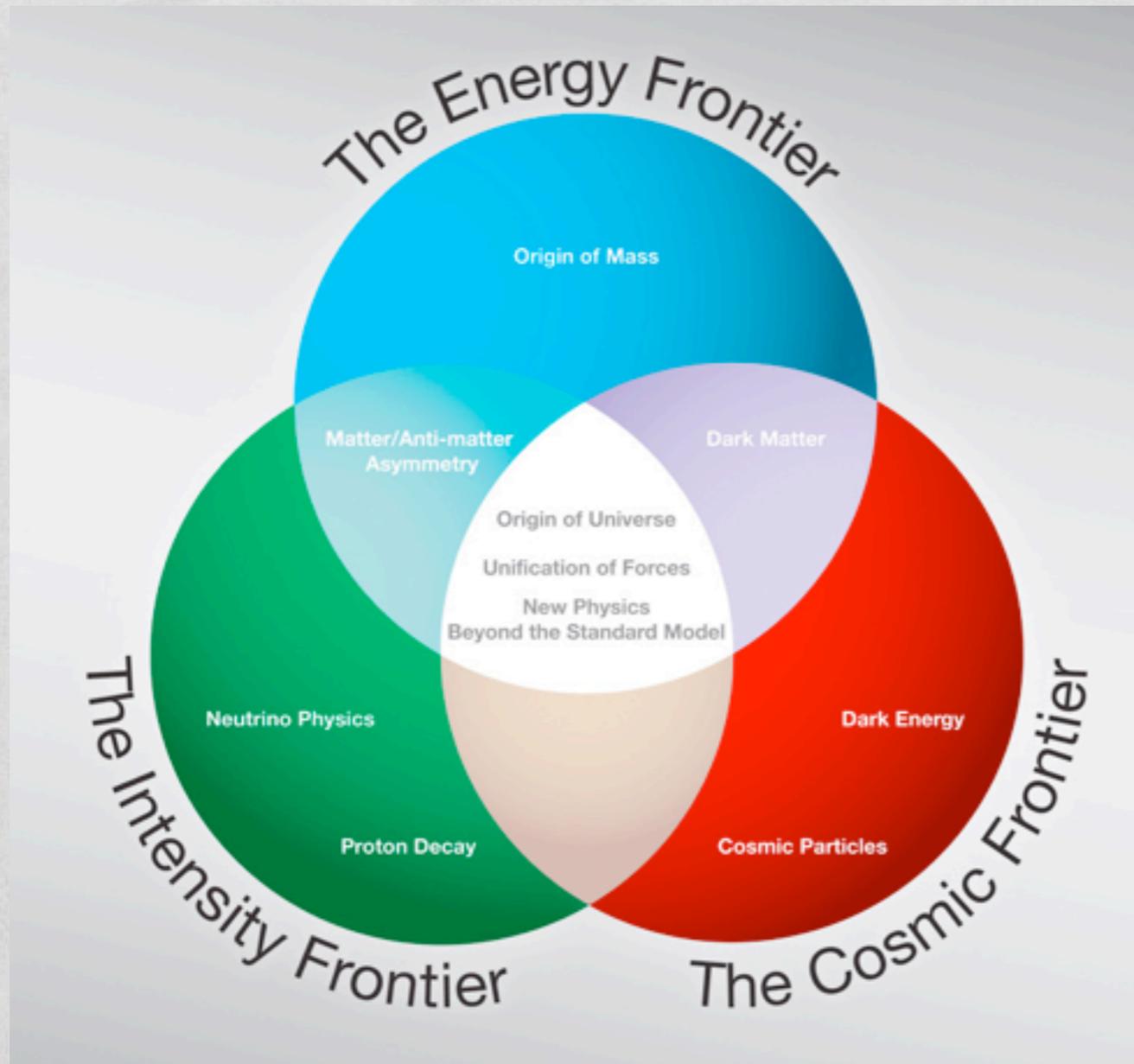




# DPF COMMUNITY PLANNING

Patricia McBride  
Fermilab/DPF Past Chair  
Aspen PAC  
June 20, 2012

# US PARTICLE PHYSICS



The American Physical Society's Division of Particles and Fields is initiating a long-term planning exercise for the high-energy physics community.

Its goal is to develop the community's long-term physics aspirations.

Its narrative will communicate the opportunities for discovery in high-energy physics to the broader scientific community and to the government.

[snowmass2013.org](http://snowmass2013.org)

# PLANNED EVENTS

## **Community Planning Meeting - CPM2012**

Oct. 11-13, 2012 at Fermilab Auditorium

## **“Snowmass” Community Summer Study - CSS2013 (aside)**

planned for Summer 2013 - dates and venue are under discussion.

1-2 weeks possibly July 29-Aug 10, 2013  
probably not in Snowmass.

# WORKING GROUPS

- **Energy Frontier** - Chip Brock + Michael Peskin
- **Intensity Frontier** - JoAnne Hewitt + Harry Weerts
- **Cosmic Frontier** - Steve Ritz + Jonathan Feng
- **Frontier Facilities** - Bill Barletta + Gil Gilchriese
- **Instrumentation Frontier** - Marcel Demarteau + Howard Nicholson
- **Education and Outreach** - Marge Bardeen + Dan Cronin-Hennessey
- **Frontiers of Computing (NEW)**

# THE PLAN

- At CPM2012, the groups will present the scientific issues to be emphasized, experiments to be discussed, and strategies for implementation both in national and global terms. The meeting will include opportunities for contributed presentations and discussions.
- After CPM2012, subgroup conveners will formulate specific charges for their areas. These charges will clarify the physics questions to be discussed and the experiments to be given most attention. They will also detail choices made in treating areas-overlapping subgroups or linking high energy physics to other areas. In principle, these charges could evolve over the year in response to continued research, new physics results, and new proposals.
- During the winter and following spring, each subgroup will hold meetings to develop and refine its ideas. We encourage groups interested in specific proposals or scientific topics to assemble white papers on their subjects.

- CSS2013 (“Snowmass”) will provide an opportunity for discussion, analysis, and arrive at conclusions for each area of the study.
- By the end of this meeting, each pair of conveners will have prepared an executive summary for their area, and overlap areas if necessary. Each subgroup will produce a report answering its charge and summarizing the discussion of its area throughout the process.
- The ensuing electronic record, which may also contain contributed papers, will be an important resource for the community.
- We anticipate that this long-term planning process will trigger an **independent process of review and prioritization** solicited by the funding agencies.

# DOE's Perspective

In 2008 HEPAP through the work of its P5 subpanel laid out a compelling strategic vision for the future of High Energy Physics.

Given recent exciting results at all the HEP scientific frontiers, and the ongoing evolution of budget projections and project plans, it is prudent to revisit the HEPAP/P5 plan with an eye towards examining the science options that have been put forward as well as emerging opportunities.

As a first step in this process, we need a strong scientific case that covers the range of opinion in the community. We would like to understand if our opportunities enable programs that are capable of achieving most or all of the scientific goals as the program considered in the 2008 roadmap, or whether some modifications to those goals and plans are needed.

To that end, a planning process that carefully considers the science opportunities and trade-offs involved, and can clearly elucidate the pros and cons of the various options, would be extremely valuable input for updating the HEP strategic plan.

Jim Siegrist,  
Associate Director, Office of High Energy Physics  
Office of Science, U.S. Department of Energy

# STATUS

- Met with the group conveners to finalize the subgroup structure and the subgroup goals.
- Looking for nominations for subgroup conveners and Computing Frontier conveners.
- Working on the agenda for CPM2012 in October.
- Looking for a place/date for CSS2013 for Summer 2013.

# NEXT STEPS

- Announce subgroups on the wiki and the goals of each subgroup.
- Following the model of the Intensity Frontier Workshop, assign three conveners to each subgroup: a theorist, an experimentalist, and an “observer”.
- The subgroup structure should be in place by the end of June 2012.
- Suggestions (subgroup topics, sub-conveners names, interactions between frontiers, ...) and participation from the high-energy physics community, and from members of our sister APS divisions, DAP, DPB, and DNP are essential for success.

# COMMUNITY PLANNING MEETING - OCT 2012

- The agenda will follow a model of the ICFA seminar. A second (and similar) model would be the European Strategy Group Open session.
- Sessions for each frontier plus general overview, international view, “overlap/connections” sessions.
- Summary talk(s) on the big issues, status of the field and the open questions to be addressed by the working groups.
- Time for contributions and lots of time for discussion

# OPTIONS FOR “SNOWMASS”

- ~~Snowmass for 3 weeks in June~~
- University hosted meeting for 2 weeks in early August
- Snowmass meeting for 1 week in early August
- Smaller Group and Subgroup meetings throughout the year (Yes, but important to also get together.)
- Co-locate with DPF meeting at Santa Cruz in August
- Constraints: LP2013 (24-29 June), EPS2013 (July 18-24), DPF2013 (Aug 11-17)

# WORKING GROUPS

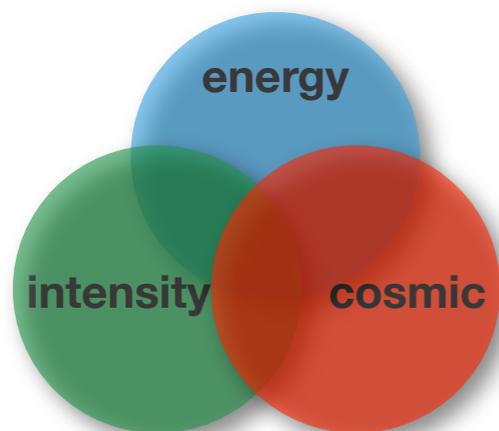
- Energy Frontier - six subgroups defined (later)
- Intensity Frontier- The subgroups are largely in place from the Intensity Frontier Workshop.
- Cosmic Frontier - six subgroups defined
  - CF1:WIMP Dark Matter Direct Detection
  - CF2:WIMP Dark Matter Indirect Detection
  - CF3: Non-WIMP Dark Matter
  - CF4: Dark Matter Complementarity
  - CF5: Dark Energy
  - CF6: Cosmic Particle Probes of Fundamental Physics

- Facilities - Two branches: Accelerators and Non-Accelerator. Each will have subgroups and the conveners are working to define the scope of each subgroup.
- Instrumentation - Coordination is being arranged with the DPF Coordinating Panel for Advanced Detectors (CPAD): Sensors, Gaseous, Systems, Electronics, Software, Emerging Technologies
- Outreach - The structure will depend to some extent on the venue chosen for “Snowmass” 2013. The activities of this group might well extend beyond CSS2013 itself.

# the overlaps

our challenge is to find connections and encourage dialogue among the groups

This is our community:



This is the organizational reality:



# WORKING GROUP EXAMPLE: ENERGY FRONTIER

Slides courtesy of Chip Brock

# Energy Frontier subgroup structure and charges

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## The Physics Groups:

*The Higgs Boson*

*Precision Study of Electroweak Interactions*

*Fully Understanding the Top Quark*

*The Path Beyond the Standard Model—New Particles, Forces, and Dimensions*

*Quantum Chromodynamics and the Strong Interactions*

*Quark Flavor and Mixing at High Energy*

## The Connections:

*Liaison with the Frontier Facilities Group*

*Liaison with the Instrumentation Frontier Group*

*Liaison perhaps with the other two Physics Frontier Groups?*

# for all Energy Frontier groups:

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Many ideas for future accelerators are on the table. These include:

- A. *The LHC with  $E = 14 \text{ TeV}$  and  $L = 10^{34} \text{ cm}^{-2} \text{ sec}^{-1}$*
- B. *A luminosity upgraded LHC with:  $E_{\text{cm}} = 14 \text{ TeV}$ ,  $L = 10^{35} \text{ cm}^{-2} \text{ s}^{-1}$*
- C. *An energy upgraded LHC*
- D.  *$e+e-$  lepton colliders,  $E_{\text{cms}} < 1 \text{ TeV}$*
- E. *A circular  $e+e-$  collider operating as a Higgs factory.*
- F.  *$e+e-$  or gamma-gamma colliders,  $E_{\text{cms}} > 1 \text{ TeV}$ .*
- G. *A  $\mu+\mu-$  collider.*
- H. *A lepton-hadron collider.*
- I. *A VLHC hadron collider with energy well above the LHC energy.*

- Other possible future facilities may be proposed in the course of the year. The studies should look broadly at the opportunities for each of these machines. It is especially important to point out critical points in energy or luminosity that are essential to realize physics goals.
- For experiments at hadron colliders, a specific question is the effect of the machine environment for high-luminosity running. Do high-luminosity conditions compromise the needed measurements? Are there detector designs or experimental strategies that can ameliorate these problems?
- For the required measurements, evaluate also: (a) What new theoretical or simulation tools (for signal or background) are needed to achieve the goals? (b) What are the challenges for the detector and the computing capability?
- We expect to have dialogues with the Facilities and the Instrumentation study groups on all of these issues.

# Preliminary Charge to the group, **The Higgs Boson:**

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A. Please provide a compact summary of the state of the search for the SM Higgs Boson, including information from LEP, the Tevatron, and the LHC.

B. Please address the following goals for Higgs Boson physics in the future:

1. *What measurements are required to prove that a candidate scalar boson is indeed THE SM Higgs boson? If this boson has small admixtures of other isoscalar, -doublet, or -triplet states, to what accuracy can this be determined?*
2. *What is the potential for combining Tevatron and LHC Higgs boson searches?*
3. *What accuracies can be obtained in the measurement of the SM Higgs boson mass?*
4. *What is required in order to make high-precision measurements of a Higgs boson branching ratios and couplings? Is there a program of measurements that reveals the full phenomenological profile of the Higgs boson? What are the advantages and disadvantages of different proposed hadron and lepton colliders for this program?*
5. *How do the eventual measurement accuracies for Higgs properties compare to the predictions for deviations from the Standard Model in models of new physics?*
6. *What are the most important rare branching fractions of the Higgs boson, and how can these be observed?*

C. Please guide your exploration of the above goals with the following scenarios/caveats:

- i) Evaluate the above goals in the context of facilities A-J. (Collaboration with the Facilities Group is expected.) Pay particular attention to any benchmark energies or luminosities that enable physics goals.*
- ii) Are new theoretical or simulation tools (for signal or backgrounds) required in order to achieve the goals?*
- iii) What are the detector and computing challenges that the above goals imply? (Collaboration with the Instrumentation Group is expected.)*

# CONCLUDING THOUGHTS

Slide courtesy of J. Siegrist

# Using the Plan

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- The program plan will be valuable in helping to describe, plan, defend and execute our program, both internally at DOE and with other government offices and the community.
- Even if we have funds available and all project-related requirements met, we still have to “sell” projects up the chain at DOE. We also have to articulate and defend our program to all the stakeholders
- We’re in competition with other SC offices, so we need to be able to have a strong case for why HEP project/facility/plan is important to our field
- A clear plan leads to support within DOE and other government offices.
- Selling the plan takes time – all bases need to be covered. This is a continuing process
- Plans have a shelf-life. We try to push through what we can at the time. A few years later, the plans may need to be updated due to a changing landscape of activity, new discoveries, geo-politics, etc.
- **Take the DPF planning process seriously, and participate!**

QUESTIONS?

Thank you!

# LINKS

- CPM2012 - Community Planning Meeting
  - <https://indico.fnal.gov/conferenceDisplay.py?confId=5323>
- “Snowmass” wiki
  - <http://snowmass2013.org>
- European Strategy Open Session 2012
  - <http://indico.cern.ch/conferenceDisplay.py?confId=175067>