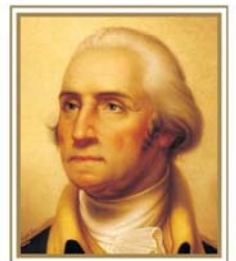


Science & Engineering Complex Benchmarking & Programming

Workshop 3: Faculty Forum
December 4, 2009



THE GEORGE
WASHINGTON
UNIVERSITY
WASHINGTON DC

Ballinger

Faculty Collaboration Session – December 4, 2009

PART 1: SUMMARY TO DATE

- The Benchmarking & Programming Process
- Engagement Opportunities/Strategies
- Roadmap for Programming, Benchmarking, Optimizing Site
- Key Findings to Date
- Review of GW's Goals and Vision

PART 2: A CONVERSATION ABOUT THE NATURE OF THE PROGRAM

Q1: How Are We Going To Do Research? (Reports on three strategies from Chairs' meeting)

Q2: How Are We Going To Teach Science and Engineering?

Q3: How Can We Build / Enhance Community?

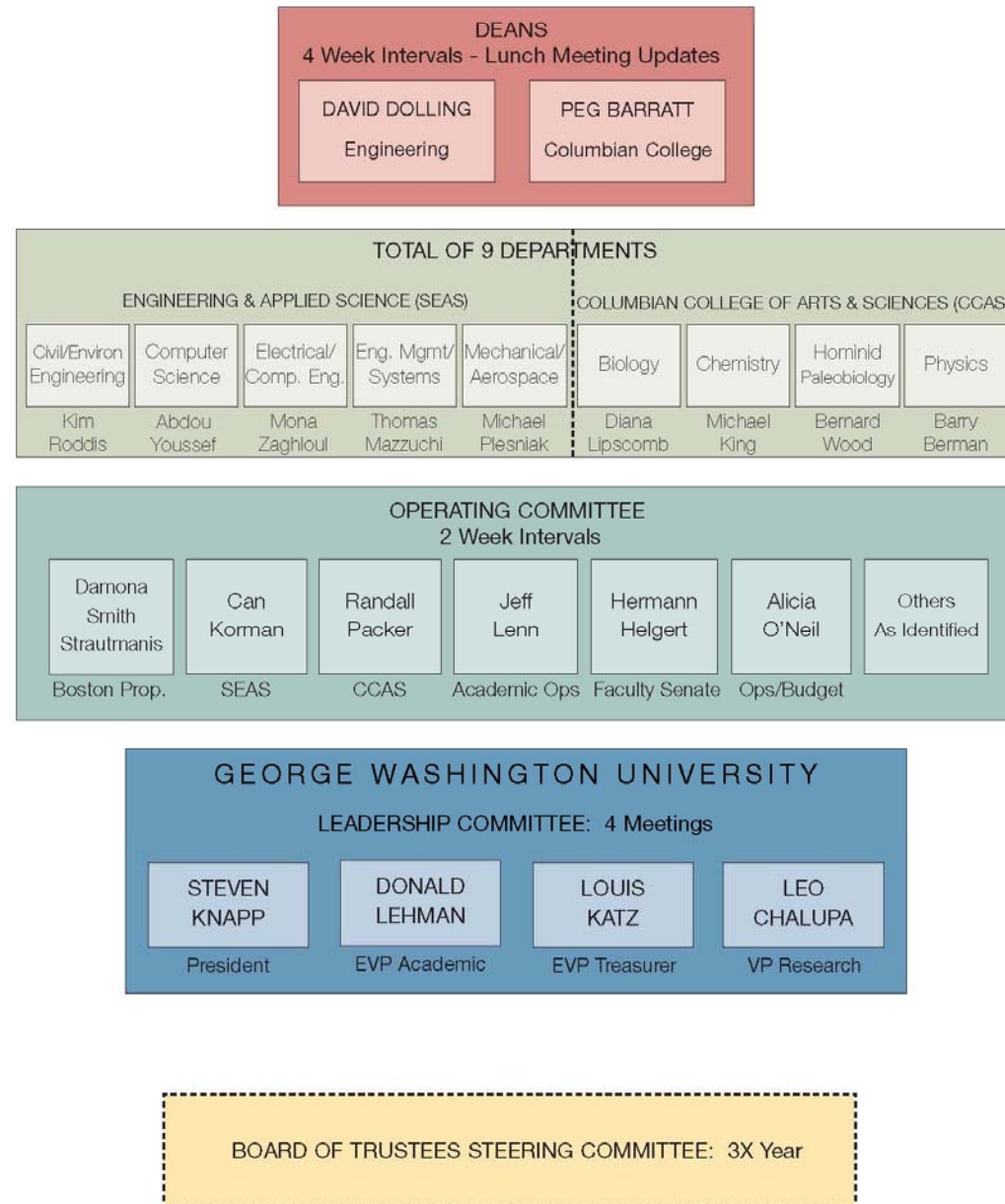
Q4: How Can We Share Equipment / Resources?

PART 3: NEXT STEPS

- The Program Draft: January
- Site Visits: December / January
- Benchmarking: January

NEXT FACULTY COLLABORATION SESSION – Scheduled for January 8, 2010

Team Structure: Interaction Plan



ROADMAP PROGRAMMING / BENCHMARKING / CONCEPTUAL DESIGN: November 2009 - January 2010

WORKSHOP	WORKSHOP FOCUS: KEY ISSUES / DISCUSSION	DEANS / CHAIRS COMMITTEE DECISIONS / ACTIONS
1. November 3/4/5	<ul style="list-style-type: none"> Initial Department Chair, Deans & Leadership Interviews Confirmation of Project Vision Setting Processes & Formats 	<ul style="list-style-type: none"> Review Meeting Notes - Concurrence Validate Faculty / Student Loading: FTE's Impact on Vision / Strategy
2. November 17/18	<ul style="list-style-type: none"> Second Round of Program Interviews Visits to On-Campus Facilities Collaborative Session with Chairs: Department Focused (11/20: 10:00-12:00) 	<ul style="list-style-type: none"> Commentary on Emerging Issues Participation in Site Visits Ideas / Input on Adjacency Models
3. Nov 30 / Dec. 4 (Tradeline: Dec. 2/3)	<ul style="list-style-type: none"> Discuss Potential Site Visits Initial Benchmarking Feedback Faculty Forum (Proposed 12/4: 10:00-12:00) 	<ul style="list-style-type: none"> Commentary on Benchmarking Participate in Faculty Forums
4. December 15/16	<ul style="list-style-type: none"> Initial Program Draft Impact of Systems & Sustainability on Program Collaborative Session with Chairs: Research/ Teaching Neighborhoods (12/18: 10:00-12:00) 	<ul style="list-style-type: none"> Critique of Program Draft Participate in Site Visits: MD / PA / VA Ideas / Input on Research / Teaching Neighborhoods
5. January 5/6	<ul style="list-style-type: none"> Review Benchmarking Study: Metrics Discuss Additional Site Visits Critique / Modify Program Critique Blocking / Stacking Options Faculty Forum (Proposed: January 8) 	<ul style="list-style-type: none"> Options to Program Input on Blocking / Stacking Participate in Faculty Forums
6. January 19/20	<ul style="list-style-type: none"> Collaborative Session with Chairs: Options Discussion (January 20: 10:00-12:00) Evaluate Block & Stack Alternatives 	<ul style="list-style-type: none"> Participate in Site Visits: Boston / Chicago Recommendations on Blocking / Stacking

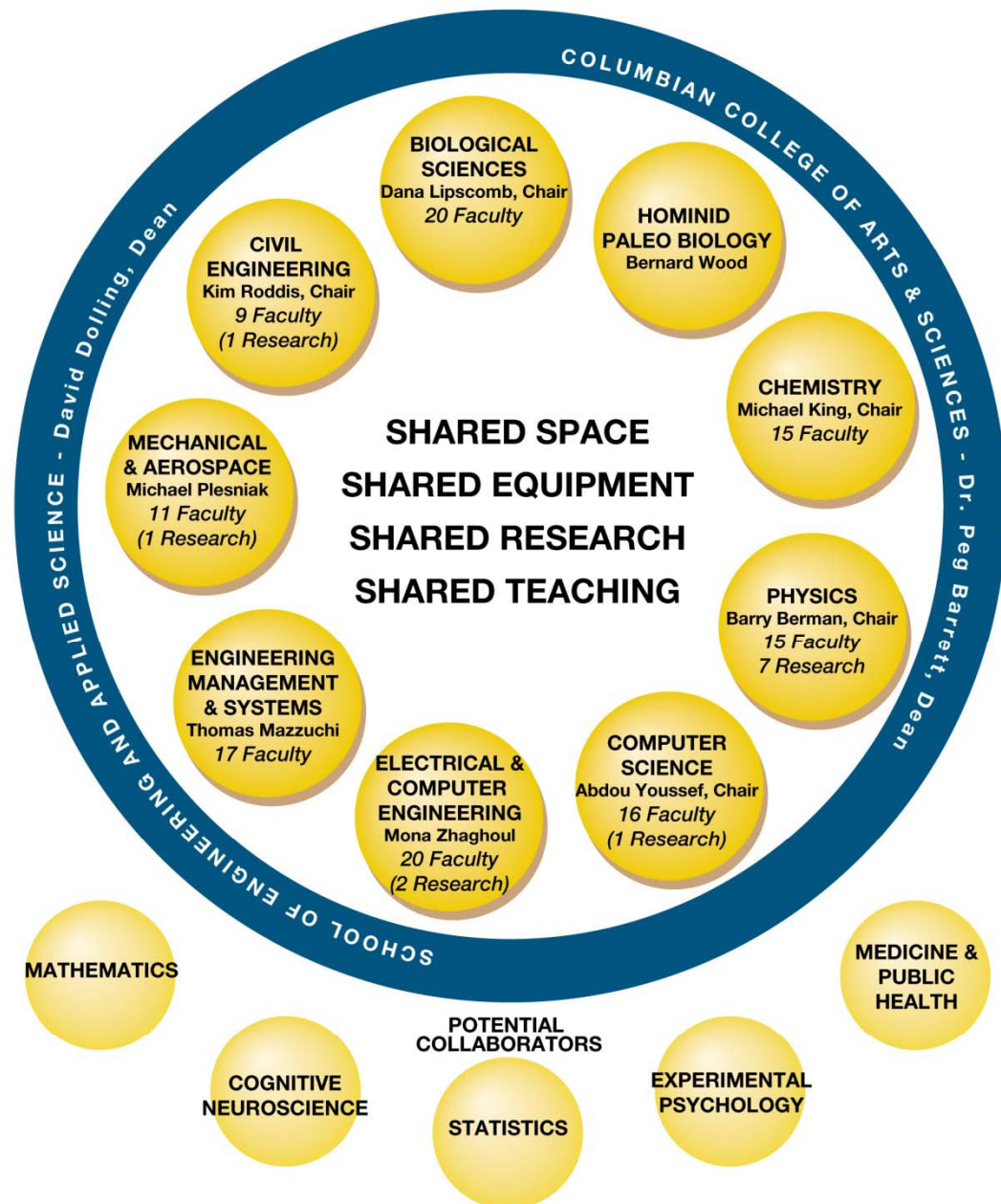
Notes:

- (1) Additional interactions for the month of February will be added at a later date and will be based on project progress and key issues at that time.
- (2) The process will also include student interactions, which have not yet been scheduled

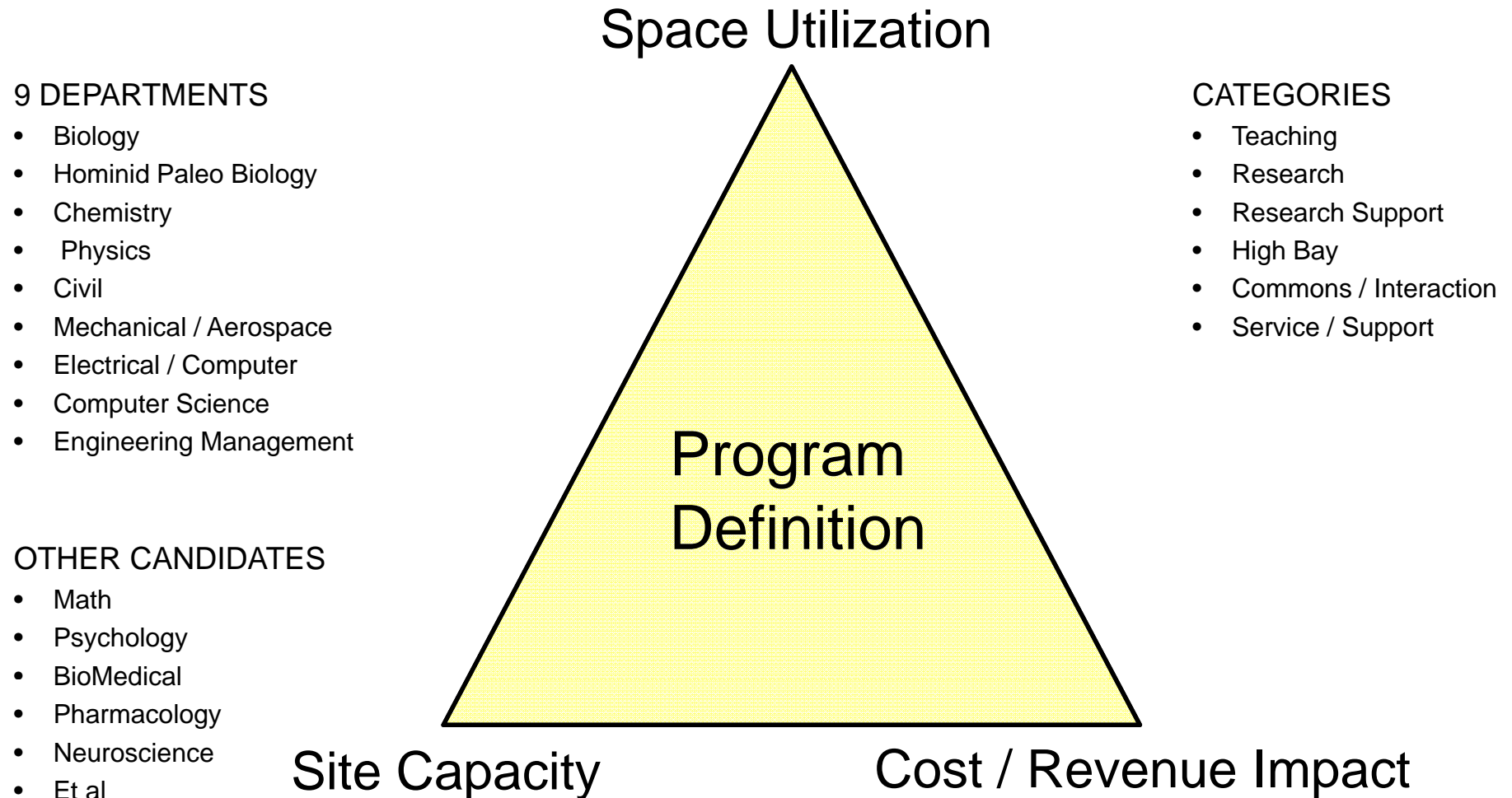
Engineering & Science Collaboration Potential

Key Findings to Date:

- a. Current Space:
 - 9 Departments
 - Fragmented:
 - Multiple Buildings
 - Multiple Floors
 - 153,800 NASF
- b. Projected Growth:
 - 9 Departments
 - Faculty / Students
- c. Capacity of Site:
 - Above Grade
 - 400,000 GSF
 - High Bay Below Grade:
 - 50,000 GSF



Optimization Model





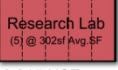




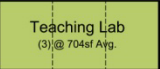
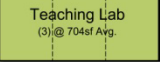


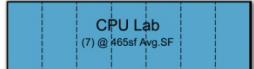





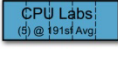





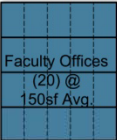
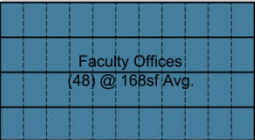
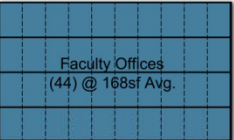
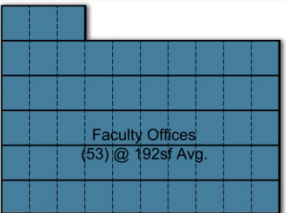
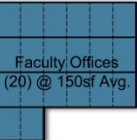


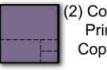
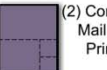
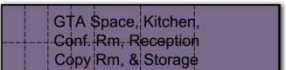

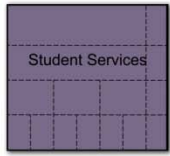

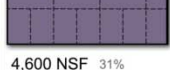


WHAT MIX OF TEACHING / RESEARCH / SUPPORT = SYNERGY?

Initial Program Assessment: CCAS

	BIOLOGY	CHEMISTRY	PHYSICS	HOM-PAL	ADMIN & DEAN
Research Labs 25,599 NSF 38%	 10,560 NSF 35%	 10,049 NSF 49%	 2,284 NSF 17%	 2,705 NSF 52%	
Teaching Labs 18,365 NSF 23%	 8,968 NSF 30%	 4,586 NSF 23%	 3,903 NSF 28%	 908 NSF 16%	
Instrument Labs 2,234 NSF 3%	 1,118 NSF 4%	 1,116 NSF 5%			
Computer Labs 508 NSF 1%	 165 NSF 1%		 323 NSF 2%		
Lab Support 3,106 NSF 4%	 2,059 NSF 7%	 988 NSF 5%		 59 NSF 1%	
Office 19,705 NSF 25%	 6,368 NSF 21%	 3,113 NSF 15%	 5,536 NSF 40%	 1,506 NSF 29%	 3,162 NSF 31%
Office Support 9,687 NSF 12%	 551 NSF 2%	 454 NSF 2%	 1,729 NSF 13%		
Common - NSF 0%					 6,953 NSF 69%
TOTAL: 100% 76,395 NSF	BIOLOGY: 38% 29,810 NSF	CHEMISTRY: 26% 20,326 NSF	PHYSICS: 17% 13,775 NSF	HOM-PAL: 7% 5,178 NSF	ADMIN & DEAN: 13% 10,115 NSF

Initial Program Assessment: SEAS

	CEE	COMPUTER SCIENCE	ECE	EMSE	MAE	SEAS ADMIN
Research Labs 15% 11,664 NSF	  2,805 NSF 33%	 1,554 NSF 14%	  3,015 NSF 19%		  4,290 NSF 36%	
Teaching Labs 8% 5,987 NSF	  1,766 NSF 21%		  4,221 NSF 27%			
Instrument Labs 1% 879 NSF					  879 NSF 7%	
Computer Labs 11% 8,557 NSF		  1,143 NSF 10%		  1,020 NSF 7%	  1,300 NSF 11%	
Lab Support 3% 2,442 NSF	 150 NSF 2%		 642 NSF 4%		 1,650 NSF 14%	
Office 46% 35,313 NSF	 2,996 NSF 36%	 8,058 NSF 70%	 6,819 NSF 44%	 10,183 NSF 66%	 3,226 NSF 27%	 3,991 NSF 27%
Office Support 15% 11,410 NSF	 700 NSF 8%	 551 NSF 5%	 790 NSF 5%	 4,124 NSF 27%	 645 NSF 5%	
Common 0% 143 NSF		 143 NSF 1%				 4,600 NSF 31%
TOTAL: 100% 77,352 NSF	CEE: 11% 8,417 NSF	COMPUTER SCIENCE: 15% 11,449 NSF	ECE: 20% 15,487 NSF	EMSE: 20% 15,327 NSF	MAE: 16% 12,030 NSF	SEAS ADMIN: 19% 14,642 NSF

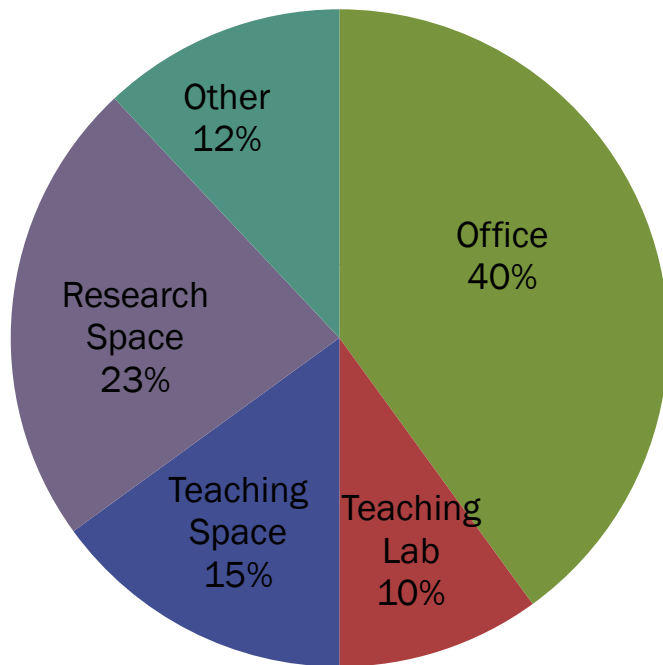
Department Chairs Faculty Growth Projections

	Department Chair Reported Faculty Growth Projections				
	Full Time Faculty		Research / Teaching Faculty		TOTAL GROWTH Full Time / Research & Teaching Faculty
	2009	2014+	2009	2014+	2009 - 2014+
Biology	22	28	1/0	1/0	6
HOM – PAL Hominid Paleobiology	6	8	1/0	1/0	2
Chemistry	12	16	1/2	1/2	4
Physics	12	17	9 / 0	9/0	5
TOTAL CCAS	52	69	12/2	12/2	17
CEE Civil & Environmental Engineering	10	15	3/0	3/0	5
CS Computer Science	18	22	0/0	0/0	6
ECE Electrical & Computer Engineering	26	30	1/0	5/0	4
MAE Mechanical & Aerospace Eng.	12/4	20	0/0	10/0	4
EMSE Engineering Mgt. & Systems Engineering	19/2	25	0	0	4
TOTAL SEAS	82/6	112	4/0	18/0	23
TOTAL	137/6	181	16/2	30/2	39

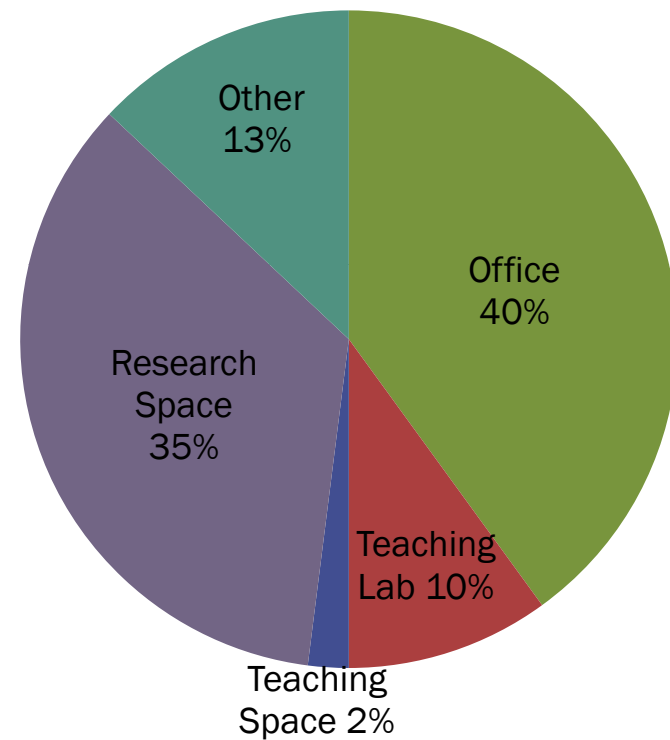
Metric Comparison: CCAS & SEAS

		BENCHMARK AVG. NASF / Faculty (PI)		GWU TODAY NASF / Faculty (PI)		GWU PROJECTED NASF / Faculty (PI)	
		Research	Total	Research	Total	Research	Total
CCAS	Biology			874 SF (20,105 sf / 23 PI's)	1,296 SF (29,810 sf / 23 PI's)		
	HOM - PAL			652 SF (4,211 sf / 7 PI's)	740 SF (5,178 sf / 7 PI's)		
	Chemistry			1,174 SF (15,266 sf / 13 PI's)	1,563 SF (20,326 sf / 13 PI's)		
	Physics			652 SF (7,820 sf / 12 PI's)	1,147 SF (13,775 sf / 12 PI's)		
SEAS	CEE			280 SF (2,805 sf / 18 PI's)	842 SF (8,417sf / 10 PI's)		
	CS			86 SF (1,554 sf / 18 PI's)	636 SF (11,449 sf / 18 PI's)		
	ECE			131 SF (3,015 sf / 23 PI's)	673 SF (15,487 sf / 23 PI's)		
	MAE			358 SF (4,290 sf / 12 PI's)	1003 SF (12,030 sf / 12 PI's)		
	EMSE			0 SF (0 sf / 19 PI's)	806 SF (15,327 sf / 19 PI's)		

Relative Space Ratios: Engineering Example



**EXISTING GWU
PROFILE**



**BENCHMARK
MODEL**

Project Goals & Criteria: Evolving Story

GOALS

CAMPUS WIDE IMPACT

Catalytic Effect

- Site Location: HUB
- Urban Sustainability
- Raise Quality for All

COLLABORATIVE / INTERDISCIPLINARY

Faculty & Students

- Interaction: SEED
- No Barriers
- Open Character

ENGAGED LEARNING PARADIGM

New Direction

- Integrate Research with Teaching
- Learning Commons
- Public Outreach

MEASURABLE OUTCOMES

Metrics Of Success

- Research Revenue
- Building Performance
- Cost / Delivery

50 / 100 YEAR BUILDING

Space & Systems

- Flexible to Adapt
- Catalyst for Campus Growth (Next Phases)

Faculty Collaboration Session – December 4, 2009

PART 1: SUMMARY TO DATE

- The Benchmarking & Programming Process
- Engagement Opportunities/Strategies
- Roadmap for Programming, Benchmarking, Optimizing Site
- Key Findings to Date
- Review of GW's Goals and Vision

PART 2: A CONVERSATION ABOUT THE NATURE OF THE PROGRAM

Q1: How Are We Going To Do Research? (reports on three strategies from Chairs' meeting)

Q2: How Are We Going To Teach Science and Engineering?

Q3: How Can We Build / Enhance Community?

Q4: How Can We Share Equipment / Resources?

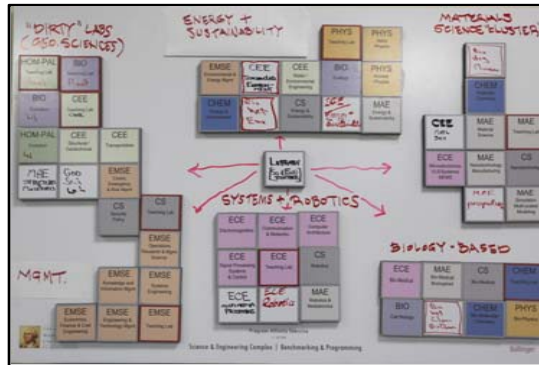
PART 3: NEXT STEPS

- The Program Draft: January
- Site Visits: December / January
- Benchmarking: January

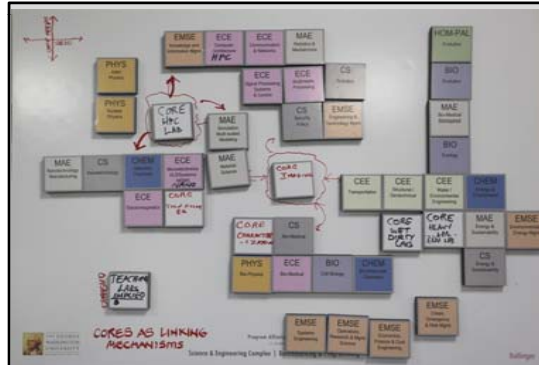
- **NEXT FACULTY COLLABORATION SESSION – Scheduled for January 8, 2010**

How Are We Going to Do Research?

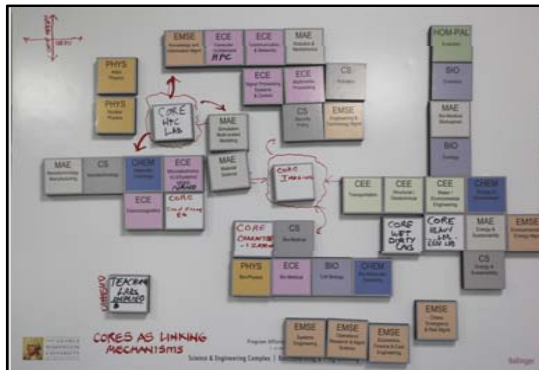
SCIENCE & ENGINEERING COLLABORATION OPPORTUNITY



Information Commons / Interdisciplinary Clusters



Science & Engineering Clusters / Separate Teaching



Core Centric / Micro to Macro / Computational Intensity

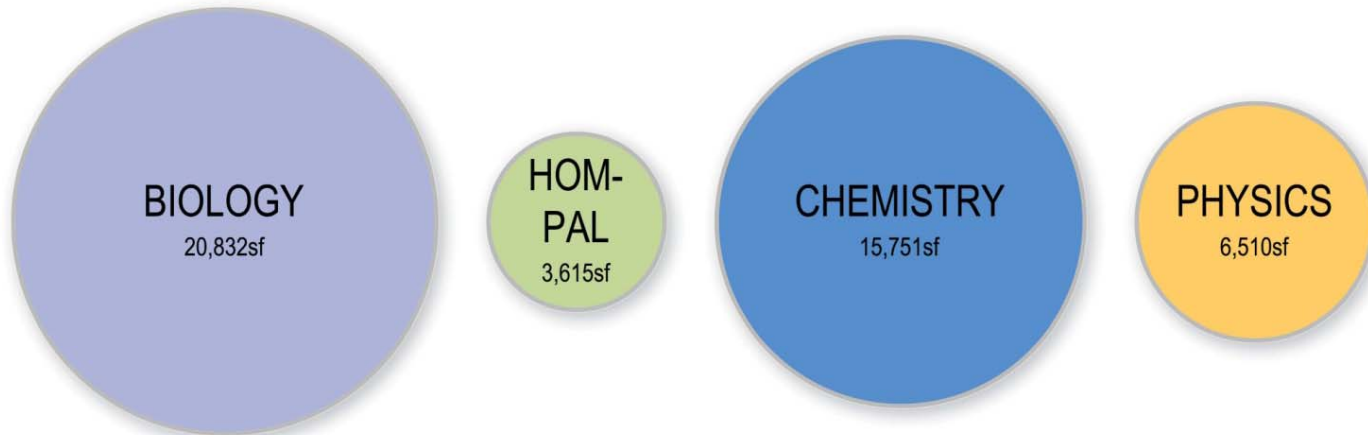
DISCUSSION POINTS

- Collaboration / Teamwork Culture
- Size of Research Teams: 1-20 PI's
- Support Staff / Principal Investigator Ratio
- Embedding Teaching in Research
- Impact of Student Research In Summer
- Floor / Building Security
- Duration of Research Teams

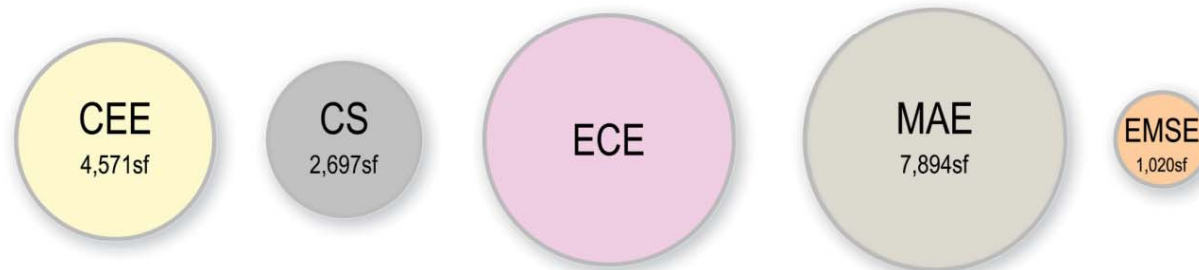
How Are We Going to Do Research?

Affinity Exercise: Existing Departmental Size Comparison

CCAS



SEAS



How Are We Going to Do Research?

Research Focus Areas

CCAS

BIO Teaching Lab	BIO Evolution
BIO Cell Biology	BIO Ecology

HOM-PAL Teaching	HOM-PAL Evolution
---------------------	----------------------

CHEM Teaching	CHEM Energy & Environment
CHEM Materials Chemistry	CHEM Bio-Molecular Chemistry

PHYS Teaching	PHYS Bio-Physics
PHYS Nuclear Physics	PHYS Astro Physics

SEAS

CEE Teaching	CEE Water / Environmental Engineering
CEE Transportation	CEE Structural / Geotechnical

CS Teaching	CS Bio-Medical
CS Energy & Sustainability	CS Nanotechnology
CS Robotics	CS Security Policy

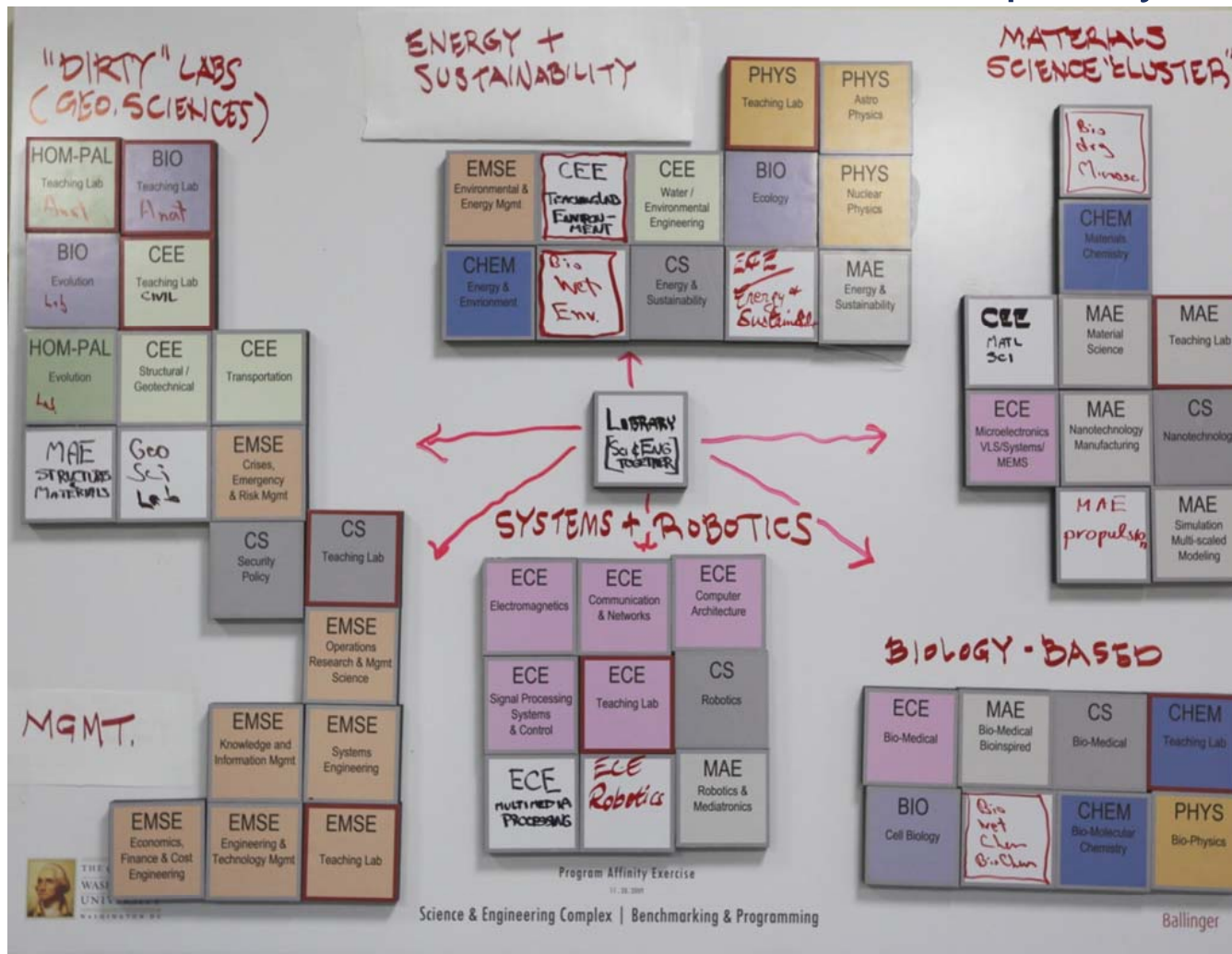
ECE Teaching	ECE Bio-Medical
ECE Communication & Networks	ECE Computer Architecture
ECE Electromagnetics	ECE Microelectronics VLS/Systems/ MEMS
ECE Multimedia Processing	ECE Signal Processing Systems & Control

MAE Teaching	MAE Energy & Sustainability
MAE Bio-Medical Bioinspired	MAE Material Science
MAE Nanotechnology Manufacturing	MAE Simulation Multi-scaled Modeling
MAE Robotics & Mechatronics	

EMSE Teaching	EMSE Crises, Emergency & Risk Mgmt
EMSE Economics, Finance & Cost Engineering	EMSE Engineering & Technology Mgmt
EMSE Environmental & Energy Mgmt	EMSE Knowledge and Information Mgmt
EMSE Operations Research & Mgmt Science	EMSE Systems Engineering

How Are We Going to Do Research?

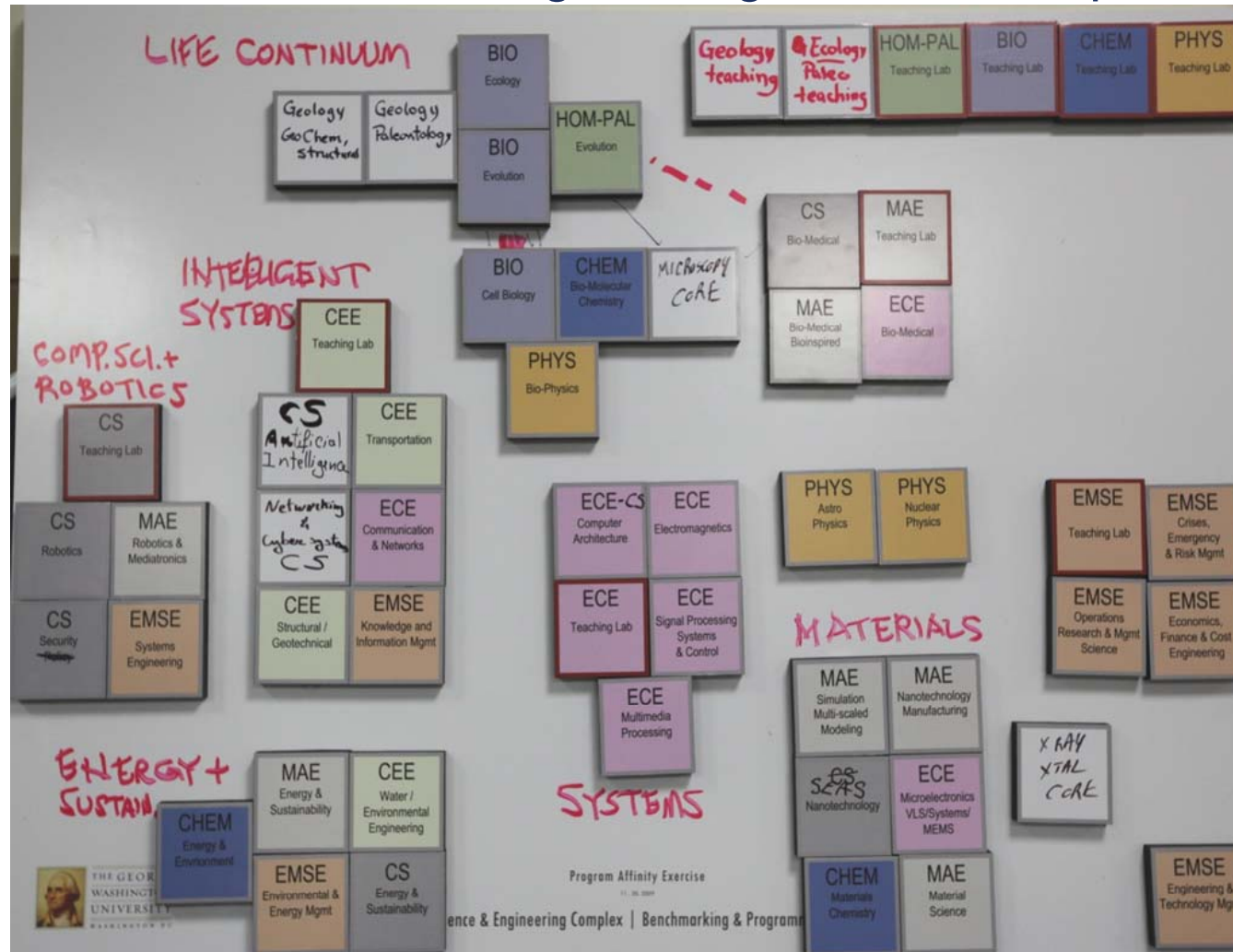
Team 1: Information Commons / Interdisciplinary Clusters



- Robert Harrington-ECE
- Michael Keidar-MAE
- Randall Packer- Biology / CCAS Deans Office
- Kim Roddis-CEE

How Are We Going to Do Research?

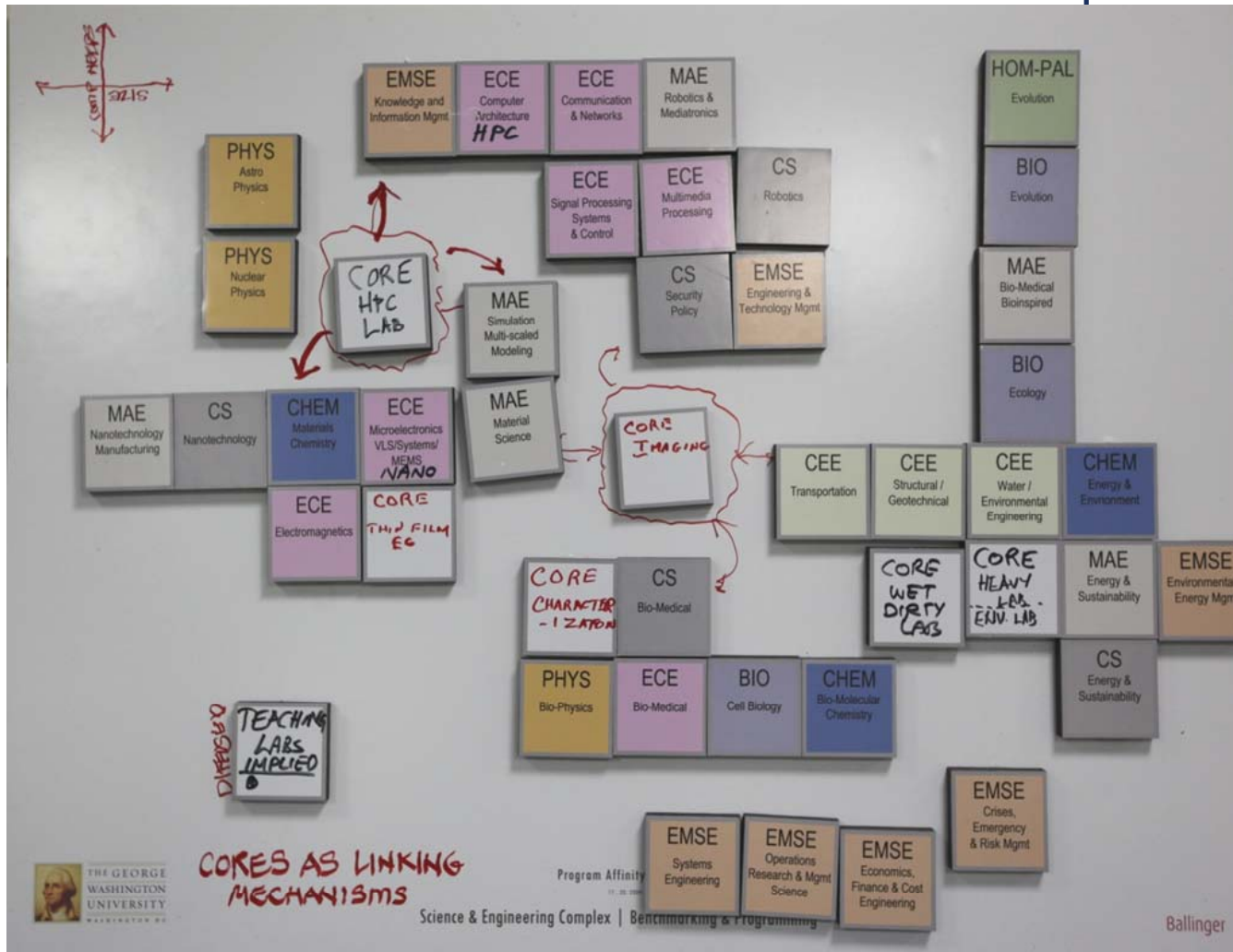
Team 2: Science & Engineering Clusters / Separate Teaching



- David Dolling - SEAS Dean
- Diana Lipscomb, Biology
- Houston Miller-Chemistry
- Abdou Youseff, CS

How Are We Going to Do Research?

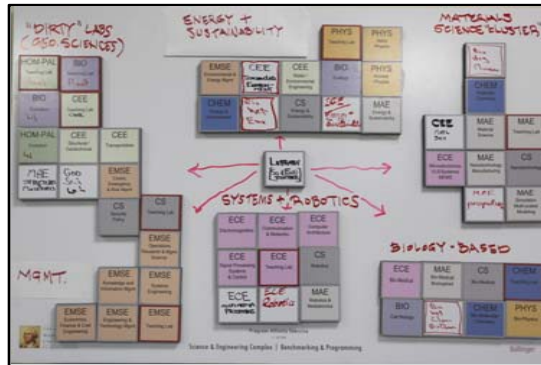
Team 3: Core Centric / Micro to Macro / Computational Intensity



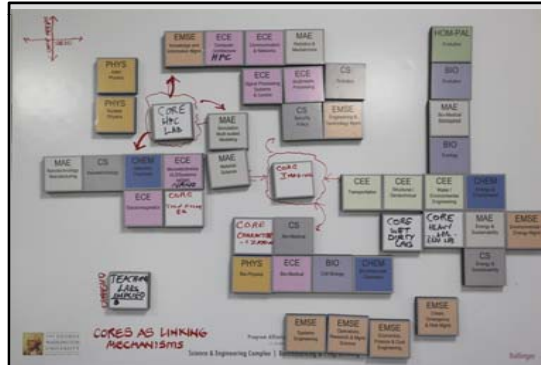
- Can Korman- ECE Assoc. Dean for Research
- Michael King- Chemistry,
- Bernard Wood- HOM-PAL

How Are We Going to Do Research?

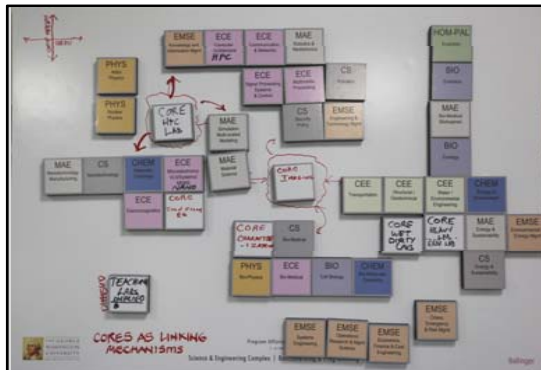
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- Embedding Teaching in Research
- Impact of Student Research In Summer
- Floor / Building Security
- Duration of Research Teams

How Are We Going to Teach Science & Engineering?

UNIQUE CHARACTER



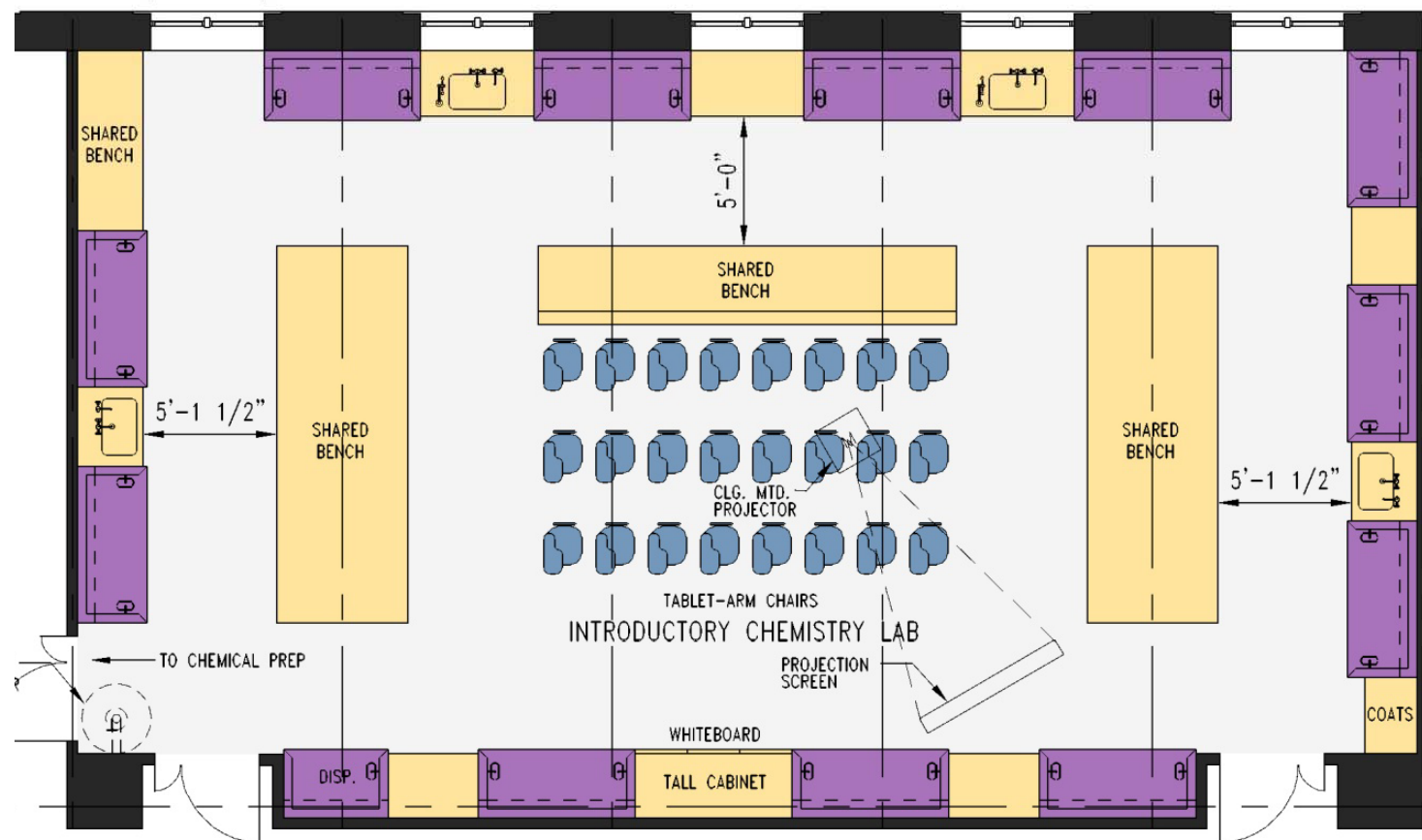
DISCUSSION POINTS

- Size of Entry Lab Sections
- Size of Advanced Lab Sections
- Team Teaching:
Interdisciplinary / Disciplinary
- Use of Teaching Assistants /
Grad Assistants
- Technology Assist
 - In Classroom
 - Out of Classroom
- Student Research
 - Entry Level: 1 – 2
 - Advanced: 3 – 4
- Unique Character

KEY IDEA: WHAT PEDAGOGY FITS 2014 OPENING?

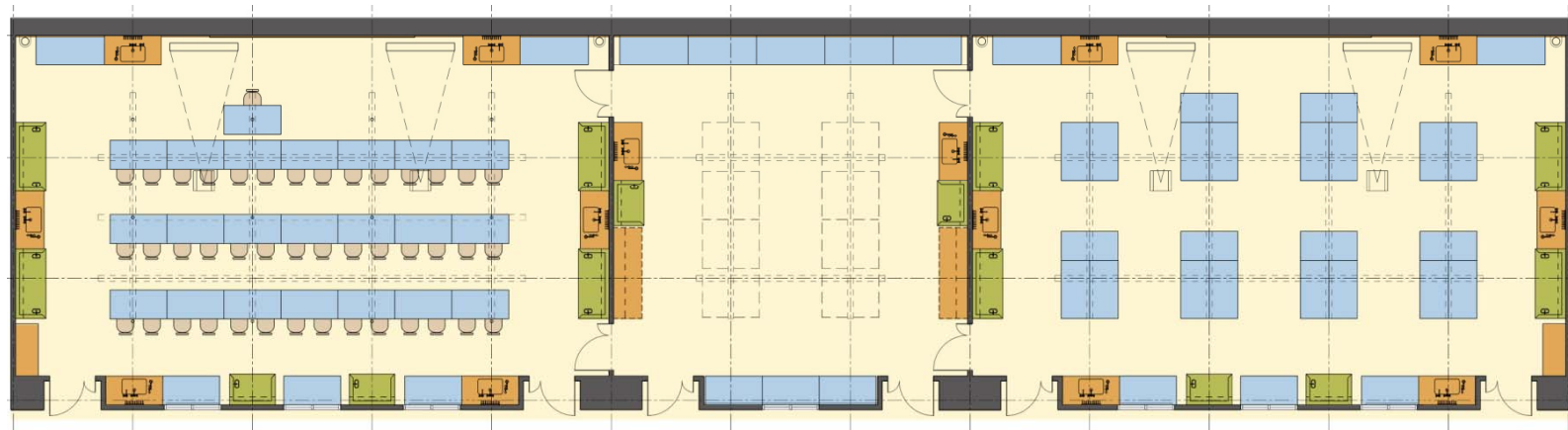
Teaching Styles

INTEGRATION: LAB & CLASSROOM



Teaching Styles

FLEXIBLE TEACHING / LAB WITH SUPPORT CORE



TEACHING LAB TYPE B:
1,650 NSF
UP TO 32 STUDENTS IN LAB

LAB SUPPORT:
990 NSF

TEACHING LAB TYPE B:
1,650 NSF
UP TO 32 STUDENTS IN LAB / LECTURE



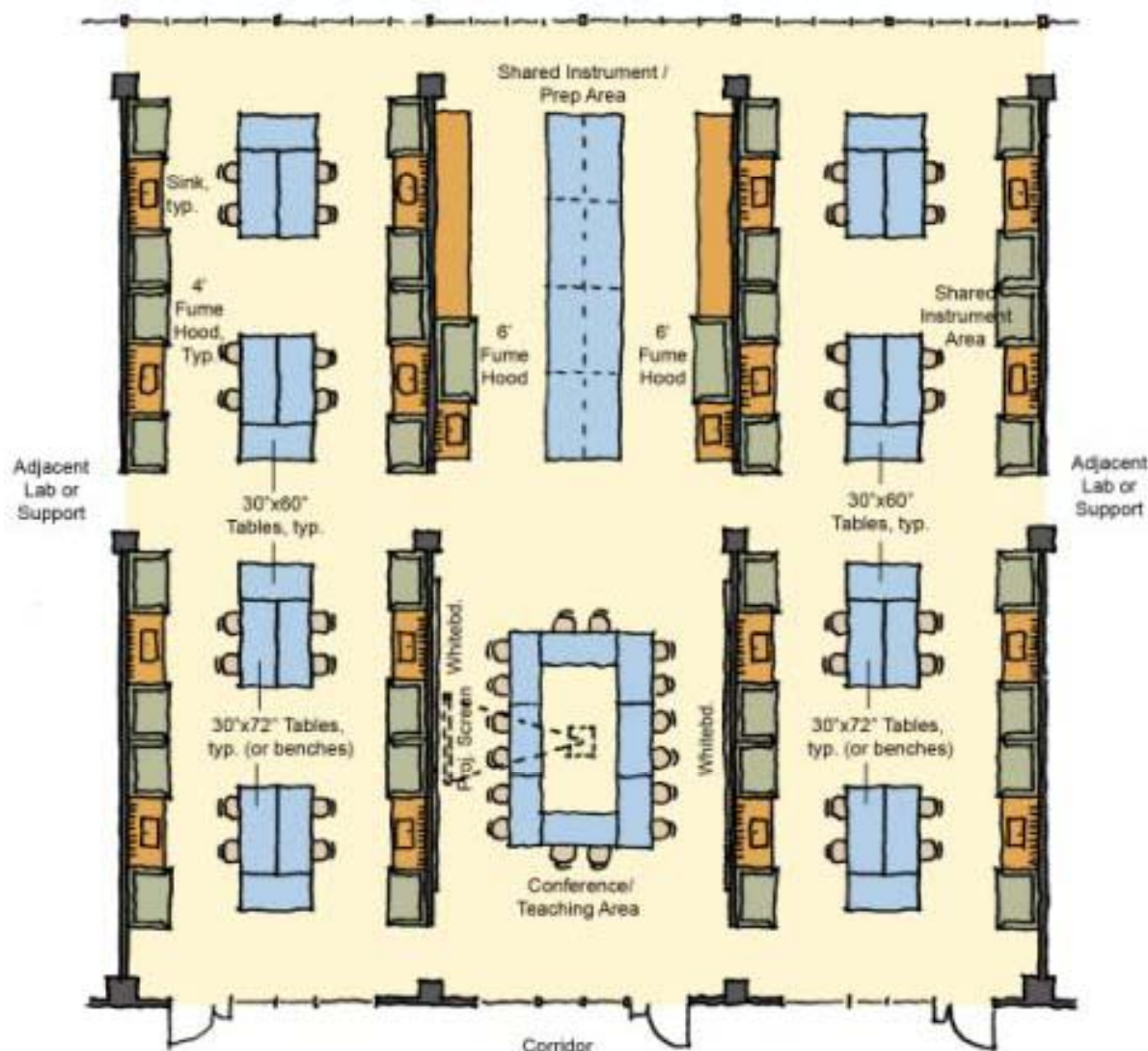
TEACHING LAB TYPE B:
1,650 NSF
UP TO 24 STUDENTS IN LAB

LAB SUPPORT:
990 NSF

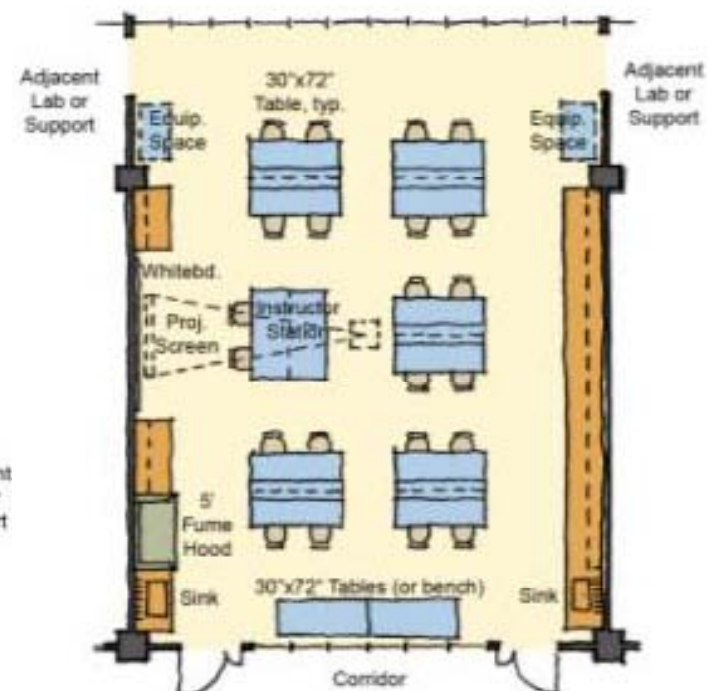
TEACHING LAB TYPE A:
1,380 NSF
UP TO 24 STUDENTS IN LAB / LECTURE

Teaching Styles

USE OF TEACHING ASSISTANTS / GRAD ASSISTANTS



ADVANCED ORGANIC CHEMISTRY



NEUROSCIENCE

Teaching Styles

FLEXIBLE CASEWORK SYSTEMS



Teaching Styles

CAPSTONE LAB AS FOCUS OF STUDENT RESEARCH



Teaching Styles

TECHNOLOGY ASSIST



How Are We Going to Teach Science & Engineering?

UNIQUE CHARACTER



DISCUSSION POINTS

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 - Out of Classroom
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 - Entry Level: 1 – 2
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KEY IDEA: WHAT PEDAGOGY FITS 2014 OPENING?

How Can We Build / Enhance Community?

A FACILITY THAT PROMOTES COLLABORATIVE INTERACTION

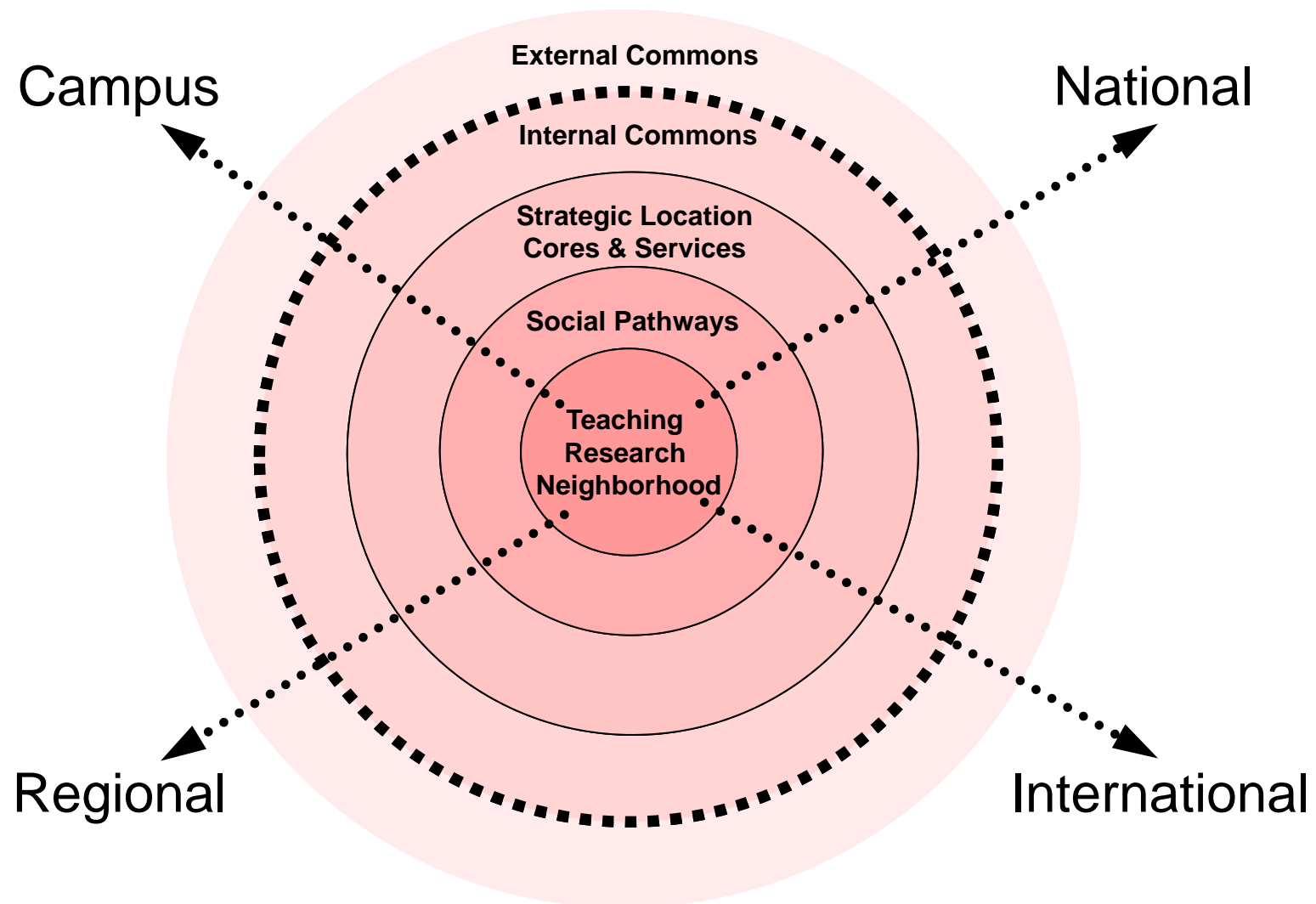


DISCUSSION POINTS

- Retail / Food
- Forum Symposium
- Collaboration
 - Business
 - Outreach
- Study Center
- Commons / Wintergarden
- Interaction Centers
- Administrative Support
- Support
 - Operations
 - Loading

KEY IDEA: COMMUNITY SPACE ENERGIZES
BUILDING

Connecting Communities: Interaction Continuum



How Can We Build / Enhance Community? *Retail / Food*



December 4, 2009

How Can We Build / Enhance Community? *Forum / Symposium*

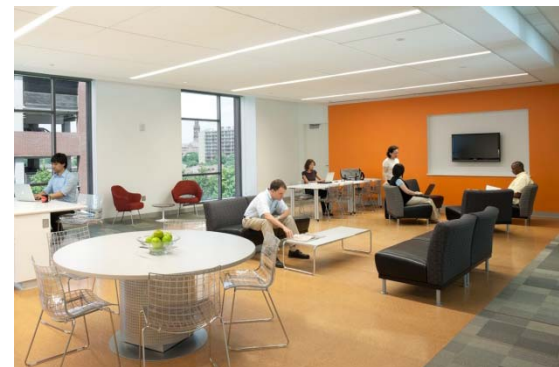


December 4, 2009

How Can We Build / Enhance Community? *Collaboration Centers*

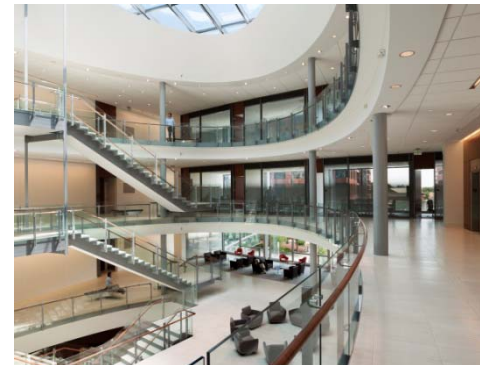


How Can We Build / Enhance Community? *Study Center*



December 4, 2009

How Can We Build / Enhance Community? *Commons / Wintergardens*



December 4, 2009

How Can We Build / Enhance Community? *Interaction Centers*



December 4, 2009

How Can We Build / Enhance Community?

A FACILITY THAT PROMOTES COLLABORATIVE INTERACTION



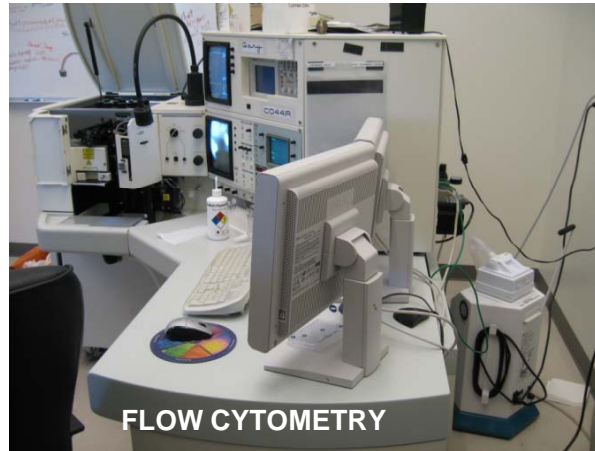
DISCUSSION POINTS

- Retail / Food
- Forum Symposium
- Collaboration
 - Business
 - Outreach
- Study Center
- Commons / Wintergarden
- Interaction Centers
- Administrative Support
- Support
 - Operations
 - Loading

KEY IDEA: COMMUNITY SPACE ENERGIZES
BUILDING

How Can We Share Equipment & Resources?

BUILDING / UNIVERSITY / REGIONAL RESOURCES



FLOW CYTOMETRY



VIRTUAL REALITY LAB

DISCUSSION POINTS

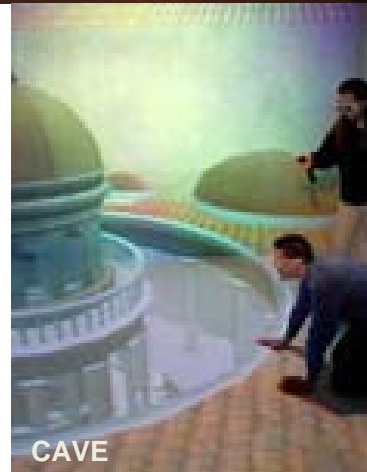
- Microscopy
- NMR Spectroscopy
- Imaging | fMRI
- Mass Spectrometry
- Proteomics (Complimentary to McCormick Genomics Core)
- Flow Cytometry
- X-Ray Crystallography
- Motion Capture Lab
- Vivarium / Mouse Genetics (Ross Hall)
- Greenhouse
- Shops
- Vibration / Particulate Free Nano-Fabrication / Clean Room
- Thin Film Vapor Deposition Lab
- High Performance Computing (Virginia Campus)
- Electron Discharge Machine



TOYODA 5 AXIS
MACHINING
CENTER



CLEAN ROOM



CAVE

KEY IDEA: POTENTIALS / HIGH BAY /
TECHNICAL REQUIREMENTS

Faculty Collaboration Session – December 4, 2009

PART 1: SUMMARY TO DATE

- The Benchmarking & Programming Process
- Engagement Opportunities/Strategies
- Roadmap for Programming, Benchmarking, Optimizing Site
- Key Findings to Date
- Review of GW's Goals and Vision

PART 2: A CONVERSATION ABOUT THE NATURE OF THE PROGRAM

Q1: How Are We Going To Do Research? (reports on three strategies from Chairs' meeting)

Q2: How Are We Going To Teach Science and Engineering?

Q3: How Can We Build / Enhance Community?

Q4: How Can We Share Equipment / Resources?

PART 3: NEXT STEPS

- The Program Draft: January
- Site Visits: December / January
- Benchmarking: January

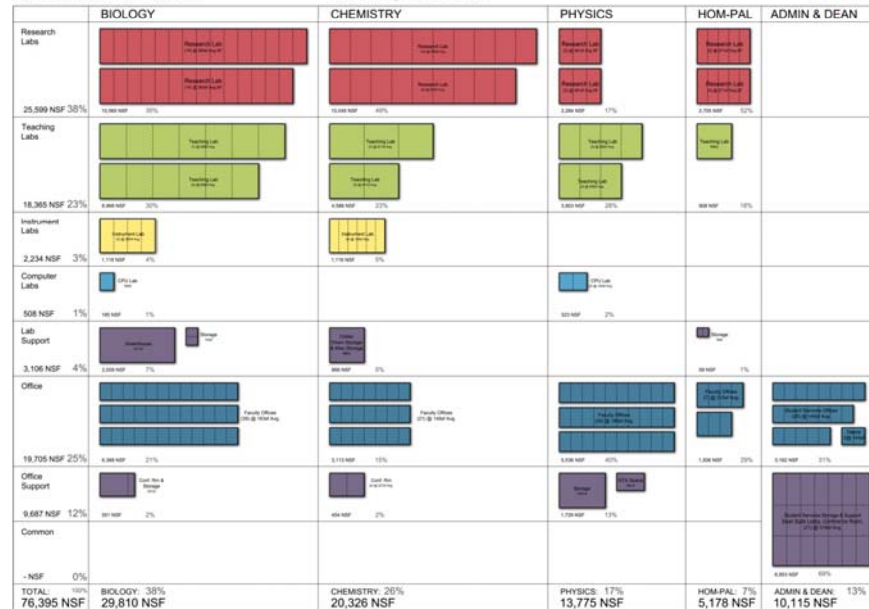
NEXT FACULTY COLLABORATION SESSION – Scheduled for January 8, 2010

Initial Program Draft: January

GEORGE WASHINGTON UNIVERSITY: SCIENCE AND ENGINEERING COMPLEX | BENCHMARKING & PROGRAMMING

EXISTING GRAPHIC PROGRAM

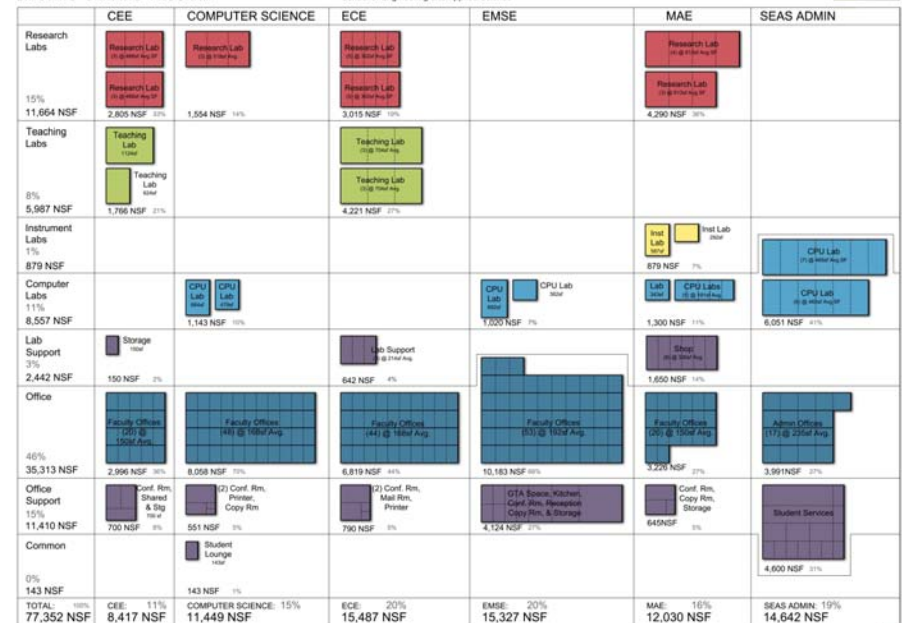
Columbian College of Arts and Sciences



GEORGE WASHINGTON UNIVERSITY: SCIENCE AND ENGINEERING COMPLEX | BENCHMARKING & PROGRAMMING

EXISTING GRAPHIC PROGRAM

School of Engineering and Applied Science



BENCHMARKING: GWU @ 85th / \$119M

NSF RANK	SCHOOL	RESEARCH \$	ENGINEERING	SCIENCE
1	Johns Hopkins	\$1,425	✓	✓
13	Duke U.	\$451M	✓	✓
16	Washington U.	\$393M	✓	✓
24	Vanderbilt U.	\$331M	✓	✓
28	Emory U.	\$291M	3/2 Program	✓
36	Northwestern U.	\$264M	✓	✓
42	U. of Maryland	\$236M	✓	✓
43	Boston U.	\$235M	✓	✓
48	U. of Virginia	\$219M	✓	✓
51	NYU	\$199M	New Acquisition	✓
67	Wake Forest U.	\$146M	3/2 Program	✓
100+	Boston College		✓	✓
100+	Lehigh U.		✓	✓
100+	Arizona State		✓	✓

Potential Site Visits: Benchmarking

LOCATION	INSTITUTIONS	PROJECTS
Washington, DC (2 Day Trip)	Johns Hopkins University of Maryland	Benchmark Schools Multiple Projects Multiple Projects
Philadelphia (1 Day Trip)	University of Pennsylvania CHOP Temple University	Multiple Projects Research Tower Teaching / Research Tower
Boston (2 Day Trip)	Harvard University MIT Boston University	Multiple Projects Multiple Projects Broad Institute
Chicago/Madison (2 Day Trip)	University of Chicago Northwestern University of Wisconsin	Multiple Projects Multiple Projects Multiple Projects
Other: List	Duke / Lehigh / Illinois Wake / Vanderbilt / Emory	Multiple Projects Disparate Locations
Target Dates	Early / Mid December Early / Mid January	Virtual Tour to Precede Actual Tour

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