

**Engineering and Technology Industry Council
Campus Investment Proposal
Biennium from July 1, 2011 to June 30, 2013**

Campus: Oregon Health & Science University

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Summary of Proposal: [10 to 100 words]

Emerging ocean technologies for ecosystem and human health

We seek to establish Oregon as a leader in ocean technologies and services for anticipating and mitigating impacts of climate change and emerging contaminants on ecosystem and human health.

We capitalize on—and transformatively strengthen—an existing multi-institutional center of excellence: the Center for Coastal Margin Observation and Prediction (CMOP), the only Science and Technology Center of the National Science Foundation ever headquartered in Oregon.

The proposal addresses two substantial challenges: workforce development and academia-industry synergies. Initiatives are of three types: development of educational pathways, faculty recruitment and retention, and technology incubation.

Vision and Goals Statement [10-100words]

The global environmental monitoring technologies market was \$9.1 billion in 2008 and should reach \$13 billion in 2014, a 5.2% compound annual growth rate.

We envision establishing Oregon as an international leader in a niche of that market: emerging ocean technologies for ecosystem and human health.

Capitalizing on CMOP's research on coastal margin observation and prediction—which catalyzes innovation in education, knowledge transfer, and diversity—we will:

- Strategically strengthen an already exceptional core of faculty at OHSU and statewide;
- Establish the multi-institutional educational pathways to sustain specialized workforce development; and
- Bridge traditional “valleys of death” in technology development.

Investment Description

A. Introduction

To establish Oregon as a leader in emerging ocean technologies for ecosystem and human health, we request state investment in three major initiatives:

- I. Faculty and leadership recruitment and retention;
- II. Educational pathways towards workforce development; and
- III. Technology development.

We define technologies as including sensors and platforms, high-performance computing software and hardware, and information technologies.

Each initiative will be implemented in stages, with short (2011-2013 biennium), mid-term (through June 30, 2015) and long-term (beyond 2015) perspectives.

The performance of each initiative will be regularly evaluated via the following mechanisms (besides others in place via ETIC):

- Bi-annual assessment report by an external project management consultant
- Review by the CMOP External Advisory Board which meets annually.
- Review during CMOP site visits, conducted annually by National Science Foundation review teams.

The following sections describe synergies for the investment (B), and specifics for each initiative (C-E). A summary is provided in Section F.

B. Synergies for the investment

All initiatives will capitalize on the following distinctive strengths:

- NSF Science and Technology Centers (STCs) are transformative national programs designed for impact on society and workforce development in a selected science and technology field. They are awarded with the prospect of 10 years of core NSF funding, established through a cooperative agreement with the lead institution. The cooperative agreement is subject to annual and mid-term evaluations.
- Established in 2006, CMOP is one of only two STCs dedicated to the ocean, and the only such center focused on observation and prediction at the highly populated

margin between land and sea. CMOP is also the only major NSF research center (i.e., STC or Engineering Research Center) ever headquartered in Oregon. Besides OHSU (lead institution), anchor partners are Oregon State University and the University of Washington. Outputs of CMOP are already significant, across research, education, knowledge transfer, and broadening participation:

“The EAB is extremely pleased at the continuing development of CMOP. This group of scientists and educators is working as a center and has moved into a position to launch towards major goals and more complex activities and grander challenges. The EAB highly endorses the path this Center is on and sees clearly how it will make a national impact.” CMOP External Advisory Board (EAB), April 16, 2009

- OHSU is unique in its integration of science and engineering in general—and environmental and ocean science and technology, specifically—in a School of Medicine. The OHSU Division of Environmental and Biomolecular Systems (EBS), designed with an innovative gene-to-climate philosophy, provides an intellectual and educational anchor for CMOP, and a bridge towards a range of human health programs. *Note: EBS, a division within the Department of Science and Engineering at OHSU (formerly, Oregon Graduate Institute of Science & Technology, OGI), emerged from the merger in 2002 of two former OGI departments: Environmental Science and Engineering and Biochemistry and Molecular Biology.*
- CMOP has multiple academic partners. In Oregon, these include OUS institutions (OSU and Portland State University), private four-year colleges (Pacific University and Lewis & Clark College), and the Clatsop Community College. We view this broad spectrum of partnerships as essential for transformative impact, statewide, on workforce development and on research with impact on environmental sustainability. Administration-level contacts for the various academic institutions listed above, are:
 - Clatsop Community College: Dr. Stephen Schoonmaker, Vice President of Instruction
 - Lewis & Clark College: Dr. Julio de Paula, Dean, College of Arts and Sciences
 - Oregon State University: Dr. Mark Abbot, Dean, College of Ocean and Atmospheric Sciences
 - Pacific University: Dr. Lesley Hallick, President
 - Portland State University: Dr. Wu-Chi Feng, Department Head, Maseeh College Computer Science Department
- Oregon industries currently collaborating with CMOP include WET Labs, SHARP of America, and Intel Corporation. Other collaborating industries, nationwide, include The Boeing Company, Microsoft, CombiMatrix, Translume, World Precision Instruments, IBM, and Google.
- A part of the CMOP funding comes through variable-duration regional research collaborations, conducted with or funded by national, tribal and state agencies with mandates on coastal margins. Examples include Columbia River Inter-Tribal Fish Commission, National Oceanic and Atmospheric Administration, Bonneville Power

Administration, Corps of Engineers, USGS, Oregon Department of Geology and Mineral Industries and Oregon Department of Environmental Quality.

- The CMOP construct allows for other partnerships to be developed, as determined by strategy and opportunity. The CMOP construct also allows for funds to be competed internally. Starting 2011, CMOP will initiate—with NSF core funding, opportunistically complemented with other funding sources—a formal annual competition opened to students, post-docs, tribal groups, and faculty across partner institutions.

Specifics for each ETIC initiative follow.

C. Initiative I: Faculty and leadership recruitment and retention

Through this initiative, we will strategically add to a core group of exceptionally qualified faculty in areas of fundamental relevance to the stated goal. All faculty will have CMOP membership, with established roles and responsibilities, but primary appointments could be made at any CMOP academic partner (or across partners).

July 1, 2011- June 30, 2013: We will:

I.1 Recruit one new and retain two faculty at the OHSU Division of Environmental and Biomolecular Systems, as follows:

- High-performance computing: One faculty hire will be made in an area of ocean and/or climate modeling, with relevance for sustainable environmental management. This will be a new recruitment which will begin in FY12 with a start date at the beginning of FY13. Among the preference criteria will be the potential to develop a working synergy with a CMOP industry partner. Wilfred Pinfold, from Intel Corporation, will serve in the search committee.
- Trans-disciplinary integration: This will represent retention of a junior faculty (Dr. Tawnya Peterson), who has shown exceptional potential as a faculty able to advance sensing technologies and to integrate leading-edge biological sensors in gene-to-climate thinking towards environmental sustainability.
- Development of new sensors: This also represents a retention of a junior faculty (Dr. Joe Needoba), who is a major driving force within CMOP for the advancement or new development of chemical sensors, most often in partnership with industry.

I.2 Recruit a CMOP Associate Director for Industry Relations, charged with creating and implementing a long-term business plan for a program that addresses the “valley of death” in ocean technology development, by:

- bringing together faculty, industry, and investors, through short-term (up to two years) funding opportunities that are not restricted to any particular stage of technology development, but rather are directed at overcoming barriers that are time critical or for which no adequate alternative funding mechanisms exist—wherever they might be in the development-to-production pipeline.

- taking advantage of the extensive and sophisticated ocean observing capabilities of CMOP (e.g., see http://www.stccmop.org/datamart/observation_network), to field test and evaluate emerging technologies.
- help establish educational pipelines into and from industry, including creating opportunities (internships, thesis projects) for M.S. and Ph.D. students in industry, cross-environment short sabbaticals for faculty and industry staff, and teaching opportunities for industry staff.

The business plan will require this position, and associated infrastructure, to evolve towards funding self-sufficiency in a defined timeline. The position will support activities both at OHSU and across partner institutions.

July 1, 2013- June 30, 2015: We will

I.1 We will continue to invest in the faculty hired or retained in the previous biennium. In general, we target a five-year window of investment for the ramp-up of each junior faculty, valued typically at \$700K/faculty.

We will also recruit two additional faculty in fields and institutions to be determined by late 2012. The selection process will be led by CMOP (through its multi-institutional Senior Management Team and its national External Advisory Board), in coordination with and approval by academic departments and senior administrations across eligible institutions. Criteria for eligibility and selection will be consistent with:

- Contributing to Oregon leadership in emerging ocean technologies for ecosystem and human health.
- Creating statewide synergies across academic institutions, and with industry – within the CMOP framework and consistent with ETIC funding eligibility.
- Having measurable impact on an educational pathway towards sustainable workforce development.
- Having measurable impact on the development, testing and marketing of technology with or by industry.

I.2. We will continue to support the CMOP Associate Director for Industry Relations and associated infrastructure (partial support, according to business plan to be agreed upon at time of hiring).

July 1, 2015 and beyond: We will

I.1 Conclude the cycle of funding for faculty recruited in the previous biennia, consistently with a multi-year total ramp-up cycle per faculty.

We will also recruit one additional faculty in a field and institution to be determined.

I.2. Conclude the cycle of partial funding for the CMOP Associate Director for Industry Relations and associated infrastructure by year 6.

D. Initiative II: Educational pathways towards workforce development

Through this initiative, we will add critical mass and steer programmatically promising CMOP-related efforts in the development of educational pathways. These pathways will support the sustainable tenure of Oregon as a leader in emerging ocean technologies for ecosystem and human health. Our goal is to increase numbers, quality and diversity of students that receive MS and PhD degrees in relevant fields, from OHSU and other Oregon universities

We recognize the need for holistic pathways of education, and CMOP educational initiatives do span the K-gray continuum (i.e., from K-12 through professional experiences). However, this proposal concentrates on activities at college and graduate levels.

An important consideration across the development of all educational pathways described below will be broadening participation. CMOP has strategies in place (and recent track record in recruitment) to engage a range of groups underrepresented in Science & Technology. Of likely direct impact in the proposed activities, we are working with Paul Lumley, Executive Director of the Columbia River Inter-Tribal Fish Commission, towards a joint long-term vision and strategy to enhance workforce development among American Indians.

July 1, 2011- June 30, 2013: We will:

- II.1 Add critical mass to the CMOP summer undergraduate internship program started in 2007. This very successful program brings students from across the country to Oregon, to conduct inter-disciplinary team-based research in CMOP projects. Each undergraduate is mentored by a junior scientist (graduate students and post-docs) under the supervision of teams of senior mentors (faculty or external experts). The program has grown to 18 students, but funding is on a year-per-year basis. We request support for 8 interns per year to support projects on emerging ocean technologies for ecosystem and human health.
- II.2 Add critical mass to a new track in Estuarine and Ocean Systems of the MS and PhD programs in the Division of Environmental and Biomolecular Systems at OHSU. We request stipends and fees to support 4 graduate students per year. It is anticipated that this program will be fully established by the end of year 6.
- II.3 Develop a new Professional Science Masters program, Environmental Systems and Human Health, which will support Oregon's leadership in ocean technologies for ecosystem and human health. This program will be developed in collaboration with other departments at OHSU (e.g., Public Health and Preventative Medicine) and partner universities and four-year colleges and will combine interdisciplinary science education with value added courses providing practical training in areas such as project management, environmental law, intellectual property law, marketing and commercialization, etc. Funds are requested for a 0.5 FTE program coordinator and for stipends to support students. It is anticipated that this program will become self-supporting by the end of year 6.

II.4 Design a system of course shareware to assist universities throughout Oregon in delivering high-quality, cost-efficient classroom teaching in support of the educational pathway, including but not limited to the MS and PhD programs identified above.

July 1, 2013- June 30, 2015: We will continue all activities within this initiative, at about the same funding levels.

July 1, 2015 and beyond: We will ramp-down the need for investment in all activities. All initiatives will become self-supported by 2019.

E. Initiative III: Technology development

Through this initiative, we will facilitate new technologies to be advanced into production, through targeted projects typically involving at least a CMOP investigator and an industry partner. Funding might occur at various phases of technology development, testing and marketing.

Four projects will be conducted in the first biennium, based on already identified CMOP priorities. Three projects (two at OHSU and one at OSU) will be on microbial and biogeochemical sensors for in-situ deployment, all of which are currently in conceptualization, development, or field evaluation. A fourth project (at PSU) will be on information technology for storage and retrieval of sparse biological and biogeochemical data from laboratory experiments and field observations. For other biennia, internal CMOP-wide competition will determine the projects to be proposed to ETIC.

In each biennia, we anticipate to fund 3-5 projects, at a total of approximately \$200K/y.

F. Summary of investment (and fit to ETIC priorities)

The table below summarizes the request for the 2011-2013 biennium, and provides an estimate of the anticipated investment needs for 2013-2020. The 2013-2020 estimated investment will be refined in later biennia.

Initiative	2011-2013* (in thousands)	2013-2020* (in thousands)	Fit to ETIC
I. Hiring and retention			
I.1 Faculty	\$764	\$3264	Increases Oregon's expertise in ocean technologies for ecosystem and human health; provides more courses and training opportunities for students.
I.2 Assoc. Dir. Industry Relations	\$305	\$330	Enhances technology transfer and commercialization; facilitates workforce development through training and provides new pipelines between industry and the universities
II. Workforce Development			
II.1 Summer interns	\$114	\$315	Attracts new undergraduates into the field.
II.2 Ph.D. students (OHSU)	\$256	\$559	Training students provides an educated and experienced workforce for potential employers.
II.3 Professional Science Master's program	\$335	\$732	Training students provides an educated and experienced workforce for potential employers and with practical skills required of managers.
II.4 Course shareware	\$51	\$133	Expands the potential course offerings universities across Oregon can provide
III. Technology R&D			
III.1 Pool at OHSU	\$203	\$563	Technology development. Enhanced industry-academia collaborations.
III.2 Pool- unspecified		\$563	Technology development. Enhanced industry-academia collaborations. [note: this category is for funds to be allocated in future biennia to CMOP partners based on merit]
III.3 Pool-PSU	\$102	0	Technology development. Enhanced industry-academia collaborations.
III.4 Pool-OSU	\$102	0	Technology development. Enhanced industry-academia collaborations.
TOTAL	\$2,232	\$6460	

*includes 3% per year inflation

Private Support and Other Support

For the 2011-2013 biennium, we anticipate receiving an endowment allocation from of \$1,700,000 for EBS and \$600,000 for CMOP. Thus total private funding for our project is \$2,300,000.

For other sources of support for the 2011-2013 biennium. pending normal continuation of NSF funding, we estimate based on prior experience, that the center of excellence addressed by this proposal (CMOP) will have the following non-state sources of support:

- Core funding (from NSF): \$8,000,000
- Cost-sharing (from OHSU and partner institutions): \$2,400,000 (of which ~\$600 is from the allocation of endowment funds)
- From other sources: ~\$2,000,000 in grants and contracts.

In addition, the observation network maintained by CMOP in the Columbia River, which is integral to all its research and education activities, received in 2009 a \$500,000 field equipment award from the Murdock Foundation, the impact of which will continue to be felt through the 2011-2013 biennium and beyond.

Results and Benefits

The short term and long term initiatives have been described above in detail. In the short term we expect to:

1. a) Retain two very recent hires and recruit one new faculty member to OHSU. ETIC funds will ensure the success of the recent hires (one of which has received modest ETIC support during the last two years) and the recruitment of a new faculty in an area (high-performance ocean modeling) of strategic importance.
b) Recruit a Ph.D. level staff person to serve in a role of Associate Director of Industry Relations. This person will serve as a liaison for both technology and workforce development with industry.
2. Strengthen educational pathways for workforce development through undergraduate and graduate student training and developing a new Professional Science Master's program to serve the needs of Oregon industries.
3. Perform research on new technologies for coastal margin monitoring and prediction that have commercialization potential as products or services.

In the long term we expect:

1. a) To recruit 3 new faculty into the program to have appointments at OHSU *or* affiliated institutions and that new faculty and faculty retained will be well on their way to establishing their research portfolios.
b) The Associate Director for Industry Relations will be making a measureable impact on workforce development and commercialization of products or services, thus providing a mechanism to transition this person to an internally supported position.
2. We will have trained and placed our early cohorts of M.S. and Ph.D. students into jobs in the State of Oregon.
3. We will have developed our first technologies for commercialization.

Our proposal answers the challenges put forth in the ETIC criteria for successful programs:

Centers of Excellence

Consistent with strategy: Our program fits directly into the Sustainable Engineering theme. The sustainable management of Columbia River coastal margin, a regional focus of the CMOP research, is an urgent need with far reaching implications on the economy, environmental health and health and quality of life of populations across Oregon and the Pacific Northwest.

Leverages existing strengths: Leverages CMOP, leverages statewide CMOP partnerships, leverages industry partnerships of CMOP, leverages our interdisciplinary focus in the Division of Environmental and Biomolecular Systems (EBS), and leverages EBS' home in the OHSU School of Medicine.

Strong growth opportunity: Environmental technologies are a growing market. As mentioned earlier, the global environmental monitoring technologies market should reach \$13 billion in 2014, a 5.2% compound annual growth rate.

Collaboration: We are already collaborating with other Oregon universities, four-year colleges, and industries and our proposal will expand this further and develop two-way pipelines for workforce development. CMOP is already a center of excellence

Commercialization: Our research is developing new technologies for chemical and biological sensors, informatics, and prediction modeling which have potential for commercialization.

Benefits Oregonians: The Northwest has the potential to be a hot bed for observational and prediction technology and products. New jobs in both industries that support the hardware/technology and agencies that use the data are anticipated to grow substantially in the coming decades.

2X increase in work-ready graduates

Forecasted results: This is a relatively new area of technology and new jobs are expected to result. Our new Professional Science Masters program should provide work-ready technical graduates.

Educational capacity & productivity: We propose to increase our educational offerings through course shareware, augmentation of our EOS track and development of the new Professional Science Masters program.

Outreach: Take advantage of CMOPs well-developed program and to augment undergraduate intern programs to attract students to the new careers opportunities presented.

5X increase in externally funded research

Forecasted results: The CMOP grant has already achieved some success in this area, but this is a growing area of research and one of national and international impact.

Research capacity & productivity: We are proposing to increase faculty, increase the number of students, and increase the number of students in the pipeline for our programs (through summer internships).

General

Private support ratio: We have at least equivalent matching funds in the form of private support. If you account for other non-state funding we'll have a leverage of >5:1.

Track record: Aided by modest prior investment from ETIC (\$200K), EBS has been able to conceptualize and partner statewide and beyond, to successfully attract the first

ever Science and Technology Center to Oregon, via national competition (CMOP). Prior ETIC contributed—together with OHSU Oregon Opportunity funds—to the hiring of three EBS faculty (Drs. Holly Simon, Joe Needoba and Tawnya Peterson) who are important contributors to CMOP, and are all involved in emerging ocean technology development. EBS and CMOP have partnered to create a new track in MS and PhD degrees. CMOP-driven recruitment strategies have increased the number and diversity of EBS graduate students (implication in graduating numbers will be seen in 2011 and beyond)

Internal consistency: The area of emerging ocean technologies for ecosystem and human health is a priority for both CMOP and EBS, and is integral to their research and educational missions. This area is an anticipated bridge to other units within the OHSU School of Medicine, and to diverse universities statewide—including CMOP partners at the Maseeh College Computer Science Department at PSU (contact: Wu-chi Feng, Department Head) and the College of Ocean and Atmospheric Sciences at OSU (contact: Mark Abbott, Dean).

Sustainability: Additional faculty will help provide for more Ph.D. students and the Professional Science Master’s program should provide revenues above what is needed to support the program within 5-6 years.

Future Plans & Resources

We anticipate the following additional requests for ETIC investment, by biennium:

- 2013-2015: \$2,813,700
- 2015-2017: \$2,399,000
- 2017-2019: \$723,600

A justification is provided in the Investment Description section. The outcomes of all initiatives will be self-supported after 2019, through a combination of EBS-raised tuition and research revenues.

Assuming normal continuation of funding, the core NSF funding for CMOP and associated cost-sharing (30% of the NSF funds) are estimated at:

Biennium	NSF funding	Cost-sharing
• 2013-2015:	\$8,000,000	\$2,400,000
• 2015-2017:	\$5,976,000	\$1,792,800
• 2017-2019:	\$0	\$0

A range of proposals for long-term funding will be launched by CMOP in 2013-2019, with the objective to replace the NSF funding and associated cost-sharing. Some of the proposals will target federal funding, others will target private foundations.

In addition, we expect that, under the leadership of the Associate Director for Industry Relations, CMOP will have created some mechanism for sustained industry support, perhaps in the form of an Affiliates Program with membership fees.

Proposed Investment and Private Support Forecast (\$M)

		2011-2013 Biennium
1	Sources of funds	
2	Base budget for ETIC-related programs -- all sources except ETIC allocation & private support	\$ 11,800,000
3	Proposed allocation from ETIC budget (\$M) (3)	\$ 2,229,310
4	Expected private support (\$M) (4)	\$ 2,300,000
5	Total (\$M)	\$ 16,329,310
6	Personnel supported (FTE) (5)	
7	Existing faculty (1)	1.5
8	New faculty(2)	0.5
9	Existing staff (1)	0.0
10	New staff(2)	1.5
11	Total	3.5
12	New positions created (6)	3
13	Faculty (2)	1.0
14	Staff (2)	1.5
15	Total	2.5
16	Uses of ETIC funds in line 3	
17	New facilities	\$ -
18	Improvements to facilities (7)	\$ -
19	Laboratory equipment (7)	\$ -
20	Other equipment (7)	\$ -
21	Other one-time expenses -PROJECTS@OHSU,PSU&OSU	\$ 406,000
22	Existing faculty salaries & benefits (1)	\$ 203,750
23	New faculty salaries & benefits (2)	\$ 235,000
24	Existing staff salaries & benefits (1)	\$ -
25	New staff salaries & benefits (2)	\$ 324,000
26	Services & supplies	\$ 376,300
27	Other - STUDENT STIPENDS&FEES, COURSE SHARE	\$ 684,260
28	Total (8)	\$ 2,229,310
	(1) Hired through June 2011 that will be supported by ETIC funds during 2011-13	
	(2) To be hired with ETIC funds during 2011-2013 biennium.	
	(3) Include any Certificates of Participation to be issued during 2009-2011 biennium.	
	(4) Consistent with ETIC Private Support Policy dated 1-23-02.	
	(5) FTE expressed as percent of full time over 2 years of biennium. For instance, a new full-time faculty member hired on 7/1/12 would be counted as 0.5 because he/she joined half way through the biennium.	
	(6) FTE on an ongoing basis. For instance, if a new half-time position is created but not expected to be filled until the last month of the biennium, it would still be counted as 0.5.	
	(7) Include improvements and equipment to be purchased with ETIC funds and any Certificates of Participation to be issued during the biennium.	
	(8) Totals on line 3 and line 28 should match.	

Metrics Forecast (for programs/departments receiving ETIC funding):

	Actuals (1)(13)		Projected (2)(14)		
	AY 99	AY09	AY13	AY15	AY20
Undergraduate student credit hours	N/A	N/A	N/A	N/A	N/A
Graduate student credit hours	10,018	4,812	1920	2160	2640
Graduation rate, 6-year (3)	87%	73%	85%	85%	85%
Bachelor's degrees granted	N/A	N/A	N/A	N/A	N/A
Master's degrees granted	113	36	8	10	15
PhD degrees granted	16	8	4	4	6
Women graduating (4)	29%	23%	30%	35%	40%
Minorities graduating (5)	21%	18%	10%	15%	20%
Externally-funded research expenditures (6)	15,883,154	12,203,531	11,593,000	12,300,000	14,270,000
Invention disclosures (7)	N/A	23	1 (15)	2 (15)	4 (15)
License/options (8)	N/A	N/A	(15)	(15)	(15)
License income received (9)	N/A	N/A	(15)	(15)	(15)
Spin-off Companies (10)	-	-	(15)	1 (15)	1 (15)
National ranking of <program or department> (11)			(16)	(16)	(16)
National ranking of <college> (12)	N/A	N/A	N/A	N/A	N/A

Notes/instructions. (Delete these notes and replace with your own in the document you submit.)

(1) Actuals for 12-month period ending in June of the year shown.

(2) Forecast for the 12-month period ending in June of the year shown.

(3) Percentage of undergraduate students who started ETIC-Supported program as freshmen six years earlier who have completed bachelor's degree in an ETIC-supported degree.

(4) From engineering, computer science, and other programs directly benefiting from ETIC funding, stated as percent of all those graduating.

(5) Racial and ethnic minorities who are US citizens or permanent residents, stated percent of US citizens or permanent residents graduating.

(6) Total external dollars spent by ETIC-related departments towards research during academic year.

(7) See Association of University Technology Managers (AUTM) survey definitions.

(8) Number of license or option agreements executed during the year. See AUTM survey definitions.

(9) License issue fees, payments under options, annual minimums, running royalties, termination payments, the amount of equity received when cashed in, and software end-user license fees equal to \$1000 or more, but not research funding, patent expense reimbursement, valuation of equity not cashed-in, or end-user license fees less than \$1000. See AUTM survey definitions.

(10) New companies that were dependent on the licensing of your program's technology for their initiation. See AUTM survey definitions.

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

(12) Add additional metrics as appropriate.

additional footnotes:

(13) These numbers are inclusive of the three divisions within the Department of Science and Engineering - Biomedical Engineering, Biomedical Computer Science and Environmental and Biomolecular Systems

(14) These numbers are for the Division of Environmental and Biomolecular Systems plus the Center for Coastal Margin Observation and Prediction (CMOP)

(15) This is a new effort on the part of EBS/CMOP. The recruitment of a person in Industry Relations should facilitate commercialization activities which we see as an important component of our ETIC request.

(16) CMOP is one of only 17 NSF-funded Science and Technology Centers in the U.S.