



## UNIVERSITY OF WASHINGTON

OFFICE OF THE DEAN  
*College of Engineering*

February 11, 1999

Brotman Award Selection Committee  
Teaching Academy  
Office of Undergraduate Education  
Box 351209

Dear Colleagues:

I take enormous pleasure in nominating the Department of Computer Science & Engineering (CSE) for the inaugural Brotman Awards for Instructional Excellence. CSE exemplifies the integration of research and education and therefore provides truly outstanding undergraduate and graduate education. CSE is one of a handful of UW programs consistently ranked in the top ten in their field at the doctoral level – currently 9<sup>th</sup> by the National Research Council for faculty quality, 6<sup>th</sup> by the National Research Council for graduate program effectiveness, 7<sup>th</sup> by *US News* in Computer Science, and 10<sup>th</sup> by *US News* in Computer Engineering (out of more than 100 programs in each case). Recent CSE graduates have received offers from essentially every top academic department and industrial research laboratory, and dozens of the department's recent graduates populate these outstanding programs.

What is *truly* unique about CSE, though, is the way in which this excellence in graduate education and research is complemented by – and contributes to – excellence in undergraduate major education, introductory education, institutional educational leadership, and community educational outreach. Excellence in these four complementary areas, and in particular the seamless confluence of research and education achieved by CSE, is the foundation of my nomination and the reason that CSE should receive a Brotman Award.

### UNDERGRADUATE MAJOR EDUCATION

Computer Science & Engineering Chair Ed Lazowska has long been a vocal and effective proponent for the type of education that a research institution is uniquely able to provide: an education that brings outstanding students to the forefront of knowledge in close partnership with the faculty. CSE's two undergraduate major programs – Computer Science (offered through the College of Arts & Sciences) and Computer Engineering (offered through the College of Engineering) – attract the strongest students at the University of Washington. Among the reasons these students choose CSE:

Undergraduates participate extensively as teaching assistants in the department's courses, a practice that enhances the learning experience both for the students in these courses and for the undergraduate TAs. Even today this is not a common practice at UW, but CSE has been doing it for a decade with great success.

Similarly, undergraduates participate extensively in the research life of the department and have been doing this long before it became fashionable. Often these students begin their close association with faculty as TAs, then progress to RAs. When Professor David Salesin founded Numinous Technologies, Inc., a computer graphics spinoff, every technology that the company licensed from UW had at least one undergraduate co-inventor.

The department's Capstone Design Courses provide a unique and intensive learning experience in which teams of seniors undertake significant computer system design and implementation projects in order to synthesize the knowledge they have gained throughout their studies. Topics in the past few years have included integrated circuits, embedded systems, computer animation, videogames, software engineering, and computer telephony. These courses typically are co-designed and co-taught by industry professionals and have a significant interdisciplinary character.

Let me describe one example of such a capstone course in more detail:

Three years ago, Professor David Salesin worked with Art Professor Shawn Brixey and Music Professor Richard Karpen to obtain a donation from Silicon Graphics, Inc., to establish the Laboratory for Animation Art (LA<sup>2</sup>). Using the facilities in LA<sup>2</sup>, Salesin then created a nationally unique course on computer animation. In this course, teams of students from Art, Music, and CSE learn all aspects of computer animation, then produce a two-minute animated "short subject." Co-instructors have included Annabella Serra from RainSound, Cassidy Curtis from Pacific Data Images, and Ronen Barzel from Pixar Animation Studios. As a result, Pixar hired two students and the undergraduate TA from the course in which Ronen participated. In the past three years, the students' works in animation have been accepted into a dozen highly competitive national and international animation festivals, and the course has been profiled in the *Chronicle of Higher Education* and in local and regional print and broadcast news.

CSE has produced a CD-ROM containing 17 minutes of video footage describing three of CSE's Capstone Design Courses from Spring 1998: Software System Design, Computer Animation, and Embedded Systems. The CD-ROM also contains the *Chronicle* article concerning the Computer Animation course.

Throughout the curriculum, state-of-the-art instructional laboratories are made possible by hardware and software donations negotiated with the department's research partners. Companies such as Silicon Graphics, Intel, Microsoft, Visio, and WRQ completely equip these laboratories. In addition, the software company partners provide free software for the personal systems of undergraduate majors, a program that to our knowledge is available nowhere else in the nation.

Written and verbal communication skills are being integrated into the curriculum in a unique way through co-registration in Technical Communication 333 and CSE 477 (the Embedded Systems Capstone Design Course) – "linked courses" in the educational vernacular. The writing and presentation assignments for TC 333 are further perfected to become the project reports and presentations for CSE 477.

Excellence in teaching receives tremendous emphasis, and the results are evident in the classroom. It has always been the custom in CSE that every course taught by every faculty member, regardless of rank, receives student evaluations every quarter. Histograms of student evaluations are distributed each quarter so that faculty and TAs know where they stand. Within the past five years, three CSE faculty members have been nominated for and received the University of Washington Distinguished Teaching Award. The undergraduate student society was encouraged to create a departmental teaching award, which it presents annually. Center for Instructional Development and Research (CIDR) is used extensively, not only for instructor diagnosis but also for the creation of an innovative TA training program that has been widely emulated on campus. An annual TA award was created more than a dozen years ago. Self-evaluations and peer-evaluations of teaching are exceedingly thoughtful; this is particularly evident to me when CSE presents faculty to the College for promotion and tenure.

## INTRODUCTORY EDUCATION

CSE's two-quarter introductory course sequence (CSE 142 and 143) is now taken by nearly 2,500 students annually – nearly 1600 in the first course, and nearly 900 in the second course. Only five years ago, the annual enrollment was less than 700. What has caused this change? Partly it is the excitement of the field, but it is also the extraordinary effort that CSE has devoted to creating a truly first-rate course and experience. Some specific examples:

These courses were among the first at UW to make aggressive use of the World Wide Web. For a half dozen years, the courses' web sites have included every assignment, exam, and solution (including "best student solutions" to programming exercises in both source code and executable form). Immediately following each lecture, the transparencies used by the instructor are made available on the web, where they can be accessed at home or in the dorm. Once each year, the audio from the lectures is recorded and synchronized with the transparencies, then archived on the web – a particular asset for non-native speakers who have difficulty comprehending the lectures in real time. The web pages from five previous quarters are maintained on-line, thereby improving education and leveling the playing field by providing all students with access to previous examinations, assignments, and solutions.

In partnership with the Office of Undergraduate Education, a dedicated laboratory was established for CSE 142 and 143. As part of this transition, these courses were moved from Macintoshes to PCs, in order to better tap the personal systems of UW students, who predominately own PCs rather than Macintoshes. Support for computing on personal systems has been provided at such a high level that fully 60% of the students in these courses do all of their computing outside of the dedicated lab – a tremendous savings for UW. This support includes, for example, what to our knowledge is the first use in the nation of *teleconsulting*, in which Microsoft tools are used to allow a consultant to converse online with a remote student via Internet "chat" or audio, and to "take over" the program editor on the remote student's system to help the student solve his or her problem.

CSE is now partnering with the renovated School of Library and Information Science to design and introduce a course on Information Technology (IT) Fluency for "the other 2000" UW freshmen. This course, CSE 100, will first be taught in Spring 1999 by CSE Professor Larry Snyder, who is chairing a National Research Council study commission on IT Fluency.

## INSTITUTIONAL EDUCATIONAL LEADERSHIP

CSE has provided strong educational leadership across the campus. A few specific examples

CSE worked extensively with UWired to bring information literacy to freshmen through the original UWired Freshman Interest Group program.

CSE runs seminars on educational technology and distance learning for the campus community, sharing the knowledge it has gained through its cutting-edge initiatives.

CSE has been a catalyst for interdisciplinary education at both the undergraduate and graduate level. The Computer Animation Capstone Design Course, described above, is a wonderful example at the undergraduate level. At the graduate level, CSE has partnered with the Business School to create and teach a course on Software Entrepreneurship, which enrolls equal numbers of CSE and Business students and features outstanding guest speakers from the region's software and venture capital firms. CSE also is a partner in the Business School's Entrepreneurship Lecture Series. The CSE's research and educational partnerships with the Department of Molecular Biotechnology are well known, and are reaping great rewards for the University.

CSE's affirmative action programs are a model for the campus. Funded by a donation from alumnus Jeremy Jaech (co-founder of Aldus and co-founder and current CEO of Visio) and his wife, these programs focus on students from under-represented groups interested in pursuing computer science and computer engineering, and on preparing these students for success. Example activities include:

- The widespread annual distribution of a CD-ROM describing Capstone Design Courses.
- Partnerships with Microsoft and other companies to identify and recruit students from under-represented groups.
- Aggressive participation in the ALVA program, which places groups of pre-freshmen in industrial R&D settings for summer employment and calculus instruction.
- Special sections in introductory courses for "limited background" students.
- A wide variety of tutoring programs for pre-majors and majors who require special assistance.

#### COMMUNITY EDUCATIONAL OUTREACH

CSE has been highly responsive to the educational needs of the community beyond the campus in an intelligently selective way. Here are some examples:

CSE's colloquium series, which brings to the campus twice each week national leaders in computer science and computer engineering, is webcast live (both audio and video), so that it is available on the desktops of computing professionals throughout the region. The CSE colloquium series also is archived on the web for on-demand access, delayed-broadcast on UWTV, and, through UWTV's partnerships, broadcast throughout the state and nationally. In partnership with Microsoft, a website has been created that now provides the live and archived computer science colloquia from UW, Stanford, MIT, Carnegie Mellon, Microsoft Research, and Xerox PARC – a true national resource.

Working with the Provost's Office, the Office of Educational Outreach, and Computing & Communications, CSE introduced three years ago a Professional Masters Program (PMP) that meets the needs of fully-employed professionals in the state's burgeoning information technology industry. The PMP has been an enormous success. It currently enrolls 120 students from more than two dozen companies, students whose GRE scores match those in the department's top-ten Ph.D. program. Classes are available in the evening, via videoconferenced and Internet-based distance learning, and on-demand on the web. A unique combination of audio/video with web-based transparencies provides high production quality with modest bandwidth requirements.

For students who need certificate-level training in modern information technology skills, CSE has partnered with the Office of Educational Outreach to design and deploy nine different certificate programs which today generate roughly 1,500 course enrollments and grant about 500 certificates each year.

Recognizing the importance of a higher quality of introductory computer programming instruction statewide, CSE has worked extensively with Washington's community and technical colleges, in conjunction with the Office of Educational Partnerships and the College of Engineering. Activities have included:

- Campus gatherings of community college instructors.
- Sabbatical visits by community college instructors.
- A Microsoft-sponsored one-week summer institute for two instructors from each community and technical college in the state.
- An exciting program in which community college instructors use Tutored Digital Video Instruction (TVI) to provide UW content to their students. TVI has only been used previously at Stanford University to provide Engineering Master's degrees to fully-employed engineering professionals. Jim Gibbons, former dean of Engineering at Stanford and the inventor of TVI, is working with UW CSE in its community college TDVI initiative.

Recognizing the importance of alternatives for the students who cannot be accommodated in its own undergraduate major programs, CSE has worked with UW Bothell to create Bothell's highly successful Computing & Software Systems program. A similar initiative is now underway with UW Tacoma.

CSE Chair Ed Lazowska received the 1998 University of Washington Outstanding Public Service Award on behalf of the department for spearheading these initiatives and comparable initiatives at the K-12 level in Seattle and statewide.

#### CONCLUSION

The Department of Computer Science & Engineering truly exemplifies the best possible synergism of research and education. In my view, CSE's extraordinary undergraduate major programs with their seamless integration of education and research and their unique interdisciplinary Capstone Design Courses make the department an ideal recipient of the Brotman Award. The addition of the other elements (undergraduate major education, introductory education, institutional educational leadership, and community educational outreach) strengthens this nomination. On behalf of the College of Engineering, I enthusiastically recommend the Department of Computer Science & Engineering for the inaugural Brotman Award for Instructional Excellence.

Sincerely,



Denice D. Denton  
Dean, College of Engineering