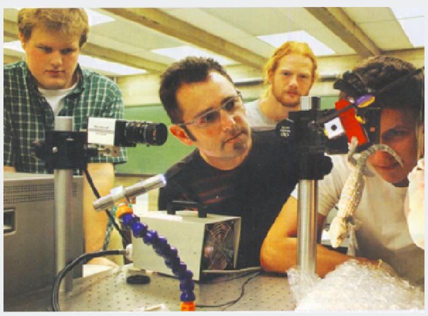
Lewis & Clark College
Science Facilities Expansion Feasibility Study



UPDATE

February 14, 2007

SRG PARTNERSHIP INC

ARCHITECTURE PLANNING INTERIORS

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SRG PARTNERSHIP INC

January 21, 2007

Michael Sestric
Campus Planning
Lewis and Clark College
301 Frank Manor House
0615 SW Palatine Hill Road
Portland, Or 97219

Subject: 2002 Science Facilities Expansion Feasibility Study
Reference: Update

Dear Michael:

The challenge of our charge was to find a valid rational for breaking the project into three phases. There are countless ways of dividing the project, but it's very difficult to find the right one that would meet the Science programs' overall objectives. After meeting with the faculty and reading the Vision statements by the Dean and the Biology department chair, it was very clear that creating a complex that integrated the six departments was a central goal. In the quest to raise the national stature of these programs, the interdisciplinary nature of a new facility is critical to be established in the first phase of construction. To achieve this, there has to be a substantive amount of space built in the first phase for the department, as well as having several departments and enough shared space to support the inter-department collaboration and interaction. We quickly realized that the larger the first phase, the easier it was to provide a truly integrated program. This solution is described as Option A.

We explored several other viable possibilities. Option B has a considerably smaller first phase than Option A; this is achieved by removing any space for Chemistry in this phase. Option C considers the possibility of preserving and remodeling Bodine and the Bio/Psych buildings, thereby reducing the overall project costs somewhat. It also proposes chemistry rather than psychology in the first phase, so offers a different academic mix. And Option D includes all of the new construction in phase one, but "building-out" some of it in the second phase. This raises the cost of phase one but might allow a more integrated overall design and eliminate fears about the overall size of the project.

Hopefully this analysis will help the College in choosing their best course. Please let us know if there's anything else we can do to assist you.

Sincerely,

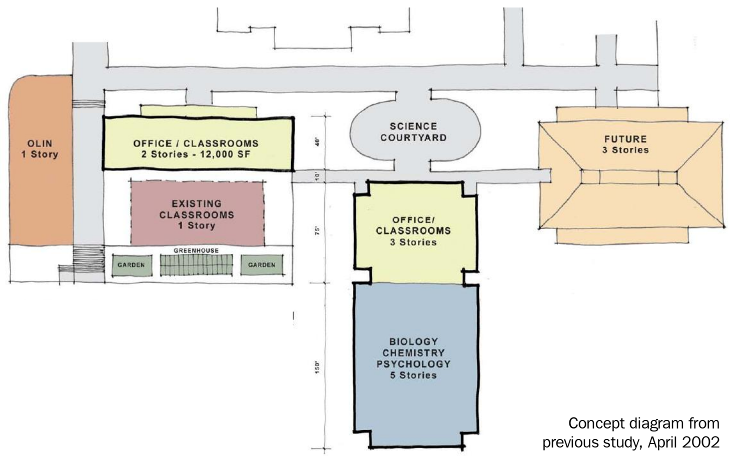
Jon Wiener, AIA
Principal

FEASIBILITY STUDY UPDATE

SRG PARTNERSHIP INC

STUDY UPDATE OBJECTIVES and OVERVIEW

Our charge was to review the material developed in the Science Facilities Expansion Feasibility Study completed in April 2002, update it and present options to break the concept for new construction and remodel into three phases. As stated in our proposal, our goal was to “Review the 2002 space program for any significant changes, omissions or issues. Discuss recent developments in pedagogy, institutional priorities, research emphasis or equipment. Discuss with workshop participants implications to space organization and prioritization. Develop program priorities to accommodate three phases. Provide cost estimates.”



Concept diagram from previous study, April 2002

PROCESS

On December 18, Rick Heinz from RFD and Jon Wiener from SRG met with Dean de Paula and Michael Sestric to review the process for this study and the overall objectives of the project. The following day, with the addition of Kent Duffy from SRG, we all met with faculty representatives from each program in a series of 20 – 30 minute meetings. This was then followed by an overview presentation by Rick Heinz to the entire group of “national trends in undergraduate science facilities.” SRG also made a brief presentation of a very recent similar project that addressed many of the same issues central to this project. The group then discussed organizational criteria and overall objectives that would help to frame the phasing criteria. The results of that discussion are noted below.

The faculty involved in this process were:

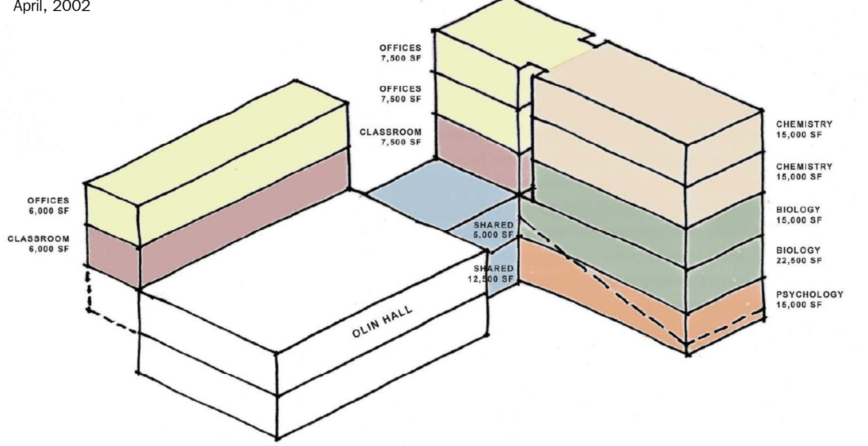
Julio de Paula, Dean of the College of Arts and Sciences
Kellar Autumn, Associate Professor of Biology
Jay Odenbaugh, Assistant Professor of Philosophy
Janis Lochner, Professor of Chemistry
Jerusha Detweiler-Bedell, Assistant Professor of Psychology
Thomas Olsen, Associate Professor of Physics
Yung-Pin Chen, Assistant Professor of Mathematics

DESIGN CRITERIA and PROGRAM PRIORITIES

The following are comments made by the faculty representatives during their interviews:

- Biology prefers lab space that is dedicated to their use (not shared) so professors don't have to constantly take down and set up experiments. It would be possible to share a lab if used during different semesters.
- The building should present science ("science on display") to the campus as well as department majors
- The building should draw students and faculty into it
- The building should be as open as possible to promote interdisciplinary communication; the architecture should help to create "bridges" between departments that are not static
- General purpose classroom space is not a high priority
- There should be plenty of student "hang-out" space inside and out.
- Interdisciplinary space works best if in the same building as the two (or more) departments it serves
- Chemistry's most pressing need is reconfigured space rather than more space. However, the changes needed are radical.
- Exterior circulation at Olin does not work well for the current uses by chemistry
- Psychology's most pressing need is for more lab space. Currently their teaching labs also are used for research
- Physics would like more light into their rooms and more social spaces
- Math/CS faculty offices are currently very isolated, which does not encourage collaboration with other departments.
- Math/CS would like spaces that are adaptable to future changes
- Math/CS needs a hearth space and a conference room in order to foster department solidarity

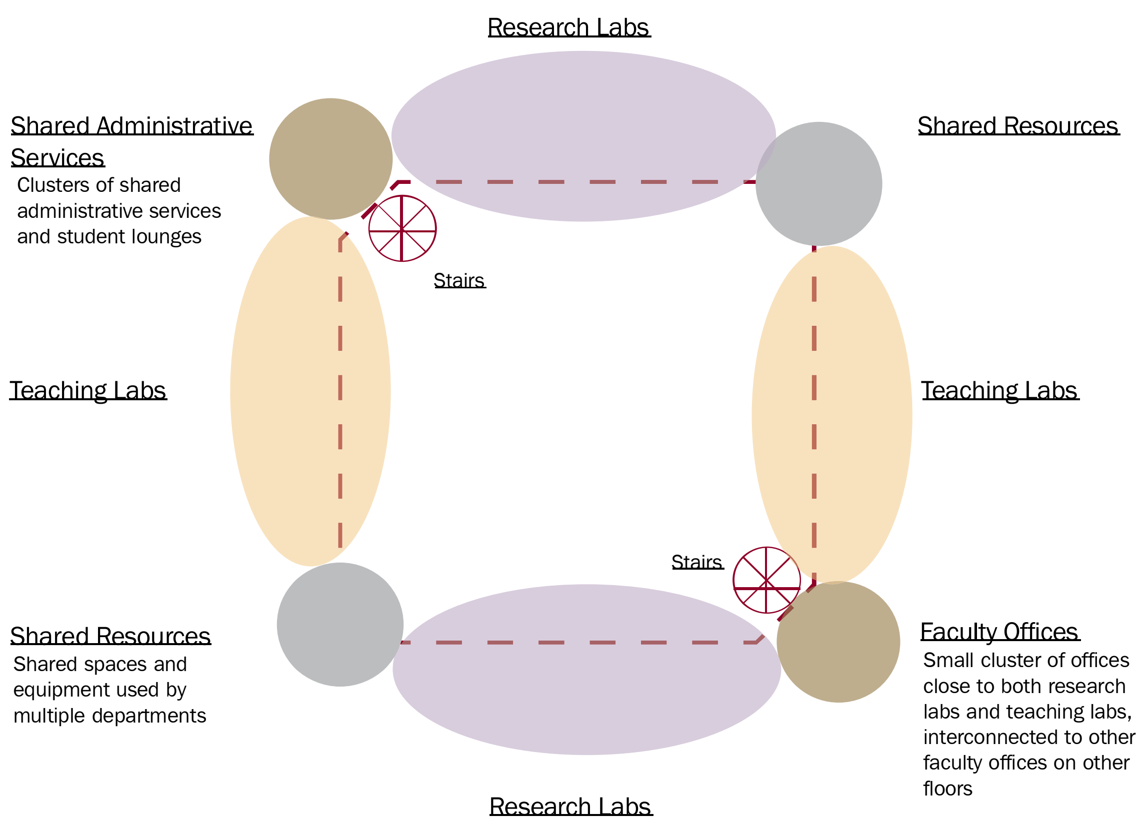
Option D
April, 2002



- There should be small clusters of faculty offices surrounded by research labs. The offices should be interspersed with administrative spaces and student lounges.
- Consider placing the introduction labs on upper floors to draw students into the building
- Shared resources (rooms and equipment) should be clustered into nodes in order to promote interdisciplinary interaction. These might include:

1. math skills center (including GIS center)
2. microscopy suite
3. laser/optics lab
4. bio-chemistry lab
5. molecular modeling lab
6. computational suite
7. animal facilities
8. analytical instrumentation lab
9. prep rooms
10. cold room
11. centrifuge, autoclave or other specialized equipment

Organizational Diagram



PROGRAM REVIEW

We reviewed the program line by line with the department heads. We made minor adjustments that included reducing the size of the teaching labs in Biology and eliminated a few spaces that were duplicated elsewhere in the program. The net result was a reduction in the overall space requirement of 6,305 square feet, or just over 11,000 gross square feet. This adjustment reduced estimated construction costs by about $5.3m.

We also confirmed faculty counts and expansion potential with the Dean. Attached at the end of this report is an estimate of the faculty and technical staff requirements for each department over a thirty year period. The space required for this future expansion along with the associated labs has been accommodated in the second and third phases.

UPDATED CONSTRUCTION COST

In the original 2002 report, Hoffman Construction estimated the direct cost of construction for the various options. In the almost five years that have transpired, there has been significant escalation in construction costs. Hoffman provided us with the appropriate factors for the escalation in each year since then (3% in each of 2002 and 2003; 12% in 2004; 10% in each of 2005 and 2006; and projected 5% for the first half of 2007.) Based on this, their overall estimate for direct construction escalated from an average of $205 per square foot to $308 for a combination of new construction and remodel. We estimated the break down as roughly $350/sf for new construction and $200 - $250/sf for remodel. This matches well with our recent experience on similar projects.

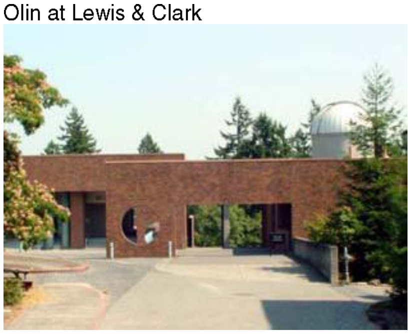
The range for renovation costs depends on the condition and appropriateness of the existing facility, the extent of the remodel and the type of new facilities. For example, if the renovation is extensive and includes structural upgrades and labs, it will be at the high end range. If it does not include structural upgrades and the program is for classrooms and offices rather than labs, then it can be at the low end range. Since a structural upgrade is not required by code, it is the College's decision as to how much improvement should be included. There are too many variables to enumerate or elaborate upon in this type of study. Furthermore, a detailed evaluation of the existing condition has not been performed.

Given these escalation factors, the total project cost for the program as listed in the original report would now be $78,115,765 for 134,000 sf of new construction and a comprehensive remodeling of Olin (55,000 sf.) With the program adjustment noted above, the revised budget would be approximately $73m. Please note that all costs are projected for July 2007. Future phases do not include any escalation beyond this time.

The factor for adjusting construction costs into "Total Project Cost" is based on the College's own experience, and remains as in the original report at 1.37. This does not include extensive equipment costs however, and therefore, it is important for the College to determine those needs as soon as possible.

Bodine, Biology-Psychology at Lewis & Clark

Olin at Lewis & Clark



PHASING STRATEGIES

When meeting with the faculty representatives, we discussed a number of criteria that might be useful to generate phasing strategy:

- What are their most pressing space needs?
- Could we empty out one existing building after the first phase so that it was available as "swing" space for future phases?
- Could we build enough structure to accommodate the entire program and just "shell" whatever space was beyond the capacity of the budget?
- What are the desired organization and program relationships that might dictate the appropriate pieces in each phase?

  Related to this, what are the institutional objectives that might create the parts and the size of these partial programs in each phase?
- Should the first phase provide a little something for each program or is it more important for a critical mass of certain programs be built first

As we considered all of these questions, two criteria quickly became very clear. First, the desire for an integrated science program had very strong faculty support and is central to the department's strategy to raise the stature of their program. Therefore this objective rose immediately to the top. Second, there are significant space needs right now. Biology and psychology are bursting at the seams and clearly need much more space than they currently have. Chemistry does not need significantly more space right now, but does need radically reconfigured space. Our conclusion from the combination of these two factors was that the larger we could make the first phase, the better. The goal of integrating the science programs meant that we should not accommodate just one department, and that we really should include a major part of the Shared spaces. The shared spaces noted in the Criteria above are central to creating an integrated science program. In order to address the pressing needs of the Biology, Psychology and Chemistry departments, and create the critical mass so that they can flourish, we also determined they would need around 70% of their total program.

PHASING COSTS

Breaking the project into phases will add to the overall cost of the project. The most significant factor by far will be escalation. In addition, phasing usually requires some temporary construction. If a subsequent phase is added onto an earlier phase, there might be a wall or roof that has to be removed to accommodate the addition. The extent of this would be entirely dependent on the particular design. From past experience, we would suggest allocating 1 – 2% of the total construction cost. For a $53m project, this calculates to roughly $.5m. Another factor is the increase in length of the construction time. In the original study, the construction period was calculated as 20 months. For a three phase project, this could easily double. Since the "general conditions" were calculated at $67,500 per month, the total for this line item would increase by $1,350,000. These added costs for phasing have not been included in the total product cost listed for each option.

Master Plan Implications

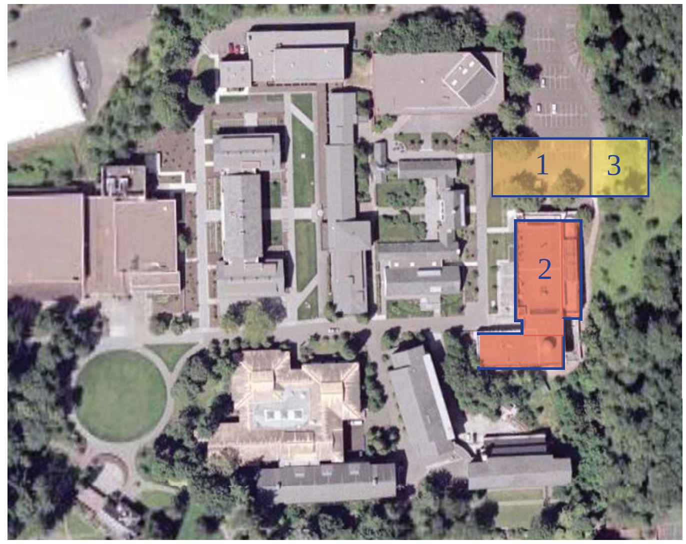
The College's approved Master Plan envisions the demolition of the Bodine/Bio-Psychology buildings as illustrated in the site plan below. This creates a significant new "Quad" as the heart of the academic campus. Options A and B comply with this concept, Options C and D, which represents a major change to the vision of the campus. Since it will affect all of the surrounding buildings, the campus planning implications of Options C or D should be considered thoroughly.

Proposed "Quad" site Master Plan

Summary of Options

	New Construction	Remodel	Total Cost
Option **A**	121,000 sf	55,000 sf (Olin)	$73 - $77m
Option **B**	121,000 sf	55,000 sf (Olin)	$73 - $77m
Option **C**	77,000 sf	99,000 sf (Olin, Bodine/Bio)	$64 - $70m
Option **D**	77,000 sf	99,000 sf (Olin, Bodine/Bio)	$64 - $70m
Option **E**	121,000 sf	55,000 sf (Olin)	$73 - $77m

OPTION A



We went through their space program line by line (copy attached) and determined that the first phase should be approximately 82,000 square feet to best meet these criteria. A benefit of this phasing strategy is that it removes much of the functions currently in Bodine and Bio/Psych, thereby creating “swing” space that could accommodate future phases.

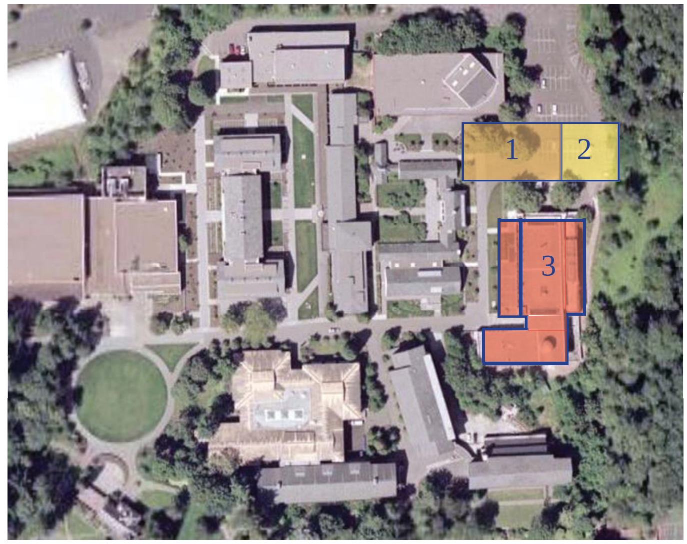
Having addressed the majority of the needs for these three programs, the next step would be to improve the existing conditions of Olin and upgrade the facilities for the remaining programs. Phase two is proposed to address all of the program requirements for Math/CS, Geology and Physics. Bodine/Bio/Psych buildings could be used for swing space. It might also be possible to do the remodeling over a course of two summers rather than relocating the entire program for an entire year. This will need to be studied further.

The last phase would then add onto the new building in some fashion to provide the remaining 30% of the program spaces for Biology, Chemistry and Psychology. Over half of the Phase 3 addition would accommodate Shared program requirements. This would include large lecture halls and a number of general-purpose classrooms, which would be helpful in drawing the general student population to the furthest corner of campus.

			Total Project Cost
Phase One	New Construction	81,861 gsf	$39,252,862
	Biology	27,655 gsf	
	Psychology	12,517 gsf	
	Chemistry	25,172 gsf	
	Shared	16,517 gsf	
Phase Two	Remodel Olin	55,000 gsf	$15,070,000 - $18,837,500
	Geology	6,276 gsf	
	Math/CS	13,259 gsf	
	Physics	19,643 gsf	
	Shared	15,828 gsf	
Phase Three	New Construction	39,155 gsf	$18,774,310
	Biology	10,897 gsf	
	Chemistry	3,724 gsf	
	Psychology	2,724 gsf	
	Shared	21,810 gsf	
Total Project Cost			**$73,097,767 - $76,865,267**

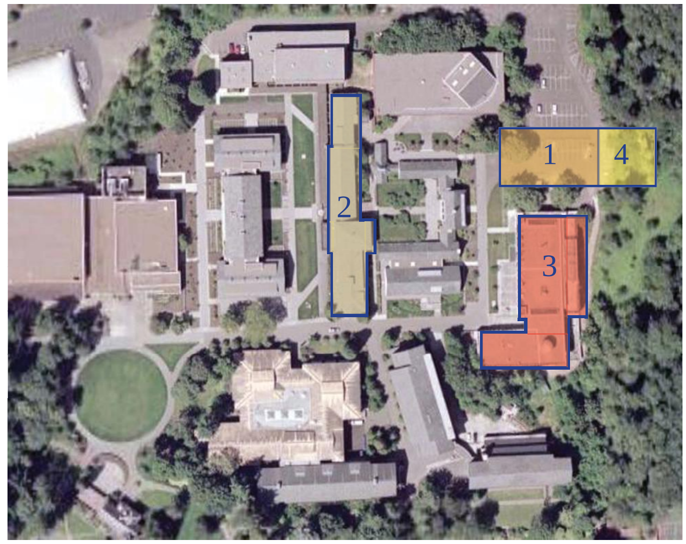
OPTION B

This option is designed to reduce the size and cost of phase one. By eliminating Chemistry from the mix but following the rest of the same general parameters as in Option A, the overall building size is reduced to 56,689 square feet with a project cost of roughly $27m. Since the first phase would be addressing the most pressing needs for Biology and Psychology, the second phase should address the needs of Chemistry. New construction would be best suited for this program due to the extensive lab requirements. The strategy for the second phase then would be an addition or a separate but connected facility that provides all of the space for Chemistry, plus the remainder of the space for Biology and Psychology. There would also be some Shared spaces to bring the total of this phase to approximately the same size as the first phase. The third phase would include remodeling all of Olin along with a small addition.



			Total Project Cost
Phase One	New Construction	56,689 gsf	$27,182,375
	Biology	27,655 gsf	
	Psychology	12,517 gsf	
	Shared	16,517 gsf	
Phase Two	New Construction	58,346 gsf	$27,976,907
	Chemistry	28,897 gsf	
	Biology	10,897 gsf	
	Psychology	2,724 gsf	
	Shared	15,828 gsf	
Phase Three	Remodel Olin & New	60,988 gsf	$17,941,246 - $21,708,746
	Physics	19,643 gsf	
	Math/CS	13,259 gsf	
	Geology	6,276 gsf	
	Shared	21,810 gsf	
Total Project Cost			**$73,100,528 - 76,868,028**

OPTION C



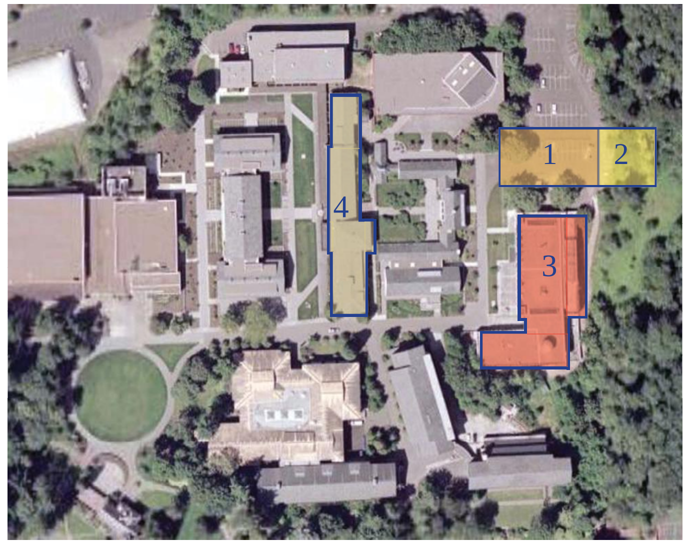
We were also asked to consider remodeling Bodine and the Bio/Psych buildings rather than vacating them. Since this would keep at least two of the programs remote from the rest, we decided to begin by deciding which two departments could be located there and have the least detrimental affect to the integrated science concept. The answer was Math/CS and Psychology. To accomplish this, we decided the first phase should include Biology and Chemistry in the new construction. We propose providing 70% of their program requirements as in the other options. To keep the magnitude of this phase as small as possible, we did not include any shared spaces.

Overall, this strategy broke naturally into four phases. After the initial new construction, there would be two buildings to remodel, Olin and Bodine/Bio/Psych. A final phase of more new construction would be needed to provide the total area required for the overall space requirements.

			Total Project Cost
Phase One	New Construction	52,827 gsf	$25,330,546
	Biology	27,655 gsf	
	Chemistry	25,172 gsf	
Phase Two or Three	Remodel Olin	55,000 gsf	$15,070,000
	Geology	6,276 gsf	
	Physics	19,643 gsf	
	Shared	29,081 gsf	
Phase Two or Three	Remodel Bodine/BioPsych	44,000 gsf	$12,056,000 - $15,070,000
	Math/CS	13,259 gsf	
	Psychology	15,241 gsf	
	Shared	15,500 gsf	
Phase Four	New Construction	24,195 gsf	$11,601,502
	Biology	10,897 gsf	
	Chemistry	3,724 gsf	
	Shared	9,574 gsf	
Total Project Cost			**$64,058,046 - $70,839,546**

OPTION D

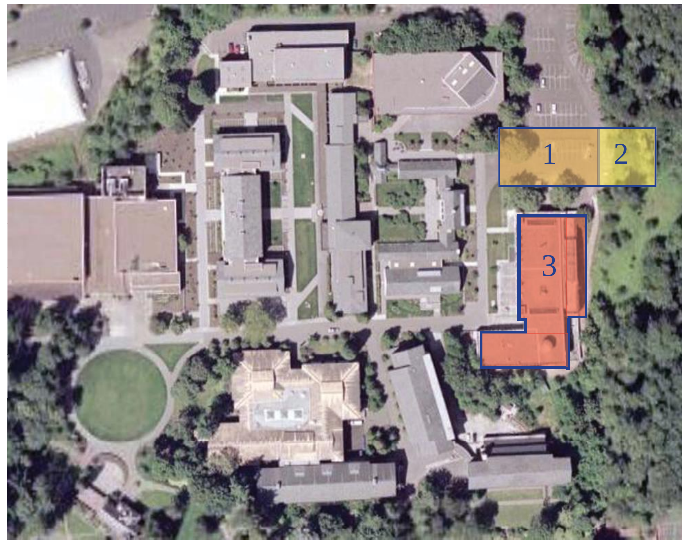
Another option would be to build the entire amount of new construction in the first phase, but "build out" the interior for only a portion. Since this would add significant cost in the initial phase, we decided to make this a variation of option C which has the smallest first phase and the least amount of new construction. We broke the new construction costs down into $200/gsf for shell and core and $150/gsf for the interior construction.



			Total Project Cost
Phase One	New Shell & Core	77,022 gsf	$21,104,028
	Interior "build out"	52,827 gsf	$10,820,602
	Biology	27,655 gsf	
	Chemistry	25,172 gsf	
Phase Two	Interior "build-out"	24,195 gsf	$4,972,072
	Biology	10,897 gsf	
	Chemistry	3,724 gsf	
	Shared	9,574 gsf	
Phase Three or Four	Remodel Olin	55,000 gsf	$15,070,000 - $18,837,500
	Geology	6,276 gsf	
	Physics	19,643 gsf	
	Shared	29,081 gsf	
Phase Three or Four	Remodel Bodine/BioPsych	44,000 gsf	$12,056,000 - $15,070,000
	Math/CS	13,259 gsf	
	Psychology	15,241 gsf	
	Shared	15,500 gsf	
Total Project Cost			**$64,022,702 - $70,804,203**

OPTION E

A variation of Option D will take the same approach but will not remodel Bodine/Bio-Pyschology. This will make the new construction much larger. The intent is to build the entire shell and core in the first phase thereby insuring that the planning for the complete facility will be done at one time. The cost of phase one will be dependent on the extent of the tenant improvements.

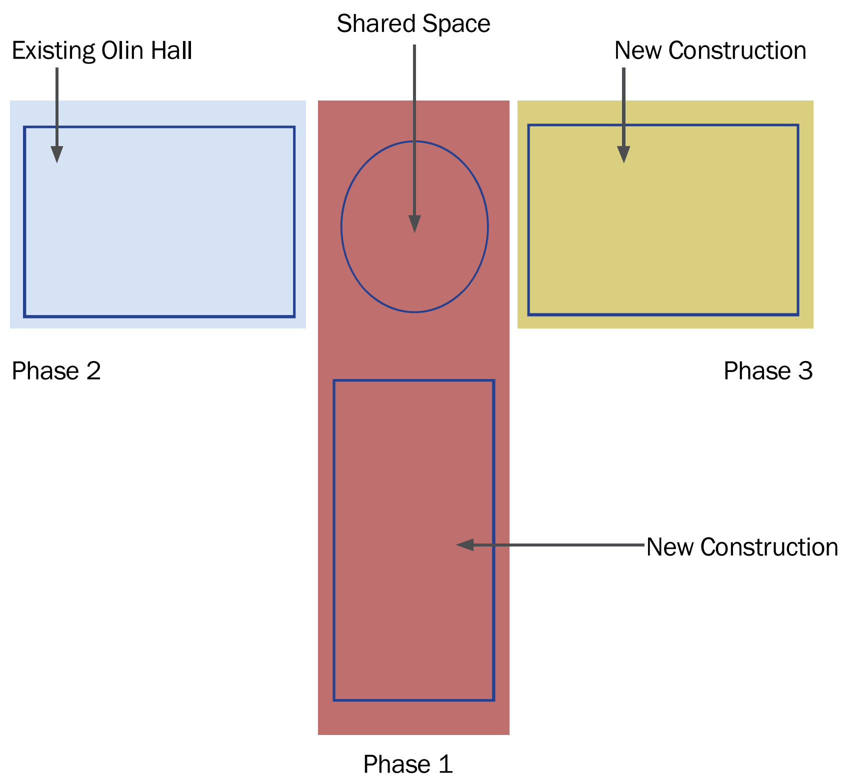


			Total Project Cost
Phase One	New Shell & Core	121,022 gsf	$33,160,028
	Interior "build out"	52,827 gsf	$10,855,948
	Biology	27,655 gsf	
	Chemistry	25,172 gsf	
Phase Two or Three	Interior "build-out"	68,195 gsf	$14,014,072
	Biology	10,897 gsf	
	Chemistry	3,724 gsf	
	Math/CS	13,259 gsf	
	Psychology	15,241 gsf	
	Shared	25,074 gsf	
Phase Two or Three	Remodel Olin	55,000 gsf	$15,070,000 - $18,837,500
	Geology	6,276 gsf	
	Physics	18,816 gsf	
	Shared	29,908 gsf	
Total Project Cost			**$73,100,048 - $76,867,548**

NEXT STEPS

The actual location of the new building and any subsequent buildings or additions should be determined when design process begins. It should also be based upon the College's approved facilities master plan. Any new science facilities should help to build the overall campus. Attempts to develop a clear understanding of placement or relationships now would be premature. An addition could be on top of an earlier phase or adjacent to it. Obviously both are possible but have different implications and requirements. These differences should be carefully and thoroughly considered during design. A concept design or preferably, schematic design, should be done on all phases at the very onset of the project. This process should consider swing space, the number of moves, construction duration, etc, so that there are not any surprises. This would also ensure that the end result truly creates an integrated science program.

We decided the key to creating an integrated science program was to have all of the shared facilities centrally located. The diagram below illustrates this. It is important to have some of these in the first phase. It is also important that the circulation system pull all of the parts together. As stated in the Dean's Vision Statement, promoting interdisciplinary interaction is at the heart of this project.



SPACE LIST

Overall Space Summary

Department	Existing Space	Draft Program-1/15/02				Phase 1 Program				Phase 2 Program				Phase 3 Program				Totals
	NSF	Laboratory	Lab Support	Office/Other	Totals	Laboratory	Lab Support	Office/Other	Totals	Laboratory	Lab Support	Office/Other	Totals	Laboratory	Lab Support	Office/Other	Totals	All Phases
Biology	11,497	17,600	4,560	3,730	25,890	11,040	3,080	1,920	16,040	-	-	-	-	3,520	1,480	1,320	6,320	22,360
Chemistry	12,056	14,080	3,520	2,700	20,300	9,920	3,200	1,480	14,600	-	-	-	-	1,280	320	560	2,160	16,760
Geology	1,190	2,240	960	440	3,640	-	-	-	-	2,240	960	440	3,640	-	-	-	-	3,640
Math/Comp.Sci.	4,056	-	-	8,300	8,300	-	-	-	-	-	-	7,690	7,690	-	-	-	-	7,690
Physics	10,388	8,640	1,033	2,010	11,683	-	-	-	-	8,640	1,353	1,400	11,393	-	-	-	-	11,393
Psychology	4,185	8,160	320	2,370	10,850	5,300	320	1,640	7,260	-	-	-	-	1,260	-	320	1,580	8,840
Shared	16,283	3,840	5,180	20,435	29,455	3,840	2,200	3,540	9,580	-	2,660	6,520	9,180	-	320	12,330	12,650	31,410
Total Net Area	**59,654**	**54,560**	**15,573**	**39,985**	**110,118**	**30,100**	**8,800**	**8,580**	**47,480**	**10,880**	**4,973**	**16,050**	**31,903**	**6,060**	**2,120**	**14,530**	**22,710**	**102,093**
Net/Gross Ratio	**59%**				**58%**				**58%**				**58%**				**58%**	
Total Gross Area	**100,820**				**189,859**				**81,862**				**55,005**				**39,155**	**176,022**
Existing GSFof Olin to Remodel					**55,000**								**55,000**					**55,000**
New Gross Area Required for New Construction					**134,859**				**81,862**								**39,155**	**121,017**
Estimated Construction Cost - Renovation				**$140**	**$7,700,000**								**$200**				**$0**	
Estimated Construction Cost - Addition				**$280**	**$37,760,414**				**$350**								**$350**	
Total Estimated Construction Cost					**$45,460,414**				**$28,651,724**				**$11,000,000**				**$13,704,310**	**$ 53,356,034**
Project Cost Multiplier					**1.35**				**1.37**				**1.37**				**1.37**	**1.37**
Total Estimated Project Cost					**$ 61,371,559**				**$ 39,252,862**				**$ 15,070,000**				**$ 18,774,905**	**$ 73,097,767**

Lewis & Clark College Science Facilities
RFD Project No. 2001056-01

FTE	11.5	Professors	10
Count	12	Admin	1
		Lab	1

BIOLOGY DEPARTMENT
February 13, 2007

Space ID	Space Name	Existing Space Room No.	Existing Space NSF	# of Statns.	Draft Program-1/15/02 NSF	No.	Total NSF	Phase 1 Program NSF	No.	Total NSF	Phase 2 Program NSF	No.	Total NSF	Phase 3 Program NSF	No.	Total NSF	Totals
LABORATORIES																	
B1.01	Introductory Biology	11-001,008	1344 *	24	1,440	2	2,880	1,280	1	1,280			-	1,280	1	1,280	2,560
B1.02	Non-majors 11-009,	12-101	1460 *	24	1,440	1	1,440	1,280	1	1,280			-			-	1,280
B1.03	Cell/Molecular/Developmental	11-008	315 *	24	1,440	1	1,440	1,280	1	1,280			-			-	1,280
B1.04	Molecular Biology	11-008	315 *	24	1,440	1	1,440	1,280	1	1,280			-			-	1,280
B1.05	Neuro/Physiology	11-013	977	24	1,440	1	1,440	Listed under Shared Space					-			-	0
B1.06	Evolution/Behavior/Vert/Invert.	12-101	470 *	24	1,440	2	2,880	1,280	1	1,280			-	1,280	1	1,280	2,560
B1.07	Faculty/Student Research		2404	4	480	10	4,800	480	7	3,360			-	480	2	960	4,320
B1.08	Student Research	None		6	640	2	1,280	640	2	1,280			-			-	1,280
	11-011,14,15,20,21,22,12-102,104,104a,112						-			-			-			-	0
							-			-			-			-	
Subtotal Laboratory Space			7,285			20	17,600		14	11,040		0	-		4	3,520	14,560
LABORATORY SUPPORT																	
B2.01	Stockroom	12-100	255		1,280	1	1,280	960	1	960			-	320	1	320	1,280
B2.02	Microscopy Suite	None			640	1	640			-			-	640	1	640	640
B2.03	Fly Room Preparation	11-003	77 *		160	1	160	160	1	160			-			-	160
B2.04	Preparation Room (Autoclave)	11-003	77 *		480	1	480	480	1	480			-			-	480
B2.05	Field Equipment Storage	None			240	1	240			-			-	240	1	240	240
B2.06	Equipment Room	12-105	145		480	1	480	320	1	320			-	160	1	160	480
B2.07	Controlled Temperature Rooms	11-010,012	202		120	3	360	120	2	240			-	120	1	120	360
B2.08	Greenhouse	13-100	1178		240	2	480	240	2	480			-			-	480
B2.09	Greenhouse Prep.	included	included		120	1	120	120	1	120			-			-	120
	Cleanup & Glass Wash	?????			320	1	320	320	1	320							320
													-			-	
Subtotal Laboratory Support Space			1,934			13	4,560		10	3,080		0	-		5	1,480	4,560
OFFICE/ADMINISTRATIVE																	
B3.01	Faculty Offices 2-210,11-218, 19,20,21,22,23,24,25,26,27,28,29,		1792	1	160	10	1,600	160	9	1,440			-			-	1,440
B3.02	Laboratory Coordinator Office	11-211A	166	1	160	2	320	120	1	120			-	120	1	120	240
B3.03	Administrative Support	11-211.1	50 *	2	250	1	250 *	See Shared space list					-			-	0
	Workroom	11-211.2	62.5 *	WS & WR included, share w/ Pysch? *													0
B3.04	Conference (Seminar) Room	11-201	207 *	12	320	1	320			-			-	320	1	320	320
B3.05	Student Offices	None		4	160	0	-			-			-			-	0
B3.06	Student Study	None		4-6	120	5	600	120	3	360			-	120	2	240	600
B3.07	Museum for specimens				640	1	640			-			-	640	1	640	640
							-			-			-			-	
Subtototal Office/Administrative Space			2,278			20	3,730		13	1,920		0	-		5	1,320	3,240
										-			-			-	
										-			-			-	
Totals			11,497			53	25,890		37	16,040		0	-		14	6,320	22,360
Total GSF (at 58% Net/Gross Ratio)							44,638 GSF			27,655 GSF			- GSF			10,897 GSF	38,552 GSF

* Shared space - SF prorated

Lewis & Clark College Science Facilities
SRG Partnership, Inc.

Portland, Oregon
Research Facilities Design

Lewis & Clark College Science Facilities
RFD Project No. 2001056-01

FTE	8.83	Professors	7
Count	9	Admin	1
		Lab	1

CHEMISTRY DEPARTMENT
February 13, 2007

Space ID	Space Name	Existing Space Room No.	Existing Space NSF	# of Statns.	Draft Program-1/15/02 NSF	Draft No.	Draft Total NSF	Phase 1 Program NSF	Phase 1 No.	Phase 1 Total NSF	Phase 2 Program NSF	Phase 2 No.	Phase 2 Total NSF	Phase 3 Program NSF	Phase 3 No.	Phase 3 Total NSF	Totals
LABORATORIES																	
CH1.01	General Chemistry/Perspectives	17-116,310	2034 *	24	1,600	2	3,200	1,280	2	2,560			-			-	2,560
CH1.02	Organic Chemistry	17-215	889	24	1,920	1	1,920	1,600	1	1,600			-			-	1,600
CH1.03	Physical Chemistry/Instrumentation	17-224	349 *	12	960	1	960	960	1	960			-			-	960
CH1.04	Biochemistry (Shared?)	17-115,116	1000 *	24	1,280	1	1,280	Listed under Shared					-			-	0
CH1.05	Inorganic Chemistry	17-224	348 *	12	960	1	960	960	1	960			-			-	960
CH1.06	Molecular Modeling	12-101	378	24	640	1	640	640	1	640			-			-	640
CH1.07	Faculty/Student Research 17-114A, 115*, 118,		1973 *	4	640	8	5,120	640	5	3,200			-	640	2	1,280	4,480
	119,120,121,224B						-			-			-			-	0
							-			-			-			-	0
Subtotal Laboratory Space			6,971			15	14,080		11	9,920		0	-		2	1,280	11,200
LABORATORY SUPPORT																	
CH2.01	General Chemistry Preparation	17-116D,307	275		640	1	640	640	1	640			-			-	640
CH2.02	Stockroom Suite:						-			-			-			-	0
CH2.02a	Preparation Room - in labs and stockrooms				320	1	320	320	1	320			-			-	320
CH2.02b	Stockroom (Disposables, dry goods)	17-124	210		640	1	640	640	1	640			-			-	640
CH2.02c	Stockroom (Chemicals) 17-212,213,241A		488		640	1	640	640	1	640			-			-	640
CH2.02d	Solvent Storage 17-241C,241B		136		160	1	160	160	1	160			-			-	160
CH2.02e	Corrosives Storage				160	1	160	160	1	160			-			-	160
	Ethanol Storage	17-213A	40														0
	Acid Storage	17-116A	55														0
	Base Storage	17-116B	95														0
CH2.03	Instrument Room	17-114,220	972		640	1	640	640	1	640			-			-	640
	Balance Room	17-122	397														0
CH2.04	NMR Room (in equipment room 17-114)				320	1	320			-			-	320	1	320	320
	Dark Room	17-111A	16 *														0
	Filtration System for Deionized Water	17-116C	95	Locate in Building Mechanical space			-			-			-			-	0
Subtotal Laboratory Support Space			2,779			8	3,520		7	3,200		0	-		1	320	3,520
OFFICE/ADMINISTRATIVE																	
CH3.01	Faculty Offices (7) 17-216,217,18,19,21,23,25		1428	1	160	8	1,280	160	7	1,120			-			-	1,120
CH3.02	Laboratory Director Office	17-222	163	1	120	1	120	120	1	120			-			-	120
CH3.03	Administrative Support	17-226A	229.5 *	1	500	1	500	See Shared space list					-			-	0
CH3.04	Work Room	17-224A	158 *	WS & WR included, share w/Physics						-			-			-	0
CH3.05	Conference Room	17-232	80 *	12	320	1	320			-			-	320	1	320	320
CH3.06	Student Study	17-117	247	4-6	120	4	480	120	2	240			-	120	2	240	480
							-			-			-			-	0
							-			-			-			-	0
Subtotal Office/Administrative Space			2,306			15	2,700		10	1,480		0	-		3	560	2,040
Totals			12,056			38	20,300		28	14,600		0	-		6	2,160	16,760
Total GSF (at 58% Net/Gross Ratio)							35,000 GSF			25,172 GSF			- GSF			3,724 GSF	28,897 GSF

* Shared space - SF prorated

Lewis & Clark College Science Facilities
SRG Partnership, Inc.

Portland, Oregon
Research Facilities Design

Lewis & Clark College Science Facilities
RFD Project No. 2001056-01

FTE	1	Professors	1
Count	1	Admin	
		Lab	

GEOLOGY
February 13, 2007

Space		Existing Space		# of	Draft Program-1/15/02			Phase 1 Program			Phase 2 Program			Phase 3 Program			Totals
ID	Space Name	Room No.	NSF	Statns.	NSF	No.	Total NSF	NSF	No.	Total NSF	NSF	No.	Total NSF	NSF	No.	Total NSF	
LABORATORIES																	
G1.01	Teaching Laboratory (Shared)	17-112	247 *	24	1,280	1	1,280			-	1,280	1	1,280			-	1,280
G1.02	Research Laboratory	17-105,108	755	5	480	2	960			-	480	2	960			-	960
							-			-			-			-	0
							-			-			-			-	0
							-			-			-			-	0
		12-101					-			-			-			-	0
Subtotal Laboratory Space			1,002			3	2,240		0	-		3	2,240		0	-	2,240
LABORATORY SUPPORT																	
G2.01	Field Staging (Mud Room)	None			160	1	160			-	160	1	160			-	160
G2.02	Field Equipment Storage	None			160	1	160			-	160	1	160			-	160
G2.03	Preparation Room	None			320	1	320			-	320	1	320			-	320
G2.04	Map/Sample Storage	None			160	1	160			-	160	1	160			-	160
G2.05	Seismograph Room	None			160	1	160			-	160	1	160			-	160
							-			-			-			-	0
							-			-			-			-	0
							-			-			-			-	0
							-			-			-			-	0
							-			-			-			-	0
Subtotal Laboratory Support Space			-			5	960		0	-		5	960		0	-	960
OFFICE/ADMINISTRATIVE																	
G3.01	Faculty Office	17-234	188	1	160	2	320			-	160	2	320			-	320
G3.02	Student Study	None		4-6	120	1	120			-	120	1	120			-	120
G3.03	Admin Support & Conference	see Chem		shared w/ Chemistry			-			-			-			-	0
							-			-			-			-	0
							-			-			-			-	0
Subtotal Office/Administrative Space			188			3	440		0	-		3	440		0	-	440
Totals			1,190			11	3,640		0	-		11	3,640		0	-	3,640
Total GSF (at 58% Net/Gross Ratio)							6,276 GSF			- GSF			6,276 GSF			- GSF	6,276 GSF

* Shared space - SF prorated

Lewis & Clark College Science Facilities
SRG Partnership, Inc.

Portland, Oregon
Research Facilities Design

Lewis & Clark College Science Facilities
RFD Project No. 2001056-01

FTE	10.58	Professors	10
Count	11	Admin	1
		Lab	-

MATHEMATICS AND COMPUTER SCIENCE
February 13, 2007

Space ID	Space Name	Existing Space Room No.	Existing Space NSF	# of Statns.	Draft Program-1/15/02 NSF	Draft No.	Draft Total NSF	Phase 1 Program NSF	Phase 1 No.	Phase 1 Total NSF	Phase 2 Program NSF	Phase 2 No.	Phase 2 Total NSF	Phase 3 Program NSF	Phase 3 No.	Phase 3 Total NSF	Totals
OFFICE/AMINISTRATIVE/CLASSROOM																	
M/CS3.01	Math Skills Center:						-			-			-			-	0
M/CS3.01a	Work Room	11-006	410	20	960	1	960			-	960	1	960			-	960
M/CS3.01b	Testing Room	11-005	410	10	320	1	320			-	320	1	320			-	320
M/CS3.02	Math Library	12-313B	85		320	1	320			-	320	1	320			-	320
M/CS3.03	Student Study (Quiet)	12-311	118	4-6	120	5	600			-	120	5	600			-	600
M/CS3.04	Group Work Area (w/ computers)	12-301	144	10	320	1	320			-	320	1	320			-	320
M/CS3.05	Computer Science Instructional	17-305	625	24	1,280	2	2,560			-	1,280	2	2,560			-	2,560
M/CS3.06	Computer Science Instructional	17-309	659	18	960	1	960			-	960	1	960			-	960
M/CS3.07	Faculty Offices 12-303-310, 12-313A		1006	1	160	11	1,760			-	160	8	1,280			-	1,280
M/CS3.08	Commons			1	250	1	250			-	250	1	250			-	250
M/CS3.09	Administrative Support	12-313	399 *	1	250	1	250			-	See Shared space list					-	0
	Kitchenette	12-313	200 *				-			-			-			-	0
M/CS3.10	Lab Coordinator Office						-			-	120	1	120			-	120
	Access to shared Conference Room						-			-			-			-	0
							-			-			-			-	0
							-			-			-			-	0
							-			-			-			-	0
							-			-			-			-	0
							-			-			-			-	0
							-			-			-			-	0
							-			-			-			-	0
							-			-			-			-	0
							-			-			-			-	0
							-			-			-			-	0
							-			-			-			-	0
										-			-			-	
Totals			4,056			25	8,300		-	-		22	7,690		-	-	7,690

* Shared space - SF prorated

Total GSF (at 58% Net/Gross Ratio)	Draft Program	Phase 1	Phase 2	Phase 3	Totals
	14,310 GSF	- GSF	13,259 GSF	- GSF	13,259 GSF

Lewis & Clark College Science Facilities — **Portland, Oregon**
SRG Partnership, Inc. — Research Facilities Design

Lewis & Clark College Science Facilities
RFD Project No. 2001056-01

FTE	6	Professors	6
Count	6	Admin	Shared
		Retired	1

PHYSICS DEPARTMENT
February 13, 2007

Space ID	Space Name	Existing Space Room No.	Existing Space NSF	# of Statns.	Draft Program-1/15/02 NSF	No.	Total NSF	Phase 1 Program NSF	No.	Total NSF	Phase 2 Program NSF	No.	Total NSF	Phase 3 Program NSF	No.	Total NSF	Totals
LABORATORIES																	
PH1.01	General Physics	17-303	1043	16	1,280	2	2,560			-	1,280	2	2,560			-	2,560
PH1.02	Advanced Physics	17-226	648	12	640	1	640			-	640	1	640			-	640
PH1.03	Advanced - Optics, etc.	17-237	562	12	640	1	640			-	640	1	640			-	640
PH1.04	Advanced - Experiments	17-111,112	304	12	640	1	640			-	640	1	640			-	640
PH1.05	Science Instrumentation	17-110	830	16	1,280	1	1,280			-	1,280	1	1,280			-	1,280
PH1.06	Faculty/Student Research	12-101	3122	4	480	6	2,880			-	480	6	2,880			-	2,880
	17-106,108A,109,201c,202,203a						-			-			-			-	0
	17-228, 230,236,236B,236D,						-			-			-			-	0
													-			-	0
Subtotal Laboratory Space			6,509			12	8,640		0	-		12	8,640		0	-	8,640
LABORATORY SUPPORT																	
PH2.01	Observatory (Existing)	17-401,501	553				553			-			553			-	553
PH2.02	Storage 17-112A,201,203,303A		1011		320	1	320			-	640	1	640			-	640
PH2.03	Darkroom		175		160	1	160			-	160	1	160			-	160
							-			-			-			-	0
							-			-			-			-	0
							-			-			-			-	0
Subtotal Laboratory Support Space			1,739			2	1,033		0	-		2	1,353		0	-	1,353
										-							
OFFICE/ADMINISTRATIVE/CLASSROOM										-							
PH3.01	Faculty Offices 17-227,229,231,233,235		1033	1	160	8	1,280			-	160	5	800			-	800
PH3.02	Administrative Support	17-226A	114.75 *	2	250	1	250 *			-	See Shared space list					-	0
PH3.03	Lab Coordinator Office										120	1	120				120
	Conference Room	17-232	80 *	Shared w/ Math?						-			-			-	0
PH3.04	Student Study	none	0	4-6	120	4	480			-	120	4	480			-	480
	Workroom	17-224A	53 *				-			-			-			-	0
	Lecture Prep*	17-205	859				-			-			-			-	0
	Must be near Physics can be shared						-			-			-			-	0
Subtotal Office/Administrative/Classroom			2,140			13	2,010		0	-		10	1,400		0	-	1,400
										-			-			-	
										-			-			-	
Totals			10,388			27	11,683		-	-		24	11,393		-	-	11,393

* Shared space - SF prorated

	Draft Program	Phase 1	Phase 2	Phase 3	Totals
Total GSF (at 58% Net/Gross Ratio)	20,143 GSF	- GSF	19,643 GSF	- GSF	19,643 GSF

Lewis & Clark College Science Facilities — **Portland, Oregon**
SRG Partnership, Inc. — Research Facilities Design

Lewis & Clark College Science Facilities
RFD Project No. 2001056-01

FTE	6.7	Professors	7
Count	7	Admin Lab	Shared

PSYCHOLOGY DEPARTMENT
February 13, 2007

Space ID	Space Name	Existing Space Room No.	Existing Space NSF	# of Statns.	Draft Program-1/15/02 NSF	No.	Total NSF	Phase 1 Program NSF	No.	Total NSF	Phase 2 Program NSF	No.	Total NSF	Phase 3 Program NSF	No.	Total NSF	Totals
LABORATORIES																	
PS1.01	Human Neuroscience Lab			25-28	1,280	1	1,280	1,280	1	1,280			-			-	1,280
PS1.02	Animal Physiology Lab (Shared)			15-20	1,280	1	1,280	1,280	1	1,280			-			-	1,280
PS1.03	Computer Lab			25-28	1,600	1	1,600	Share with Computer Science					-			-	0
PS1.04	Human Computer Interaction Lab	11-121	814	15-20	640	1	640	640	1	640			-			-	640
PS1.05	Faculty/Student Research: 11-105,7,18,19,20,22,23,24,25,26,202,203,204		1669				-			-			-			-	0
PS1.05a	Main Laboratory			6-8	240	8	1,920	240	5	1,200			-	240	3	720	1,920
PS1.05b	Waiting Room			3-4	120	8	960	120	5	600			-	120	3	360	960
PS1.05c	Observation/Control Room			2-3	60	8	480	60	5	300			-	60	3	180	480
	Rat Cages	11-131	69				-			-			-			-	0
																	0
Subtotal Laboratory Space			2,552			28	8,160		18	5,300		0	-		9	1,260	6,560
LABORATORY SUPPORT																	
PS2.01	Equipment/Storage Room				320	1	320	320	1	320			-			-	320
PS2.02							-			-			-			-	0
PS2.03							-			-			-			-	0
							-			-			-			-	0
Subtotal Laboratory Support Space			-			1	320		1	320		0	-		0	-	320
OFFICE/ADMINISTRATIVE																	
PS3.01	Faculty Offices	11-232,35,36,39,40,43	1065	1	160	10	1,600	160	7	1,120			-	160	2	320	1,440
PS3.02	Laboratory Assistant Office	None		1	120	1	120	120	1	120			-			-	120
PS3.03	Administrative Support	11-211.1	50 *	2	250	1	250 *	See Shared space list					-			-	0
PS3.04	WorkRoom	11-211.1	63 *	WS & WR Included, share w/ Biology?			*			-			-			-	0
PS3.05	Student Lounge			20	400	1	400	400	1	400			-			-	400
PS3.06	Conference Room	11-201	207 *	Shared w/ Biology			-			-			-			-	0
PS3.07	Student Study Rooms	12-212,13,14,15,16,17	248				-			-			-			-	0
							-			-			-			-	0
							-			-			-			-	0
Subtotal Office/Administrative Space			1,633			13	2,370		9	1,640		0	-		2	320	1,960
Totals			4,185			42	10,850		28	7,260		0	-		11	1,580	8,840
Total GSF (at 58% Net/Gross Ratio)							18,707 GSF			12,517 GSF			- GSF			2,724 GSF	15,241 GSF

* Shared space - SF prorated

Psych faculty would prefer having all space in phase 1
They are also concerned about the size of their neuroscience spaces
These issues should be considered and refined in the next design phase of the project
Adding 2,724 sf to Phase 1 would add $1.3 m to the Total Project Cost if all new construction

Lewis & Clark College Science Facilities
SRG Partnership, Inc.

Portland, Oregon
Research Facilities Design

Lewis & Clark College Science Facilities
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SHARED SPACE
February 13, 2007

	Nat.Shop	ScienceDivision
FTE	1.53	0.92
Count	2	1

Space		Existing Space		# of	Draft Program-1/15/02			Phase 1 Program			Phase 2 Program			Phase 2 Program			Totals
ID	Space Name	Room No.	NSF	Statns.	NSF	No.	Total NSF	NSF	No.	Total NSF	NSF	No.	Total NSF	3 Program	No.	Total NSF	
LABORATORIES																	
SH1.01	Neuroscience/Physiology			24	1,280	1	1,280	1,280	1	1,280			-			-	1,280
SH1.02	Biochemistry			24	1,280	1	1,280	1,280	1	1,280			-			-	1,280
SH1.03	Field Biology/Geoscience			24	1,280	1	1,280	1,280	1	1,280			-			-	1,280
Subtotal Laboratory Space			-			3	3,840		3	3,840		-	-		-	-	3,840
LABORATORY SUPPORT		12-101															
SH2.01	Radioisotope Storage (Low)	17-112B	28		30	1	30			-			-	30	1	30	30
SH2.02	Radioisotope Storage (High)	17-112C	49		50	1	50			-			-	50	1	50	50
SH2.03	Hazardous Waste	None			160	1	160			-			-	160	1	160	160
SH2.04	Gas Cylinder Storage	None			80	1	80			-			-	80	1	80	80
SH2.05	Loading Dock	None?			480	1	480	480	1	480			-			-	480
SH2.06	Animal Suite:						-			-			-			-	0
SH2.06a	Animal Holding Rooms	11-011			120	6	720	120	6	720			-			-	720
SH2.06b	Animal Procedure Room	None			160	2	320	160	2	320			-			-	320
SH2.06c	Cagewash Room	None			160	1	160	160	1	160			-			-	160
SH2.06d	Feed/Bedding Storage Room	None			160	1	160	160	1	160			-			-	160
SH2.06e	Animal Suite Circulation	None			240	1	240	240	1	240			-			-	240
SH2.07	Field Staging/Mudroom	None			120	1	120	120	1	120			-			-	120
SH2.08	Machine Shop 17-205,B,C,207,208, 209A		2439		1,920	1	1,920			-	1,920	1	1,920			-	1,920
SH2.09	Electronics Shop		208		640	1	640			-	640	1	640			-	640
SH2.10	Shop Storage (Trailer)		32				-			-			-			-	0
SH2.11	Student Poster/Easel Storage	None			100	1	100			-	100	1	100			-	100
							-			-							0
Subtotal Laboratory Support Space			2,756			20	5,180		13	2,200		3	2,660		4	320	5,180
OFFICE/ADMINISTRATIVE/CLASSROOMS																	
SH3.01	**Dean's Suite:**																0
SH3.01a	Dean's Office	None		1	160	1	160	Delete					-			-	0
SH3.01b	Administrative Office	17-226A	115 *	1	160	1	160	Delete					-			-	0
SH3.01c	Conference Room	None		8	160	1	160			-	160	1	160			-	160
SH3.01d	Wating Area	None		2	75	1	75	Delete					-			-	0
SH3.01e	Workroom	17-224A	53 *		100	1	100	Delete					-			-	0
SH3.01f	File/Storage Room	None			50	1	50	Delete					-			-	0
	Administrative Support Offices							500	2	1,000	500	1	500				1,500
	Visitor/Emeriti Offices	????		2	160	2	320							Delete			0
	Adjunct Offices							80	3	240	80	2	160				400
	Technician/Post Doc Offices							80	9	720	80	6	480				1,200
SH3.02	Animal Technician Office	None			120	1	120	Included in Tech Offices above					-			-	0
SH3.03	Shop Office	17-206A,206	218	2	160	1	160			-	Included in Tech Offices above					-	0
SH3.04	Lecture Room (Theatre) - tiered			150	2,560	1	2,560			-			-	2,560	1	2,560	2,560
SH3.05	Lecture Room - tiered 12-110,300,17-204,301		6209	80	1,280	2	2,560			-			-	1,280	2	2,560	2,560
SH3.06	Classroom			50	1,280	7	8,960			-	1,280	3	3,840	1,280	4	5,120	8,960
SH3.07	Seminar Room 11-104,137,12-201,202,17-101,102,302,306, 11-		4730	20	640	4	2,560	640	1	640	640	2	1,280	640	1	640	2,560
SH3.08	Lecture Preparation Room **	17-205	859		860	1	860			-			-	860	1	860	860
SH3.09	Computer Room			Distributed & Shared w/ Departments						-			-			-	0
SH3.10	Faculty/Student Interaction			Distributed & Shared w/ Departments						-			-			-	0
SH3.11	Student Lounge	17-126	1189	Distributed & Shared w/ Departments						-			-			-	0
SH3.12	Student Study Areas			Distributed & Shared w/ Departments						-			-			-	0
SH3.13	Exploratorium				200	1	200	200	1	200			-			-	200
SH3.14	Hearth Spaces???			Distributed & Shared w/ Departments						-			-			-	0
SH3.15	IT Support Office				120	1	120	120	1	120			-			-	120
SH3.16	IT Server Room				100	1	100	100	1	100			-			-	100
SH3.17	HazMat/Radiation Safety Office				120	1	120			-			-	120	1	120	120
SH3.18	First Aid Station				100	1	100			-	100	1	100			-	100
SH3.19	Shower/Dressing Room				Pamplin					-			-			-	0
SH3.20	Theatre/Bistro???				Albany					-			-			-	0
SH3.21	Student Science Help Center			Shared w/ Math Skills, Exploratorium?						-			-			-	0
SH3.22	Covered/Secure Bike Storage			20	200	1	200	200	1	200			-			-	200
SH3.23	Main Entrance Lobby/Display				320	1	320	320	1	320			-			-	320
SH3.24	Library/Reading Room				320	1	320			-			-	320	1	320	320
SH3.25	Staff Kitchenette	17-104	154		150	1	150							150	1	150	150
Subtotal Office/Administrative/Classroom Space			13,527			34	20,435		20	3,540		16	6,520		12	12,330	22,390
Totals			16,283			57	29,455		36	9,580		19	9,180		16	12,650	31,410

**PrepRoom Accounted for in Physics also

	Draft Program	Phase 1	Phase 2	Phase 3	Totals
Total GSF (at 58% Net/Gross Ratio)	50,784 GSF	16,517 GSF	15,828 GSF	21,810 GSF	54,155 GSF

Lewis & Clark College Science Facilities — **Portland, Oregon**

SRG Partnership, Inc. — Research Facilities Design

PROGRAM UPDATE

Lewis & Clark College
College of Arts and Sciences

Dean of the College

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January 2, 2007

Michael Sestric
Campus Planner
Lewis & Clark College

Dear Michael,

As promised, here is a tentative plan, in tabular form, for possible expansion of the departments that would occupy a new Integrated Mathematical and Natural Sciences Center at Lewis & Clark. It is important to regard what follows as the best estimate that can be made at this time, based on minimal expansion of the student body over the next thirty years, a reasonable lifetime for the new facility.

Faculty and technical staff members slated to occupy an Integrated Mathematical & Natural Sciences Center over a 30-year period

Department	Tenure-track faculty	Adjuncts	Technicians/Post-Docs
Biology	9	1	4
Chemistry	7	1	4
Geological Science	2	0	0
Mathematical Sciences	8	1	2
Physics	5	1	2
Psychology	9	1	1
Machine shop	0	0	1
Electronics shop	0	0	1
TOTAL	**40**	**5**	**15**

A few explanatory notes are in order:

- The Biochemistry & Molecular Biology Program does not have its own faculty; it consists of faculty from the Biology and Chemistry Departments.
- Administrative support should be calculated on the basis of one staff person for every two departments, excluding Geological Science. Mathematical Sciences is already a compound department (Mathematics and Computer Science) and should be assigned one assistant. Therefore, it is reasonable to plan for three administrative assistants, possibly sharing a common, centrally located space.

- Adjuncts, technicians, and post-docs should share office space when possible.
- I have not made provisions for emeriti faculty. This is always a delicate issue, but we do find ourselves in a difficult budgetary situation and must prioritize space for active members of the staff and faculty.

Please let me know if you need additional information.

Sincerely,

Julio C. de Paula
Dean of the College of Arts & Sciences

A Vision for the Mathematical and Natural Sciences at Lewis & Clark College

Contributors: Julio C. de Paula, Jennifer Carter McGuirk, Gary Reiness, Deborah Lycan, Michael Sestric, Charles Ault, Daniel Rohlf, Chairs of the Mathematical and Natural Sciences Division, PKAL Leadership Initiative Group

October 14, 2006

SUMMARY

To educate students in current and emerging areas of scientific exploration and to promote cutting-edge research by faculty and students, Lewis & Clark College will build the Integrated Mathematical and Natural Sciences Center, a locus of collaboration between the departments of biology, chemistry, physics, mathematical sciences, and psychology.

Located in Portland, Oregon, Lewis & Clark is an independent national college with a proud tradition of excellence in teaching, research, and public service. Its growing reputation for leadership in the mathematical and natural sciences was recognized with a profile in the 2006 Newsweek-Kaplan College Guide. In summer 2005, external reviewers of the biology department stated that Lewis & Clark's program "was among the 20 to 25 best biology programs at liberal arts colleges in the nation." In the last five years, science faculty members have earned 46 grants totaling over $3.9 million, and since 1993, 15 Lewis & Clark students have received Barry M. Goldwater Scholarships, the nation's highest honor for undergraduate science. Our science community is vibrant and highly regarded, but the College's facilities for scientific scholarship have not kept pace with the quality of our faculty and students or the nature of science education. Spaces for departments, classrooms, and laboratories trail national standards for science facilities, impeding progress in teaching and research, especially in rapidly evolving areas such as neuroscience, bioinformatics, and materials science.

The Integrated Center for Mathematical and Natural Sciences will be erected by renovating and expanding the existing Olin Center for Physics and Chemistry and constructing a new structure. The result will be the addition of nearly 135,000 gross square feet of space to existing science facilities, making possible the enhancement of curricular offerings and research opportunities that will make Lewis & Clark unique among its peers in its ability to train students and conduct research at the cutting edge of traditional and interdisciplinary areas of scientific study.

The Center will be completed within five years, will cost approximately $70 million, and will be the centerpiece of a planned comprehensive campaign for Lewis & Clark. The College has the experience to bring the project to completion successfully and in a manner that incorporates sustainable design, while anticipating future technology needs and increases in the number of students and faculty. The Center will match the high caliber of the College's science community and provide optimal space for the development of generations of scientists through innovative teaching and student-faculty collaborative research.

IMAGINING THE FUTURE: CHALLENGES AND OPPORTUNITIES

The beginning of the 21st century poses significant challenges for science education and research. It is becoming difficult to locate boundaries between the disciplines of biology, chemistry, computer science, mathematics, physics, and psychology. Already such fields as biochemistry and molecular biology, which lie at the interface between chemistry and biology, are regarded as mature modes of investigation. Materials science, which guides technological advances with a unique blend of chemistry and physics, is becoming increasingly more important as scientists develop nanotechnology, the design and fabrication of devices as small as clusters of a few hundred atoms. The most significant advances in the investigation of the human mind and behavior are beginning to come from collaborative efforts between biologists, biochemists, and psychologists in the field of neuroscience. Mathematicians, statisticians, and computer scientists are also working with biologists in the new area of bioinformatics to unravel the complexity of such processes as biological evolution and the discovery of new medical treatments. And lastly, the study of the environment will continue to demand that scholars from all fields share knowledge on such diverse topics as atmospheric science, geology, ecology, and public policy. As modes of inquiry evolve, so should the undergraduate curriculum. However, few institutions of higher education are poised to respond effectively to rapid changes in the nature of science.

The mission of Lewis & Clark College is to know the traditions of the liberal arts, to test their boundaries through ongoing exploration, and to hand on to successive generations the tools and discoveries of this quest. By these means the College pursues the aims of all liberal learning: to seek knowledge for its own sake and to prepare for civic leadership. Founded in 1867 and shaped by its three schools—undergraduate College of Arts and Sciences (CAS), Graduate School of Education and Counseling, and Lewis & Clark Law School—the institution is distinguished by its strengths in environmentalism, learning, service, leadership, and scholarship. Lewis & Clark students represent nearly every state in the nation and 43 countries around the globe. Approximately 3,000 students are enrolled each year at the College, with the majority of these (about 1,900) studying in the CAS.

Scientific literacy is a fundamental aim of liberal arts and sciences education at the College. The CAS Mathematical and Natural Sciences (MNS) Division is committed to grounding both MNS majors and nonmajors in the scientific ways of knowing and developing in students sound ability in quantitative reasoning. Students engage in rigorous scientific study that includes participation in original research. The College seeks to provide all science majors with a sound basis for science careers and to ensure that all CAS students graduate with the ability to understand and evaluate scientific and quantitative information. Lewis & Clark recognizes that the scientific skills of experimental design, execution, analysis, and presentation promote critical thinking and effective communication—essential components of engaged citizenship.

For cutting-edge research and curricular development to be successful, three elements of the enterprise must be considered carefully: the motivation and qualifications of the people, the institutional infrastructure, and the continual generation of ideas. Ideas must be the product of a complex intellectual process that tests a scientist's knowledge, creativity, and ability—particularly in this information age—to gather and sort information in rapidly changing fields of study. Unlike the novelist who often engages in solitary battles with a blank sheet of paper, modern scientists often rely on collaborations to develop ideas that are likely to result in new curricula and new contributions to knowledge.

Any scientist must face the challenges described above, but faculty members at liberal arts colleges work in unique environments that present unique obstacles and opportunities for achievement. Because the faculty devotes so much time to teaching undergraduates in traditional classroom and instructional laboratory settings, it is difficult to implement innovative curricula while staying productive in current research areas, to enter a new research area, and to be competitive in a rapidly changing research environment where principal investigators at large universities have the edge on productivity. Yet the environment at a liberal arts college is less rigid and allows for rapid movement into new areas and new collaborations. For example, the faculty is not under constant pressure to raise very large sums of money to maintain research programs capable of producing very large numbers of papers. Also, liberal arts colleges tend not to punish their faculty—particularly after tenure—for taking certain risks, such as drastically changing research areas and making extensive use of collaborations. Very importantly, the undergraduate curriculum at liberal arts colleges can evolve rapidly to respond to changes in the worlds of ideas and technology. The key to this evolution is the realization that research—the acquisition of new knowledge—develops the intellectual and technical skills required for scientific work in the 21st century. Examples from several institutions, including Lewis & Clark, show that it is far easier to integrate cutting-edge research activities into the undergraduate curriculum at liberal arts colleges than at larger, doctoral institutions where research is done primarily by graduate students.

As it seeks to shape the future of its programs in the mathematical and natural sciences, Lewis & Clark College will take advantage of the inherent flexibility of the liberal arts setting to make significant changes in its science curriculum and its research environment. What follows is a plan for articulation and implementation of these changes, which will make Lewis & Clark unique among its peers. The key element of the strategy is bringing faculty and students together in both teaching and research, along the way achieving greater integration between disciplines and preparing students for careers in such emerging fields as nanoscience, neuroscience, and bioinformatics.

REGARDING THE PRESENT: THE MATHEMATICAL AND NATURAL SCIENCES AT LEWIS & CLARK COLLEGE

Before planning for the future, it is important to understand the current state of the mathematical and natural sciences at Lewis & Clark. The MNS Division consists of 30 tenure-track faculty offering majors in seven disciplines: biochemistry, biology, chemistry, environmental studies/geology, mathematics, mathematics and computer science, and physics. Six faculty members are in chemistry and eight in biology, with five constituting the biochemistry/molecular biology faculty. There are also ten faculty members in mathematics and computer science, one in environmental studies/geology, and five in physics, including two biophysicists. In addition, faculty in the social science of psychology and faculty in biology collaborate on biopsychology research and curriculum. The CAS also offers courses in pre-health/pre-medicine and engineering. For this latter field, Lewis & Clark partners in a 3-2 program with the nationally recognized engineering programs of Oregon Health & Science University OGI School of Science & Engineering, Columbia University, Washington University in St. Louis, and the University of Southern California.

Expectations for faculty emphasize excellence in teaching and in research, including a substantial focus on scholarship as a requirement for promotion and tenure. The College has long understood the importance of faculty engagement in their fields and the special role of undergraduate colleges in the preparation of future scientists. This institutional philosophy is in agreement with that espoused by Donald Kennedy, president emeritus of Stanford University and editor-in-chief of *Science*, who said in the October 22, 2001, issue of *Chemical and Engineering News* that undergraduate colleges provide a vital focus on “the process of learning science and the mode of inquiry....They’re able to pay individual attention to their students and make sure that every one of them gets a full dose of laboratory experience. And in the absence of graduate students they make undergraduate participation in original faculty research a requirement.” The opportunities that exist for undergraduate students at liberal arts colleges were highlighted in the 2006 Newsweek-Kaplan College Guide article “Under the Microscope,” which profiled cutting-edge science research at Lewis & Clark. Our program and those of other small schools enable students to benefit from low faculty-to-student ratios, which are critically important in the hands-on teaching and learning that science demands. As a consequence, comparatively small schools like Lewis & Clark are able to “compete with world-famous institutions such as Berkeley or Michigan, with their unparalleled resources.”

Fittingly, a hallmark of the Division is the endowed John S. Rogers Science Research Program, developed in the early 1990s with the support of the M.J. Murdock Charitable Trust. Each summer, the program supports student-faculty research in biology, chemistry, mathematical and computer sciences, geological science, and physics. About 30 students participate annually, investigating individually or in small groups of two to four students with a faculty mentor. They present their research to the campus community at summer brown-bag lunch sessions and again in the fall at an on-campus poster conference. Other students participate in research projects off campus through programs including the National Science Foundation’s Research Experiences for Undergraduates program. Students also conduct research during the academic year, and research teams at the College often present results at regional and national conferences and publish in peer-reviewed journals of the highest quality. Thus close to half the graduates in the natural sciences have independent undergraduate research experience, as do about a third in mathematics and computer science.

These students are guided in their research endeavors by experienced and active scientists who are dedicated to teaching; three of the College's last six student-selected Teachers of the Year were from the MNS Division. Currently, the faculty in the MNS Division are funded by both federal (NIH, DARPA, NSF) and private (Research Corporation, American Chemical Society, M.J. Murdock Trust) agencies. Since 2001, MNS faculty members have received 45 grants totaling over $4.5 million. Undergraduates are full partners in this research enterprise; since 2000 over 50 of them have published jointly with faculty in national and international journals—and these students have distinguished themselves in other significant ways. Since spring 2000, seven MNS students have earned Barry M. Goldwater Scholarships (15 since 1993), the premier undergraduate award in science, and three have earned National Science Foundation Graduate Research Fellowships. One of the Goldwater recipients also received a Howard Hughes Medical Institute Predoctoral Fellowship in Biomedical Sciences, and one of the NSF fellows received a Fannie and John Hertz Foundation Fellowship. The Division has also been home to four Morris K. Udall Foundation scholars; two of these students received the Udall award twice (for a total of six awards at the College). The highest achieving graduate of the College each year receives the Rena Ratte Award, and students of natural science have won that award three of the last five years, while representing less than 25% of the student body. In addition, the College's own honorary society, the R. B. Pamplin Society, inducts seven fellows from each class whose academic performance and leadership credentials distinguish them from their classmates; since 2000 two to three Pamplin scholars each year have been science majors.

Our students have accomplished so much as undergraduates because they are mentored by faculty who are themselves outstanding scientists and teachers, such as:

- Kellar Autumn, Associate Professor of Biology, who studies the way in which geckos move and adhere to smooth surfaces. His work, published with six student coauthors in *Nature*, *Science, the Proceedings of the National Academy of Sciences*, and other prestigious journals, has been featured in *Discover* and *Fortune* magazines.
- Greta Binford, Assistant Professor of Biology, who uses evolutionary approaches to understand patterns of diversity in spider venoms. A member of the Lewis & Clark faculty since 2003, she received one of the highly coveted NSF CAREER Awards, given only to the most promising young scientists, in 2006.
- Louis Kuo, Professor of Chemistry, who studies new catalysts that degrade nerve gases. He also is interested in the catalytic mechanisms of ribozymes from archeobacteria. Funded by NSF and the American Chemical Society, Dr. Kuo has published with seven student coauthors since 2000.
- Stephen Tufte, Associate Professor of Physics, who studies the interstellar medium, the material between stars. His work has been published in such prestigious journals as *Nature*.

Also in the past several years, the College has received three significant grants to support the advancement of science education at Lewis & Clark. The Andrew W. Mellon Foundation issued a grant to support the development of the environmental studies program, the W.M. Keck Foundation supported the enhancement of computer science at the College, and the Sherman Fairchild Foundation made a grant to support the enrichment of science education via the purchase of scientific equipment.

As the national recognition and support for the MNS Division and its community has grown, so too has the percentage of students majoring in MNS disciplines. Over the period 1985 to 1997, 9.4% of Lewis & Clark graduates majored in the natural sciences. Almost 18% of the students who graduated in 2004 majored in the natural sciences (biochemistry, biology, chemistry, or physics), 5.6% in mathematics or mathematics and computer science, and 3.5% in environmental studies. The percentage of natural sciences graduates since 2000 has ranged between 11.9% and 17.8% (mean 14.7%), 50% higher than our baseline figures for the classes that graduated between 1985 and 1997.

Faculty in biology, chemistry, mathematical sciences, physics, and psychology are housed in three dedicated science buildings: Biology/Psychology building, BoDine building, and Olin Center for Physics and Chemistry. The department of mathematical sciences, including computer science, has offices in a building separate from its classrooms and laboratories. None of these buildings is meeting current research and teaching needs. While Olin can be renovated, cost is prohibitive for upgrading Biology/Psychology and BoDine due to building design.

The College's outstanding science teacher-scholars and students are working in outdated facilities. The College's three science buildings, all built before 1979, do not meet the needs of current and future scholarship in the natural sciences. They were not designed to accommodate change and fall far behind national standards for research and study space. Lewis & Clark must expand and renovate the Olin Center for Physics and Chemistry and construct a new laboratory and classroom facility to provide our community with space that meets current needs and anticipates those of the future, to support our faculty and students in making scientific discoveries of lasting importance, and to prepare increasingly capable scientists for service in our world.

Nationally, science buildings constructed between 1960 and 1970 have become obsolete. The efforts of Lewis & Clark faculty, highlighted by increased dedication to research activity and emphasis on active learning by students, represent a prime example of how the nature of teaching and research has evolved, yet the buildings in which our faculty and students explore remain in the past. They were not built to accommodate new and unanticipated technologies, such as computers and emerging computer-based technologies for teaching and research. In addition, classrooms with lecture-style seating and fixed-seating setups do not support the rigorous exploration we desire—investigation in which students work independently or in small groups to learn science by doing it.

Classroom and laboratory space also fail to meet needs, as well as national norms. In 2002, Lewis & Clark hired the science facilities planning firm of Research Facilities Design to evaluate the instructional, research, and conference space that 15 peer and aspirant colleges dedicate to biology, chemistry, mathematics and computer science, geology, physics, and psychology. Evaluated schools included Carleton College, Grinnell College, Macalester College, and Willamette University. The study found that these colleges provided an average of 74,562 net square feet for departmental space, whereas Lewis & Clark provides 43,372 net square feet. This is a difference of 31,190 net square feet—a great disparity in space available for teaching, research, and collaborative conversation.

Lack of appropriate space impedes pedagogy and investigation, not just when looking at the overall space allotted for the sciences currently at Lewis & Clark, but when looking at the individual classroom and laboratory level. To meet the increased needs for space that have come with a greater emphasis on doing research and with small increases in faculty, Lewis & Clark has converted instructional facilities into research suites and reduced classroom space to enable the creation of small laboratories, but they still fail to meet student and faculty demand for teaching and research facilities of high quality. Furthermore, space in the mathematical and natural sciences does not meet our commitment to ADA and federal safety guidelines.

Although Lewis & Clark science faculty and students have achieved for themselves and the College national accolades, our inadequate facilities have hindered recruitment and retention of talented faculty. As we seek to improve academically, we need to be able to offer current faculty and potential hires adequate research space. In doing so, we also provide our students with the best possible science education. One byproduct of the accretion of spaces for laboratories and offices has been a reduction in the space for students and for student-faculty or faculty-faculty interactions. One by one, student lounges or student-faculty break rooms have been converted to other uses. Faculty can meet with each other and with students only in faculty offices. The MNS Division deserves space that supports its growth as a community of scholars and encourages the cross-pollination of ideas across disciplines.

Renovation and construction are also vital to raising the visibility of the sciences with the entire campus community. The three science buildings are located outside of usual pedestrian traffic patterns on campus, which renders the sciences relatively invisible to the nonscientists on campus. It is necessary to build facilities that symbolically bring the campus closer together, reflect Lewis & Clark's value of scientific knowledge and inquiry, and recognize the increasingly central role of the sciences and technology in our interdependent world.

PLANNING FOR THE FUTURE: THE INTEGRATED CENTER FOR MATHEMATICAL AND NATURAL SCIENCES

To make Lewis & Clark unique among its peers in its ability to meet the challenges of educating students for careers in science in the 21st century, the institution will integrate the sciences by paying equal attention to building modern facilities and to fostering collaboration between the teacher-scholars and students who bring the classrooms and laboratories to life. Lewis & Clark's faculty will eliminate walls and habits that have hindered progress in interdisciplinary areas of scientific inquiry requiring constant and organic dialog between the traditional disciplines of biology, chemistry, physics, mathematics, computer science, geology, and psychology.

By institutionalizing collaborative work, Lewis & Clark will develop interdisciplinary curricula and provide research experiences to undergraduates that incorporate elements of biochemistry, molecular biology, bioinformatics, materials science, environmental studies, and neuroscience.

The first step toward integration will be the design and construction of new facilities for science education and research. Working with science faculty and administrative staff, the firm Research Facilities Design analyzed space at comparable institutions and determined that Lewis & Clark College should have approximately 189,000 gross square feet to meet future space requirements. The net new space required to meet standards among our national peers is approximately 134,652 gross square feet.

Soderstrom Architects, a firm experienced in the design of undergraduate science facilities, evaluated the space allocation requirements that Research Facilities Design developed. This effort resulted in a working design of the Integrated Center for Mathematical and Natural Sciences, a cluster consisting of one new three-story building of 112,500 square feet, a remodeled 55,000-square foot Olin, and a 12,000-square foot addition to this existing building. The project will also add 10,000 square feet of new space on two below-grade levels between the new building and Olin.

The new structure and Olin will be connected by a covered walkway/bridge to facilitate interaction among faculty, staff, and students. Olin and its partner building will be focused around an outdoor plaza that serves as a gathering space for the entire campus. They will be linked together to provide a welcoming entrance to students, science majors and nonmajors alike, as they come to the buildings for courses or for the casual conversation that is central to the college experience. These informal gathering spaces will be complemented by logically arranged spaces for formal interaction. The new building will be organized in two parts, the front third for offices and classrooms and the back third for laboratories. Special attention will be given to creating spaces that support collaboration across departments.

Safety and regulatory issues, including ADA standards, have been foremost in planning; the buildings will be constructed to anticipate more stringent future requirements. Additionally, the plan takes into account the growth of the faculty and student bodies. We are highly cognizant that a new building constructed just large enough to serve current needs will be quickly outgrown, and that science facilities that do not encourage interdisciplinary collaboration will be unable to support the new areas of scholarship that are emerging at the boundaries of existing disciplines.

The Center will be designed to accommodate new technologies. Facilities are being planned for maximum flexibility to enable future cost-effective remodeling or reconfiguration. Instructional and research rooms will meet space standards and be equipped to meet technology needs, such as providing wired and wireless access to the Internet via laptop computers. Classroom space, in particular, will encourage students to be active participants in science exploration with one another and with their teachers.

Rooms will give students ready access to learning resources over computer networks. Movable seating will be the standard, making it easy to divide classes up into small discussion or working groups. This design will also allow faculty members and students from every department at the College to take advantage of the Center's premier facilities.

The Center will also reflect the College's commitment to environmentalism. Recent building projects at Lewis & Clark have received regional and national recognition for their "green" building designs. We plan our buildings to meet the stringent standards of the U.S. Green Building Council's LEED (Leadership in Energy and Environmental Design) program, and have done so with long-term benefits to the campus and larger community. Lewis & Clark is home to a LEED Gold certified teaching and research facility and a LEED v2 Silver certified residence hall.

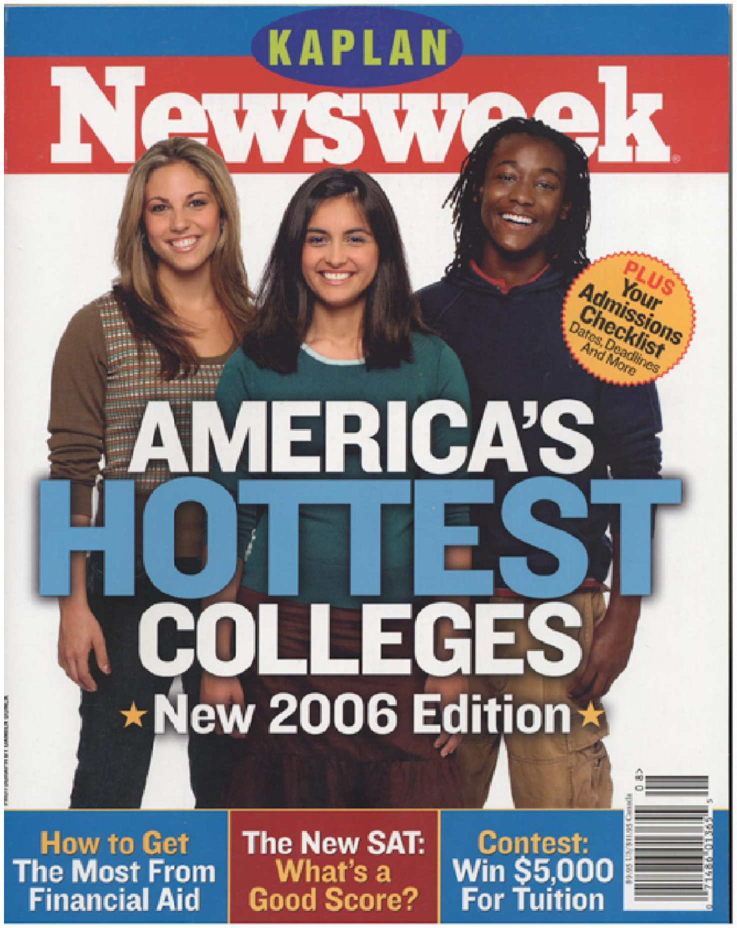
This essential building project will make possible the second step in our plan for integration and innovation: achieving a new level of scientific exploration and achievement at Lewis & Clark. By facilitating collaboration, the Center will make possible several new interdisciplinary educational and research programs. Already being discussed are initiatives in neuroscience, materials science, and bioinformatics. A few liberal arts institutions have made curricular advances in these areas, but Lewis & Clark can mount more comprehensive and modern programs by drawing upon existing faculty expertise and using the latest technology to outfit instructional and research spaces that are designed specifically for such interdisciplinary work.

New curricular and research initiatives will be the main outcomes of a new Faculty Development Program featuring workshops and seminars that will retrain the faculty and foster collaborations. Teams of faculty members from several departments will spend one or more weeks during the summer months exploring a topic with the help of experts who will visit the College for seminars and tutorials. That the retraining and discussions will happen at the College and not at a remote location will make it possible for the workshops to occur with minimal disruption of teaching and research activities at the College.

The Center will be a locus for collaboration between the College's three schools. First, the Lewis & Clark Law School has faculty with teaching and scholarly interests at the interface between law and science, particularly environmental science. Activities at the Center will be designed to enhance dialog in these areas of inquiry. Second, each year the Graduate School of Education and Counseling awards over ten Master of Arts in Teaching degrees to students who become licensed to teach in mathematics, biology, chemistry, physics, or general science. Their responsibility is to make science inviting, accessible, and useful to children and adolescent learners. To do so, they must pay careful attention to context and technique. Context makes the purpose and value of science meaningful; technique makes its practice possible. In order to understand the context and techniques of evolving disciplines, new teachers need the opportunity to communicate with scientists in the College of Arts & Sciences. A common space for faculty and students from both schools would promote thinking about curricular innovations that can benefit K-16 education both locally and nationally.

The Center's activities will not serve the College only. Our aim is to create a combination of facilities and programming that will make Lewis & Clark the premier gathering place for scientific exploration and discussion in the Portland area. With state-of-the-art facilities and capitalizing on collaborations involving its faculty members, the College will be able to host scholars from around the world to teach and conduct extensive research projects. To widen the scope of the Center's programming, we will establish a strong lecture series featuring eminent scientists who do not visit the Portland area frequently. Attendance of these events will be open to our colleagues from nearby institutions, such as Linfield and Reed Colleges, the University of Portland, Portland State University, Willamette University, the University of Oregon, Oregon State University, and the Oregon Health & Science University and its OGI School of Science & Engineering.

The estimated project cost for establishing the Center is $70 million, with a project timeline of five years. Lewis & Clark intends to begin construction as soon as possible, with full building occupancy and use in time for the beginning of the 2011 academic year. The Integrated Center for Mathematical and Natural Sciences, conceived as a collection of innovative and dynamic programs carried out in state-of-the-art facilities, will attract the best scientific talent to Lewis & Clark College, from the brightest students wishing to pursue careers in science or enhance their scientific literacy to the most energetic young faculty seeking the ideal academic environment to develop into prominent teacher-scholars.



TRENDS

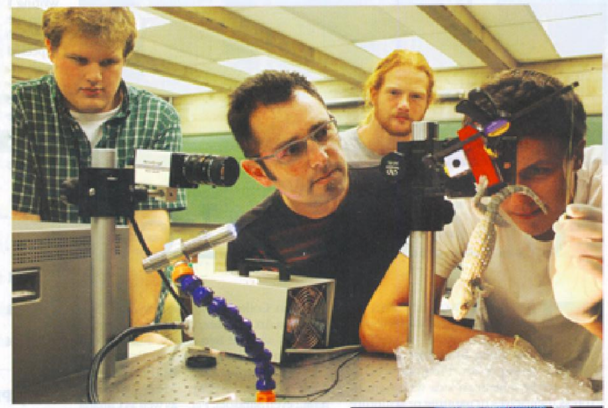
Under the Microscope

Big research universities have traditionally produced the best scientists. But studying science at small schools can really magnify a student's learning.

By DAVID WOLMAN

KJELL SCHRODER, A SOPHOMORE at Lewis & Clark College, figured he was going to spend his summer at home in Washington state—bagging groceries. So when his biology professor offered him a chance to work instead on a cutting-edge research project, Schroder jumped at the chance. With Jimi Hendrix's "Electric Ladyland" blaring in a basement lab, Schroder trains a video camera on a gray and orange gecko, and jots measurements in a logbook. He's part of a team studying the physics of how gecko feet stick to different surfaces. These adhesive properties may someday be applied to medical, electronic and even sporting-goods technologies (think gloves for rock climbers). By the end of the summer, the student team hopes to publish its data in a top-tier scientific journal. "This is a chance to do unique research, which is rare at our age," Schroder says.

While aspiring scientists once pinned their hopes on powerhouse research universities such as the University of California, Berkeley, or the University of Michigan, these days they do just as well—if not better—at small liberal-arts schools like Lewis & Clark in Portland, Ore. Over the past decade undergraduate science education at liberal-arts schools has undergone a quiet renaissance. "Many of the small colleges are focusing more on research because it resonates so well with the personalized education that is central to their missions," says Tim Elgren, president of the Council on Undergraduate Research and an associate professor of chemistry at Hamilton College. The results are impressive: according to the National Science Foundation, small colleges enroll only about 8 percent of all undergraduate students, yet between 1996 and 2002, they produced 15.5 percent of all future Ph.D.s in science and engineering.



UP CLOSE AND PERSONAL: Lewis & Clark's Autumn (center), with his students, studies geckos in the biology laboratory. Gecko feet (magnified, right) come in a wide range of colors, shapes and sizes.

How could a comparatively tiny school like Lewis & Clark compete with world-famous institutions such as Berkeley or Michigan, with their unparalleled resources and enough Nobel laureates for a softball team? One key is that smaller schools have much lower faculty-to-student ratios, which is especially crucial because scientific skills are more hands-on than, say, history. "From the intimate classroom setting to the research lab, science students at these schools get direct access to the faculty," says Julio de Paula, Lewis & Clark's dean. "Kjell showed up on my doorstep saying he'd read all my papers," says biology professor Kellar Autumn, who promptly welcomed Schroder to the gecko team and arranged funding for his summer position.

During her first two years at George Washington University, Meghan Dunn found that even the graduate students "were too busy doing their own thing" to show her the ropes in the lab. So Dunn transferred to Hamilton College in upstate New York. There, under the watchful eye of chemistry-department chairman George Shields, Dunn and another student have published two papers on computational chemistry and presented their work at a symposium. "I didn't think about the lab-experience issue when I was looking at schools," says Dunn, who plans to highlight her training in her applications to Ph.D. programs in environmental chemistry. "I guess I should have."

To better serve women undergrads like Dunn, schools small and large are trying to become more hospitable places to study science. In early 2005, Harvard president Lawrence Summers sparked a national debate by questioning whether men were innately more gifted at the high-powered math that can fuel science careers. Even before Summers's remarks, the lack of women science professors had been the subject of hundreds of white papers and conferences.

Today most of the big research institutions and Ivies have initiatives in place to better accommodate women students and professors. At Michigan, faculty are using a grant from the National Science Foundation to train a theater troupe to perform sketches on gender bias for groups of faculty, deans and department chairs. At Berkeley, reformers are pushing to make academic life easier on working moms on the faculty. Among the likely fixes: new mothers may get up to two terms off (with pay) from teaching duties, and faculty will be able to shift temporarily to part-time work to meet family demands. At every school, the hope is that these changes will help bring more women onto science faculties.

Men or women students who take the small-college route to a science career will find themselves in good company. The ranks of top scientists include luminaries such as Thomas R. Cech, president of Howard Hughes Medical Institute, who graduated from Iowa's Grinnell College, and Peter Agre, who earned his B.A. from Minneapolis's Augsburg College and went on to win the 2003 Nobel Prize in Chemistry. "Science isn't only about experiments," says Caltech president David Baltimore (B.A., Swarthmore College), who won the 1975 Nobel Prize in Physiology or Medicine. "It's about interacting with people, writing, speaking—it is a social as well as an intellectual enterprise. A small liberal-arts school can be a more effective place to develop those skills." For, as every scientist knows, great things can grow in a small petri dish.

With GILLIAN GILLERS

WOLMAN is a journalist based in Portland, Ore.

LEFT TO RIGHT: SHANNON SMITH—COURTESY OF LEWIS & CLARK COLLEGE; DR. PAUL STEWART—BBC; COURTESY OF THE FARRELL FAMILY

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The Biology department at Lewis & Clark College seeks to build a science education program of national stature. Our primary goal is to provide a research-rich curriculum that is relevant, exciting and engaging. Three principles guide our efforts. First we seek to anticipate new frontiers in biological research and thus to hire new faculty who will be positioned to make important contributions to scientific inquiry for years to come. Second, we seek to recruit and retain teacher-scholars of the highest caliber who are committed to research involving undergraduates, and teaching that involves research. Third, we seek to build an educational program that will prepare students to solve the integrative and interdisciplinary problems of the future.

In the past 15 years, Lewis & Clark College has invested considerable resources towards its goal of becoming a liberal arts college of national repute. The Biology department has been a leader in this transformation, recruiting faculty who have developed externally funded research programs and involved undergraduates in that research. It is now the case that seven of eight of us have an active research program involving undergraduate students. Our faculty have garnered national research grants from DARPA, NIH and NSF, including the prestigious NSF Career Award, for their research with undergraduates. During both the summer and the academic year, the research labs downstairs are now bursting with busy undergraduates doing original research projects. These students are now frequently co-authors are papers published in the best professional journals in the discipline; in PNAS, Molecular Biology of the Cell, Evolution and Genetics.

One of the first consequences of our success in involving students in research was a new and shared enthusiasm for revising the teaching curriculum. Observing the way research experience transformed our students into independent thinkers led us to discuss how we could create courses for our other students that would achieve the same outcome. Over a decade, we have transformed our curriculum into one that is very research-rich, open ended and investigative. Starting in our freshman-level foundation courses, students get the chance to design experiments and analyze data, and in their upper division courses, they have even more independence, often working on projects of their own and/or writing grant proposals. We have seen a significant increase in the scientific sophistication of our graduates, and an increase in the percentage that go on to top graduate and professional programs. We are committed to maintaining both our commitment to innovative curriculum development and teaching, and to supporting active scholars whose research is significant and involves undergraduates.

Our third goal is to address the need for interdisciplinary training of our students. Science graduates in the 21st century will increasingly need to grapple with problems that require multidisciplinary solutions. Not only is science divided into traditional disciplines like chemistry, biology and physics, but the discipline of biology has itself fractured in the last 50 years into sub-disciplines. Departments that seek to teach the breadth of biology can find their students dividing into separate “molecular” and “organismal” camps. It has been our goal for some years to teach and do research in a way that erases sub-disciplinary boundaries. Our last two hires, for example, were investigators whose research questions span the organismal and molecular levels. Greg Hermann uses genetics, molecular and cell biology in the worm *C. elegans* to understand how multi-cellular organisms are put together during embryonic development, and Greta Binford uses molecular systematics to study spider evolution and venom protein evolution. In addition to eliminating divides within the department, we have been building bridges to other disciplines; over 10 years ago we created a Biochemistry/Molecular Biology program that is supervised and sustained by faculty from Biology and Chemistry. More recently Biology faculty participated in the creation of an interdisciplinary Environmental Studies program, and helped design the conservation biology concentration for these students. Three faculty members in the department are participating in Merck-AAAS supported collaborative research projects with faculty in Chemistry. Looking to the future, we are beginning to discuss ways to bridge other divides, such as those between Biology and Psychology and between Biology and Math. A workshop this summer focused on ideas for developing a neuroscience track involving biology, biochemistry and psychology faculty, and we are beginning discussions with faculty in math with expertise in statistics and computer science to plan how to develop coursework in bioinformatics/genomics.

COST UPDATE

Rider Hunt
Levett Bailey

NEW CONSTRUCTION - SCIENCE and CLASSROOM FACILITIES - COST DATA
Lewis and Clark

	Comparable Facilities	Location	Stage of Project	Cost Data Source	Time of Estimate/Bid	GFA (sf)	Cost per sf ($)	Escalation Point	Total Construction Cost ($) Less Sitework	Work Type	Description of Facility
1	UPS	Washington	Complete	Estimate	2004	48,044	358	Escalated to 1Q2007	17,200,210	New Construction	3 Storey facility
2	WSU	Washington	Pre-Design	Estimate	Not Yet Bid 2006 Estimate	56,250	358	Escalated to 1Q2007	20,142,549	New Construction	3 Storey including Basement applied technology & Classroom Building
3	Onami	Oregon	Under Construction	Bid	2006	28,635	304	Escalated to 1Q2007	8,696,570	New Construction	Mainly basement construction, some unfinished space
4	OIT - Phase 1	Oregon	Under Construction	Bid	2006	42,371	251	Escalated to 1Q2007	10,622,232	New Construction	3 Storey facility

Notes
Costs per sf excludes basement work and sitework (except part basement for UOO).
All projects are escalated to 1Q2007.
Bid costs used where available.
Onami cost per sf is lower as there was some fit out costs excluded from the contract.

Rider Hunt
Levett Bailey

NEW CONSTRUCTION - CLASSROOM and OFFICE FACILITIES - COST DATA
Lewis and Clark

	Comparable Facilities	Location	Stage of Project	Cost Data Source	Time of Estimate/Bid	GFA (sf)	Cost per sf ($)	Escalation Point	Total Construction Cost ($) Less Basement & Sitework	Work Type	Description of Facility
1	UOO School of Music & Dance	Oregon	95% CD	CD Estimate	Dec-06	18,983	297	Escalated to 1Q2007	5,634,839	New Construction	3 Storey inc part Basement
2	PSU Recreation Center	Oregon	Concept Design	Concept Estimate	Oct-06	200,570	247	Escalated to 1Q2007	49,580,307	New Construction	5 storey
3	Clatsop Community College	Oregon	Cancelled	Schematic Estimate	Nov-06	176,836	225	Escalated to 1Q2007	39,845,330	New Construction	3 Storey. Basement and Sitework excluded
4	Stout Hall	Washington	?	Estimate	2005	19,880	210	Escalated to 1Q2007	4,181,116	New Construction	?

Notes
UOO Costs per sf is higher due to the considerable acoustic requirements included in the building.
Costs per sf excludes basement work and sitework (except part basement for UOO).
All projects are escalated to 1Q2007.
Bid costs used where available.

Rider Hunt
Levett Bailey

NEW CONSTRUCTION - SCIENCE and CLASSROOM FACILITIES - COST DATA
Lewis and Clark

Shell Only Costs For Science Buildings - Order of Magnitude

The cost of TI depends on Level of Shelling. Using the OIT project Phase 1 for example, the Shell and Finishes Costs were approximately;
OIT is a low range cost.

Architectural		Fit Out Cost $/sf
	Partitions (assume full exclusion of partitions on cost per sf)	14
	Interior Doors (assume full exclusion of partitions on cost per sf)	3
	Fittings & Equipment	35
	Wall Finishes	5
	Floor Finishes	4
	Ceiling Finishes	4
		$ 65

MEP		Total $/sf		Shell Cost $/sf		Fit Out Cost $/sf
	Plumbing	$ 8.00		$ 3.00		$ 5.00
	HVAC	$ 29.00		$ 20.00		$ 9.00
	Fire Protection	$ 3.00		$ 2.50		$ 0.50
	Service & Distribution	$ 11.00		$ 11.00		$ -
	Lighting & Power	$ 12.00		$ 4.00		$ 8.00
	Communications & Security	$ 4.00		$ 2.00		$ 2.00
		$ 67	sf	$ 43	sf	$ 25

Note : split of base building & TI depends on configuration and user requirements.

Total Fit Out Cost without Markups (Low Range Cost)	$ 90
Total Fit Out Cost with Markups (Low Range Cost)	$ 107
Adjust Total Fit Out Cost with Markups (to Mid Range Cost)	$ 128
Adjust Total Fit Out Cost with Markups (to High Range Cost)	$ 151

Summary	**Total $/sf**	**Shell $/sf**	**TI $/sf**
High Range	358	207	151
Mid Range	304	176	128
Low Range	251	144	107

Notes: Summary cost inclussive of margins & adjustments
Assumes total elimination of finishes on a cost per sf basis