with DNP and DAP about sharing invited sessions, with one sponsored by GHP alone. The speakers and schedule are currently being developed. The full GHP invited program for the April meeting will be announced in the next newsletter.

In this connection, the Executive encourages GHP members to submit suggestions to the Program Committee, which is

GHP Program Committee, preparing for April 2012

Spencer Klein, LBL srklein@lbl.gov	Peter Petreczky, BNL petreczk@quark.phy.bnl.gov	Ramona Vogt, LLNL rlvogt@lbl.gov
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Ramona Vogt is Chair.

To be of most assistance, a nomination should be EMail-ed to the program committee [chair](#) and provide (it should all fit within a $\frac{1}{2}$ -page)

- Topic (title and short description)
- Rationale as to why the topic is timely
- Speaker (Name and qualifications)

The deadline for submission of GHP Invited Session Programs to the APS is

15th October, 2011.

Also, for the first time, the GHP has introduced sorting categories of our own. There are four:

- light mesons and baryons
- heavy flavor hadrons
- spin structure of the nucleon
- QCD effects in medium

These categories are rather broad and should be interpreted as covering both theory and experiment. The first two can be interpreted as covering production, spectroscopy, decay, lattice simulations, exotics, and effective theories, at least. Spin structure includes measurements of parton densities, polarized measurements, experiments at JLab, RHIC and elsewhere, and future studies such as at the EIC. The last category includes lattice studies at finite temperature and density, gluon saturation at small x in protons and nuclei, cold nuclear effects on quarkonium, energy loss in Drell-Yan production and other many-body effects in QCD.

When submitting abstracts to the April 2012 meeting, please consider choosing one of these categories. GHP's portion of the proceeds from the Meeting increase in proportion to the number of abstracts submitted to its categories.

5 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. The 2011 APS Unit Convocation took place at the American Center for Physics (APS Headquarters) in College Park, Maryland, on Friday, April 15. There are now 41 APS Units, including new Groups on Climate and Energy Research.

This year, one member of the GHP's Executive took part: Ramona Vogt. The Convocation began with an on overview of the Structure of the APS and its Executive Office, delivered by Kate Kirby, Executive Officer of the APS. It was followed by presentations on: APS finances; APS publications; introductions to key APS staff and a discussion of public policy.

One interesting note about APS journal publications: the largest number of accepted papers now come from Western Europe rather than the US. The majority of referees are also at institutions outside the US.

The biggest expense for the APS is publication even though APS journals have a very low publication-cost/article; viz., roughly \$1/article cf. *Springer* \approx \$17 and *Nature* \approx \$30. Nevertheless, the APS journals still provide the bulk of APS income, the largest fraction of which comes from non-member subscriptions. Printing costs are decreasing, 60% of subscriptions are online only.

Some of the revenue from the APS journals goes to cover other expenses such as outreach activities. In 2010 the APS provided free onsite access to APS journals from US public libraries. Likewise, in 2011, the APS began providing free onsite access for US high schools with 103 schools signed up so far. (Note that onsite access means inside the library only in this case.) For more about this service, see the July 2011 edition of APS NEWS (<http://www.aps.org/publications/apsnews/index.cfm>).

Other outreach activities include PhysicsQuest and the Spectra comics, written and drawn by APS staff members. The comics were a big hit at ComicCon last year.

Mike Lubell, the APS director of public affairs, gave a very interesting and thought-provoking talk about the public perception of science, in particular how it relates to the current funding climate in Washington. While 93% of responders in a recent poll support scientific research, when asked what they would cut from the budget, the response was that they would cut science funding ahead of anything else (by 20%). This response was relatively independent of political affiliation, even though most responders also believed that the US position in the world economy will only get worse. People don't seem to think that government is doing a good job of funding science and they do not seem to be looking to universities for scientific support. Rather, they believe industry should support more research.

What can we, as scientists, do to alter the public view of what we do? Lubell suggested that we try harder to engage the public and talk about our science in ways that they understand. Connecting to medical and energy research helps, as does talking about job creation and innovation. Think about giving public lectures or talking about the benefits of science to non-scientists at PTA meetings, political town hall meetings, local clubs, or working with kids on science topics.

6 Fellowship

Each year the APS allocates a number of Fellowship Nominations to a Topical Group (and to Units in general). That number is based primarily on membership. A strong GHP can nominate more of our members for Fellowship.

This year, owing to our expanded membership, we were allocated two Regular nominations for the first time.

In order to maintain this level, however, expansion needs to continue: our membership must exceed 500 for this to become normal. With so many excellent hadron physicists, a limitation to anything less places stresses on our Fellowship Committee, which this year was

2011 GHP Fellowship Committee

John Arrington (Chair) johna@anl.gov	Volker Crede crede@fsu.edu	James Vary jvary@iastate.edu
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We thank them for their efforts.

The 2012 Fellowship Committee will be formed after results of our forthcoming elections are known, and will be chaired by the incoming Vice-Chair.

The Executive urges members of GHP to be prepared in 2012 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 deadline for nominations will be

6th April 2012

and 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/or 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.
- 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, it is preferable in practice that sponsors be APS Fellows.

The APS subsequently forwards the Nominations to the GHP's Fellowship Committee.

7 GHP 2011: 4th Workshop of the GHP

The Fourth Meeting of the APS Topical Group on Hadron Physics took place over 2.5 days:

27-29 April 2011

i.e., just before the 2011 APS April Meeting and at the same hotel. It attracted approximately 100 participants.

The Organizing Committee was chaired by Ron Gilman and Ramona Vogt, and constituted from the entire Executive and selected members of GHP; viz., Abhay Deshpande (Stony

Brook), Cheung Ji (North Carolina State), Peter Petreczky (BNL), Sevil Salur (UC Davis); Susan Schadmand (FZ-Juelich); and Karl Slifer (University of New Hampshire).

The program, with links to the abstracts and talks, can be found on the workshop web page, <https://sites.google.com/site/ghpworkshop>, again maintained by webmistress Susan Schadmand.

Thanks to the enthusiasm of the members of the RHIC community on the organizing committee, there were a record number of high-energy heavy-ion talks, including a full parallel program on heavy-ions and spin (six sessions). There were sessions on experimental results on heavy flavor and quarkonium, jets, and hadronic observables. First results from the LHC collaborations were presented, including the first observation of Z^0 production in Pb+Pb collisions by Jorge Robles (CMS, UC Davis), J/ψ suppression by Tiesheng Dai (ATLAS, U Michigan), and low mass hadronic observables by Betty Abelev (ALICE, LLNL). RHIC talks on production of anti-helium by Declan Keane (STAR, Kent State), high- p_T and jets by Richard Hollis (PHENIX, UC Riverside) and Helen Caines (STAR, Yale), and quarkonium by Daniel Kikola (STAR, Purdue) and Matt Wysocki (PHENIX, U Colorado) were also highlights.

RHIC spin results were presented in a session on proton spin structure by Swadhin Taneja (PHENIX, Stony Brook) and Pibero Djawotho (STAR, TAMU). There were also talks on the proposed electron-ion collider. Theory talks focused on hydrodynamic modeling (Huichao Song, LBNL; Michael Cheng, LLNL; and Bjoern Schenke, BNL) and lattice results (Szaboic Borsanyi, Wuppertal and Heng Tong Ding, BNL).

Plenary talks were given by Jamie Dunlop (STAR, BNL) on heavy flavor at RHIC; Alexei Bazavov (BNL) on lattice progress; Michael Strickland (Gettysburg College) on quark-gluon plasma theory; Ming Liu (LANL) on Drell-Yan physics; Julia Velkovska (Vanderbilt) on first LHC results; Marco Stratmann (BNL) on EIC opportunities; Steve Vigdor (BNL) on RHIC future; and the summary talk by Al Mueller (Columbia).

GHP11 saw the largest participation by the heavy-ion community at a GHP workshop thus far, with about 30% of the talks on RHIC-related topics. We hope to continue to expand the GHP and the portion of membership from the high-energy heavy-ion community.

There were also talks on several fundamental neutron physics measurements which use cold and ultra-cold neutrons at LANSCE, NIST, and the SNS. These included talks by: Bradley Filippone (Caltech), on the UCNA experiment; Nadia fomin (LANL), on the NPDGamma experiment; and Jeff Nico (NIST), on the spin rotation experiment.

In addition there were lively discussions during plenary sessions on AdS/QCD (Carl Carlson, William and Mary), the proton size (Gerry Miller, U Washington), condensates (Peter Tandy, Kent State), light meson spectroscopy (Josef Dudek, JLab) and the JLab 12 GeV upgrade (Bob McKeown, JLab).

Other parallel sessions canvassed: continuum- and lattice-QCD studies of mesons and nucleons; spin structure of the proton; quarkonium and light hadron spectroscopy; strangeness in the nucleon; nucleon structure (various types of parton densities and form factors); photoproduction; and future facilities.

To expand a little, one session focused on the production and interpretation of nucleon resonances excited lively discussion amongst the audience and speakers, particularly in connection with the role played by so-called “meson cloud” contributions in constituting nucleon resonances, which has been exposed by the Excited Baryon Analysis Center at JLab

and similar sophisticated coupled-channels models. This is significant because for almost 50 years the “Roper resonance” has defied understanding. Discovered in 1963, it appears to be an exact copy of the proton except that its mass is 50% greater. The mass was the problem: hitherto it could not be explained by any symmetry-preserving QCD-based tool. That has now changed, with a demonstration that the Roper resonance is indeed the proton’s first radial excitation, and that its mass is far lighter than normal for such an excitation because the Roper obscures its dressed-quark-core with a dense cloud of pions and other mesons.

Another session included both experimental and theoretical perspectives on the “BaBar anomaly;” viz., BaBar collaboration data on the $\gamma^*\gamma \rightarrow \pi^0$ transition form factor, published and interpreted in 2009 as a challenge to QCD. It was shown, however, that a significant body of theoretical analysis suggests the data cannot be an accurate measure of the transition form factor. Only better data will settle the debate.

8 Meeting Summaries

A comprehensive list of meetings that are relevant to GHP members is available at <http://cnr2.kent.edu/manley/BRAGmeetings.html>.

8.1 Highlights of 2010 workshops on EIC physics

(On overview communicated by Vadim Guzey (Jefferson Lab) – vguzey@jlab.org.)

The EIC project received an informal recommendation by the 2007 DOE/NSF National Science Advisory Committee (NSAC) Long-Range Plan. To develop and sharpen the science case for a medium-energy EIC (the first stage of the EIC project) and to obtain support of a wider nuclear physics community, Jefferson Lab and the Jefferson Lab Users Group formed four working groups – ep , eA , electroweak, and detector working groups – and organized a series of workshops on the respective topics in the Spring of 2010. Also, Jefferson Lab, Brookhaven National Lab and the Institute for Nuclear Theory (INT), Seattle, organized a ten-week program on EIC physics that took place in the Fall of 2010. Selected highlights follow.

- *Workshop on Partonic Transverse Momentum in Hadrons: Quark Spin-Orbit Correlations and Quark-Gluon Interactions*, Duke University, March 12-13, 2010, <http://michael.tunl.duke.edu/workshop/index.php>

The aim of the workshop was to identify unique capabilities of an EIC for the studies of transverse momentum dependent parton distributions (TMDs) and fragmentation functions, and multi-parton correlations. Emphasis was placed on TMDs that describe 3D parton distributions in momentum space and encode information on spin-orbit correlations and the dynamics of strong interactions inside hadrons. At the workshop, simulations for experimental studies of TMDs through measurements of single-spin asymmetries (SSA) from semi-inclusive deep inelastic scattering (SIDIS) processes with an EIC were presented, and detector requirements for SIDIS measurements were discussed. Workshop participants identified SSA measurements in SIDIS as a key program to study both valence and sea quark TMDs (e.g., via the Sivers asymmetry) and gluon TMDs (via open charm production). Workshop proceedings were published: M. Anselmino *et al.*, Eur. Phys. J. A47, 35, 2011.

- *Electron-Ion Collider Workshop: Electron-Nucleon Exclusive Reactions*, Rutgers University, March 14-15, 2010,
<http://www.physics.rutgers.edu/np/2010rueic-home.html>

The workshop focused on exclusive electron-nucleon reactions intended to chart generalized parton distributions (GPDs), which describe light-front 3D distributions of quark and gluons in the mixed longitudinal momentum-transverse coordinate space, and can be used to express hadron structure information. This was a “working meeting,” to investigate the potential of EIC for studies of GPDs beyond the JLab 6 and 12 GeV eras. Presentations and discussions at the workshop covered such topics as: deeply virtual Compton scattering (DVCS) and exclusive π and K meson production; J/ψ production and gluonic structure; nuclear effects in GPDs; and elastic form factors and two-photon physics. Proceedings, containing detailed discussions and simulations, will be published.

- *Workshop on Nuclear Chromo-Dynamic Studies with a Future Electron Ion Collider*, Argonne National Lab, April 7-9, 2010,
<http://www.phy.anl.gov/mep/EIC-NUC2010/>

The eA working group, organized by the Jefferson Lab Users Group (see above), was charged with identifying the potential of an EIC for studies of QCD in nuclei. The considered topics included: exclusive processes in lepton-nucleus scattering; parton propagation and fragmentation; the role color in nuclei; short range nuclear structure; EMC effect; and nuclear medium modifications. The purpose of the workshop at ANL was to report on the progress in eA working group and to define future directions for investigation. As an outcome of the meeting, each study group compiled a list of measurements pertaining to the nuclear QCD physics topics mentioned above and planned the strategy for their further analysis, simulation, and assessment of the corresponding EIC detector requirements. Proceedings will be published. (Some of the contributions have already appeared in the write-up of the EIC INT program summarized below.)

- *Workshop on Electroweak structure of the nucleon and tests of the Standard Model*, College of William and Mary, May 17-18, 2010,
https://eic.jlab.org/wiki/index.php/Electroweak_Working_Group

This workshop aimed to determine the potential of an EIC for studies of proton structure in electroweak processes and for tests of the Standard model (SM). The topics discussed included: nucleon spin structure functions; nuclear structure functions; precision higher twist measurements; searches for charged lepton flavor and number violation; precision weak mixing angle measurements; and searches for new flavor-diagonal contact interactions beyond the SM.

- *EIC Detector Workshop at JLab*, Jefferson Lab, June 4-5, 2010,
<http://conferences.jlab.org/eic2010/>

This workshop dealt with the experimental implementation of the physics program of a medium-energy EIC. While its primary goal was to provide input for the JLab EIC detector design, it also formed a part of the broader EIC effort. Presentations and discussions at the workshop were structured into four sessions covering: particle identification; calorimetry; charged particle tracking; and small-angle detection.

- Joint BNL/INT/JLab program *Gluons and the quark sea at high energies: distributions, polarization, tomography*, INT Seattle, September 13 - November 19, 2010,
<http://www.int.washington.edu/PROGRAMS/10-3/>

This program aimed to develop and sharpen the science case for an EIC by attempting to answer the following guiding questions:

- i) What are the crucial science issues?
- ii) How do they fit within the overall goals for nuclear physics?
- iii) Why can't they be addressed adequately at existing facilities?
- iv) Will they still be interesting in the 2020s, when a suitable facility might be realized?

The program provided a forum for more than 120 theorists and experimentalists from all over the world to contribute to building the science case for an EIC.

Presentations and discussions were organized around four major themes:

- i) the spin and flavor structure of the proton;
- ii) light-front three-dimensional structure of nucleons and nuclei in momentum and configuration space;
- iii) QCD matter in nuclei;
- iv) and Electroweak physics and the search for physics beyond the Standard Model.

As an outcome, “golden” observables, measurements and associated detector requirements for each of the themes were indentified by participants. These are presented and discussed in a published report, which also contains detailed contributions on various aspects of the scientific opportunities presented by an EIC ([arXiv:1108.1713 \[nucl-th\]](https://arxiv.org/abs/1108.1713)).

8.2 LIGHTCONE 2011

Applications of light-cone coordinates to highly relativistic systems

(On overview of the workshop, communicated by Simon Dalley – sdalley@smu.edu, Chueng Ji – crji@ncsu.edu and Stan Brodsky – sjbth@slac.stanford.edu.)

The 2011 edition of the Light Cone meeting took place at Southern Methodist University (SMU) in Dallas, Texas: 23-27 May – <http://www.lightcone2011.org>. The local organizing committee consisted of S. Dalley (Chairperson), F. Olness, P. Nadolsky, K. Hornbostel and M. Burkardt.

This series of meetings is held under the supervision of the International Light Cone Advisory Committee (ILCAC, Inc. <http://www.ilcacinc.org>). A main emphasis of the LIGHTCONE workshops is the impact of light-front methods, the light-front QCD Hamiltonian, and light-cone coordinates to fundamental problems in hadron physics. The LC2011 Workshop in Dallas received generous contributions from a variety of sponsors: the Office of the Dean of Graduate Studies at SMU, the SMU Physics Department through the Lightner-Sams Foundation, Springer-Verlag Publishing, and the Gary McCartor Travel Awards of ILCAC.

LIGHTCONE 2011 had about 50 participants, and featured a total of 45 presentations (invited talks and posters). The workshop was purposely limited in size to avoid parallel sessions and to allow all participants to present if they wished. Each day began with a one-hour thematic keynote talk, followed by $\frac{1}{2}$ -hour talks; a well-attended poster session generated a lot of discussion. About half the working time of the conference was given to informal discussion.

The daily themes were:

- AdS/CFT/QCD;
- Partons;
- Ab Initio Calculations,

- Nuclear & Many-Body;
- and a final morning covering a variety of Lightcone topics.

Many phenomenological applications to hadrons were discussed using (especially) Holographic QCD, Covariant Constituent Models, and Chiral Perturbation Theory. Light-Front Holography (presented by S. Brodsky and G. de Teramond) provides a connection between the AdS/QCD amplitudes in the fifth dimension of anti-de Sitter space with the wavefunctions of hadrons evaluated at fixed light-front time, thus allowing predictions for many hadronic observables. For example, the Generalized Parton distributions measured in Deeply Virtual Compton scattering can be computed directly in terms of overlaps of the light-front wavefunction eigenstates of the nucleons. Discussions of the kinematic issues in extracting GPDs (presented by B. Bakker and C. Ji) were shown to be highly relevant to the analyses of DVCS experiments at JLab and DESY.

Also, a number of new directions were presented at this workshop, including the phenomenology of multi-parton distributions (M. Diehl), and new computational methods such as Light-Cone Coupled-Cluster (J. Hiller and S. Chabysheva) and Singular Value Decomposition (M. Weinstein).

The most lively discussions centered on “in-hadron” condensates, championed particularly by C. Roberts, S. Glazek, and S. Brodsky, reflecting the trivial vacuum of regulated lightcone quantization. For example, the quark-condensate that appears in the Gell-Mann–Oakes–Renner Relation is replaced by a pion decay matrix element when derived for a composite system in the Bethe-Salpeter and Light-Front formalisms. The concept of “in-hadron quark and gluon condensates” removes a forty-five orders of magnitude conflict of QCD vacuum condensates with the measured cosmological constant. This concept seems at odds with the traditional idea of Lorentz invariant vacuum-expectation values associated with dynamical symmetry breaking – it was thus strongly supported by some but vigorously opposed by other participants.

During the Conference dinner, Sheila McCartor presented awards to this year’s Gary McCartor Fellows: Natalia Tsirova (Clermont University), Hikmat BC (University of Texas at El Paso), and Fabrizio Caola (Fermilab). The award takes the form of a travel grant, which contributes toward the expenses incurred by each awardee in attending LIGHTCONE 2011. Chueng Ji (Chair of the ILCAC) introduced the officers of the ILCAC: Wayne Polyzou (Vice Chair), Tobias Frederico (Secretary) and Simon Dalley (Treasurer).

The next Light Cone meeting was announced:

LC2012: Cracow, Poland, July 9-13, 2012.

The Proceedings of the conference will be refereed and published in 2012 as a special issue of Few Body Systems. The detailed program and all (unedited) presentations can be found at <http://www.lightcone2011.org>.

8.3 Third Workshop on Hadron Physics in China and Opportunities in US

(On overview of the workshop, communicated by Peter Tandy – tandy@kent.edu.)

At Weihai, an ocean front resort city in the province of Shandong, China, the third in a series of workshops on Hadron Physics was held during August 8-11, 2011. The special emphasis of this series is hadron physics in China, and specifically to explore and promote opportunities in

the U.S. for Sino-US collaboration. The two previous workshops were held at Lanzhou University (2009) and Tsinghua University (Beijing, 2010). This third workshop was hosted by Shandong University, and received sponsorship from: Peking Univ.; Tsinghua Univ.; Shandong Univ.; Univ. of Science and Technology of China; Jefferson Lab.; Inst. of Modern Physics of the Chinese Academy of Sciences; Huazhong Univ. of Science and Technology; Huangshan Univ.; and the China Center of Advanced Science and Technology.

The co-chairs of Weihai 2011 were Haiyan Gao (Duke U), Jian-ping Chen (JLab), Zuo-tang Liang (Shandong U) and Zhengguo Zhao (USTC). They are to be congratulated on their ability to quickly rearrange the scientific program for the whole meeting on Monday morning after it became evident how many speakers were stranded for 24 hours in various places owing to the typhoon that closed down much of the transport system along the east coast of China for the previous two days.

Focus topics of the workshop were

1. Hadron Structure and QCD [*Nucleon Spin Structure; Transverse Momentum Dependent Distributions; Generalized Parton Distributions; Baryon and Meson Spectroscopy and Exotic States*];
2. Few-Body Physics;
3. Nuclear Medium Effects;
4. Low Energy Tests of the Standard Model.

The workshop website <http://hepg.sdu.edu.cn/THPPC/conference/weihai2011/Home.html> provides the program and the presentations, including those from the previous two workshops in the series.

There were comprehensive reports on: experimental hadron physics programs at China's new and emerging facilities (BESIII@IHEP, HIRFL-CSR@IMP); detector work at a number of participating universities in China; the experimental program at JLab, including China's present participation and the planned program for the 12 GeV upgrade; and status reports on anticipated physics and developing proposals for an electron-ion collider (EIC) in the U.S. Although the physics outside China was strongly focused on the JLab program, specific presentations were made about TMD physics with COMPASS at CERN and the spin and W -production programs at RHIC; historic hadron structure and existing Standard Model results from various international labs were put into perspective by a number of speakers. Presentations were made on theoretical approaches relevant to all the major experimental themes and included hadron spectroscopy in Dyson-Schwinger Equation approaches to hadron physics, lattice-QCD, light-front field theory and models, generalized parton distributions; and issues with decomposition of angular momentum, spin and parton momentum in a gauge symmetric context.

An enthusiastically received presentation was made by the Director of the Physics and Mathematics Division of the National Science Foundation of China (NSFC), Peiwen Ji. He outlined the various targeted funding programs (e.g., for young scientists and for international cooperative arrangements of various sizes); and he impressed a lot of the attendees by his obvious personal support and his willingness to be present through the wee hours of the morning-after to learn about hadron physics and to answer all questions about access to research funding for investigators in hadron physics in China. An eye-catching component of his presentation was the twenty-five year funding profile of his organization, which is reproduced in Fig. 2. By way of context, the FY 2010 appropriation for the Office of Nuclear

Budget NSFC budget has been increased at an annual rate of over 20%. The total budget for 2010 is **8.33 billion** yuan, an increase by 30.2% over the year 2009.

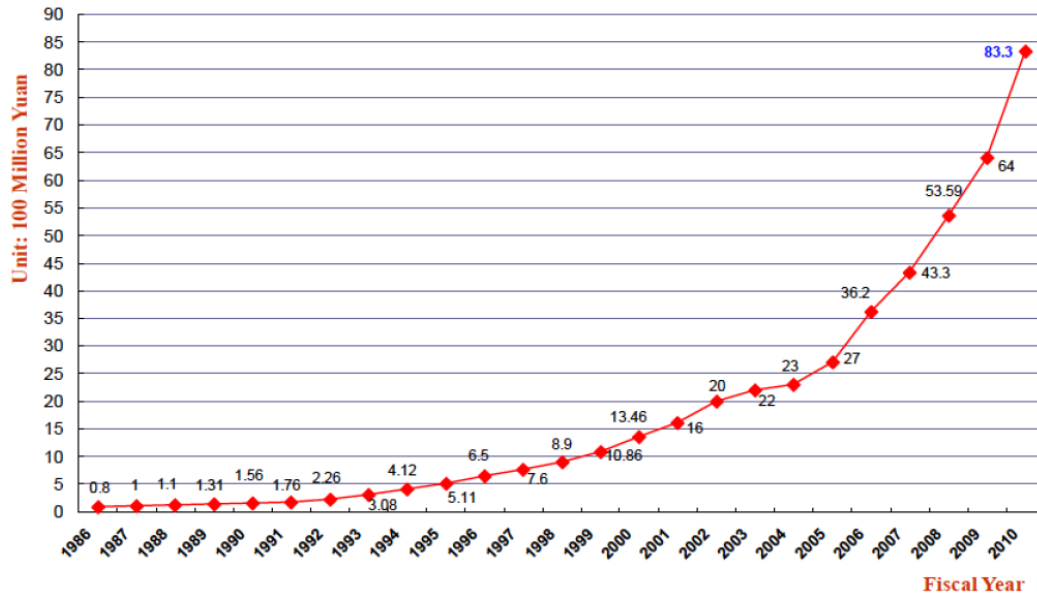


Figure 2: Twenty-five year budget profile for the Physics and Mathematics Division of the National Science Foundation of China (NSFC). At present, \$ US 1 = 6.4 Yuan, so that the 2010 budget is \$US 1.3-billion.

Physics was \$522.5-million, and that for High-Energy Physics was \$790.8-million: a total of \$1.313-billion. Regarding our future, it is notable that the Heritage Foundation has expressed the view that “Much like HEP, funding for Nuclear Physics has become excessive. The FY 2012 request for \$605.3 million should be returned to the FY 2008 amount of \$423.7 million, [...]” This would implement a 19% reduction from FY 2010. A cut of 12% is urged in HEP.

The next workshop in this series is anticipated to be held in Beijing in July 2012, in association with the Kavli Institute and the China Academy of Sciences. It is clear that China is building a significant international presence in hadron physics.

9 State of the Laboratories

NB. We would be pleased to receive input from GHP membership, in particular from people at labs with hadron physics programs who are willing to prepare input and clear it with their labs leadership. The following contributions should serve as a template.

9.1 Japanese hadron labs after the earthquake and tsunami

(Communicated by Shin’ya Sawada, High Energy Accelerator Research Organization (KEK) – shinya.sawada@kek.jp.)

As you may know, no one was killed or even injured at the Japanese hadron labs by the March 11 earthquake and tsunami. After this disaster, enormous efforts have been made to recover.

At J-PARC, the accelerators as well as the experimental facilities, such as the Hadron Hall, were damaged by the earthquake (not by the tsunami). Many kinds of recovery work, such as realignment of the magnets, restoration of the electric power system, etc., are underway, aiming at resuming the beam operation in December, this year. In fact at the Hadron Hall, about 100 magnets and other beam line elements are being realigned. A goal is to conduct user experiments at the Hadron Hall for one or two months during the first quarter of 2012.

At KEK, the Photon Factory resumed partial operation in May. The KEK-B facility had been shut down for upgrade before the earthquake and continues its upgrade effort.

The former LNS, now the Research Center for Electron Photon Science (ELPH), Tohoku University, suffered heavy damage by the earthquake but was also not affected by the tsunami. The high energy part of its old 300-MeV linear accelerator cannot be repaired, and will be replaced by a new linear accelerator. The goal of the low energy part, used for rare isotope production, is to resume its operation within Japanese Fiscal Year (JFY) 2011 (which runs until the end of March, 2012). The new accelerator and its downstream machine, the 1.2-GeV electron synchrotron, will become available by the end of JFY 2012.

The SPring-8/LEPS facility didn't suffer any damage by the earthquake and tsunami, as it is located in the western half of Japan.

People in the field in Japan really acknowledge your warm messages sent just after the disaster. They are making every effort to recover as soon as possible.

9.2 TAPAS: Proposed Antiproton Measurements at Fermilab

(Communicated by Daniel Kaplan, IIT – kaplan@iit.edu.)

The AntiProton Annihilation Spectrometer (TAPAS) experiment at Fermilab is proposed for precision measurements and symmetry-violation searches in the hyperon, charm, charmonium, and Drell–Yan sectors. TAPAS can perform unique studies of:

- charmonium and many of the “XYZ” states [1];
- hyperon rare decays and CP violation;
- charm rare decays and CP -violation;
- and the first measurements with an antiproton beam, in this high- x , low- Q^2 region, of the Drell–Yan dilepton continuum.

The concept is to exploit the high luminosity and low multiplicity of fixed-target antiproton interactions at ≤ 8 GeV at the Fermilab Antiproton Accumulator.¹ This can be done both capably and cost-effectively by adding a magnetic spectrometer to the existing Fermilab E760/835 lead-glass calorimeter [2], using an available superconducting solenoid [3], fine-pitch scintillating fibers (SciFi), the existing DØ SciFi readout system [4], and hadron-ID via precision time-of-flight measurement [5]. For improved vertexing capabilities, this configuration could be augmented with a small, high-rate TPC or new, thin silicon detectors. If approved, the experiment could start one to two years after completion of the Tevatron Collider run.

Thanks to the precisely known collision energy of the stochastically cooled \bar{p} beam (with its $\approx 0.02\%$ energy spread) with a hydrogen cluster-jet target, Antiproton Accumulator

¹Other potential Accumulator experiments include [12] testing CPT symmetry via measurement of the spectrum of antihydrogen in flight and testing the Weak Equivalence Principle of General Relativity via measurement of the gravitational acceleration of antihydrogen (the subject of the AGE Letter of Intent).

experiments E760 and E835 made the world's most precise ($\lesssim 100$ keV) measurements of charmonium masses and widths [6, 7]. Significant charmonium-related questions remain to be answered, most notably the nature of the mysterious $X(3872)$ state [1] and improved measurements of the h_c and η'_c [8]. The width of the X may well be $\ll 1$ MeV [9]. The unique $\bar{p}p$ precision is what is needed to establish whether the $X(3872)$ is a $D^{*0}\bar{D}^0$ molecule [10], a tetraquark state [11], or something else entirely.

Rare decays and CP -violation searches in the charm and hyperon sectors may shed light on mechanisms beyond the Standard Model that appear to be required in order to account for the baryon asymmetry of the universe. Precision antiproton Drell-Yan measurements could augment, in valuable ways, the precise data samples already in hand from deep-inelastic lepton scattering and proton-induced Drell-Yan experiments, to help build a more comprehensive and consistent picture of nucleon structure.

Obtaining approval at Fermilab will require strengthening the collaboration. Anyone interested in joining is invited to contact Dan Kaplan at the email address above.

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12. More information on proposed antiproton experiments at Fermilab may be found at <http://capp.iit.edu/hep/pbar/>.

9.3 The Year 2011 at Jefferson Lab

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

Thomas Jefferson National Accelerator Facility (JLab) is maintaining an active physics program at 6 GeV while construction has continued on its 12 GeV upgrade. The experimental programs for 2011 in Hall A and C ran very successfully during the period to May 2011, and in Hall B up to March. In May, the accelerator was shut down for a planned six months, in order to install equipment in the accelerator tunnels for the 12 GeV upgrade project. Running is planned to continue in November 2011, through May 2012, followed by a year-long shutdown to upgrade the CEBAF accelerator and the start of commissioning the upgraded facility in 2013-4. Highlights of the program during the first half of 2011 are briefly discussed in the following.

Semi-inclusive DIS – New results on SIDIS using Bigbite and a transversely polarized ^3He target in Hall A were reported and submitted for publication. The kinematics focused on the valence-quark region, $0.16 < x < 0.35$ with $1.4 < Q^2 < 2.7 \text{ GeV}^2$. The corresponding neutron A_{LT} asymmetries were extracted, which probe the transverse momentum dependent parton distribution function g_{1T}^q and therefore provide access to quark spin-orbit correlations. The results indicate a positive azimuthal asymmetry for π^- - production on ^3He and the neutron, while the π^+ -asymmetries are consistent with zero.

Form Factors – A major focus of the JLab hadron physics program has been nucleon form factors, which describe the charge and magnetization distributions within the hadron. There is renewed interest in the proton form factors at very low Q^2 , owing to a measurement at PSI of the Lamb shift in muonic Hydrogen. The muonic Lamb shift measurement indicates that the proton charge radius is $r_p = 0.84184(67) \text{ fm}$, which differs by 5.0 standard deviations from the CODATA value (fit to atomic hydrogen data) of $0.8768(69) \text{ fm}$. Jefferson Lab results reported in 2007, along with more recent data, have been analyzed to provide better constraints on the ratio G_E^p/G_M^p . These new data, combined with the existing electron scattering data and atomic hydrogen measurements, yield $r_p = 0.8772(46)$, 7.7 standard deviations from the muonic hydrogen result. In addition, a new high-precision measurement of G_E^p/G_M^p at $Q^2 < 0.4 \text{ GeV}^2$ is planned for Hall A in FY 2012.

Two-photon exchange – Over the last few years, data from Jefferson Lab have established that the values of G_E^p extracted from recoil polarization measurements disagree with those extracted from Rosenbluth separation. The resolution to this conundrum is thought to involve contributions from two-photon exchange amplitudes. An experiment to address this issue by precise comparison of electron and positron scattering was successfully completed in Hall B. It is expected that the results will provide a definitive test of the contribution of two-photon exchange and its implications for the form factor measurements, and will be complementary to the ongoing OLYMPUS experiment at DORIS/DESY.

Parity violation – The contribution of strange quarks to the electromagnetic form factors of the nucleon has been investigated through parity-violating (PV) elastic electron scattering from protons, deuterons, and ^4He at Bates, Mainz, and Jefferson Labs. A very precise result for the forward angle asymmetry at $Q^2 = 0.63 \text{ GeV}^2$ was reported this year by the HAPPEX group. The results do not indicate any significant contribution from strange quark-antiquark pairs to electromagnetic form factors at this Q^2 .

The PREX experiment ran in Hall A in 2010, studying parity violation in elastic scattering of electrons on ^{208}Pb . The neutral weak charge of the proton is suppressed by the factor $1 - 4 \sin^2 \theta_W$, so the PV asymmetry on such a heavy nucleus is dominated by the neutron. Such a measurement can thus be used to extract the neutron radius of ^{208}Pb . The experiment ran with very high luminosity, which became a challenge for the experimental hardware in Hall A, and as a result only a partial dataset was acquired. Nevertheless, useful information on the neutron radius was obtained. The results were reported at the April APS meeting, and indicate that the neutron radius is 0.35 fm larger than the proton radius in ^{208}Pb , with about 2σ significance. This value is in accord with expectations from nuclear theory, and begins to constrain the symmetry term in the nuclear equation of state. A future experiment to further reduce the uncertainty is being planned.

At low Q^2 , where strange quarks are expected to play a negligible role, PV can be used to measure the weak charge of the proton. This can be viewed as a measurement of the running of the weak mixing angle with momentum transfer, or as a search for physics beyond the standard model. The experiment, Qweak, is one of the largest dedicated experimental

installations at JLab to date and was successfully installed and commissioned in Hall C during the fall of 2010. During the period November 2010 to May 2011, CEBAF delivered excellent parity-quality beam properties, and Qweak acquired a significant dataset corresponding to about 25% of the experimental goal. Several hardware improvements relevant to increasing the running efficiency are planned for the six-month shutdown in 2011. The Qweak experiment is expected to complete the full data set during the running period in 2011-12 before the twelve-month shutdown beginning in May 2012.

Baryon Resonances – A major experimental program has been in progress in Hall B which aims, for the first time, to uniquely determine (overdetermine in the case of Λ -production) the reaction amplitudes in meson-baryon photoproduction from the proton and neutron. In 2010, data on single, double, and triple polarization observables were successfully acquired, employing the polarized proton target FROST in combination with polarized photon beams and the measurement of recoil polarization in hyperon decays. Results were reported at the annual user group meeting in June 2011. The HDICE target is currently being constructed, which will enable comparable data on polarized neutrons, utilizing polarized deuterium. The start of the HDICE experiment was delayed this year owing to technical difficulties with the target, which now seem resolved so that the target will move to the Hall in late-August. It is expected that the experiment will be ready for a successful run after the six-month shutdown during the period Nov. 2011 to May 2012.

Heavy Photon Searches – A new neutral weak vector boson, now referred to as A' , with mass in the 10-1000 MeV range, was recently proposed. Such a new particle represents a very natural extension to the standard model and could help in addressing issues related to dark matter in the universe. The APEX experiment was proposed to search for such a particle in Hall A. The idea is to produce A' 's via a bremsstrahlung process on a Tungsten ribbon target and detect them through a supposed decay into e^+e^- pairs. The APEX experiment conducted a very successful test run in 2010, and reported results that set new limits on the existence of the A' . It should also be mentioned that two other experiments have been proposed to search for this type of particle with complementary capability to the APEX experiment. One, proposed for Hall B, is called Heavy Photon Search (HPS) and the other, proposed for the low energy FEL beam, is called DarkLight.

12 GeV Upgrade – The 12 GeV upgrade project made excellent progress during 2011. 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 proposed GlueX experiment. Construction activities are visible across the JLab site for both the 12 GeV project and also for the new Technology and Engineering Development Facility, a modernization and enlargement of the existing Test Lab building. Major procurements are well underway, various detectors are being built by university groups, and the civil construction is well advanced. In general, the project remains on schedule and budget, and the civil construction achieved a major milestone in Dec. 2010, with Hall D being granted “Ready for Equipment” status. During the present six-month accelerator down, major activities include modification and reinstallation of many of the arc dipole magnets and installation of the first two new cryomodules in the south linac.

The 12 GeV physics program continues to develop. The January 2011 Program Advisory Committee (PAC37) assigned beam time and scientific ratings in the category: “Low-energy tests of the Standard Model and Fundamental Symmetries”. In addition, PAC37 approved eight proposals for the future 12 GeV program, bringing the total to 45 approved experiments. The report is available online at http://www.jlab.org/exp_prog/PACpage/PAC37/PAC37_report.pdf.

PAC38 is scheduled for August 2011, and the final category “The 3D structure of the hadrons” will be rated at that meeting. In addition, PAC38 will consider thirteen new proposals along with seven Letters of Intent.

*** Disclaimer ***

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