GHP Newsletter October 2008

AMERICAN PHYSICAL SOCIETY TOPICAL GROUP ON HADRON PHYSICS

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

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NB. EMail addressed to ghpexec@anl.gov will reach all members of the Executive.

Contents

1 2009 J. J. Sakurai Prize for Theoretical Particle Physics

The Executive of the GHP would like to offer our hearty congratulations to:

John C. Collins, Pennsylvania State University; *R. Keith Ellis*, Fermilab; and *Davison E. Soper*, University of Oregon

who have shared the 2009 J. J. Sakurai Prize for Theoretical Particle Physics, which was awarded:

> "For work in perturbative Quantum Chromodynamics, including applications to problems pivotal to the interpretation of high energy particle collisions."

This prize was endowed in 1984 as a memorial to and in recognition of the accomplishments of

J. J. Sakurai his family and friends. It is intended to recognize and encourage outstanding achievement in particle theory. The prize consists of $10,000, an allowance for travel to the meeting of the Society at which the prize is to be awarded, and a certificate citing the contributions made by the recipient. It is presented annually.

(This year's Selection Committee: Ben Grinstein, Stan Brodsky, Sekhar Chivukula, Sally Dawson, Scott Willenbrock.)

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2 Elections

Elections for posts in the GHP Executive must soon be held. We need to fill two positions:

- Vice-Chair (As reported in the last Newsletter, Winston Roberts will become Chair and Stan Brodsky, Chair-Elect. This leaves the position of Vice-Chair vacant. Naturally, Curtis Meyer will become Past-Chair. Heaven has rejected Craig Roberts' application. He's speaking with John Milton.)
- and one Member-at-Large (Again, Paul Eugenio will by then have completed his service.)

Herewith the Nominating Committee solicits input from the GHP membership. The nomination of candidates will close on Fri., 7 November and an electronic ballot will subsequently be held over a four week period: 17 November – 15 December.

The 2008 Nominating Committee is

2008 Nominating Committee

Paul Eugenio eugenio@fsu.edu	Craig Roberts cdroberts@anl.gov	Raju Venugopalan raju@quark.phy.bnl.gov	Haiyan Gao gao@phy.duke.edu

Craig Roberts is Chair.

We urge GHP members to send in nominations NOW. Naturally, we ask that a nominator first check with the nominee to see if they're willing.

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3 Fellowship

It is time to remind the GHP that each year the APS allocates a number of Fellowship Nominations to a Topical Group. That number is based primarily on membership. A strong GHP can nominate more of our members for Fellowship. This year we are allocated ONE Regular nomination and ONE Alternate, for a total of TWO nominations.

The Executive urges members of GHP to be prepared in 2009 to nominate colleagues who have made advances in knowledge through original research and publication or made significant and innovative contributions in the application of physics to science and technology. They may also have made significant contributions to the teaching of physics or service and participation in the activities of the Society.

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

The entire process is now performed on-line.

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

- Ensure 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 nomination process should be complete prior to GHP's deadline:
25^{th} April 2009

The APS will subsequently forward the Nominations to the GHP Fellowship Committee. The 2009 Fellowship Committee will be chaired by the incoming Vice-Chair of GHP.

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4 Budget News

On Sat., 27/Sept., a Continuing Resolution was passed that will keep the government operating until March, 09. U.S. science agencies will receive no budget increases until March 2009, at the earliest.

The continuing resolution holds agencies to current spending levels until 6 March. Many fear that it could be extended for the rest of the fiscal year.

It is reported that scientists in the Department of Energy judge the $62.5 million they received in July will tide them over for several months. However, few wish to speculate on what will happen in March should additional funds not become available.

Amongst other things, the APS reports that the CR could have the following effects:

- Department of Energy user facilities would be forced to cut back operations substantially;
- a new round of layoffs at the national laboratories could occur;
- and the number of university grants would be cut, with new, young investigators especially harmed.

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5 GHP09

We are planning for a *Third Meeting of the APS Topical Group on Hadronic Physics* to take place in 2009. **Winston Roberts** has volunteered to serve as Chairman of the Organizing

Committee. The GHP Executive is still examining the feasibility of holding a workshop immediately before/after the APS April meeting in Denver, Co. We will provide further details as they become available.

Details of the Second Meeting, which took place during the period October 22-24, 2006 at the Opryland Resort, Nashville, Tennessee, can be found at

http://fafnir.phyast.pitt.edu/GHP06/index.html ,

and most of the presentations made can be obtained from

http://www.hep.vanderbilt.edu/ johnswe/ghp06/Pgm.html.

The Proceedings of the Second Meeting (http://www.iop.org/EJ/toc/1742-6596/69/1) were published in the open access "Journal of Physics: Conference Series" which is published by Institute of Physics Publishing in the UK.

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6 APS April Meeting, 2009

A topical group is invited to participate in planning the program of major APS meetings. This year there will be two sessions of invited talks sponsored by the GHP at the April meeting in Denver, Colorado. One session will focus on recent results and opportunities in hadron spectroscopy, while the second will focus on nucleon structure and fundamental symmetries. The list of speakers and schedule are currently being finalised.

The program committee for the meeting is

GHP Program Committee, preparing for April 2009

Mary Alberg alberg@seattleu.edu	David Richards dgr@jlab.org	Winston Roberts (FSU) wroberts@fsu.edu

Winston Roberts is Chairman.

NB. The April Meeting is actually taking place in May; viz., **2-5 May 2009**.

http://www.aps.org/units/pmfc/meetings/meeting.cfm?name=APR09

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7 Forthcoming Meetings

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

Here we'd nevertheless like to draw membership's attention to the following meetings:

October, 08 ...

- 2008 Annual Meeting of the APS Division of Nuclear Physics
  23-26 October, Marriott City Center Hotel, Oakland, California
- Joint CERN-Jefferson Lab-GSI/FAIR International Workshop: Physics and Methodology in Meson Spectroscopy ... **22-24 October**, Munich, Germany

November, 08 ...

- PANIC 08: 18th Particle And Nuclei Int. Conf.
  9-14 Nov., Eilat, Israel
- Int. Linear Collider Wksp. 2008: LCWS08 and ILC08
  16-20 Nov., Chicago, IL
- Lattice QCD and experiment: Revealing the structure of hadrons
  21-22 November, Jefferson Laboratory, Newport News, VA

December, 08 ...

- 2008 Int. Wksp. on Heavy Quarkonia
  2-5 Dec., Nara, Japan
- Int. Wksp. on Strangeness in Nuclear and Hadronic Systems
  15-18 Dec., Sendai, Japan

March, 09 ...

- TIPP09: 1st Int. Conf. on Technology and Instrumentation in Particle Physics
  12-17 Mar., Tsukuba, Japan
- Int. Conf. on Computing in High Energy and Nuclear Physics
  21-27 Mar., Prague, Czech Republic
- Quark Matter 2009
  29 Mar. - 4 Apr., Knoxville, TN
- MAMI and Beyond
  30 Mar. - 2 Apr., Mainz, Germany

April, 09 ...

- NSTAR 2009: Wksp. on the Physics of Excited Nucleons
  19-22 April, Beijing, China

May, 09 ...

- April Meeting of the American Physical Society
  2-5 May 2009, Denver, Colorado
- CIPANP 2009: Tenth Conference on the Intersections of Particle and Nuclear Physics ... **26-31 May**, Torrey Pines Hilton, San Diego, CA

June, 09 ...

- CPOD – 5th International Workshop on Critical Point and Onset of Deconfinement
  15-19 June, Physics Department, Brookhaven National Laboratory, NY

August, 09 ...

- 19th International Conference on Few-Body Physics – Few Body 2009
  31 Aug. – 5 Sept., Bonn University, Bonn, Germany

September, 09 ...

- EINN 2009: Int. Conf. on Electromagnetic Interactions with Nucleons and Nuclei
  27 Sep. - 3 Oct., Athens, Greece

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8 State of the Laboratories

For this issue the Executive solicited and received input for this section from Richard Galik and Hanna Mahlke with CLEO, Jeff Appel at FNAL, and Rolf Ent and Allison Lung at JLab.

(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 contribution should serve as a template.)

8.1 CLEO Collaboration at the Cornell Electron Storage Ring (CESR)

(Communicated by Richard Galik – rsg@mail.lepp.cornell.edu and Hanna Mahlke – mahlke@mail.lepp.cornell.edu.)

While the CLEO detector stopped recording data in March 2008, the flow of analyses and results will continue for quite some time. Below we give a few details on those that have recently been completed and have a bearing on light hadrons or the nature of QCD, both areas at the core of the GHP's interests. These results are based on the 27M ψ' decays recently collected and on older samples of data from the Υ energy regime. We only give the CLEO references; please see the references within these articles for further details.

The η meson was discovered a half-century ago and yet there was still controversy over its mass, a basic parameter of great importance in understanding octet-singlet mixing and the gluonic content of the pseudo-scalars η and η'. CLEO used the decay chain $\psi' \to \eta J/\psi$ with the J/ψ decaying to lepton pairs, and took advantage of the narrowness of the two charmonium resonances to enhance the detector resolution. CLEO's result [1], which uses all four dominant η decay modes, is:

$$M(\eta) = 547.785 \pm 0.017 \pm 0.057 \text{ MeV} ,$$

with the uncertainties being statistical and systematic, respectively. This is of comparable precision to recent NA48, KLOE and GEM measurements, being consistent with the former two and over six standard deviations larger than the latter.

This sample of $\psi' \to \eta J/\psi$ decays was also used [2] to simultaneously obtain precision measurements of the branching fractions of $\eta \to \gamma\gamma, 3\pi^0, \pi^+\pi^-\pi^0, \pi^+\pi^-\gamma$, and $e^+e^-\gamma$, which sum to 99.9% of the total. Two of these branching fraction measurements are $\sim 3\sigma$ different from prior results and of comparable precision.

Having helped resolve the conflict of the η mass, CLEO then used the decay chain $\psi' \to \pi^+\pi^- J/\psi$, $J/\psi \to \gamma\eta'$ to address the poorly measured η' mass, using three of its dominant decay modes. CLEO's result [3] of

$$M(\eta') = 957.793 \pm 0.054 \pm 0.036 \text{ MeV}$$

is consistent with the world average, but a factor of four more precise.

With an initial sample of some 3M ψ' decays, CLEO had previously definitively determined the existence and measured the mass of the spin-singlet state $h_c(^1P_0)$. The comparison of its mass to that of the spin-triplet χ_c states, *i.e.*, the hyperfine splitting for L = 1, is important for understanding the nature and relevance of the confinement part of the QCD potential. The new, larger sample of ψ' decays allowed CLEO to observe the h_c with over 10σ significance with both inclusive and exclusive techniques. This present analysis obtains a mass [4] of

$$M(h_c) = 3525.28 \pm 0.19 \pm 0.12 \text{ MeV} .$$

This precision should help discriminate among various models of the QCD interaction at charmonium mass scales, although some theoretical input is needed on how to spin-average the masses of the χ_c triplet.

Two other charmonium analyses concentrated on using QED (*i.e.,* photons) to probe QCD, looking at $c\bar{c}$ analogues to positronium. In the first [5] CLEO examined the decay $\chi_{cJ} \to \gamma\gamma$ to extract the two-photon partial width $\Gamma_{\gamma\gamma}$ via decay (as opposed to the formation via two-photon fusion). The ratio of these widths for $J = 2$ to $J = 0$ is of particular interest in its dependence on relativistic effects and radiative corrections. CLEO's result is

$$\Gamma_{\gamma\gamma}(\chi_{c2})/\Gamma_{\gamma\gamma}(\chi_{c0}) = 0.237 \pm 0.043 \pm 0.015 \pm 0.031 \ ,$$

with the last uncertainty from the PDG branching fractions for the ψ' to the χ_{cJ} and the values of the χ_{cJ} full widths. CLEO also improved the limit on the rate of forbidden decay $\chi_{c1} \to \gamma\gamma$ by more than an order of magnitude. The other analysis [6] is for the decay $J/\psi \to \gamma\gamma\gamma$, the first observation of *any* meson decaying to three photons. CLEO's result, based on a signal of 6σ significance, is

$$\mathcal{B}(J/\psi \to \gamma\gamma\gamma) = (1.2 \pm 0.3 \pm 0.2) \times 10^{-5} \ .$$

This is a factor of 2.5 lower than what would be predicted from zeroth order QCD and the well-measured di-lepton decay rate of the J/ψ.

Another interesting χ_{cJ} analysis [7] looked at radiative decay rates to the vector mesons ρ, ω, and ϕ. For $J = 1$ these are found to be surprisingly large! For example,

$$\mathcal{B}(\chi_{c1} \to \gamma\rho) = (2.43 \pm 0.19 \pm 0.22) \times 10^{-4} \ ,$$

which is almost 20 times the pQCD prediction, perhaps implying a large light quark component in that axial vector state. The polarization of the ρ meson is intriguingly like that observed in the radiative decay $f_1(1285) \to \gamma\rho$.

For $b\bar{b}$, CLEO has observed [8] the soft-gluon process $\Upsilon(2\mathrm{S}) \to \eta\Upsilon(1\mathrm{S})$ and set limits on related pseudo-scalar transitions, all of which require a chromo-magnetic dipole emission of a soft gluon. CLEO's measured branching fraction of this 5.3σ signal is

$$\mathcal{B}(\Upsilon(2\mathrm{S}) \to \eta\Upsilon(1\mathrm{S})) = (2.1^{+0.7}_{-0.6} \pm 0.3) \times 10^{-4} \ ,$$

about 1/4 the prediction obtained from scaling from of the analogous charmonium transitions. CLEO determined an upper limit on this transition from the $\Upsilon(3S)$ which is less than half than the predicted rate. These results indicate a lack of understanding of how soft gluons hadronize into an η, or some suppression of the b quark chromo-magnetic moment.

In summary, CLEO continues to analyze its numerous datasets and is looking forward to the swift completion of further analysis work and interesting results.

(Work supported by the National Science Foundation, the U.S. Department of Energy, the Natural Sciences and Engineering Research Council of Canada, and the U.K. Science and Technologies Facilities Council.)

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2. A. Lopez *et al.* (CLEO), Phys. Rev. Lett. **99**, 122001 (2007).
3. J. Libby *et al.* (CLEO), arXiv/hep-ex: 0806.2344v1 (subm. to Phys. Rev. Lett.).
4. S. Dobbs *et al.* (CLEO), arXiv/hep-ex: 0805.4599v1 (subm. to Phys. Rev. Lett.).

5. K. M. Ecklund *et al.* (CLEO), arXiv/hep-ex: 0803.2869v1 (subm. to Phys. Rev. Lett.).
6. G. S. Adams *et al.* (CLEO), Phys. Rev. Lett. **101**, 101801 (2008).
7. J. V. Bennett *et al.* (CLEO), arXiv/hep-ex: 0806.3718v1 (accepted by Phys. Rev. Lett.).
8. Q. He *et al.* (CLEO), arXiv/hep-ex: 0806.3027v2 (subm. to Phys. Rev. Lett.).

8.2 Report from Fermilab

(Communicated by Jeff Appel, EMail: appel@fnal.gov.)

The excitement of record-setting current operations and the roller-coaster ride of funding and the future program at Fermilab is palpable. First, let's look at the physics program. It is nice to note that three of the ten best physics news stories of 2007 as cited the by the American Institute of Physics are part of the Fermilab program (Tevatron collider, MiniBooNE, and the Pierre Auger Observatory).

The Fermilab accelerators are setting records regularly, both for the Tevatron collider program and the Main Injector (MI) and Booster neutrino programs. The particle astrophysics program is also achieving acclaim for its productivity.

A sample of the new accelerator records includes:

- Highest initial luminosity: 3.18×10^{32} cm^{-2} s^{-1} (July 5, 2008)
  – Record at end of FY 2007: 2.92×10^{32} cm^{-2} s^{-1} (February 25, 2007)
- Highest delivered luminosity for one week: 57.1 pb^{-1} (June 30, 2008)
  – Record at end of FY 2007: 44.8 pb^{-1} (January 7, 2007)
- Highest integrated luminosity in one month: 221 pb^{-1} (May, 2008)
  – Record at end of FY 2007: 167 pb^{-1} (January, 2007)
- Highest number of antiprotons accumulated in an hour: 2.7×10^{11} (June 3, 2008)
  – Record at end of FY 2007: 2.3×10^{11} (March 23, 2007)
- Highest number of antiprotons accumulated in a week: 3.460×10^{13} (July 6, 2008)
  – Record at end of FY 2007: 2.807×10^{13} (March 3, 2007)
- Highest typical protons per pulse for the NuMI neutrino beam: 3.1×10^{13} protons per pulse with $\overline{p}$ production, 3.7×10^{13}, when alone
  – Record at end of FY 2007: 3.35×10^{13}, when alone
- Highest number of 120 GeV protons on target in a week for NuMI neutrino beam: 7.23×10^{18} at an average power on target of 234 KW (May 19, 2008)
  – Record at end of FY 2007: 5.68×10^{18}
- Highest number of 8 GeV protons on target in a week for the Booster Neutrino Beam: 1.16×10^{19} (June 30, 2008)
  – Record at end of FY 2007: 1.13×10^{19} (August 27, 2006)
- Highest number of 8 GeV protons on target in a month for the Booster Neutrino Beam: 4.3×10^{19} (June 30, 2008)
  – Record at end of FY 2007: 3.9×10^{19} (March, 2005)

The dates for these records are quite recent, only because records are falling with regularity these days. The achievements have been made possible by good reliability of the many machines contributing to each capability, attention to optimized and stable orbits, shorter set-up times and, for the collider and NuMI neutrino programs, newly implemented operation in mixed mode with slip-stacking of two Booster batches for antiproton production and nine batches for the NuMI beamline.

The total integrated luminosity delivered to each of the two Tevatron collider experiments, CDF and D0, is now almost four and a half inverse femtobarns, already nearly the so-called base projection made for running through 2009. The total protons-on-target for NuMI is now 4.19×10^{20}, and for the Booster Neutrino Beam (running in both neutrino and antineutrino modes) is 11.1×10^{20}.

The experiments are making excellent use of the delivered beams. Each year, the two collider experiments have had about 70 PhD theses granted, about 90 physics-result publications in the major refereed journals, and very large numbers of presentations at conferences and workshops – among all this output are some of the most cited results, including new observations (measurements of B_s mixing, new bottom baryons, discovery of WZ production, and evidence for single top-quark production) and more precise measurements of fundamental parameters (the top quark mass and the W boson mass and width). Sensitivities to New Physics such as Higgs and SUSY particles have been improving, relative to earlier results, even faster than projected sensitivities based on the amount of data collected. Improved analysis techniques and the addition of new search channels have both played important roles in this achievement.

In neutrino physics, there are three running experiments: SciBooNE and MiniBooNE in the Booster Neutrino Beam, and MINOS in the NuMI beam. SciBooNE has just achieved its desired goal of receiving 2×10^{20} protons on target for the combination of neutrino and antineutrino production. The experiment will complete its run August 18, 2008. It is measuring cross sections at energies specially relevant for understanding backgrounds at the future T2K neutrino-oscillation experiment in Japan. The MiniBooNE experiment demonstrated that the signal reported by the LSND experiment at Los Alamos National Laboratory cannot be explained as a simple neutrino oscillation effect since MiniBooNE did not observe the LSND-projected signal at the same energy divided by distance as at LSND. MiniBooNE did observe an excess of events at low energy which is still unexplained and remains under investigation. MiniBooNE is also measuring cross sections. MINOS is observing higher-energy neutrino oscillations by comparing rates in a detector in the Soudan Mine in Minnesota to those in a near detector, measuring the atmospheric-neutrino oscillation parameters with precision. MINOS also searched for evidence of sterile neutrinos by comparison of neutral-current-like events in the two detectors. No evidence for sterile neutrinos was found. Finally, the MINERvA experiment has received DOE construction funding starting this year, and will measure higher energy neutrino cross sections relevant for oscillation experiments using the NuMI beam, MINOS, NOvA, and DUSEL.

In particle astrophysics, the Sloan Digital Sky Survey continues to be immensely successful in its output. Its annual results have led again to its being recognized as the "most cited astrophysics observatory" in the world. Two experiments with strong Fermilab participation, the Pierre Auger Observatory and the Chicagoland Observatory for Underground Particle Physics (COUPP) have important and popularized results appearing in "Science" this year. Auger reported measurement of anisotropy in the distribution of ultra-high cosmic rays, and their apparent origin in active galactic nuclei. COUPP was cited for resurrecting the bubble chamber technique in a new way in pursuit of direct observation of dark matter. In its engineering run underground at Fermilab, COUPP pushed the search for dark matter via spin-dependent interactions to higher sensitivity for low-mass WIMPS. Fermilab's other dark-matter search experiment, the Cryogenic Dark Matter Search (CDMS) regained the sensitivity lead in searching for WIMPs above 40 GeV in mass. A quick axion search experiment, GammeV, published a null result, closing the last possible open window in parameter space suggested by an earlier PVLAS experiment observation.

As part of its participation in this broad range of physics research, the Laboratory has had the underpinning of very strong groups in particle theory and in astroparticle theory. These groups have helped the Laboratory and its users in both the ongoing programs and in investigating and choosing directions for the future. Both theory groups continue to have very active visitor programs to enhance the depth of local discussions and the amount of physics output. Typically, there are some 75 theory papers per year in refereed journals with at least one Fermilab staff theorist author.

Fermilab is the home institution for the US CMS collaboration. The Laboratory has developed an LHC Physics Center and a Remote Operations Center as part of its participation in LHC physics. These facilities and organizations will provide US scientists a location for concentrated effort on CMS, a critical mass of people and expertise to help university groups maximize their contributions to CMS physics, and to keep Fermilab involved directly in the Energy Frontier for the future. Similarly, Fermilab remains the most likely US site for an ILC should it be built in the US, and is continuing to build its superconducting rf and other infrastructure to be a major player in a future such machine.

In the meantime, Fermilab is developing plans for Project X, a new 8 GeV superconducting linac which will allow the Laboratory to strengthen its program at the Intensity Frontier, both for neutrinos and for beams of hadrons and muons.

In pursuit of understanding current developments in particle physics and the definition of its future, Fermilab has been host to many conferences and workshops. These include the Hadron Collider Physics Workshop, a Workshop on Polarization in the Cosmic Microwave Background, one workshop on the Project X accelerator, and three workshops on the Physics of Project X. In the area of science and technology, the Laboratory has had recently and will soon have workshops on topics as varied as the ILC, pixel detectors, and materials used in superconducting rf devices. The Laboratory has also hosted multi-week schools dedicated to hadron collider physics, neutrino physics, and ILC accelerator physics.

Physics from previous fixed-target runs of particular interest to the APS Topical Group on Hadronic Physics include recent results from the FOCUS, HyperCP, KTeV, NuTeV, and SELEX experiments, all of which continue to publish new results. Both HyperCP and KTeV have just completed the final results on their flagship measurements, the hyperon CP asymmetry measurement and the kaon ϵ'/ϵ, respectively. There are 16 new papers submitted or just published from these experiments.

A total of 150 PhD theses using data from Fermilab-related experiments was listed in the program of the Annual Fermilab Users Meeting. This is a large fraction of the physics PhD's granted per year.

At the same time as all this physics output has been occurring, it has been an up-and-down year for funding. Fiscal year 2008 began with increases in the anticipated budget, based on both the President's proposal and actions in Congress. Then, the omnibus budget bill cut Fermilab funding by $52 million and prevented the start of construction on NOvA, the next-generation, off-axis neutrino oscillation experiment. Fermilab also had to stop virtually all work on the R&D for the International Linear Collider. Furthermore, the funding level required all staff to take unpaid leave (furloughs amounting to a 12% salary reduction for 8 months) and a nearly 200-person reduction in staff. Halfway through the furlough program, a generous, anonymous gift to the University of Chicago allowed the Laboratory to terminate the program. On June 30, the President signed into law a supplemental funding bill that goes far towards restoring Fermilab funds. It will allow resumption of work on NOvA. Moreover no involuntary staff reductions will be necessary although the staff has already been reduced by about 6% due to voluntary departures.

Fermilab is facing a redefinition of itself as the LHC prepares to wear the mantle as the world's highest energy accelerator. Fermilab is now operated for the Department of Energy by the Fermi Research Alliance, a joint effort of the University of Chicago and URA, the former operator of the Laboratory. Also, Fermilab is now the only US national laboratory dedicated to particle physics. In this era of change, Fermilab sees itself in the future continuing to play a leadership role at the Energy Frontier, one of the three frontier areas identified by the DOE-NSF Particle Physics Project Prioritization Panel (P5): the Energy Frontier, the Intensity Frontier, and the Cosmic Frontier. In fact, Fermilab anticipates playing a leading role in all three Frontiers. Fermilab has had a significant role in building the LHC and the CMS experiment, and considers this program to be very important in its future. Fermilab's contributions to ILC R&D and the Laboratory's developing expertise in superconducting rf will position it to play as large a role as funding and siting of the ILC allow. As for the Intensity Frontier, Fermilab is already supplying the world's most intense neutrino beams. Staged increases in proton flux, leading to that available with the Project X linear accelerator, will allow Fermilab to continue to be a leader in this line of neutrino research and to also provide the capability for the most intense beams of pions, kaons, and muons. The Cosmic Frontier has been explored at Fermilab for decades: the Laboratory had the first particle astrophysics groups at any national laboratory. This will continue in the future with new projects, including the Dark Energy Survey, an experiment based on a new camera built at Fermilab and operated at the Cerro Tololo Inter-American Observatory in Chile, and participation in the SNAP experiment, candidate for the DOE-NASA Joint Dark Energy Mission.

Thus, Fermilab will continue to contribute to the directions that remain the most opportune to increase our understanding of fundamental physics and will remain one of the most exciting places to pursue particle physics research.

8.3 CD3 at JLab

(Communicated by Rolf Ent EMail: ent@jlab.org and Allison Lung lung@jlab.org.)

Thomas Jefferson National Accelerator Facility (Jefferson Lab) received approval from DOE on September 15, 2008 to begin construction on the $310 million upgrade project that will provide physicists worldwide with an unprecedented ability to study the basic building blocks of the visible universe. The construction approval, known as Critical Decision 3 or CD-3, concludes an exhaustive, multi-year review process that clearly established the scientific need, merit and quality of the 12 GeV CEBAF Upgrade project. The project will see DOE's Jefferson Lab double the maximum energy of its accelerated electron beam from 6 billion electron volts (GeV) to 12 GeV; construct a new experimental hall; and upgrade the equipment in its three existing experimental halls. Construction funds are included in the President's Fiscal Year 2009 Budget Request so construction activity will begin in October 2008 with full project completion planned for 2015.

The upgraded accelerator will boost efforts in four main areas of study:

- Quark Confinement – High energy photon-proton collisions will be used to search for exotic mesons, in which fluctuations of the self-interacting gluons are an unavoidable part of the structure. Finding such exotics and mapping their spectrum addresses one of the great mysteries of modern physics - why quarks only exist together, and never alone.

- The Fundamental Structure of Protons and Neutrons – The upgrade will enable experiments designed to provide a perspective on the spin and flavor distributions of valence quarks in space and momentum.
- The Physics of Nuclei – Accurate studies aimed at elucidating the origin of the "nuclear EMC effect" in the valence quark region, to shed light on the role valence quarks play in the deep structure and properties of atomic nuclei, and how these quarks interact with a dense nuclear medium.
- Tests of the Standard Model – Extremely high precision studies of parity violation, developed in order to study the role of hidden flavors in the nucleon, would enhance efforts to explore physics beyond the Standard Model, on an energy scale that cannot be explored even with the proposed International Linear Collider.

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