Overview of Theory Group in Argonne HEP Division

H.Weerts

HEP Division

Argonne National Laboratory

Review of the HEP theory groups at national labs.

July 26, 2011

Rockville, MD, USA

Introduction

Purpose of the talk.

This talk:

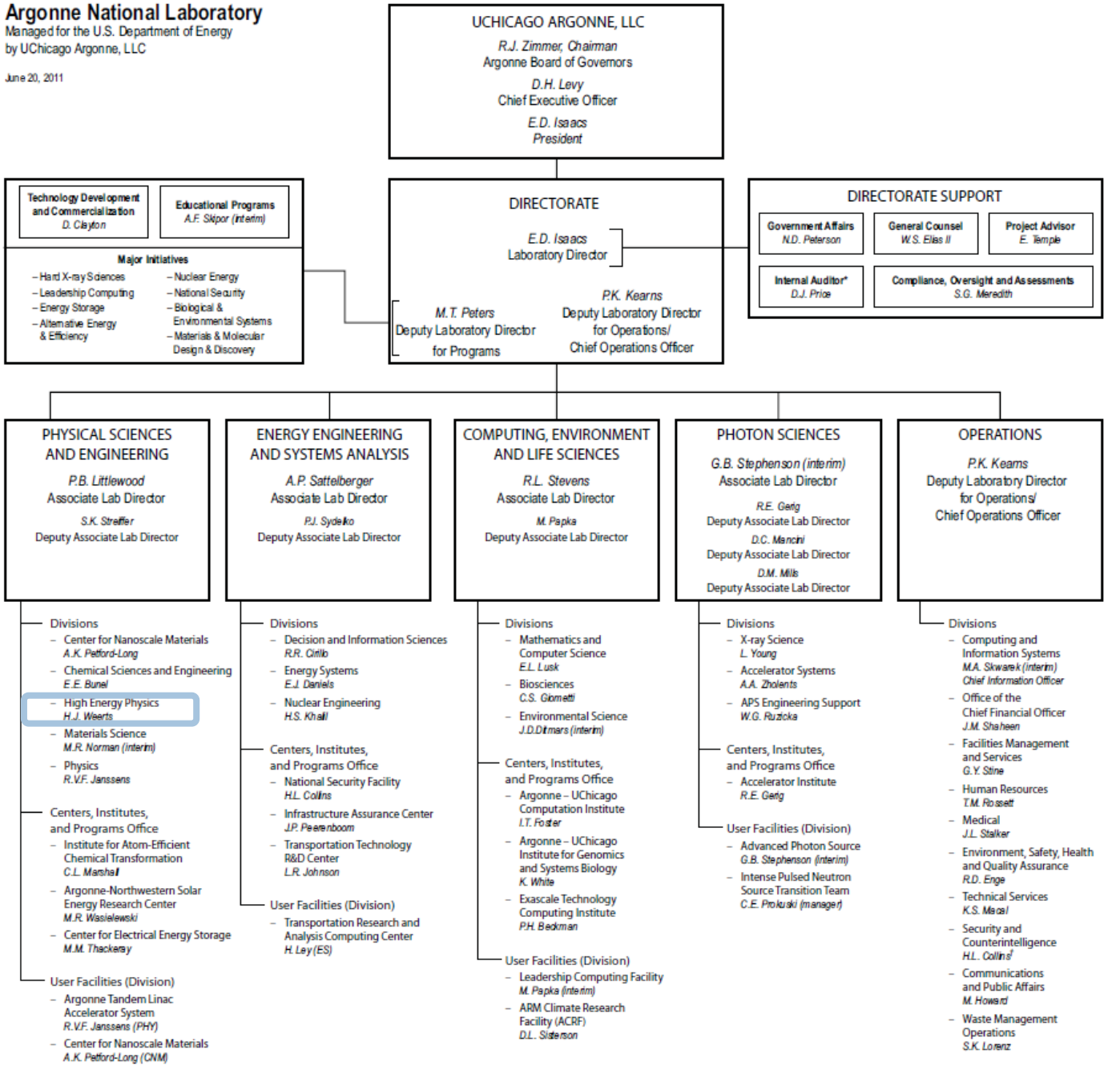
Give you high level overview of HEP division

A bit of how we got here from 2008 (last review)

Funding & Joint appointments

A sense of the direction of program

Where and how theory group fits in.



HEP within Argonne

$ Scale: ANL/HEP/HEP theory= 500/24/2

ANL HEP DIVISION ORGANIZATION CHART

VERSION: MAY 2011

Environment/ Safety/ Health

L. Reed	ESH Admin.
(K. Wood)	366 Bldg. Mgr.
(N. Guirguis)	Safety Coord.
(V. Guarino)	Env. Comp. Rep.
	Chem. Hyg. Off.
L. Reed	QA Rep.

Division Office

H. Weerts	Director
L. J. Nodulman	Assc. Div. Director
N. Guirguis	Asst. Div. Director
J. Seivwright	Office Manager

Finance & Administration

- S. Gotlund
- **N. Guirguis**
- N. La Rue
- P. Malhotra
- N. Rezek
- J. Seivwright
- R. Young

Astrophysics

- J. Bernstein^
- R. Biswas^
- **K. Byrum**
- J. Carlstrom**
- C. Chang**
- G. Decerprit^ (DESY)
- (E. Kovacs)
- K. Kuehn^
- S. Kuhlmann
- (A. Smith)
- (H. Spinka)
- (R. Talaga)
- R. Wagner
- G. Wang
- B. Zitzer^

Computing

- (R. Blair)
- **(S. Chekanov)**
- (T. Hayden)
- J. Hinthorn
- E. Kovacs*

Accel. Physics

- M. Conde
- S. Doran
- B. Feng*
- **W. Gai**
- R. Konency
- M. Lien
- W. Liu
- D. Mihalcea*
- J. Power
- C. Whiteford
- E. Wisniewski*
- Z. Yusof

Theory

- E. Berger
- G. Bodwin
- R. Boughezal
- Q. Cao^
- W. Huang*
- J. Gainer**
- W. Keung+
- (H. Lipkin)
- I. Low**
- S. Quackenbush^
- F. Petriello**
- P. Schwaller*
- G. Shaughnessy**
- (D. Sinclair)
- Z. Sullivan+
- **C. Wagner****
- C. Zachos

Electronics

- C. Adams
- J. Anderson
- M. Anthony
- J. Bulka
- T. Cundiff
- P. De Lurgio
- **G. Drake**
- D. Fellman (CERN)
- W. Haberichter*
- T. Hayden
- A. Kreps
- (M. Oberling)
- (J. Pratl)*
- (J. Schlereth)
- J. Walendziak

Mech. Support

- **V. Guarino**
- T. Nephew
- Z. Matijas
- F. Skrzecz
- K. Wood
- H. Zhao

CDF Group

- (R. Blair)
- (S. Kuhlmann)
- (T. LeCompte)
- **L. Nodulman**
- **A. Wicklund**

Medium Energy

- W. Fernando^
- S. Gliske^
- T. Kaspyzyk*
- **H. Spinka**
- (R. Stanek)
- D. Underwood

Neutrino

- M. D'Agostino^
- Z. Djurcic
- (T. Fields)*
- **M. Goodman**
- X. Huang^
- S. Magill
- J. Paley
- S. Phan Budd^
- M. Sanchez**
- (P. Schreiner)
- R. Talaga
- (M. Wetstein)

ATLAS

- L. Asquith^
- R. Blair
- G. Blazey*
- D. Chakraborty*
- S. Chekanov
- J. Cranshaw
- T. LeCompte
- G. Lima*
- **D. Malon**
- (L.J. Nodulman)
- A. Paramonov^
- L. Price*
- **J. Proudfoot**
- M. Salvachua Ferrando^ (CERN)
- (R. Stanek)*
- (D. Underwood)
- A. Vaniachine (CERN)
- P. Van Gemmeren
- R. Yoshida
- J. Zhang (CERN)
- Q. Zhang

Detector R&D

- **M. Demarteau**
- M. Derrick*
- (W. Fernando)^
- K. Francis^
- (H. Nicholson)
- **J. Repond**
- J. Smith*
- (R. Stanek)
- D. Trojand*
- (D. Underwood)
- L. Xia

LAPD

See adjoining chart

HEP Projects & Visitors

See adjoining chart

Cosmic Frontier Theory

- S. Habib
- K. Heitmann
- A. Pope ^
- A. Upadhye ^

*Part Time or Subcontracted Employee
**Joint Appointment
+ Semi-permanent visitors
( ) Secondary Assignment or STA
^ Postdoctoral Appointee
BOLD font designates Group Leader

Argonne HEP science program overview

Now 2011

Collider physics	Neutrino physics	Astro physics	Theory Pheno.	Advanced Acc. R&D	Detector R&D	ILC R&D (AAI)
CDF analysis	MINOS analysis	VERITAS analysis & trigger	BSM & QCD ⇔ Collider program	AWA facility (dielec. wakefield, two beam, LC concept)	LAPD(new photo detectors)	SCRF, positron source, controls system
ATLAS analysis center & upgrade	Nova building	DES Commissioning	Need theory & exp. for physics	Accel. Physics	DHCAL (digital gas HCAL)	Physics @ LCs
LC longer term (R&D & SiD @ ILC & CLIC)	Double Chooz starting up	SPTpol/ CMB sensors		.....	DAQ systems	
	LBNE preparing	Proposal: CTA-US		Muon Collider (breakdown)	New sensors	
				SCRF new directions	Trigger systems	

"Science" program

Energy Frontier | Intensity Frontier | Cosmic Frontier | THE Frontier

Science ⟷ Technology

Argonne HEP science program overview

Now 2011 & beyond

Collider physics

CDF analysis

ATLAS analysis center & upgrade

LC longer term (R&D & SiD @ ILC & CLIC)

Neutrino physics

MINOS analysis

Nova building

Double Chooz starting up

LBNE preparing

Astro physics

VERITAS analysis & trigger

DES Commissioning

SPTpol/ CMB sensors

Proposal: CTA-US

Theory Pheno.

BSM & QCD ⇔ Collider program

Need theory & exp. for physics

Advanced Acc. R&D

AWA facility (dielec. wakefield, two beam, LC concept)

Accel. Physics

.....

Muon Collider (breakdown)

SCRF new directions

Detector R&D

LAPD(new photo detectors)

DHCAL (digital gas HCAL)

DAQ systems

New sensors

Trigger systems

ILC R&D (AAI)

SCRF, positron source, controls system

Physics @ LCs

Computational Cosmology / Cosmic Frontier Theory

Argonne Leadership/Exascale Computing

"Other" Argonne expertise ⟷ HEP

Composition of group

2008 staff	2011 staff	2011 Postdocs & Fellows	2012 Postdocs & Fellows
E. Berger	E. Berger	Q.Cao	S.Quackenbush
G.Bodwin	G.Bodwin	S.Quackenbush	C-R. Chen
C.Zachos	C.Zachos	*J.Gainer(NU)*	M.Schulze*
	R.Boughezal	*G.Shaughnessy(NU)*	*J.Gainer(NU)*
I.Low(NU)	*I.Low(NU)*	*P.Schwaller(UIC)*	*Xiaohui Liu (NU)*
T.Tait(NU)	*F.Petriello(NU)*	*S.Gori *(UoC)*	*P.Schwaller(UIC)*
C.Wagner(UoC)	*C.Wagner(UoC)*		*H.Zhang *(IIT)*
			*S. Mantry *(NU)*
			S.Gori(UoC)*
	S.Habib*	A.Pope*	A.Pope*
	K.Heitmann*	A.Upadhye*	A.Upadhye*
		S.Deb*	S.Deb*
			S.Bhattacharya*
			J.Kwan*

Visitors: W-Y. Keung (UIC), Z.Sullivan (IIT)

ANL theory "transformation" 2008 ➔ 2012

Good Leverage of DOE HEP funding

Italics is joint position

* non-DOE funding

Joint appointments

Joint appointments do:

- Graduate students part of program
- Share excellent people
- Share the cost/less expensive
- More communication univ <-> lab
- Improve "HEP theory" in Chicago land
- Larger theory group at Argonne
- Personal: wish they could all be 100% at ANL

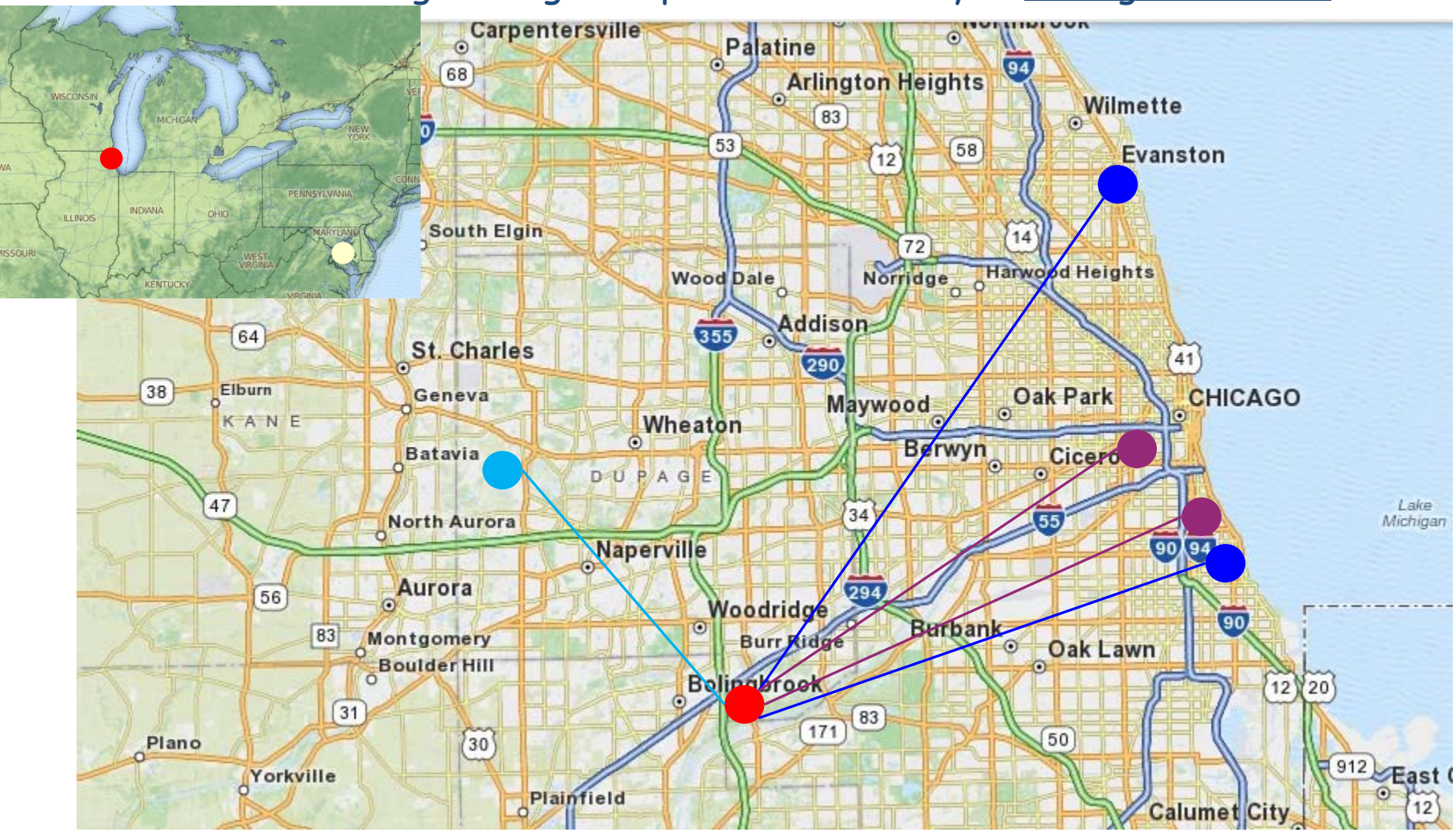
Joint Staff Appointments (logistics & financially):

- True joint appointments (appointment at both institutions)
- 50-50 shared in cost
- Tenure position (tenure track) at university
- Official arrangement between lab and university
- Time/cost sharing can vary year by year (mostly 50-50)

Still somewhat of an experiment

Argonne: "HEP Theory hub" ➔

Strengthening & Improve HEP theory in Chicago land area



- Joint staff & postdoc positions: UoC and NU
- Visitors & Joint postdoc positions: IIT and UIC
- Connections to Fermilab

For both HEP theory & Cosmology/Cosmic frontier Theory

HEP Theory Funding overview

k$	FY08	FY09	FY10	FY11		FY12
DOE HEP funding	1723	1763	2003	1760		~2400
ANL support			200+	200		30
ANL student support	30	30	30	30		30
Director's Postdoc						100
UoC seed funds				40		40
LHC fellow						fellow
Cosmic Frontier Initiative, ANL+ NASA				1000 + 100		1100+ 100

FY12 need

"have"

Cosmic Frontier initiative

~1000/yr for 2011-2013 from ANL initiative

Why theory at Argonne ?

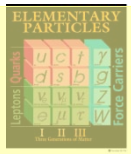
Personal:

Any physics research group, especially HEP/particle physics can not exist without a theory effort. Theory is integral part of any physics enterprise in terms of guidance and interpretation of the experimental program.

Graphically ➔

Synergy between: science ⇔ HEP program

Slide from 2007
Updated



Standard Model

CDF

ZEUS

QCD

PDF's of proton

Higgs

EWSB

ATLAS

Beyond Standard Model

LC R&D

Theory

Detector R&D

GUT scale

Accel. R&D

Dark Matter

Large Scale Universe

VERITAS

Matter asymmetry

Dark Energy

DES

Minos

Neutrino mixing

CMB/SPTpol

Nova

Double Chooz

Expertise gained on one is used in other

Summary

This was the beginning

We look forward to the discussions with the panel and your feedback on our program and plans

Now to the research

Higgs and BSM	*C.Wagner (30')*
The Argonne QCD Effort	*F.Petriello(30')*
Global Structure of Renormalization Group	*C.Zachos (15')*