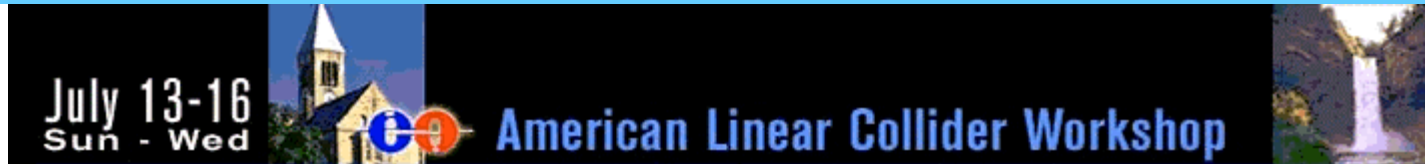


# Workshop Introduction



- the "Organization"
- Recent activities and news
- Future plans



American Linear Collider  
Physics Group

Jim Brau, Cornell, July 13, 2003

# The Universe and the Linear Collider

- The physical universe is a curious place
  - Symmetry in Leptons/Quarks
    - broken  $\Rightarrow$  Very Heavy Top - why?
  - Standard Model-like Electroweak couplings
    - but unsatisfying Standard Model
  - Evidence for light Higgs boson - can we see it?
  - Dark Matter - what is it?
  - Dark Energy - WHAT IS THIS??
  - Extra dimensions? - can we "see" them?
- We Need the Linear Collider to explore and reveal the underlying reasons for these effects
  - we must sharpen our skill at communicating this message
  - Neil Calder will speak to us Wednesday on how to do it

Sean Carroll and Wolfgang Kilian will speak to the physics shortly



F E R M I  
N E W S

Volume 26 | Friday, June 27, 2003 | Number 11

[In This Issue](#) | [FermiNews Main Page](#)

## Why Accelerators Matter

### A cosmologist's assessment: The universe is not enough

by Michael S. Turner  
University of Chicago and Fermilab

For two decades, I have been an advocate for using the universe as a heavenly laboratory to extend our experimental reach in addressing some of the most exciting questions in science. Indeed, experiments using beams of neutrinos from the sun, a distant supernova and cosmic-ray collisions in Earth's atmosphere have



To realize this opportunity of a lifetime, we will need both accelerators and telescopes, and that's why accelerators matter

The fields of cosmology and particle physics have been drawn together by advances in both, made possible by telescopes and accelerators. Cosmology and particle physics are now joined at the hip by a new set of profound questions, whose asking and answering cannot be neatly partitioned into physics and astronomy. Answering these questions will lead to a quantum leap in our understanding of the universe, of the laws that govern it and even of our place within it. To realize this opportunity of a lifetime, we will need both accelerators and telescopes, and that's why accelerators matter.



July 13-16  
Sun - Wed



American Linear Collider Workshop



We are all here to discuss our recent work on the Linear Collider (the physics, the detectors, and the collider, itself) and to plan our future efforts.

What are the structures within which we work, and which join us in our efforts?



American Linear Collider  
Physics Group

Jim Brau, Cornell, July 13, 2003

# the "Bodies"

LCRD

UCLC

ALCPG

USLCSG

DOE

NSF

WorldWideStudy

ILCSC

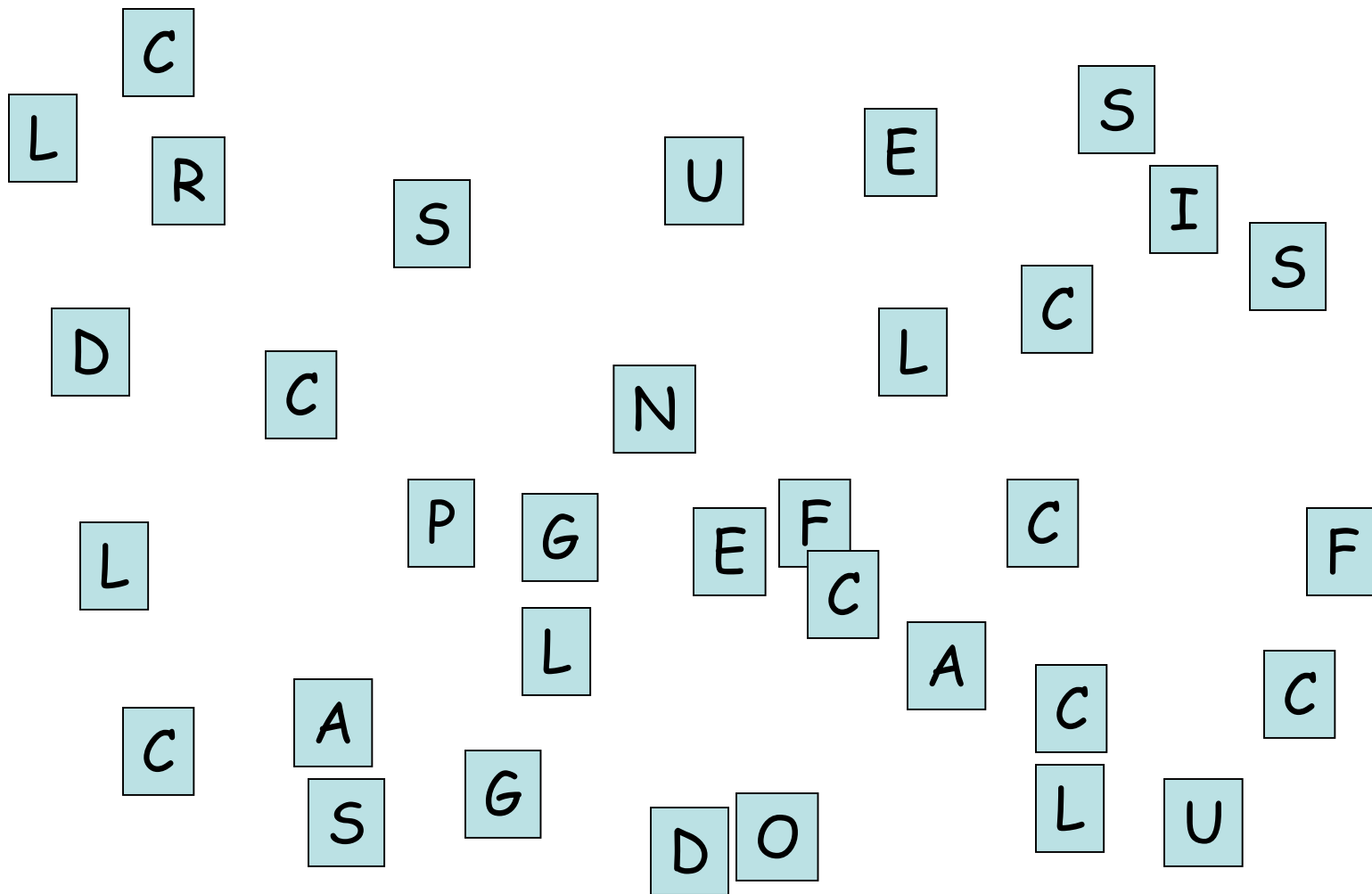
ICFA

ACFA

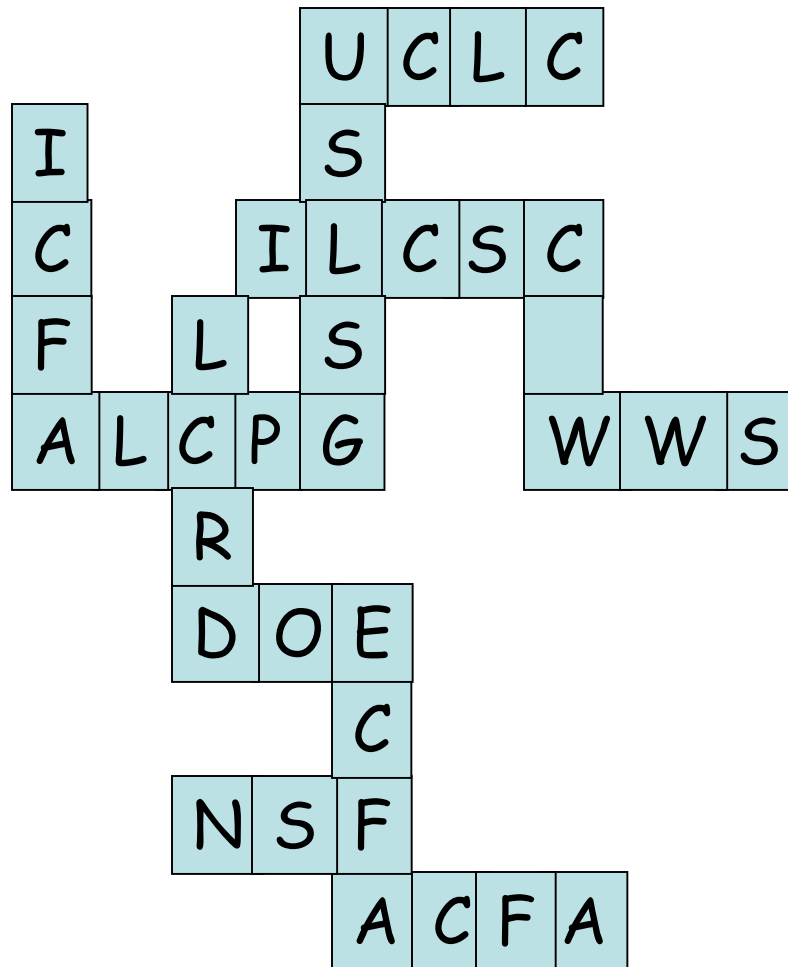
ECFA



# Does this remind you of Scrabble?



# Scrabble and the Linear Collider



# The ALCPG







American Linear Collider  
Physics Group

<http://blueox.uoregon.edu/~lc/alcp>

Detector and Physics Simulations:

Vertex Detector:

Tracking:

Particle I.D.:

Calorimetry:

Muon Detector:

DACq, Magnet, and Infrastructure:

Interaction Regions, Backgrounds:

IP Beam Instrumentation:

LHC/LC Study Group

Higgs:

SUSY:

New Physics at the TeV Scale and Beyond:

Radiative Corrections (Loopverein):

Top Physics, QCD, and Two Photon:

Precision Electroweak:

gamma-gamma, e-gamma Options:

e-e-:

Liaison to accel. R&D

Global Detector Network

UCLC and LCRD

Testbeams

Jim Brau, Cornell, July 13, 2003



<http://blueox.uoregon.edu/~lc/alcpg>

Detector and Physics Simulations:

N. Graf/M. Peskin

Vertex Detector:

J. Brau /N. Roe/M Battaglia

Tracking:

B. Schumm/D. Karlen/K. Riles

Particle I.D.:

B. Wilson

Calorimetry:

R. Frey/A. Turcot/D. Chakraborty

Muon Detector:

G. Fisk

DACq, Magnet, and Infrastructure:

U. Mallik

Interaction Regions, Backgrounds:

T. Markiewicz/S. Hertzbach

IP Beam Instrumentation:

M. Woods /E. Torrence/D. Cinabro

LHC/LC Study Group

- chaired by H. Schellman/F. Paige

## Working Group Leaders

Co-chairs: Jim Brau and Mark Oreglia

Executive  
Committee

E. Blucher

D. Gerdes

L. Gibbons

D. Karlen

Y-K Kim

H. Murayama

J. Richman

R. VanKooten

Higgs:

R. Van Kooten/M. Carena/H. Haber

SUSY:

U. Nauenberg/J. Feng /F. Paige

New Physics at the TeV Scale and Beyond:

J. Hewett/D. Strom/S. Tkaczyk

Radiative Corrections (Loopverein):

U. Baur/S. Dawson/D. Wackerroth

Top Physics, QCD, and Two Photon:

L. Orr/A. Juste

Precision Electroweak:

G. Wilson/B. Marciano

gamma-gamma, e-gamma Options:

J. Gronberg/M. Velasco

e-e-:

C. Heusch

Liaison to accel. R&D

T. Himel, D. Finley, J. Rogers

Global Detector Network

M. Hildreth/R. Van Kooten

UCLC and LCRD

D. Amidei, G. Dugan,  
G. Gollin, J. Jaros,  
U. Mallik, R. Patterson,  
J. Rogers, S. Tkaczyk

Testbeams

G. Fisk, J. Yu

Jim Brau, Cornell, July 13, 2003

## Major ALCPG Meetings/Workshops since Fall 2002

- LCDsoft                      NIU                      Nov 7-9
- $\gamma$  collider  
    workshop                  SLAC                      Nov 21-22
- LHC/LC                      Fermilab                  Dec 12-13
- **ALCPG**                      **UT-Arlington**              **Jan 9-11**
- LoopfestII                  Brookhaven              May 14-16
- LC Sim Wkshp              SLAC                      May 19-22
- **ALCPG**                      **Cornell**                      **Jul 13-16**



CORNELL

...and many other WG meetings  
(see the WG web pages  
and talk to the WG leaders)




# Regional Structure

US Linear Collider Steering Group  
(J. Dorfan - speaks Monday)

Physics and Detectors Subcommittee

Accelerator Subcommittee  
chair: G. Dugan

International Subcommittee  
chair: M. Tigner

 American Linear Collider  
Physics Group  
<http://blueox.uoregon.edu/~lc/alcpg>

**Working Group Leaders**  
Co-chairs: Jim Brau and Mark Oreglia

<p><u>Detector and Physics Simulations:</u> N. Graf/M. Peskin</p> <p><u>Vertex Detector:</u> J. Brau /N. Roe/M Battaglia</p> <p><u>Tracking:</u> B. Schumm/D. Karlen/K. Riles</p> <p><u>Particle I.D.:</u> B. Wilson</p> <p><u>Calorimetry:</u> R. Frey/A. Turcot/D. Chakraborty</p> <p><u>Muon Detector:</u> G. Fisk</p> <p><u>DACq, Magnet, and Infrastructure:</u> U. Mallik</p> <p><u>Interaction Regions, Backgrounds:</u> T. Markiewicz/S. Hertzbach</p> <p><u>IP Beam Instrumentation:</u> M. Woods /E. Torrence/D. Cinabro</p> <p><u>LHC/LC Study Group</u> - chaired by H. Schellman/F. Paige</p>	<p><u>Executive Committee</u> E. Blucher D. Gerdes L. Gibbons D. Karlen Y-K Kim H. Murayama J. Richman R. VanKooten</p> <p><u>Liaison to accel. R&amp;D</u> T. Himel, D. Finley, J. Roger</p> <p><u>Global Detector Network</u> M. Hildreth/R. Van Kooten</p>	<p><u>Higgs:</u> R. Van Kooten/M. Carena/H. Haber</p> <p><u>SUSY:</u> U. Nauenberg/J. Feng /F. Paige</p> <p><u>New Physics at the TeV Scale and Beyond:</u> J. Hewett/D. Strom/S. Tkaczyk</p> <p><u>Radiative Corrections (Loopverein):</u> U. Baur/S. Dawson/D. Wackerath</p> <p><u>Top Physics, QCD, and Two Photon:</u> Lynne Orr/Aurelio Juste</p> <p><u>Precision Elec</u> Graham V</p> <p><u>gamma-gamma</u> Jeff Gro</p> <p><u>e-e-</u> Clem Heu</p> <p><u>Testbeams</u> G. Fisk, J. Yu</p>
--	---	--

Gerry Dugan speaks Monday  
on US LC Options

UCLC and LCRD  
D. Amidei, G. Dugan,  
G. Gollin, J. Jaros,  
U. Mallik, R. Patterson,  
J. Rogers, S. Tkaczyk

\$ © \$



Canadian support as well

 Linear Collider.ca

Jim Brau, Cornell, July 13, 2003

# World-wide Structure

International Linear Collider Steering Committee  
(est. 2002) (M. Tigner - Wednesday)

## Physics and Detectors Subcommittee

Organizing Committee of the World-wide Study of Physics and Detectors for Future Linear e+e- Colliders (est. 1998, ICFA)

J. Brau, D. Miller, H. Yamamoto, co-chairs  
(past co-chairs C. Baltay, S. Komamiya)

- Coordinates three regional studies
- Organizes LCWS (Paris, April 19-23,2004)
- Fills subcommittee role to ILCSC

Accelerator Subcommittee  
Greg Loew, chair

Parameters Subcommittee  
Rolf Heuer, chair

Communications Subcommittee  
N. Calder et al

ACFA Joint Linear Collider  
Physics and Detector Working Group



American Linear Collider  
Physics Group



<http://blueox.uoregon.edu/~lc/wwstudy>

American Linear Collider Physics Group		Working Group Leaders	
<a href="http://blueox.uoregon.edu/~lc/lcpg">http://blueox.uoregon.edu/~lc/lcpg</a>		Co-chairs: Jim Brau and Mark Oreglia	
<b>Detector and Physics Simulations:</b>	N. Graf/M. Peskin	<b>Executive Committee:</b>	R. Van Kesteren/M. Carera/H. Haber
<b>Vertex Detectors:</b>	J. Brau/N. Roe/M. Battaglia	<b>SLICY:</b>	U. Nauenberg/J. Feng /F. Paige
<b>Tracking:</b>	B. Schumm/D. Karlen/K. Riles	<b>New Physics at the TeV Scale and Beyond:</b>	J. Hewett/D. Stroom/S. Tkaczyk
<b>Particle ID:</b>	B. Wilson	<b>Radiative Corrections (Loop-level):</b>	U. Baur/S. Dawson/D. Wackerath
<b>Calorimetry:</b>	R. Frey/A. Turcot/D. Chakraborty	<b>Top Physics, QCD and Two Photon:</b>	Lynne Orr/Aurelio Juste
<b>Muon Detector:</b>	G. Fisk	<b>Precision Electroweak:</b>	Graham Wilson/Bill Marciano
<b>DiAG, Magnet and Infrastructure:</b>	U. Mallik	<b>gamma-gamma, e-gamma Options:</b>	Jeff Gronberg/Maria Veloso
<b>Interaction Regions, Backgrounds:</b>	T. Markiewicz/S. Hertzbach	<b>e+e-:</b>	Clem Heusch
<b>IP Beam Instrumentation:</b>	M. Woods /E. Torrence/D. Grinbro	<b>Liaison to accel. R&amp;D:</b>	T. Himel, D. Finley, J. Rogers
<b>ILC/I-C Study Group:</b>	chaired by H. Schellman/F. Paige	<b>Global Detector Network:</b>	M. Hildreth/K. Van Kooten
		<b>Testbeams:</b>	G. Fisk, J. Yu

Jim Brau, Cornell, July 13, 2003

# R&D Support

- The single, combined proposal which was developed (led by UCLC and LCRD) last summer became:

*A University Program of Accelerator and Detector Research  
for the Linear Collider*

LCRD submitted to DOE



UCLC submitted to NSF



In addition focussed R&D effort is ongoing in Canada



American Linear Collider  
Physics Group

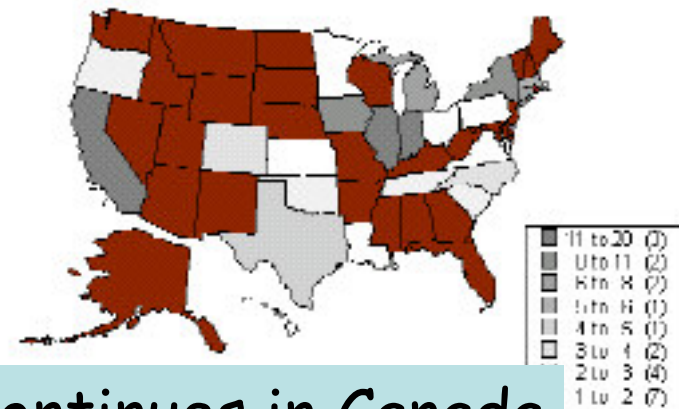
Jim Brau, Cornell, July 13, 2003

## *A University Program of Accelerator and Detector Research for the Linear Collider*

2002 Proposal	Proposed Budget	No. projects
Accelerator Physics	\$1,003,783	33
Luminosity, Energy, Polarization	\$171,541	9
Vertex Detector	\$119,100	3
Tracking	\$395,662	11
Calorimetry	\$514,540	12
Muon system and Particle ID	\$148,899	3
<b>TOTAL</b>	<b>\$2,353,525</b>	<b>71</b>

[http://www.hep.uiuc.edu/LCRD/html\\_files/proposal.html](http://www.hep.uiuc.edu/LCRD/html_files/proposal.html)

Participation, including national labs



In addition focussed R&D effort continues in Canada



American Linear Collider  
Physics Group

Jim Brau, Cornell, July 13, 2003

\$ © \$

## DOE Grants

\$ © \$

DOE responded to the proposal in FY03 by funding 14 university LC detector R&D efforts

- Lum/Energy/Pol 4
- Calorimetry 3
- Muons 2
- Particle ID 1
- Tracking 2
- Vertex 2

and 12 university LC accelerator R&D projects

4 supplements and 8 new grants

about \$500k for detectors and about \$400k for accelerator





# DOE FY04 Proposals

DOE preparing to support projects again in FY04

Jim Reidy is here and will speak on Wednesday morning

deadline a little later - October 31! (last year - Sep 3)

USLCSG has re-enlisted the review panels

funding level at least comparable to last year

for both detector and accelerator

proposals for up to 3 years acceptable,

depending on natural time-span of project

funding must not increase substantially in out years



# NSF Proposals

The UCLC received a planning grant for 150k\$ in FY03

while this is lower than proposed and severely limits the effort,  
it does support important low levels of activity

UCLC is preparing a new proposal which will be submitted  
to NSF in a few months

separate detector and accelerator proposals

strengthened explanation of urgency for detector projects

NSF decision might be possible early in FY04

Jim Whitmore will be speaking on Wednesday morning



# Test Beams

- The Detector R&D will require test beams
- The Working Groups are developing an understanding of the needs and the inventory of available beams for detector tests
- This is an issue of interest to the world-wide community
- There will be a session to discuss test beams on Tuesday, led by Gene Fisk and Jae Yu



# Linear Collider Scope

What are the requirements of the LC to do the physics?

- Three studies:
  - (1) consensus document signed by >1300 world-wide
    - [http://sbhep1.physics.sunysb.edu/~grannis/wwlc\\_report.html](http://sbhep1.physics.sunysb.edu/~grannis/wwlc_report.html)  
(you can still sign - 56% of this workshop signed!!)
    - go public at Fermilab Lepton-Photon Symposium
  - (2) US scope document (requested by USLCSG)
    - Oreglia et al (<http://blueox.uoregon.edu/~lc/scope.ps>)
  - (3) international - Parameters Comm. of ILCSC
    - Komamiya, Son, Heuer (chair), Richard, Grannis, Oreglia
    - Will meet here at Cornell



## (2) US LC Scope Document

- *Design Considerations for an International Linear Collider*
  - ALCPG Executive Committee: Ed Blucher, Jim Brau, Dave Gerdes, Lawrence Gibbons, Dean Karlen, Young-Kee Kim, Hitoshi Murayama, Mark Oreglia (edit.), Jeff Richman, Rick Van Kooten
  - requested by the USLCSG
  - detailed discussion of required LC parameters
  - <http://blueox.uoregon.edu/~lc/scope.ps>





## *Design Considerations for an International Linear Collider*

<http://blueox.uoregon.edu/~lc/scope.ps>

### Physics Goals

Initial Machine Energy and Luminosity (*500 fb<sup>-1</sup>/4 yrs @ 500 GeV*)

Ultimate Energy (*approx. 1 TeV and possibly higher*)

Beam Polarization (*80% electron, positrons as upgrade desirable*)

### Interaction Point Configuration

crossing angle (*useful*), number of collision halls (*two*)

Running at the Z Resonance (*periodic, and Giga-Z, WW threshold options*)

Collision Options (*e<sup>+</sup>e<sup>-</sup> option,  $\gamma\gamma$  and  $e\gamma$  as upgrades*)

See Mark Oreglia's talk Monday

*independent of technology choice*



# The LHC/LC Study Group

- The aim of the LHC / LC Study Group is to investigate how analyses at the LHC could profit from results obtained at a LC and vice versa.
  - Started in Spring, 2002, **truly worldwide effort**
  - Collaborative effort of Hadron Collider (HC) and Linear Collider (LC) communities
  - Study Group officially recognized by the International Linear Collider Steering Committee
  - About 190 working group members from ATLAS, CMS, LC Working Groups, theory + Tevatron contact person
  - Working Group coordination: R. Godbole, F. Paige, G. Weiglein
  - Web page: [www.ippp.dur.ac.uk/~georg/lhclc](http://www.ippp.dur.ac.uk/~georg/lhclc)



# The LHC/LC Study Group

- prepared a draft document for the Les Houches Workshop
  - Third Les Houches Workshop on Physics at TeV Scale Colliders
  - May 26 - June 6, 2003
- Revised draft will appear in near term as a hep/ph, hep/ex preprint
- This topic will be the theme of JoAnne Hewitt's talk on Wednesday





# Detectors

- Subsystem R&D is critical  
but detector integration is essential to the  
physics performance
- We have organized a Detector Integration session  
on Monday afternoon to consider integration and  
discuss options
  - SD (Silicon Detector)      Martin Breidenbach
  - TESLA Detector              Markus Schumacher
  - JLC Detector                 Hitoshi Yamamoto
  - $\gamma\gamma$  Detector             David Asner
  - Discussion
- Time to get serious about goals and milestones  
for detector performance and design



# Monthly Electronic Continental Meetings

- We we have been conducting a series of Linear Collider Seminars

Telephone-links for audio

Electronic files of the transparencies posted on the web

VRVS used for video contact

- committee: D. Amidei, S. Dawson, G. Gollin, N. Graf,  
R. Patterson, J. Brau, M. Oreglia

December 13 Summary of the Ferimlab LHC/LC  
Workshop

Sally Dawson

February 20 LC Affairs on the Intl Scene

Maury Tigner

The LC and the Cosmos:

Connections in Supersymmetry

Jonathan Feng

March 27 Challenges of Linear Collider Damping Rings

Andy Wolski

May 8

Matter and Energy, Space and Time:

Particle Physics in the 21st Century

Jonathan Bagger

June 5

SD, an Introduction

Martin Breidenbach



# Monthly Electronic Continental Meetings

- Future plan
  - remediate technical glitches
  - tentative schedule
    - 2 presentations in fall, 4 next spring
  - send suggestions for topics and speakers (and comments on overall format) to committee

D. Amidei, S. Dawson, G. Gollin, N. Graf,  
R. Patterson, J. Brau, M. Oreglia



# ALCPG Documentation System

- We have non established a repository for ALCPG notes and other LC-related documentation.
  - Steve Meyers and Ray Cowan
  - ALCPG contacts: Norman Graf and Jeff Richman
- Database provides versioning support and searching capabilities.
- Full-featured web interface for insertion and retrieval.
- Customizable to allow for future extension.
- Institutional support for database and web interface.



# ALCPG Documentation System

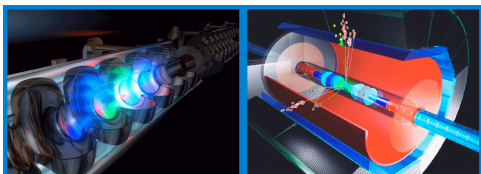
- This system now exists
- The first documents have been posted
- Please use it
  - <https://oraweb.slac.stanford.edu:8080/pls/slacquery/DOCUMENTS.STARTUP?PROJECT=LCD>
  - or link from ALCPG web page  
<http://blueox.uoregon.edu/~lc/alcpg>
- Need a SLAC oracle account to post documents
  - this is our only access restriction
  - instructions on obtaining oracle account on web page
- **HELP WANTED - we need a physicist to monitor this system and help with access**





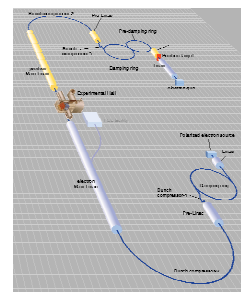
## Coordinating with European and Asian Partners

- Extended Joint ECFA/DESY Study on Physics and Detectors for a Linear Electron-Positron Collider completed this year
- new ECFA Study now begins



- Montpellier, France,  
13-16 November 2003

- ACFA Workshop series



- January, 2004 - 6th ACFA Workshop on Physics/Detector at the Linear Collider

**Many of us have been participating overseas**

20 or more from NA have been attending each of the past DESY/ ECFA WorkShops

**We need to continue and strengthen this cooperation**

Jim Brau, Cornell, July 13, 2003

## International R&D Coordination

- **International Detector R&D Committee** report summarizes the world-wide R&D effort
  - <http://blueox.uoregon.edu/~lc/randd.html>
  - report is dynamic through a set of web pages
- International R&D Review meetings
  - Jan 8 - UT Arlington
    - vertex detectors and intermediate trackers
  - March 31 - Amsterdam
    - main tracker and muon detection
  - Fall/early Winter - Asia (ACFA Workshop)
    - calorimetry and forward detectors

this series of review meetings has been very well received and we expect it to be repeated in 2004

## Other International Developments

- Maury will update us on the work of the ILCSC Wednesday
- George Kalmus will speak to us on the European perspective of a global project
- A major development on the international scene since our last meeting was the completion of the work of the International Linear Collider Technical Review Committee Report (ILC-TRC, chair: G. Loew) for ICFA
  - <http://www.slac.stanford.edu/xorg/ilc-trc/2002/2002/report/03rep.htm>
  - Carlo Pagini - this morning on TESLA's progress on R1 and R2 issues
  - Chris Adolphsen - this morning on NLC/JLC progress on R1/R2 issues





# Future Meetings of the ALCPG



American Linear Collider  
Physics Group

- The next two ALCPG meetings are now set:
  - January, 2004 at SLAC
    - <http://www-conf.slac.stanford.edu/alcp04/Default.htm>
  - Summer, 2004 in British Columbia
  - these meetings approved by ALCPG ex. comm., and USLCSG
- Beyond BC:
  - all written proposals will be considered by ALCPG ex. comm. and USLCSG
- Monthly continental televideo/teleconferences
  - variety of LC topics of general interest
  - six in coming year (2 fall, 4 spring)

# Conclusions

- We are making good progress on many fronts
- We are getting support for university R&D, making possible a real start on the detector and machine R&D
- We have a long way to go
- Keep up the charge



American Linear Collider  
Physics Group

