GHP Newsletter August 2005

American Physical Society Topical Group on Hadron Physics

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

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Elections

This year, elections for the following positions in the GHP's Executive Committee:

Vice-Chair and two Members-at-Large,

will be held in November.

In October, the Nominating Committee will solicit input from the GHP membership. The nomination of candidates will close on Fri., 28 October and an electronic ballot will subsequently be held over a two week period: 7–18 November.

We urge GHP members now to begin considering whom they would like to see filling these positions in the new year.

2005 GHP Nominating Committee

Paul Eugenio eugenio@martech.fsu.edu	Igor Strakovsky igor@va.gwu.edu	Eric Swanson swansone@pitt.edu

Eric Swanson is Chair.

Membership

At the beginning of 2005, the GHP had 308 members: 185 of these people were also in DNP (Division of Nuclear Physics), and 194 were in DPF (Division of Particles and Fields). However, since DNP has a total of 2410 members and DPF has 3303, it is likely that there are many Hadron Physics researchers who are not involved with GHP. Hence, if you are reading this newsletter but are not a member of GHP, *please join*. Current APS members can add units online through the APS secure server: http://www.aps.org/memb/unitapp.cfm.

On the other hand, if you are already a member of GHP, please discuss the merits of our Topical Group with your colleagues and encourage them to join.

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.

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.

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 were allocated ONE Regular nomination and ONE Alternate, for a total of TWO nominations.

The Fellowship Committee received and reviewed a packet of nominations from the APS, in accordance with agreed practice. Their recommendations were communicated to the the APS Fellowship Committee. That committee will complete their review by 1 September 2005. Final approval from the full APS Council is due by 30 November.

A new GHP Fellowship Committee will be named after elections are held later this year. Upon formation, that committee will solicit nominations for the next round. Those nominations should be lodged with the APS by **5 May 2006**.

The Executive urges members of GHP to react quickly to that call for nominations. We must work together to ensure that the APS community recognizes those of our 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, or those who have made significant contributions to the teaching of physics or service and participation in the activities of the Society.

For future reference, the instructions for nomination may be found at
http://www.aps.org/fellowship/fellinfo.cfm.

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 sponsored one invited session at the April meeting in Tampa. The session, entitled "Hadronic Physics 1," comprised invited talks touching three active areas within the field, and was very well attended.

First, *Glenn Young* (ORNL) presented highlights from the first years of RHIC results, including evidence of flow and jet quenching (later at the meeting, the RHIC experiments issued a press release announcing the discovery of a new type of hadronic matter, which appears to be a nearly perfect liquid). Next, *Curtis Meyer* (CMU) reviewed experimental

evidence for pentaquarks, focusing on the relative strength of the high energy data samples in comparison with the lower energy measurements. (See Curtis Meyer's "State of the Laboratories " contribution on page 7. NB. At the meeting, the results of the first high statistics searches at Jefferson Lab were also reported). Finally, *Volker Burkert* (Jefferson Lab) reviewed our present understanding of high energy electroproduction in terms of generalized parton distributions, introduced primarily to describe exclusive observables. Recent experimental results in deeply virtual Compton scattering and exclusive meson production were reviewed, and then the extensive future measurement plans at labs around the world were described.

GHP Session at the 2006 April Meeting in Dallas

In 2006, the April Meeting will be held in Dallas: April 22-25, 2006, Hyatt Regency Hotel, Dallas, Texas. The GHP will sponsor at least one invited session, and planning has already begun. GHP Members are encouraged to contact the program committee with suggestions.

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
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Ed Kinney is Chair.

Information about the Dallas meeting will become available at http://www.aps.org/meet/APR06/index.cfm.

Forthcoming Meetings

The GHP web site http://www.aps.org/units/ghp/ has a *Conferences* link – http://www.aps.org/units/ghp/meetings.cfm. This lists meetings that are likely to be of interest to GHP's membership. The Executive welcomes suggestions for postings.

The following meetings are currently listed for the coming year:

- Hadron 05, Rio de Janiero, Brazil, 21-26 August 2005
- NSTAR 2005, *The Physics Of Excited Baryons*, Florida State University, Tallahassee, Florida, 12-15 October 2005
- PANIC05, *Particles and Nuclei International Conference* Santa Fe, NM, 24-28 October 2005; NB. *The deadline for submission of abstracts is now shifted from 1 August to the new date: 17 August, 2005.*
- X Mexican Workshop on Particles and Fields, Casa de la Cultura and Teatro J. Ruben Romero, Morelia, Mexico, 7-12 November 2005
- QNP06, *IVth International Conference on Quarks and Nuclear Physics*, Madrid, 5-10 June 2006
- *APS Division of Nuclear Physics Fall Meeting*, Nashville, Tennessee, 24-28 October, 2006

- *Meeting of the APS Division of Particles and Fields* Honolulu, Hawaii, 30 October – 3 November, 2006

Meeting of GHP in 2006

The Executive proposes that GHP06 should take place in Nashville in the period Sun., 22 Oct. till Tues., 24/Oct. This immediately precedes the 2006 *Fall Meeting* of the APS Division of Nuclear Physics, which is also to be held in Nashville.

The success of GHP04 at FermiLab suggests that the themes and format employed there remain appropriate; viz., updates on status and plans from national and international hadron physics facilities, and overviews of contemporary advances and concepts in theory.

The Executive asks – Does the membership support this proposal? Whether yes or no, please provide constructive feedback.

In September, the Executive will appoint a committee to decide finally upon this matter and, if appropriate, proceed with planning. Input received before 9 September will be most valuable to us.

FY06 Budget

Senate's Budget

The Senate Appropriations Committee has sent its FY 2006 Energy and Water Development Appropriations bill to the floor. The Bill was accompanied by Senate Report 109-084. The Senate bill's recommendation for the Office of Science is $36.6 million higher than the House bill (NB. Senator Domenici's (R-NM) subcommittee had a higher budget allocation than the House subcommittee.) Here are the numbers (which include all budget items such as "Safe Guards and Security" in the Office of Science budget):

- The current budget is $3,599.9M.
- The Bush Administration requested a cut of 3.8% in the FY 2006 budget to $3,462.7M.
- The House bill would increase the budget by 1.8% or $66.2 million to $3,666.1M.
- The Senate bill would increase the budget by 2.9% or $102.8M to $3,702.7M.

The Senate's report states that "The future health of our national system of physical sciences R&D can be restored by focused investments in three areas: major scientific user facilities that support the physical sciences; the university scientists who conduct world class research and train our next generation of scientific talent; and DOE's national laboratories, which are the Nation's crucible for multidisciplinary work in challenging aspects of the physical sciences that cannot be performed elsewhere."

The following remarks and excerpts may be of particular interest to GHP's membership.

High Energy Physics. The Senate bill would cut funding for the High Energy Physics Program by 2.6% or $18.8M, from $735.7M to $716.9M. The House bill would provide $735.9M. The Bush Administration requested $713.9M. The report states:

- "The Committee recommendation includes $716,933,000 for high energy physics, an increase of $3,000,000 [over the request], to provide operational funding to ensure full utilization of facilities . . . "

Nuclear Physics. Senate appropriators recommend an increase of 3.7% or $14.9M in the Nuclear Physics Program budget, from $404.8M to $419.7M. The House bill would provide $408.3M. The Administration request was $370.7M. The report states:

- "The Committee recommends $419,741,000 for nuclear physics, an increase of $49,000,000 to ensure full utilization of experimental facilities . . . "
- "Rare Isotope Accelerator- The Committee requests the Department to submit a report within 120 days after the enactment of this Act, with information critical to moving forward with the site selection of the Rare Isotope Accelerator. The report shall include, but not be limited to, (1) the status and progress of the conceptual research and development supporting the development of RIA over the past 6 years; [. . .] (5) what technical hurdles remain before RIA site selection can resume; and (6) what funding will be required to clear those hurdles and what is the expected length of time for completion of these activities."
- "Finally, the Committee requests the Department clarify its plans to move forward with RIA, provide an estimate of when the draft request for proposals will be reissued, and assess whether in a constrained budget environment the Department has any concern that RIA, as it is currently envisioned, will not be built. If the Department anticipates that future budgets will not allow for RIA, the Committee requests the report provide alternatives and explain how the Nation would meet our need for the fundamental physics knowledge and training of scientists applicable to national security and homeland security that RIA would provide."

It appears that the Senate's priority is the operation of facilities. No information is readily available which describes how the proposed funding adjustments will directly support the remote users of facilities; namely, " . . . the university scientists who conduct world class research and train our next generation of scientific talent" and staff at the national laboratories whose research is primarily focused on a remote facility. Absent a positive commitment in these areas, the FY06 budget still presents a severe threat to the support of GHP's membership.

More information may be obtained from FYI at the American Institute of Physics; namely, http://www.aip.org/fyi/2005/098.html.

Tribble Report

On 11 March NSAC met in Rockville, Maryland. The primary business of the meeting was to present NSAC with two agency charges, with the NSAC responses due by 30 June 2005. The first charge noted that "The FY06 President's Budget Request for Nuclear Physics is an 8.4% reduction from the FY05 Appropriations and this funding level projected into the future is not sufficient to maintain the scope of the present Nuclear Physics program. In light of these budget stringencies and their implications for the U.S. Nuclear Physics program, NSAC is being asked how to implement the highest priority science in the context of available funding and world wide capabilities. NSAC is asked to provide recommendations on priorities for an optimized DOE nuclear science program over the next five years (FY07-FY11) . . . "

NSAC appointed a subcommittee chaired by Robert Tribble of Texas A&M to respond to this charge. The subcommittee reported at the NSAC Meeting on June 15, 2005. The full report is available at http://www.sc.doe.gov/np/nsac/docs/nsac-report-final1_Tribble.pdf.

The charge was widely interpreted as posing the question: "If DOE's Nuclear Physics budget doesn't improve, which of the two major DOE nuclear physics facilities should be shut down?" The Committee responded with the following statement: "Decades of careful planning and domestic and foreign investment into unique facilities have resulted in many important discoveries and remarkable payoffs. The subcommittee recognizes that under either scenario, the nation and its foreign partners will suffer a tremendous loss in science and the U.S. will no longer be able to maintain international leadership in at least one of the subfields of nuclear science. Because of the superb science lost in both scenarios, the committee was not able to make a choice based on scientific merit alone. The present budget scenario, however, represents a crisis that would preclude running both large facilities simultaneously and force an immediate choice while RHIC is still in its initial discovery phase. Based on this additional consideration, the subcommittee, while split in its decision, has a slight preference for the choice that maintains operations at RHIC. If such a budget exercise were to occur in the future, for instance, with the Jefferson Lab 12-GeV Upgrade well underway, a different choice might well be made."

The Executive urges GHP's membership to consider the complete report, which concludes:

- "If the budget projections that require closing CEBAF or RHIC, and abandoning plans for RIA become reality, U.S. nuclear science will suffer an extraordinary loss of discovery potential. But the message that this will send to potential future nuclear scientists may be even more damaging to the country in the long run. If our field must downsize in the future, it will. But closing one of our two major facilities now to achieve this will not make for a smooth transition. Clearly downsizing has long-term implications for the training of future scientists. Is there a vision of the future where nuclear scientists are no longer needed to deal with issues related to homeland security, nuclear proliferation, nuclear power and nuclear medicine?"
- "A constant effort budget at the FY05 level would preserve the core facilities in our field but sacrifices would need to be made in all sectors to accommodate this. A compromise between the budget needed to implement the 2002 LRP and an FY05 base with constant effort would allow the field to maintain the present momentum preserving our two unique facilities so that they can fulfill their science missions."
- "The field of nuclear science has a clear vision, outlined by the 2002 LRP, of a future providing a balanced attack on our three major intellectual frontiers: the physics of QCD, the physics of nuclei, and physics beyond the standard model. Achievement of a smooth transition to that future will require major investments in new facilities within the coming decade. If the presently projected constrained budgets continue, the optimal way to arrange the desired transition will have to be the subject of a new long-range planning process in the nuclear science community."

State of the Laboratories

For this issue the Executive solicited and received input for this section regarding the current status of pentaquarks; and from CLEO-c.

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.

Status of Pentaquarks

(Communicated by Curtis Meyer, http://www.curtismeyer.com/.)

Over the last two years, the topic of Pentaquarks has been the focus of a great deal of discussion and study. This was initially driven by about ten different observations of the Θ^+ pentaquark, most of which reported a low-statistics peak in either the K^+n or K_Sp invariant mass. These peaks shared several characteristics. They were all at approximately the same mass – between 1.52 and 1.56 GeV/c^2. They all had widths that were no larger than the experimental resolution, and they were all on top of a non-negligible and not well-understood background. These measurements were followed-up by a similar number of null results. Most of these came from high-statistics, high-precision experiments but suffered from the concern that – for the most part – the reactions and kinematics involved were sufficiently different from those in the positive experiments as to make a direct comparison and robust conclusion difficult.

In order to clarify the nature of the Θ^+, it was necessary improve the statistical significance of some of the positive sightings, and if the state was confirmed, to accurately measure its mass. In order to do this, two high-statistics data sets were collected with the CLAS detector at Jefferson Lab in mid 2004. During the last several months, results from both of these data sets have been reported – both of which show no evidence for the Θ^+. The first was reported at the April APS meeting in Tampa. It examined photo-production data on a proton. The null result from the reaction $\gamma p \to \Theta^+ K_S$ sets an upper limit for pentaquark production about ten times smaller than an earlier measurement in the same channel. The second null result – collected using a deuterium target – sets an upper limit on the reaction $\gamma d \to \Theta^+ K^- p$ that is about eight times smaller than an earlier CLAS measurement and several times smaller than the initial measurement at Spring-8.

These new results now cast serious doubt on the existence of the pentaquark states. In particular, they set null limits in the manifestly exotic $\Theta^+ \to K^+ n$ channel – limits that are well below earlier observations. Except for a single measurement from CLAS whose mass differs from earlier results by several sigma, all the remaining observations appear to be in the non-exotic K_Sp final state. While it will be interesting to see new experimental results coming out, there are grounds for healthy skepticism regarding the existence of pentaquarks.

News from CLEO-c

(Communicated by Richard Galik [rsg@mail.lns.cornell.edu] and Hanna Mahlke [mahlke@mail.lns.cornell.edu].)

CLEO has successfully made the transition from an era of B physics to the charmonium regime and is active in many new areas, exploiting the potential for both precision and discovery offered by the unique combination of high luminosity and a modern detector. The change was made possible by an insertion of wiggler magnets into the CESR e^+e^- collider to provide beam cooling, allowing effective running in the energy region around $E_{cm} = 3 - 4\,\mathrm{GeV}$. CESR is the first such wiggler-dominated storage ring.

The current CLEO physics program was laid out in "*CLEO-c and CESR-c: A New Frontier of Weak and Strong Interaction*[1]." The opening act was a year of running at the $\Upsilon(1,2,3S)$ resonances, thereby increasing the data sample size by a factor of ten with respect to previous experiments. The program then envisioned three years of data taking in the charmonium

[1] R.A. Briere *et al.*, CLEO-c/CESR-c Task Forces and CLEO-c Collaboration, Cornell LEPP Report CLNS-01/1742 (2001).

region, which is now well underway. Primary goals are: measurements in weak decays of D and D_s mesons (such as extraction of the CKM matrix elements V_{cd} and V_{cs}, $D \to h$ form factor measurements, and measurement of weak decay constants); branching fraction determination (from which other experiments will benefit greatly since among the decays studied are the important normalizing modes $D^0 \to K^-\pi^+$ and $D^+ \to K^-\pi^+\pi^+$); and the study of rare D decays. Most of the measurements will become available at unprecedented precision. They will therefore bear directly on other experiments, where they function as inputs. In addition, they will help to constrain theory. For example, accurate measurements will assist with the validation of Lattice QCD (LQCD) techniques by confronting improved predictions with meaningful experimental accuracy. This is important because it will facilitate application of LQCD tools to B and B_s physics.

This summer's conferences will see the first evaluation of CLEO's $280\,\mathrm{pb}^{-1}$ sample of $\psi(3770)$ data, mostly updates of analyses based on a $60\,\mathrm{pb}^{-1}$ pilot run (with substantial increase in precision due to larger statistics and improved understanding of systematics), but also new results only made possible by the superior data sample size. The $\psi(3770)$, being just above open flavor production threshold, is mostly used as a charm factory through $\psi(3770) \to D\bar{D}$. The D mesons produced in pairs and at threshold are easier to analyze than those produced at $\Upsilon(4S)$ energies. New results include a measurement of the weak decay constant f_{D^+} using $D \to \mu\nu$, analyses of semileptonic decays, and hadronic branching fractions.

CLEO has accumulated 20M / 9M / 6M $\Upsilon(1/2/3S)$ decays, $3M$ $\psi(2S)$ decays, and $21\,\mathrm{pb}^{-1}$ below the resonance in the continuum, at $\sqrt{s} = 3.67\,\mathrm{GeV}$. Therefore, a lot is offered in the spectroscopy sector, such as: study of $\psi(2S)$ decays and transitions; non-$D\bar{D}$ $\psi(3770)$ decays (such as those typical of a $c\bar{c}$ state); access to χ_{cJ} (through $\psi(2S) \to \gamma\chi_{cJ}$); and discovery of the $h_c(1^1P_1)$. Combined with CLEO's $\Upsilon(1,2,3S)$ samples, the spectroscopy results allow comparisons between bottomonium and charmonium, both of which are heavy quarkonium systems and exhibit similar overall features, but with subtle differences induced by the difference in constituent masses. CLEO bottomonium data has already resulted in some publications, *e.g.*: the first $L = 2$ meson below open flavor production threshold; photon transitions; and observation of the first non-pionic hadronic transition in bottomonium $[\chi_{b1,2}(2S) \to \omega\Upsilon(1S)]$ and $\mathcal{B}(\Upsilon(1,2,3S) \to \mu^+\mu^-)$. The data continue to be analyzed, *e.g.*: dipion transitions between the Υ's and the χ_{bJ}'s; the electronic widths $\Gamma_{ee}(\Upsilon(1,2,3S))$, $\mathcal{B}(\Upsilon(1,2,3S) \to \tau^+\tau^-)$; and more. This provides experimental input to theory. In addition, modes with $p\bar{p}$ final states will help to plan future experiments such as PANDA that study the inverse reaction $p\bar{p} \to c\bar{c} + X$.

Enabled by the vast data sample sizes at various energies combined with a modern detector, many of these publications are first observations or first high precision measurements. With data taking resuming around and above 4 GeV, more results are within reach. In particular, high precision measurements, which are not only of value by themselves, but of direct relevance to the B and B_s physics regime.

CLEO is currently in the process of developing strategies for both near term and future data-taking periods, with the options of running in the vicinity of $\sqrt{s} = 4\,\mathrm{GeV}$, adding more data in the $\psi(3770)$ area, and eventually moving down to the J/ψ (or ψ'). This will ensure a lively physics program until the scheduled end of the experiment, in 2008.

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