Engineering and Technology Industry Council
Capacity Investment Plan
Biennium from July 1, 2003 to June 30, 2005

Campus: **University of Oregon**
Contact Name: **Dave Johnson (MSI) and Michal Young (CIS)**
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Summary of Proposal: This proposal combines UO's materials and computer science initiatives for the 03-05 biennium.

CIS Goals

The over-arching goals of Computer and Information Sciences (CIS) initiatives during the 03-05 biennium are to attract and retain top undergraduate and graduate students, particularly those who would not choose to study computer science in Oregon except for the availability of a high quality, research-oriented computer science department in a comprehensive research university. We will exploit the current abundance of fine graduate students, while increasing the attractiveness of the undergraduate program to top students, maintaining the capacity to grow as the high-tech economy rebounds, and strengthening ties to Oregon high-tech industry through an expanded internship program.

University of Oregon's CIS department is currently strongest among Oregon departments granting both graduate and undergraduate degrees, but not as strong as desired to attract and retain the very best students in Oregon. In the most recent (1993) ranking by the National Research Council, CIS is ranked 61st. UO and OGI were tied at 60th in the 2002 US News and World Report rankings of graduate programs in computer science; OSU tied was tied for 67th and no other Oregon university was ranked. UO as a whole is the only Oregon university ranked by US News in the top 126 national programs (tiers 1 and 2; OGI/OHSU is not eligible for that ranking because it has no undergraduate programs). Our realistic goal is to reach 48 in NRC rankings (an improvement of 21%) and to be ranked by US News in at least one research specialty. Other measures of success are detailed under "Results," below.

MSI Goals

The Materials Science Institute (MSI) has pursued a long-term strategy to make MSI a leading materials research center in the region, as well as nationally. The first stage (recruiting outstanding faculty, establishing nationally competitive research programs and acquiring basic materials characterization equipment) was successfully accomplished with 10 of the first 12 faculty receiving prestigious national investigator awards. During the last biennium, 3 additional faculty connected with the MSI also received these national awards, thus continuing our tradition of hiring excellent faculty. The second stage of our plan was establishing working relationships with industry and creating innovative educational programs in materials chemistry and physics, enabling the expansion of our graduate program at both

the Masters and Ph.D. level by attracting more and higher quality students. The creation and equipping of CAMCOR, currently underway, is the third stage of this strategy. The added capabilities in materials preparation and characterization will not only dramatically enhance our existing, thriving research and educational programs, but positions us to recruit outstanding new faculty and graduate students and enable new research directions. While continuing the excellence created in the first three stages of this process, the next stage of our long-term strategy is to partner with other Northwest institutions to attract center funding to the region, both at the undergraduate and graduate levels.

MSI created its successful Masters Internship program in 1998 through faculty voluntarily assuming the required new course teaching assignments through course overloads and devoting time to both arrange and monitor internships. The funds requested here would permit the hire of one additional faculty member. If additional funds are available to the UO in this biennium, MSI could pursue a second hire that would eliminate the current teaching overloads assumed by faculty when the semiconductor and polymer internship programs were initiated. In the absence of such additional funds (estimated at $800K for salary and benefits, equipment, research start-up, etc.), that hire would be postponed until the 05-07 ETIC request. With an up-turning economy and a redoubled effort to recruit the best possible students to both the Ph.D. and Masters Internship programs, we aim to expand the number of students while increasing their quality. There is a strong drive for excellence within the MSI as apparent in its accomplishments to date. We aim to continue to increase outside funding received by institute members, enabling us to move up in national ranking as detailed in the metrics summary.

CIS Investment Rationale

The overall rationale of the UO CIS plan is to fill an important niche in the overall ETIC portfolio. A strong computer science program in a research university lacking an engineering school is capable of attracting and training students at least as good as, but different than, those who choose engineering schools. By focusing on its unique strengths, UO CIS can serve top students who would otherwise be lost to Oregon.

We will focus on a small number of core research strengths. Two ETIC hires in the 01-03 biennium built an exceptionally strong research program and undergraduate and graduate curricula in networking. Networking courses are extremely popular, and a large proportion of graduate applicants indicate research interests in networking. Moreover, the networking research group has attracted industrial research support from Intel and Cisco, in addition to NSF research funding. The third of three years of ETIC support for these two hires is included in the 2003-05 proposal, after which the salaries will be assumed by UO.

Building on strengths in networking and bridging to highly successful research programs in high-performance and scientific computing, we seek to build an active research program and curriculum in distributed (internet and web-based) informatics. Complete support of a new hire, as we planned in an earlier version of this proposal, is not possible at the reduced budget level. Since this area is crucial to building a strong, coherent program that attracts top students as well as research funding, we have expanded a search that was originally slated to replace a faculty member in programming languages to include distributed informatics. The requested funding in this reduced proposal includes an attractive start-up package to attract a top candidate. The major portion of this start-up package will be graduate student salary, providing additional leverage for the ETIC support.

We attempted to build an internship program two years ago by out-sourcing administration of the program to the campus career center. While fairly successful in placing students, the out-sourcing approach was not effective in building stronger links with Oregon high-tech industry. The new proposal takes the internship program in-house and places responsibility with a CIS faculty member. Professor Virginia Lo is currently 0.5FTE; the proposed funding adds 0.25FTE to support a revitalized internship program. An additional 0.25FTE is slated to support programs for improving recruitment and retention of under-represented groups in computer science, with a particular focus on women in computer science.

Students over-reacted to the dot-com boom, and now potential computer science students are over-reacting to the slump in the high-tech economy. In this climate, it is important not only to provide attractive programs, but to communicate to the brightest high school students in Oregon and surrounding states that computer science remains an attractive field of study, rewarding both intellectually and economically, and that a first class computer science education can be obtained in Oregon. While the overall UO CIS proposal budget is drastically decreased from the original ETIC plan for 03-05, we have actually added a line item for student recruitment. This includes outreach efforts to high school teachers and counselors in addition to (primarily web-based) outreach directly to high school students, as well as a modest number of freshman scholarships.

MSI Investment Rationale

The faculty of MSI responded to input from our industrial partners, creating a nationally unique Masters Internship program that was extended in this current biennium to the Ph.D. program. MSI and the University of Oregon have invested over $1,500,000 in matching funds for proposals, and faculty have attracted over $3,500,000 in federal funding specifically for laboratory equipment and stipend support for the Masters and Ph.D. Internship programs. It is important to note that during this period of teaching overloads, MSI faculty actually increased their average federal research grant level from $205,000 to over $350,000 per faculty member.

We have requested support for one faculty position, associated faculty start-up funds and a small amount of funds for a recruiting coordinator for our graduate internship program. These funds will cut the teaching overloads of MSI faculty participating in these programs by a factor of two. Since the faculty teaching these overloads are among the most productive in MSI, we anticipate an increase in research funding beyond that expected from the new hire. These faculty members are committed to using the time released on developing new opportunities such as CAMCOR, and a successful proposal for an NSF Undergraduate Research Centers targeted in the joint SOU-UO ETIC request.

Faculty members teaching in the Internship courses continue to be innovative, creating two new programs – CHIP Camp and POLY Camp – designed to make chemistry and physics students aware of the importance of basic science and the career opportunities available to them in the semiconductor and polymer industries. These programs target students between their sophomore and junior years of undergraduate studies, providing them with an expense-paid week at the University of Oregon exploring science in the context of technology and career opportunities. Almost 30 students will be participating in these programs this coming summer.

Results in CIS

The key results in CIS will be a higher quality program with a reputation and offerings that attract more and better undergraduate and graduate students, including top students who would otherwise choose a field other than computer science or a university outside of Oregon. This includes students who demand the breadth of a comprehensive research university, but who may not be attracted to an engineering school. Further, links with Oregon industry will be improved through a strong internship program.

NRC ranking: from 61st (the most recent ranking of 1993) to 48th (+21%)
Internships: From 1999 baseline of 10 to 30 in 2006 (200% increase)
SAT percentile of incoming freshmen: From 1999 baseline of 66 to 82 in 2006 (+24%)
ECS Bachelors degrees: From 1999 baseline of 58 to 92 in 2006 (+58%), increasing to 116 (+100%) by 2009.
ECS graduate degrees: From 1999 baseline of 19 to 30 in 2006 (+58%)
Women ECS graduates: From 8% 1999 baseline to 12% in 2006 (+50%)

Results in MSI

MSI has created a nationally unique program that has supplied significant numbers of skilled individuals into the high tech work force in Oregon. Our Chemistry department is ranked 7th in the nation in the number of Masters degrees given as a result of the Internship Masters program. Importantly, the majority of these individuals remain employed in Oregon. These programs are already being copied by other schools (North Carolina State, for example). The requested funding will reduce the need for faculty to teach overloads to run the program and increase our recruiting efforts. MSI faculty will attract additional grant dollars and develop new innovative programs.

During the recent economic downturn, all of the internship programs maintained their internship placements. As the economy comes out of its current recession, we anticipate significant growth in the number of participants in all programs. During the current biennium, we have developed the infrastructure (via both donations from companies and successful federal proposals) to teach more students and have added several new modules suggested by our industrial partners to each program. This evolution, based on "customer" feedback, will continue to be used to continually improve the programs.

Significantly, these programs are helping to change the attitudes in academia towards interactions with industry. It is now recognized that our Ph.D. interns have had valuable scientific and career experiences during their industrial internships. While more data are required, internships may actually shorten the time required to get a Ph.D. The success of the Polymer program lead several chemical manufactures to contact organic chemists in MSI regarding the creation of a program targeted at "Green" process organic chemistry. This program, modeled after the intensive Semiconductor and Polymer programs, started in the summer of 2002.

It is not a gamble by ETIC to recognize and reward the innovation and energy of the MSI faculty in creating the internship programs. The requested ETIC investment, which will be used to attract the best faculty candidates for this purpose, will be matched by the University of Oregon, providing the long-term support for these new hires beyond the biennium of ETIC support. Thus, the internship program will achieve the stable faculty resource it needs to continue and grow into the future.

Proposed Investment and Private Support Forecast ($M)

	7/1/03-6/30/04	7/1/04-6/30/05	Total
Proposed OUS Investment ($M)			
Support of existing faculty (1)	240,220		240,220
Funds tied to existing programs (2)	400,000	400,000	800,000
New programs (3)			0
Distributed informatics	85,000	120,000	205,000
Internships	54,340	56,515	110,855
Student recruiting	15,000	20,000	35,000
Diversity	54,340	56,515	110,855
Subtotal new programs	208680	253030	461,710
Total OUS investment	848,900	653,030	1,501,930
Expected private support ($M) (4)	1,738,063	1,902,077	3,640,140
Total ($M)			5,142,070
Faculty Supported (FTE)			
Existing (1)	1	1	1
New (5)	1	1	1
Total	2	2	2
Notes:			
(1) Hired with ETIC funds through June 2003.			

CIS - Metrics Forecast:

	Baseline	Projected			
	AY 99	**AY04**	**AY05**	**AY06**	**AY09**
Average SAT/ACT percentile of incoming freshmen (1)	66%	78%	80%	82%	84%
Average GRE percentile of incoming grad. students (2)	88%	89%	90%	90%	90%
Women graduating from ECS programs (5)	8%	8%	10%	12%	14%
Minorities graduating from ECS programs (5)(6)	unknown	5%	5%	7%	8%
ECS undergraduate student credit hours	13,925	10,000	12,000	14,000	16,000
ECS bachelors degrees granted	58	75	83	92	116
ECS graduate student credit hours	2254	2300	2385	2385	2500
ECS graduate degrees granted	19	25	27	30	36
Pre-college contact hours (8)					
(9)					

Notes:

(1) If your applicants are required to submit SAT scores, use the percentile corresponding to the average composite SAT score of those submitting them. If they have the choice of SAT and ACT, use the average composite SAT score and the average composite ACT score, convert them to percentiles, and compute a weighted average of the two.

(2) Percentile based on the average quantitative score over those submitting such scores; ignore verbal and analytic scores.

(3) As a percent of those taking it for the first time

(4) As a percent of all those entering

(5) As a percent of all those graduating

(6) Racial and ethnic minorities who are US citizens or permanent residents

(7) Forecasts for multiple programs and departments are encouraged. Each ranking should be footnoted with the ranking body or ranking methodology.

(8) Pre-college students participating in pre-college engineering, technology, computer science, math, and science programs

(9) Add additional metrics as appropriate

MSI - Metrics Forecast:

	Baseline	Projected			
	AY 99	AY04	AY05	AY06	AY09
Total research expenditures per year	2,880,000	6,000,000	6,500,000	7,000,000	8,000,000
Average GPA of incoming freshmen	3.4	3.6	3.7	3.7	3.7
Average SAT/ACT percentile of incoming freshmen (1)	66%	80%	80%	80%	80%
Average GRE percentile of incoming grad. students (2)	70%	75%	80%	80%	80%
Pass rate of Fundamental of Engineering (3)	NA	NA	NA	NA	NA
Women entering ECS programs (4)	28%	35%	35%	40%	40%
Women graduating from ECS programs (5)	25%	30%	30%	30%	35%
Minorities entering ECS programs (4)(6)	2%	5%	8%	10%	10%
Minorities graduating from ECS programs (5)(6)	2%	5%	8%	10%	10%
ECS undergraduate student credit hours	NA	NA	NA	NA	NA
ECS bachelors degrees granted	NA	NA	NA	NA	NA
ECS graduate student credit hours	190	1000	1200	1400	1600
ECS internship masters degrees granted	2	15	18	21	25
National ranking of <program or department> (7)(10)	See note	below			
Ranking of total federal expenditures as if all chemistry .	91	top 50	top 50	top 50	top 40
Ranking of total federal expenditures as if all physics .	83	top 50	top 50	top 50	top 40
Ranking of total federal expenditures as if materials dept.	31	top 25	top 25	top 25	top 20
National ranking of <college>	NA	NA	NA	NA	NA
Pre-college contact hours (8)	NA	NA	NA	NA	NA
Licenses sold (9)	0	1	1	1	1

Notes:

(1) If your applicants are required to submit SAT scores, use the percentile corresponding to the average composite SAT score of those submitting them. If they have the choice of SAT and ACT, use the average composite SAT score and the average composite ACT score, convert them to percentiles, and compute a weighted average of the two.

(2) Percentile based on the average quantitative score over those submitting such scores; ignore verbal and analytic scores.

(3) As a percent of those taking it for the first time

(4) As a percent of all those entering

(5) As a percent of all those graduating

(10) Since the MSI is an institute, not a department, we are invisible to most national rankings. MSI's status as an institute, however, makes it much more able to respond to opportunities. There would be definite losses in MSI becoming a department.

To address the issue of National rankings, we have examined the basis for the ratings given by various sources (US News and World Report, Chemical and Engineering News, …). While several are based on opinion polls, we believe the most impartial rankings are based on federal research dollars obtained. This data is collected nationally by NSF and is published yearly with breakouts based on disciplines – chemistry, physics and materials. We will determine the federal research expenditures generated by the institute (using the numbers reported to the federal government) and then compare the total dollars from chemistry, physics and materials with those from other institutions across the country. These are hard numbers that cannot be fudged. The figures for academic year 1999 are detailed as follows.

Total federal research expenditures from MSI faculty - $2,257,000
Average federal research expenditures/MSI faculty - $205,000

MSI's funding level would place it 92nd with respect to chemistry funding, 84th with respect to physics funding, and 31st as a metallurgical/materials department. Given the small number of MSI faculty in 1999 (eleven), these rankings are actually quite good. For example, the chemistry-related funds at University of Texas at Austin were generated by more than 60 faculty in both their chemistry and biochemistry departments. If the ranking were done on the basis of average federal research expenditures per faculty to compensate for the different faculty sizes at each institution, MSI would rank approximately 40th, above the University of Texas at Austin.