GHP Newsletter April 2005

American Physical Society Topical Group on Hadron Physics

Executive Officers

Chair	*Chair-Elect*	*Vice-Chair*	*Past-Chair*
Ted Barnes tbarnes@utk.edu	Ed Kinney Edward.Kinney@colorado.edu	Craig Roberts cdroberts@anl.gov	Eric Swanson swansone+@pitt.edu

Secretary/Treasurer	*Members at Large*	
Wally Melnitchouk wmelnitc@jlab.org	Mike Lietch leitch@lanl.gov	Dave Tedeschi tedeschi@sc.edu

Elections

Elections were held late last year, with the results announced on 27/January/05. The current composition of the GHP Executive appears above. Elections for *Vice-Chair* and two *Members-at-Large*, whose terms expire after one year, will be held in November, 2005.

Membership

Currently, the GHP has 308 members: 185 of these people are also in DNP (Division of Nuclear Physics), and 194 are in DPF (Division of Particles and Fields). However, DNP has a total of 2410 members and DPF has 3303. Hence, it is likely that there are many Hadron Physics researchers who are not involved with GHP.

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.

Membership is only $7. 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 the participation in those fora that affect and decide the direction of basic research.

Current APS members can add units online through the APS secure server:
`http://www.aps.org/memb/unitapp.cfm`.

Fellowship

Each year the APS allocates a number of Fellowship Nominations to a Topical Group. That number is based primarily on membership. A strong GHP can nominate more of our members for Fellowship. This year we may nominate ONE.

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

The instructions for nomination may be found at
`http://www.aps.org/fellowship/fellinfo.cfm`

To summarize, one must

- Ensure nominee is a member of the Society in good standing.
- Obtain signatures of two sponsors who are members of the Society in good standing.
- Submit a complete original nomination packet (signed Nomination Form and Supporting Letters ... these document are available for download from the web page) and one photocopy packet prior to **29th April 2005** (GHP's deadline) to:
  - Executive Officer
    ATTN: Fellowship Program
    The American Physical Society
    One Physics Ellipse
    College Park, MD 20740-3844

  Supporting letters should be included with nomination form to ensure attachment to the correct nomination package. Individuals providing letters of support do not have to be members of the APS.

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

2005 GHP Fellowship Committee

Craig Roberts	Peter Tandy	Dave Tedeschi
cdroberts@anl.gov	tandy@kent.edu	tedeschi@sc.edu

Craig Roberts is Chair. Do not hesitate to contact him or his colleagues on the committee if you have questions.

GHP Session at the April Meeting in Tampa

A topical group is invited to participate in planning the program of major APS meetings. This year, GHP is sponsoring one invited session at the April meeting in Tampa. That number can grow if we increase our membership and visibility. The session begins at **3:30pm** on **Saturday, April 16, 2005**, with the program outlined here:

3:30pm	Glenn Young	Recent Experimental Results from RHIC and the Search for Non-Hadronic Matter
4:06pm	Curtis Meyer	Overview of Experimental Pentaquark Data
4:42pm	Volker Burkert	Generalized Parton Distributions

Full details are available at
`http://meetings.aps.org/Meeting/APR05/SessionIndex/?SessionEventID=30929`

GHP Session at the 2006 April Meeting in Dallas

In 2006, the April Meeting will be held in Dallas. We expect the GHP will sponsor at least one invited session. (Perhaps more if we can increase membership.) It is not too early to think about whom to invite to speak and represent GHP initiatives. Nominations will be accepted immediately upon completion of the Tampa meeting.

The deadline for submission of GHP Invited Session Programs to the APS is **11**$^{\text{th}}$ **November, 2005**. This year's Program Committee is

2005 GHP Program Committee

Simon Capstick	Ed Kinney	Mike Leitch
capstick@martech.fsu.edu	Edward.Kinney@colorado.edu	leitch@lanl.gov

Ed Kinney is Chair. Do not hesitate to contact him or his colleagues on the committee if you have questions, and especially if you have suggestions.

XI International Conference on Hadron Spectroscopy - HADRON05

This meeting may be of interest to GHP members. It is one of a series of biennial meetings, which began in 1985. The last meeting took place in Aschaffenburg, Germany. In 2005, the meeting is organized by the *Centro Brasileiro de Pesquisas Fisicas - CBPF*, in Rio de Janeiro, Brazil, and will be held 21-26/August. Details can be found at
`http://www.cbpf.br/~hadron05/`

FY06 Budget

The President's Budget was sent to Congress on Monday, 7/Feb.

The full text for the **DOE Budget Request** is available at
`http://www.sc.doe.gov/orm/Budget_Finance/FY_06_Budget/FY_06_Budget.htm`
That document contains the following statements, which have not been selected at random but nevertheless identify concerns of the GHP community:

Nuclear Theory ... Universities ... Graduate student and postdoctoral support is a major element of this program. Funding is decreased by 13.6% ($1,716,000) compared with FY 2005 resulting in ∼14% reduction in the number of Ph.D. researchers and graduate students supported in FY 2006. Lower priority activities will be phased out in order to focus efforts on the high priority activities which are aligned with SC Strategic Plan milestones.

Nuclear Theory ... National Laboratory Research ... Research programs are supported at 7 national laboratories (ANL, BNL, LANL, LBNL, LLNL, ORNL and TJNAF). The larger size

and diversity of the national laboratory groups make them particularly good sites for the training of nuclear theory postdoctoral associates. Funding for scientific/technical staff is decreased by 8.3% ($779,000) compared with FY 2005.

BTev ... The engineering design of the BTeV ("B Physics at the Tevatron") experiment, which was scheduled to begin in FY 2005 as a new Major Item of Equipment, will be terminated by the end of FY 2005. This is also consistent with the guidance of HEPAP, which rated BTeV as of lesser scientific potential than other projects, although still important scientifically; and P5, which supported BTeV but only if it could be completed by 2010, which is not feasible given schedule and funding constraints.

The full text of the **NSF Budget Request** is available at
`http://www.nsf.gov/about/budget/fy2006/toc.htm`
That document calls for a decrease of 11.5% in funding for the Cornell Electron Storage Ring (CESR).

The challenges posed to the interests of the GHP membership by the President's Budget Request are so numerous that it is impossible to list all of them here. Therefore the GHP Executive urges members to review these documents and, at the very least, learn specifically what it does to programs to which the individual has a personal commitment. Then, when the APS calls upon us to act, possibly in April, we will all be prepared.

NB. On 9/March chairmen of both House and Senate budget panels presented their budget outlines, which broadly track the president's requests to: increase spending on defense and homeland security; extend first-term tax cuts; and trim discretionary spending across a broad array of domestic programs by 0.8%. The budget packages set overall targets for spending and tax revenues, while leaving detailed decisions about individual programs to the appropriations committees. However, the targets provide the outlines for many of those decisions, and the panel's proposals indicated sharp cuts to come in many areas, including education.

NB. On 11/March, the Nuclear Scienc Advisory Committee met in Rockville, Maryland. The agenda for the meeting is available on the DOE ONP web site at
`http://www.sc.doe.gov/henp/np/nsac/agenda31105.html`.
The primary business of the meeting was to present NSAC with two agency charges. NSAC responses are due by 30 June 2005. The first charge notes that: "the FY 2006 President's Budget Request for Nuclear Physics of $370.4 million is an 8.4% reduction from FY 2005 Appropriations ($404.8 million). At this funding level, the Nuclear Physics user facilities will operate at $\sim$65% of optimum operations and there will be a $\sim$10% reduction in the number of researchers and graduate students supported by the program. This funding level, projected into the outyears, is not sufficient to maintain the scope of the present Nuclear Physics program and, in particular, to continue operations of the program's two major facilities, RHIC and CEBAF, as they are presently conducted." The full text of the charge was circulated by the DNP in an EMail of 15/March.

APS Convocation

The Convocation brings together executive officers from the APS's thirty-seven units (divisions, fora, topical groups and sections) that represent the wide range of interests of the physics community. It is intended to provide an overview of the APS's present state of health and educate newly-elected executive officers in their responsibilities. This year's convocation was held at the Maryland Headquarters of the APS on Sat., 19/Feb., and GHP was represented by Mike Leitch and Craig Roberts. The keynote presentations may be retrieved from `http://www.aps.org/exec/handbook/index.cfm`. The APS is in very good financial shape.

APS Congressional Visits Day

Each year as a partner to the APS Convocation, the APS encourages convocation delegates to arrange appointments with the offices of Congresspeople and Senators from their state. This year, Mike Leitch and Craig Roberts participated, with Mike visiting offices of representatives from New Mexico and Craig, some of those from Illinois.

The APS provided a sound briefing for all participants on the morning of Friday, 18/Feb. This year the delegates, and the representatives too, were, perhaps, better prepared than usual because a press conference was held on Wed., 16/Feb., to herald the release of a briefing document entitled "The Knowledge Economy: Is the United States Losing its Competitive Edge?" which was prepared by the *Task Force on the Future of American Innovation*, an organization that includes the APS, Intel, and the National Association of Manufacturers, amongst a group of twenty-three.

This document is available at `http://www.futureofinnovation.org/PDF/Benchmarks.pdf`. It was prepared with a view to helping policymakers and others assess U.S. high-tech competitiveness and the health of the American science and engineering enterprize. It identifies key benchmarks in six essential areas - education, the workforce, knowledge creation and new ideas, R&D investments, the high-tech economy, and specific high-tech sectors, and concludes that although the United States still leads the world in research and discovery, our advantage is eroding rapidly as other countries commit significant resources to enhance their own innovative capabilities.

The document makes a compelling case. Many may find it a valuable source of information and charts.

On the subject of congressional visits, David Cooper (cooper@aps.org) at APS Headquarters in Washington, DC, suggests that if anyone is visiting DC, they might like to check-in with him. He can provide some briefing material and help to arrange meetings with congressional representatives.

Mike and Craig report that such meetings are interesting and constructive. They typically last about twenty-minutes and are generally a useful dialogue. The congresspeople and their staff are interested in helping their constituents, very much appreciate that their constituents take the time to visit, and value whatever useful information the visitors can provide for bolstering the case for physics funding.

Meeting Summary: GHP 2004 at FermiLab

The inaugural meeting of the GHP (GHP04) was held at Fermilab in Batavia, Illinois, October 24-26, 2004. The timing seemed right: there had been a series of recent exciting experimental claims, including pentaquarks, the $D_s(2317)$ and $D_s(2460)$, and the Selex state. Just as importantly, the GHP was in full operation and it was time for us to announce our existence in a definitive fashion.

Plenary sessions were chosen to cover a broad range of topics since one of the purposes of the GHP is to encourage communication amongst the specialties dealing with QCD. Highlights included reviews of experimental heavy flavor meson results by Gabriella Sciolla, Steve Olsen, Don Lincoln, Peter Cooper, and Kamal Seth. A stimulating theoretical overview was provided by Chris Quigg. Pentaquarks were discussed by Ken Hicks, Alex Dzierba, and Aneesh Manohar; and new results on hybrid mesons at BNL were reviewed by Gary Adams. Recent exciting results from RHIC were discussed by Glenn Young, Miklos Gyulassy, and Matthias

Perdekamp. The status of baryon spectroscopy was reviewed by Mark Manley, David Richards reviewed recent lattice-QCD computations of the N^* spectrum, and Latifa Elouadrhiri covered the promising physics of generalized parton distributions. Future plans for the FNAL proton driver, MIPP program, PANDA at GSI, and GlueX were also presented.

Finally, a "town meeting" was held to discuss funding prospects for hadron physics and related issues, which included a panel discussion with representatives from DOE, NSF and JLab. In addition, there were 14 parallel sessions and a total of approximately 80 presentations. The conference closed with an outlook presented by JLab Chief Scientist, Tony Thomas.

The organizers made the decision to charge no fees for this meeting in an effort to make the conference more accessible to early-career researchers and to simplify administration. This was possible because of the generous financial support of our hosts at Fermilab, and additional financial and logistical support from Jefferson Lab and the Institute of Physics (IOP). Workshop proceedings will appear soon in the *IOP Journal of Physics Conference Series*.

Meeting of GHP in 2006

It is anticipated that the second meeting of the GHP will be held in 2006. The Executive will begin planning for this after the April meeting of the APS in Tampa. Look for an update in the summer newsletter.

State of the Laboratories

For this issue the Executive solicited and received input for this section from JLab, HERMES and RHIC. The net will be cast wider in future issues. 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 lab's leadership. The following contributions should serve as a template.

News from Jefferson Lab

There is much exciting news to report from JLab's activities in the past year. In Hall A, several experiments ran in 2004, including the *HAPPEX-II* experiment to measure the strange electromagnetic radii and magnetic moment using parity-violating elastic scattering, and the high-luminosity deeply-virtual Compton scattering experiment on protons and deuterium to access generalized parton distributions (GPDs). An analysis of the deep-inelastic polarisation asymmetry of the neutron, A_1^n, at high Bjorken-x was completed, which showed the first clear evidence of A_1^n becoming positive in the valence region. Simple quark models predict that A_1^n vanishes identically, while pQCD suggests it should approach one as $x \to 1$. Earlier measurements from CERN, DESY and SLAC concentrated on the region of small x, where A_1^n is small and negative. This year *HAPPEX-II* will continue, and preparations will be made for measurement of the electric form factor of the neutron, G_E^n, at high Q^2.

Meanwhile, in Hall B the analysis of pentaquark data continues, with ~ 10 times the statistics of previous runs. Results are expected to be released soon. The *PrimEx* experiment, which is a precision measurement of the π^0 lifetime using the Primakoff effect, was completed. Amongst several experiments being prepared in 2005 is *BONUS*, an experiment to measure the structure function of a nearly free neutron via tagging of a low-momentum recoil proton off a deuterium target.

In Hall C, high-precision data on the transverse and longitudinal cross sections showed the first clear evidence for quark-hadron duality (equivalence of averaged resonance and scaling

structure functions) in the proton at low Q^2, and tests of duality are planned in semi-inclusive electroproduction. Measurements of inclusive electron-nucleus cross sections at high Q^2 are also scheduled this year, to investigate the region $x > 1$ (so-called "super-fast quarks"), as well as the nuclear modification of quark distributions (nuclear EMC effect) in light nuclei (^{2}H, ^{3}He, ^{4}He), some of which have never been measured. Finally, the *G0* experiment completed its forward angle measurements of the strangeness form factors of the proton and began preparations for the backward angle measurements that will allow one to separate the electric and magnetic contributions.

On the theory front, in 2004 Tony Thomas was appointed as the new Chief Scientist and Theory Group Leader. Amongst the priorities in theory that the Lab has set forth for the near future, the lattice QCD effort is continuing to make significant progress, with the installation of a new cluster yielding ~ 0.8 TFlops on lattice code. The aim is to ramp this up to ~ 10 TFlops over the next 3 years. Calculations of direct relevance to the experimental program that are being carried out by the group include: high-Q^2 form factors; the spectrum of baryon excited states (including possible pentaquarks); and moments of GPDs.

Looking ahead, a crucial development at JLab in the past year was the DOE approval of "Critical Decision Zero" (CD-0), establishing the *mission need* for the 12 GeV energy upgrade. The upgrade's Conceptual Design Report is currently being prepared in anticipation of CD-1 in 2005.

News from HERMES at DESY

The HERMES experiment uses polarized internal targets in the HERA 30 GeV e^+/e^- storage ring at the DESY laboratory. By emphasizing semi-inclusive deep-inelastic scattering (DIS) in which an identified hadron is observed in coincidence with the scattered lepton, HERMES brings a new dimension to studies of nucleon spin structure.

HERMES achieved a new milestone recently with the completion and publication [Phys. Rev. D **71**, 012003 (2005)] of a quark-flavor decomposition of the spin of the proton based on measurements of semi-inclusive double spin asymmetries, which avoids the need for use of data from hyperon decay and the assumption of SU(3) symmetry. This is the first such measurement using target double-spin asymmetries for charged pions and kaons. In contrast to previous results based solely on inclusive measurements, all extracted sea quark polarizations are consistent with zero, and within experimental errors the light quark sea helicity densities are flavor symmetric. The measurement was one of the principal objectives of the HERMES program as originally conceived.

Current activities, which are scheduled to continue through August of this year, are focused on measurements with a transversely polarized target, which probe the effects of transverse motion of the quarks. The single-spin asymmetries under study are related to the third structure function, transversity, required to describe nucleon spin structure in leading order. Results of the first phase of this study, which just appeared [Phys. Rev. Lett. **94**, 012002 (2005)], have been used for the first time to extract the signal for the quark transversity as generated by the Collins fragmentation process. From the same data a signal has been extracted for a correlation between transverse target polarization and intrinsic transverse momentum of quarks as represented by the previously unmeasured Sivers distribution function. In an analysis soon to be reported, these data have been combined with previously reported results for longitudinally polarized proton targets to evaluate the subleading-twist contributions to the longitudinal case.

Later this year the focus of the HERMES program will change with the installation of a large acceptance recoil detector, which will enhance the solid angle acceptance and missing mass

resolution in measurements of hard exclusive processes such as electroproduction of mesons and real photons(deep virtual Compton scattering). HERMES has already studied several exclusive reactions, including exclusive production of charged and neutral pions, and of ρ mesons. Recent measurements of deep virtual Compton scattering include the first measurements of a beam-charge asymmetry. The intense interest in these processes stems from their description in terms of Generalized Parton Distributions (GPDs) which are expected to provide access to the quark total angular momentum content of the nucleon. With the new detector, the exclusivity of events will be established by positive identification of the recoil proton and measurement of its recoil momentum. The enhanced selectivity of these measurements will provide a unique opportunity to assess the promise of GPDs as the next step in understanding the spin structure of the nucleon.

A very productive program of measurements of unpolarized DIS continues with the use of high-luminosity dedicated running exclusively for HERMES during the last hour of each fill of the HERA e^+/e^- storage ring. Attempts to isolate and confirm a previously reported signal for the existence of a 5-quark exotic baryon state at 1540 MeV [Phys. Lett. **B 585**, 213 (2004)] continue with the installation of an event trigger designed to select events with the expected pentaquark decay topology. Studies of quark propagation in nuclear matter are continuing with measurements of the ratio of hadron multiplicities in heavy targets to those in deuterium. Data on the kinematic dependences of these ratios as measured for different hadron types provides new insights into the propagation process. Data on the multiplicities measured for proton and deuteron targets currently under analysis will soon provide accurate measurements of quark fragmentation functions specifically at HERMES kinematics, and provide a rigorous test of factorization. The HERA accelerator will continue operations through the summer of 2007. Every effort is being made to maximize the impact of the beam time that remains.

News from RHIC at BNL

Excitement abounds as RHIC nears the end of the current $Cu + Cu$ running and users eagerly anticipate the start of polarized proton running, which will extend through June 25. Physics data taking for $Cu + Cu$ at 200 GeV began on January 11 and ended on March 6. RHIC operations exceeded the maximum projections and delivered $15\,\mathrm{nb}^{-1}$ to PHENIX and STAR (the two large experiments). All four experiments (including BRAHMS and PHOBOS) were at or near their stated goals for recorded events at 200 GeV. Two weeks at 62.4 GeV and one day at injection energy will conclude the $Cu + Cu$ running. The full $Cu + Cu$ data set will comprise an energy scan for an intermediate system size and provide an important new piece of information in understanding the new states of matter being produced and studied at RHIC. Set up and commissioning for polarized $p + p$ collisions will extend from late March through mid-April. Data taking for the spin physics program is scheduled to begin on April 16 and run for 10 weeks.

A highlight of the initial years of RHIC operation is the impending publication of detailed assessments by the four RHIC experiments of what has been learnt so far from the first few years of heavy-ion collisions at RHIC and what are the open questions. Reports from the theoretical community, which were presented at the May 14-15, 2004 RIKEN-BNL Research Center (RBRC) Workshop at BNL, are now published [*Nucl. Phys.* **A 750** (2005) pp 1-171]. The assessments by the experimental collaborations have also been submitted to *Nucl. Phys.* **A** and will be combined into a BNL Internal Report to be distributed in the near future. There is general agreement in the RHIC community that central $Au + Au$ collisions at RHIC produce hot dense matter that is in a strongly coupled and nearly perfect fluid state, rather than the non-interacting gas of free quarks and gluons that many had believed would characterize a quark-gluon plasma. Open questions include: can we find direct evidence for a state of matter that is characterized by quark deconfinement or chiral symmetry restoration?;

and what initial state leads to the hot dense matter produced in RHIC collisions and how does the matter evolve?

We are currently analyzing over a petabyte of data gathered since RHIC started collisions in June 2000, much from last year's $Au + Au$ run at 200 and 62.4 GeV. To completely understand the phenomena we are observing at RHIC, we have to look at what happens over a range of system sizes and collision energies. We have already learned from the analysis of $d + Au$ data that the dramatic hadron suppression and jet quenching observed in $Au + Au$ collisions at RHIC is due to final state interactions, rather than an initial state effect. The $Cu + Cu$ data will allow us to study what happens at intermediate energy densities. Further theoretical studies are underway at BNL and around the world. Future runs at higher luminosities with upgraded detectors are crucial to investigate, characterize, and more fully understand the fascinating state of matter discovered at RHIC.

Comparable excitement surrounds the RHIC spin physics measurements, which will qualitatively enhance our understanding of the nuclear force, the structure of protons and neutrons, and the theory of QCD. For example, spin physics measurements at RHIC will provide the first sensitive measurements of gluon polarisation and anti-quark polarisation in the proton. The higher luminosities, enhanced polarisation, and longer dedicated physics running time expected this Spring will provide significantly improved sensitivities in the gluon polarisation measurement. Future upgrades to the STAR and PHENIX detectors and further enhancements to the accelerator complex will allow the RHIC spin program to meet its ultimate goals; such as, studies of the spin decomposition of the nucleon anti-quark sea from W measurements at 500 GeV. We have recently submitted to DOE a Research Plan for Spin Physics at RHIC, which covers 1) the science of the RHIC spin program in a world-wide context; 2) the collider performance requirements for the RHIC spin program; 3) the detector upgrades required, including time-lines; and 4) the time evolution of the spin program. The full report is available at `http://spin.riken.bnl.gov/rsc/`.

As this is being written, the second of two new supercomputers for simulations of lattice-regularized QCD is being completed at BNL. The computers are based on QCDOC technology developed by Columbia, BNL and RBRC, and each is capable of 10 Teraflops peak speed. A significant fraction of the newly installed computing power will be devoted to nonzero temperature QCD (i.e., RHIC physics). To exploit this new facility, BNL has initiated a Lattice Gauge Theory Group in the Physics Department, led by Frithjof Karsch, a world leader in the field.

This GHP Newsletter was edited by Craig Roberts for the Executive Committee.